URSI 2008

XXIII Simposium Nacional de la Unión Científica Internacional de Radio

Universidad Complutense de Madrid

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Artículos

© XXIII Simposium Nacional de la Unión Científica Internacional de Radio. URSI 2008 – Madrid

Del 22 al 24 de Septiembre de 2008
Grupo de Análisis Seguridad y Sistemas (GASS)
Universidad Complutense de Madrid

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El sabio no dice todo lo que piensa,
pero siempre piensa todo lo que dice

Aristóteles

BIENVENIDA DEL COMITÉ ORGANIZADOR

En nombre del Comité Organizador es un placer dar la bienvenida a todos los participantes del XXIII Simposium Nacional de la Unión Científica Internacional de Radio que se celebra en la Facultad de Informática de la Universidad Complutense de Madrid y que organiza el Grupo de Análisis, Seguridad y Sistemas (GASS), Grupo de Investigación de la mencionada universidad.

Sirvan también estas líneas como agradecimiento a los autores y, especialmente, a los revisores, sin cuyo esfuerzo la celebración del presente evento habría sido imposible, y que hacemos extensible a los patrocinadores y colaboradores por su inestimable ayuda.

Como en pasadas ediciones, URSI 2008 se convierte en un lugar de encuentro entre personas y de intercambio de conocimientos en un campo donde constituye la reunión más importante que, a nivel nacional, se celebra en el campo de las tecnologías de la información y las comunicaciones, contándose este año además con una representativa participación iberoamericana.

La presente edición cuenta, como viene siendo habitual, con las Jornadas de Seguimiento y Evaluación de Proyectos de Investigación del Programa de Tecnología Electrónica y Comunicaciones (Subprograma de Comunicaciones) del Ministerio de Ciencia e Innovación (Jornadas TEC/TCM), y, por primera vez, con las Jornadas de Seguimiento y Evaluación de Proyectos de Investigación del Programa de Tecnología Electrónica y Comunicaciones (Subprograma de Electrónica) del Ministerio de Ciencia e Innovación (Jornadas TEC/MIC).

URSI 2008 incluye además un Workshop sobre Código y Teoría de la Información y otro sobre Procesado de Sonido, que han dado lugar a la incorporación de dos nuevas áreas temáticas dentro del Programa de Sesiones (CTI y PdS, respectivamente), un Tutorial sobre la Federación de Repositorios de Contenidos Digitales Agrega, así como sendos Premios para Jóvenes Investigadores otorgados por la Red Española de Antenas (REsA) y URSI España.

Para finalizar señalar que las actividades científicas del Simposium se complementan con un interesante programa social que espero sea de vuestro agrado.

Os deseo una feliz estancia en Madrid y un provechoso paso por URSI 2008.

Luis Javier García Villalba
Presidente del Comité Organizador URSI 2008

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Lunes 22, 12:00 - 13:00 h — Salón de Actos

Error-Correcting Codes and Their Evolution

Mario Blaum. Hitachi Global Storage Technologies, USA

Conferencia Plenaria

Lunes 22, 13:00 - 13:45 h — Salón de Actos

The Recent Evolution of Antenna Research in Europe: Networking Efforts and Some Practical Results

Juan Ramón Mosig. Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

CONFERENCIA INAUGURAL

Conferencia Inaugural

Lunes 22, 12:00 - 13:00 h Salón de Actos

Error-Correcting Codes and Their Evolution

Mario Blaum

Without a doubt, the title of this talk is pretentious. It is impossible to synthesize in an hour the richness and development of the field since Shannon to our days. I also apologize to the audience for explaining what is obvious to many people.

I will start by revising Shannon's theorem on reliable communication. Surprisingly, in 1948, Shannon found the limitations of error-correcting codes before any codes were known.

I will then try to describe the evolution of error-correcting codes: from single error-correcting codes (Hamming codes), to multiple error correcting codes (like BCH codes), codes over non-binary fields (like Reed-Solomon codes), decoding algorithms (like Berlekamp-Massey), to more recent results, like LDPC (low density parity-check) codes approaching the Shannon limit; and also codes for other applications, like burst-correction.

I will end the talk with a brief review of some of my own results. In particular, I will discuss array codes for correction of erasures, useful for RAID architectures (Redundant Arrays of Independent Disks). These codes deal with large arrays of disks in which one or more disks have failed catastrophically, and we need to retrieve the information stored in them. There are many aspects in this problem; the codes should use optimally their redundancy, i.e., they have to be MDS (Maximum Distance Separable, a concept that will be explained in the talk). But we also want to minimize the number of updates when a single information symbol is updated, and this problem gives rise to another interesting coding problem, closely related with LDPC codes.

CONFERENCIA PLENARIA

Conferencia Plenaria

Lunes 22, 13:00 - 13:45 h Salón de Actos

The Recent Evolution of Antenna Research in Europe: Networking Efforts and Some Practical Results

Juan Ramón Mosig

On January 1st, 2004, the European Network *Antenna Centre of Excellence* (ACE, see http://www.antennasvce.org and http://www.ist-ace.org) was created under the European Framework Programme FP6. With a duration of four years (2004-2007), and a total budget of 13.5 M€, including a direct European Commission contribution of 10.5 M€, the Network ACE had all the chances to strongly act on the European Antenna landscape and deeply change it. At the end of ACE (December 2007), 51 participating Institutions from 17 European countries had inscribed 323 researchers and 130 PhD students in the joint European effort.

ACE has been very successful in structuring the antenna research in Europe. Several strategic lines have been covered by specific activities and partners issued from Academy and Industry have worked together towards common R&D goals.

One of the main concerns of ACE was to ensure the survival of its most relevant innovations beyond the Network lifetime. To this end, considerable efforts were dedicated in the last phase of the Network to the creation of the *European Association of Antennas and Propagation* (EurAAP). This non-profit Association headquartered in Brussels and acting under the European law will hopefully keep alive the strong momentum created by ACE and will provide the legal framework for its relevant activities. The European Conferences on Antennas and Propagation (EuCAP) and the European School of Antennas (ESoA) are but two specific successful initiatives. Other activities (the European antenna software tool, the antenna measurement standardization, the small antennas joint project, the educational and societal initiative ...) have all successfully been continued within EurAAP and are now financially autonomous.

Dissemination aspects haven't being neglected and EurAAP has actively participated to the creation of a *Marconi Wireless Milestone* in Switzerland, endorsed by IEEE and by the International Telecommunications Union (ITU).

In the frame of the EuCAP conferences, EurAAP is seeking active collaborations with other international or world-based Institutions. The third EuCAP in Berlin (March 2009) will be technically supported by the IEEE European Chapters (Region 8) and will include joint sessions with URSI and with AMTA (the Antenna Measurement Techniques Society).

In parallel with EurAAP, ACE decided to make a proposal for one of the new generation European COST Actions, now supported by the European Union through a frame contract with the European Science Foundation.

The proposal was very successful, certainly due at least in part to the high degree of sinergy and maturity reached within ACE. With already 25 participating European countries the new Action IC0603, *Antenna Systems & Sensors for Information Society Technologies* (ASSIST,

http://www.cost-ic0603.org/) is guaranteed to provide for the next four years (2008-2011) the adequate frame and facilities for the EurAAP Activities' meetings.

To give an example among the successful collaboration inspired by ACE and to be continued under EurAAP and COST the second part of this talk will describe a joint research on the design of small antennas for wireless applications.

The need for small terminal antennas designed to fulfill the specific need of mobile communications started roughly 25 years ago with the apparition of the 1st generation of mobile phones. Indeed, the mobile phone service had new and stringent requirements for antennas, which differed from the portable radio link systems which were anterior to them. These new requirements were linked to the fact that this new communication service targeted a broad market. Thus, the handheld had to be small enough to be easily carried, of reasonable weight and low cost to manufacture. The initially selected relative low frequencies gave few degrees of freedom to the antenna designer and the only practical solution was a whip where the handheld itself acted as the ground. The strong development of the second generation of mobile phones in the last decade induced an increase of the carrier frequency, giving thus a little more freedom in the antenna design.

New mobile services like high speed data transfer (WLAN), Bluetooth, ad hoc networks, mobile peer to peer transfer, as well as the competition for the available frequency spectrum have broadened the range of requirements for the antennas which are used on the mobile terminals. These requirements include typical "user defined requirements" like 1) small dimensions; 2) low weight; 3) low induced SAR; 4) low cost. But also requirements that are defined by the service provider or by the network, like 5) high efficiency; 6) capability to handle multiple frequency bands; 7) broadband; 8) robust to changes in the environment; and 9) optimized use of the available channel capacity.

Of course, depending on the considered service, the relative importance of all these requirements will quickly change. For instance, size is far less critical for WLAN system located in a laptop than for a DCS phone. Bandwidth and capacity, however, will be far more critical in the former example.

Considering this, the design of terminal antennas is more than ever the art of defining the right compromise between all the requirements for a specific application. In this talk, we will show some design examples for specific situations and will propose some solutions to meet the design requirements listed above.

ATENCIÓN: PARA ACCEDER AL TEXTO COMPLETO DE CADA ARTÍCULO DESDE EL RESUMEN DEL MISMO HAGA CLIC EN EL ICONO SITUADO AL LADO DERECHO DE LOS AUTORES

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Aplicaciones Biomédicas I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 1

Teclados ambiguos con 1, 2, 3 y 4 celdas para entrada de texto mediante barrido

Julio Miró Borrás, Pablo Andrés Bernabeu Soler

People with severe motor disabilities need augmentative and alternative communication devices that allow them to communicate with each other and access to computers. This paper presents and compares several proposals of ambiguous keyboards with one, two, three and four cells, using scanning techniques and character desambiguation. It also proposes the use of a linguistic model based on character prediction that uses forth order n-grams. Each character is entered by a two stage process. In the first one, the scanning process highlights the cells in statistical order, more probable one first. The user clicks the switch when the desired cell is highlighted. Then, the second stage begins, showing the cell characters sequentially in a probabilistic order, taking into account the previously introduced characters. The best results are for the 3 cell keyboard, reaching a text input rate of 10.32 wpm, for a scan rate of 0.5 seconds.

Célula de cuatro electrodos conmutados para la medida de conductividades de soluciones biológicas

José Luis Sebastián Franco, Sagrario Muñoz San Martín

This work presents an experimental setup specifically designed to measure the electrical conductivity of aqueous specimens. The volume of sample required to make the measurement is only of 110 µl. The system is controlled by a low noise multiplexer that is able to work with signals below 1 µA. Signal and current-voltage phase-shifts are monitored with the aid of a digital scope. Although calibration of the system and different error sources were considered, polarization effects showed to have very little influence on the electrical conductivity measurements in the range 100 kHz-500 kHz.

Sistema de monitorización del comportamiento de pacientes en cama

Paul Bustamante Merino, Nagore Guarretxena San Damián, Gonzalo Solas Zubiaurre, Unai Bilbao Cabezas

Nowadays patients falls constitute a relatively frequent event on elderly people and represent a significant health problem, where the unique effective method to avoid them is having a permanent personnel attention. While more is investigated on the causes originating these falls, bigger knowledge is acquired on the previous behaviour to the falls. This project studies in-bed patient behaviour with the purpose of detecting a fall before it happens, sending an alarm to the complete system.

Obtención de la vascularización arterial ovárica en resonancia magnética mediante separación ciega de fuentes

Juan Ródenas García, José Joaquín Rieta Ibáñez, Roberto Sanz Requena, Luis Martí Bonmatí, Antonio Pellicer

First-pass Dynamic Constrast-Enchanced Magnetic Resonance Imaging (DCE-MRI) is used to assess ovary perfusion. In this study, a method to detect voxels representing arterial tissues, in order to acquire the arterial input function for estimating ovary hemodynamic parameters, is presented. Through the application of Blind Source Separation (BSS) to a set of ovary perfusion Magnetic Resonance images (fifty dynamics, one slice) it was possible to extract the output-independent component representing arterial behaviour. An automated particular selection of the arterial component of interest was obtained, and the implemented algorithm was applied to the rest of slices under study. Therefore, all the slices were processed to get exactly those voxels representing arteries. The results shown in this work permit to conclude that BSS allows distinguishing different blood supply patterns in different kinds of tissues, thus, giving very promising results for the application of BSS to ovary perfusion MR images.

Predicción de la terminación de la fibrilación auricular paroxística mediante transformada Wavelet y entropía muestral

Raúl Alcaraz Martínez, José Joaquín Rieta Ibáñez

Atrial fibrillation (AF) is the most commonly diagnosed sustained supraventricular arrhythmia in clinical practice. The ability to predict if an AF episode terminates spontaneously (paroxysmal AF) or not is a challenging clinical problem. This work presents a robust AF prediction method carried out by estimating, through regularity indexes, the atrial activity (AA) organization increase prior to AF termination. This regularity variation appears as a consequence of the decrease in the number of reentries into the atrial tissue. AA was obtained from surface ECG recordings using an average QRST template cancellation technique. Wavelet transform (WT) was used in a bidomain way (time and frequency) in order to improve organization estimation. Thereafter, a more robust classification process for terminating and non-terminating AF episodes was developed making use of two different wavelet decomposition strategies. Finally, the AA organization both in time and wavelet domains was estimated. Trougth the application of this strategy, 96% of the terminating and non-terminating analyzed AF episodes were correctly classified.

Herramienta mejorada de realidad virtual utilizada en la planificación de los procesos quirúrgicos

Cristina Suárez Mejías, Begoña Acha Piñero, Carmen María Serrano Gotarredona, Tomás Gómez Cía, José María de la Higuera González

In this article we present an improvement of a virtual reality tool, called VirSSPA, developed in our hospital, which allows us to optimize the planning of the surgical processes. The

current version of VirSSPA has the following disadvantages: 1) pixels belonging to the same tissue take different values depending on the image acquisition device, 2) the contrast between the different tissues in the acquired images is frequently low, 3) the segmentation algorithms are manual or semi-automatic, requiring the user to fix a number of parameters, thus the segmentation and subsequent reconstruction are very laborious for physicians and its time cost is very high. To solve these problems we present a preprocessing and segmentation algorithm which significantly improves the VirSSPA surgical planning tool.

Aplicaciones Biomédicas II

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 1

El banco de irradiación in vitro en la banda de 2 GHz del Hospital Ramón y Cajal

Juan Enrique Page de la Vega

This paper describes the experimental setup installed at Hospital Ramon y Cajal (Madrid) to study the effect of S band high power signals modulated by short pulses on in vitro cellular cultures. The setup is already in use in a provisional version and new elements are already available to prepare a new version with higher power and shorter pulses.

Análisis de patrones en imágenes dermatoscópicas basado en campos aleatorios de Markov FSCM en color

Carlos Sánchez Mendoza, Carmen María Serrano Gotarredona, Begoña Acha Piñero

In this paper a method for pattern discrimination in dermoscopic images of abnormally pigmented skin is presented. In order to diagnose a possible skin cancer, physicians assess the lesion according to different rules. While the most spread one remains the ABCD rule (Asymmetry, Border, Color, Diameter), the new trend in Dermatology is to classify the lesion by means of pattern analysis. Due to the color-textured appearance of these patterns, this paper presents a novel method based on a Finite Symmetric Conditional Model (FSCM) Markov Random Field (MRF) color extension for the characterization and discrimination of different pigmentation patterns.

Algoritmo de segmentación 3D basado en crecimiento de regiones por tolerancia adaptativa y optimización de contraste

Ignacio García Fenoll, Carmen María Serrano Gotarredona, Begoña Acha Piñero, Tomás Gómez Cía

This paper shows how to improve the main segmentation algorithm included in the surgical planification tool VirSSPA. To achieve this goal we propose a method based on a

preprocessing step (normalization and automatic histogram expansion) and on a novel semi-automatic region growing algorithm. The doctor selects the seed in the tissue to be segmented in order to set the initial conditions. The algorithm uses an adaptive tolerance parameter that is iteratively increased until the contrast is maximum.

Estudio de los efectos de la radiación en el cerebro de ratas expuestas en una cavidad GTEM a 900 y 1800 MHz

Julio Claudio Brégains, Elena López Martín, Francisco Javier Jorge Barreiro, José Luis Sebastián Franco, Eduardo Moreno Piquero, Francisco José Ares Pena

Nowadays, the ever increasing use of cellular phones is becoming a widespread source of non-ionizing electromagnetic radiation. In this study, we investigated possible biological effects on brain of rats exposed in vivo to electromagnetic (EM) fields -at frequencies of 900 and 1800 MHz-, generated in a GTEM chamber. The corresponding experimental system (ES) consisted of: a vector signal generator, a directional coupler, a spectrum analyzer, a power meter, and the GTEM chamber itself -where the animal was located with the help of an appropriate holder. The 1g averaged peak SAR and mean SAR values in the brain and whole-body of the rat were estimated from experimental power measurements, and with the aid of a FDTD software tool. The ES was also used to study the morphological effects on the brain in rats given subconvulsive doses of picrotoxin, showing that the signals produced acute influence on their neuronal activity.

Segmentación y análisis de color y forma del complejo areola-pezón reconstruido tras mastectomía

Aurora Sáez Manzano, Begoña Acha Piñero, Carmen María Serrano Gotarredona, Domingo Sicilia Castro

In this paper a color and shape analysis of the of the reconstructed CAP (complex areola-nipple) after a mastectomy is performed. First, in order to segment the CAP, a color segmentation algorithm based on the method Live Wire is proposed. Secondly color differences between the healthy and the reconstructed CAP are measured employing colordifference formulas recommended in CIE. Finally we apply a measure that allow us to quantify the roundness of the areola. The analysis has been performed with 20 images, and good segmentation results have been obtained and quantitave color difference in accordance with perpeptual color difference has been obtained.

Cálculo de dosimetría en experimentos in vitro mediante software comercial FDTD

José Enrique Varela Campelo, Juan Enrique Page de la Vega, Jaime Esteban Marzo

In this communication the effect of the electromagnetic radiation on cell cultures is evaluated by means of commercial FDTD based software. At first a simplified rectangular waveguide

model has been used in order to characterize the electric field distribution inside a single dielectric cylinder, which models the liquid contained by a Petri dish. The results show great gradients on the base of the cylinder, though the goal is to obtain a good homogeneity. A second complete model with eight Petri dishes has been build in order to evaluate the interactions between them. It is shown that the ideas of the simplified model still apply, though there is a multiple reflection effect between dishes that causes the third Petri to be less irradiated. To sum up, the actual positioning of both, dishes and cells, is favoring a significant inhomogeneity of the field distribution.

Aplicaciones Biomédicas III

Sesión V: Martes 23, 12:00 - 13:45 h Aula 1

Predicción de terminación de la fibrilación auricular mediante medidas de regularidad de parámetros espectrales

Carlos Vayá Salort, José Joaquín Rieta Ibáñez

Atrial Fibrillation (AF) is the most common arrhythmia encountered at advanced age. The possibility of applying signal analysis to the electrocardiogram (ECG) in order to distinguish between terminating and non-terminating episodes of AF would be very helpful in the regular clinical practice. In this work, an analysis of spectrogram parameters organization of the Atrial Activity (AA) is carried out in order to classify between terminating and non-terminating AF episodes. The main peak frequencies, second largest peak frequencies and their respective peak magnitudes are extracted using cubic spline fitting and several numerical series are constructed from them. The independent samples mean comparison of their Sample Entropy shows five of the constructed sequences to be relevant in the characterization of AF. The bilateral significance obtained by the Student's t test is less than 0.05 in five of the eight analyzed parameters.

Dispositivo de monitorización remota para pacientes afectados por enfermedades neurodegenerativas

Gonzalo Solas Zubiaurre, Paul Bustamante Merino, Karol Grández Rojas

The European population is becoming older and older, with the consequent increase of neurodegenerative diseases, which mainly affect elderly people. With the purpose of advancing in the search of treatment for this type of diseases, the doctors find it difficult to obtain information about the symptoms and their evolution, as well as find a lack of tools which help doing so. In this article a monitoring system of the motor status of patients affected by the type of diseases previously mentioned is presented, based on sensors distributed over the patient's body, which send the collected information to a Personal Monitoring Device that the patient takes with himself. This device is in charge of carrying out a preliminary processing of the data and sending these measures wirelessly, for their

processing and study in a hospital. The work is being developed within the project PERFORM1, founded by the European Commission and with the participation of diverse centres from the United Kingdom, Cyprus, Italy, Greece and Czech Republic.

Métodos de obtención de la actividad auricular en registros invasivos de fibrilación auricular

José Joaquín Rieta Ibáñez, Fernando Hornero Sos

Atrial fibrillation is a very common cardiovascular disease in clinical practice. One relevant issue to understand its pathophysiological mechanisms is the analysis and interpretation of atrial electrograms (AEG), which are invasive electrocardiographic recordings. To properly study these signals, ventricular artifacts have to be removed from the AEG. In this work, independent component analysis (ICA) is applied to AEG recordings in order to remove ventricular artifacts making use of only one reference lead. Therefore the technique is suitable when multi-lead recordings are unavailable, as in atrial implantable cardioverter-defibrilators. In addition, this work also presents the first comparative study, making use of unipolar epicardial AEGs, between the ICA-based technique, template matching and subtraction (TMS), and adaptive ventricular cancellation (AVC). Results indicate that, when the epicardial atrial rhythm is quite organized, ICA is able to preserve the atrial waveform very precisely and better than the other methods. Moreover, ventricular reduction is also the best for ICA. On the other hand, when the atrial activity is disorganized, TMS notably improves performance, but ICA still is the best in waveform preservation. As conclusion, ICA can be considered as notably the best approach to extract the atrial activity in organized atrial arrhythmias. On the other hand, both TMS and ICA give quite similar results when the atrial arrhythmia is disorganized.

Diseño e implementación de un algoritmo robusto de obtención del nivel de oximetría de pulso en un microcontrolador de 16 bits

Sergio Salas Arriarán, Milton Ríos Julcapoma, Isabel Guadalupe Sifuentes, Daniel Díaz Ataucuri

This work is about the design proposal of a prototype for a monitor of pulse oximetry capable of calculating the average level of the saturation of oxygen in arterial blood flow (S_PO_2) and heart pulse (BPM). In this study we have implemented an analog circuit for the amplification of the Pulse Oximetry signal obtained from a sensor (oximetry clip). After correctly amplifying the signal, it was digitalized by an analog to digital converter and the digital samples were processed by a 16-bit CPU Freescale microcontroller. The microcontroller executed a digital signal processing algorithm, which makes possible to view the pacient information on an LCD screen. Finally, the system was tested in the laboratory and results were compared with those given by a commercial pulse oximetry equipment.

Sistema basado en perturbación simultánea para la disminución de ruido muscular presente en el electrocardiograma

Jorge Mateo Sotos, José Joaquín Rieta Ibáñez, Ana María Torres Aranda, César Sánchez Meléndez

The following work presents a cancellation system of muscular noise in biomedical signals with a multilayer structure of artificial neural networks (ANN). In this study in particular the signal has been analyzed from electrocardiograms (ECG). The system consists of a simple structure similar to the neural network MADALINE (Multiple ADAptive LINear Element), which is used like a structure. The proposed system is a growing artificial neural network which allows to optimize the number of nodes of the hidden layer and the matrices of coefficients. The coefficients matrices are optimized using the algorithm of simultaneous perturbation which requires a smaller computer complexity than the required by the backpropagation algorithm. The comparison between the different typical methods (Filter FIR, biorthogonal Wavelet, Filtered Adaptive LMS) and the system proposed based on neural multilayer networks, is obtained calculating the cross correlation between the input signal to the system and the output, besides the calculation of the SIR (Signal to Interference Ratio). The results show that this method is able to preserve better the signal waveform at system output with an improved noise reduction in comparison with traditional techniques. In addition the proposed ANN is capable of eliminate white and muscular noise in just one step.

Antenas I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 2

Síntesis en el espacio complejo de agrupaciones de antenas embarcadas

Gloria Gajardo Silva, Luis Landesa Porras

Shelkunoff circle synthesis techniques are only effective for equispaced antenna arrays. These techniques are based on reorganizing the zeros on the Shelkunoff circle. We propose a technique based on locating complex-direction zeros to synthesize arbitrary on-board antenna arrays. It is based on the analytical continuation of Green's functions and on a new representation of the complex plane (analogous to the Shelkunoff circle).

Antena dual con plano de masa fractal para aplicaciones WLAN

Joan Gemio Valero, Josep Parrón Granados, Jordi Soler Castany

A novel multiband monopole antenna that provides dual band behaviour using a single-fed element is presented. The radiating element is a basic triangular monopole and the ground plane has been modified to control the allocation of both operating bands of the antenna. The ground plane is based on a mod-2 Sierpinski gasket repeated four times and rotated to obtain a square ground plane. The operating bands of the antenna are adjusted using the height of the monopole, the dimensions of the ground plane and the scale factor used to create the fractal shape. As an example a dual band antenna for 802.11 standard is presented. Simulations and measurements are in good agreement and show the advantages of using a fractal ground plane in front of a solid ground plane.

Diseño de una antena multimodo compacta para sistemas MIMO

Eva Antonino Daviu, Michele Gallo, Marta Cabedo Fabrés, Miguel Ferrando Bataller, Michele Bozzetti

In this communication, the design procedure of a multimode multiple-input multiple-output (MIMO) antenna is presented. The antenna consists of a metallic ring antenna operating with different orthogonal modes, whose performance in a MIMO system is equal to traditional multiple antenna arrays. Thus, a compact antenna for MIMO systems very suitable for mobile terminals is obtained. A modal analysis of the antenna is carried out first by means of the Theory of Characteristic Modes, in order to identify the different radiating modes of the antenna. Then a set of feeding configurations is proposed so as to excite these modes. As the modes must operate in the same frequency band, a loading technique is used in the antenna in order to shift the resonant frequency of the modes to the proper band.

Estudio de ondas quasi-TEM locales en guías anchas con una pared hard para eliminar los modos de orden superior

Esperanza Alfonso Alós, Alejandro Valero Nogueira, José Ignacio Herranz Herruzo, Per-Simon Kildal

An oversized rectangular waveguide with one hard wall was previously demonstrated to be suitable for feeding a planar slot array because it has higher-order-mode-killing properties, i.e. it supports propagation of a single quasi-TEM parallel-plate-type mode, and no higher order modes. In the present paper we detect instead many local quasi-TEM waves that follow the hard surface with identical propagation constants. The local quasi-TEM waves can be excited to produce a combined mode that is the single quasi-TEM parallel-plate-type mode. We propose to characterize this interesting feed guide in terms of the performance of the local quasi-TEM waves.

Diseño de antenas impresas de banda ancha con polarizador para sistemas WiMAX a 3.5 GHz y comunicaciones por satélite en banda X

Fernando González Fernández, José Luis Masa Campos, María Teresa Castro, Jorge Alfonso Ruiz Cruz

Mobile communications terminals are strongly affected by multi-path reflection waves, so phase error can be quite important in this case. Circular polarization (CP) is used to avoid this problem, mainly caused by reflection on buildings and ground surface. The proposed antenna with parasitic strip elements as polarizer has the advantage to be robust, low cost and easy to fabricate with conventional materials and printed circuit technology. Two prototypes are exposed, WiMAX and X band, whose measures results verify the CP and show that good return loss and axial ratio characteristics have been obtained.

Dipolos impresos multifrecuencia cargados con partículas metamateriales

Francisco Javier Herraiz Martínez, Luis Enrique García Muñoz, Vicente González Posadas, Daniel Segovia Vargas

Multi-frequency printed dipoles based on antipodal printed dipoles loaded with metamaterial particles are presented. Split Ring Resonators (SRRs) are used as metamaterial particles in order to obtain fully printed and planar antennas. First, a simplified model of these antennas is developed. This model is based on a printed dipole loaded with the equivalent circuit of the SRRs. This model shows that the working frequencies are very close to the self-resonant frequencies of the dipole and the SRRs. Moreover, a dualfrequency printed dipole is designed, manufactured and measured. This dipole works simultaneously at 1.32 GHz and 2.82 GHz. Finally, the previous idea is extended to increase the bandwidth of the dual-band dipoles and develop multifrequency printed dipoles (printed dipoles which work simultaneously at three or more frequencies). This is made by using SRRs with different dimensions.

Antenas II

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 1

Diseño construcción y medida de un reflectarray para antena terminal en banda Ka

José Antonio Encinar, Mariano Barba Gea

This contribution describes the design, manufacturing and test of a printed reflectarray for a Ka-band terminal antenna. The reflectarray has been designed to produce a focused beam at 30 GHz (uplink) in V polarisation and also at 20 GHz (downlink) in H polarisation. Two separate feeds are used to illuminate the reflectarray for H (20 GHz) and V polarisation (30GHz). The reflectarray element is made of two stacked varying-sized patches, being one dimension adjusted to focus the beam at 20 GHz in H polarization, and the other to focus the 30 GHz beam in V-polarization. A breadboard has been manufactured and tested. The measured radiation patterns show very good agreement with those obtained from the simulations. A 10% bandwidth has been obtained in both frequency bands, with an antenna efficiency of 62% at 30 GHz and 70% at 20 GHz.

Análisis y diseño de monopolos acoplados para dispositivos móviles multibanda

Sergi Risco, Jaume Anguera, Aurora Andújar, Antonio Pérez, Carles Puente

A novel low profile planar antenna is proposed. The antenna presented is a coupled monopole antenna, comprising at least a driven element coupled with one or more parasitic elements. The design proposed is suitable to be used into a handheld device. The dimensions of the antenna are 33x15x1 mm^3. In order to facilitate the integration of other components, such cameras or speakers, a ground plane area at the right side of the antenna is provided. The study carried out reveals the relevance of the arms location over the performance of the antenna. The theoretic base is reinforced by a network model and a parametrical study. The coupling between elements controls the behaviour of the antenna. In this sense, a weak coupling between the driven element and at least one parasitic element enhances the bandwidth, whereas a multiband behaviour is achieved by a strong coupling. Finally, the PCB (Printed Circuit Board) influence has also been analyzed.

Antenas microstrip de altas prestaciones para Rx/Tx en la banda de 3.5 GHz

Naima Amar Touhami, Beatriz Aja Abelán, Antonio Tazón Puente, Eduardo Artal Latorre, Mohamed Boussouis

A 3.5 GHz planar antenna system has been developed for transceiver applications. Two types of antennas have been designed with 14 dB of gain and high isolation between transmission

and reception ports. The antenna structure is based on two microstrip patch arrays, one of them for the transmitter the other one for the receiver. Each patch is excited by a slot antenna coupled to a microstrip line. Antenna manufacturing is based on a combination of different substrates for microstrip lines and radiation elements.

Reflectarray para estación base LMDS basado en parches acoplados por apertura

Eduardo Carrasco Yépez, Manuel Arrebola Baena, José Antonio Encinar, Mariano Barba Gea

A shaped-beam reflectarray based on aperture coupled elements is demonstrated as central station antenna for Local Multipoint Distribution System (LMDS) in the 10.10 - 10.70 GHz band. The antenna must cover a 60° sector in azimuth with a squared cosecant pattern in elevation. The design process consists of two steps. First, a phase-only pattern synthesis technique is applied to obtain the required phase-shift distribution on the reflectarray surface which generates the shaped pattern. The second stage consists of determining the length of the delay lines, aperture-coupled to the squared patches, in order to achieve the phase distribution synthesized in the previous step. A reflectarray antenna has been designed for vertical (V) polarization. A breadboard has been manufactured and tested in an anechoic chamber, showing a good agreement between theoretical and measured radiation patterns.

Caracterización del acoplo mutuo entre parches apilados

Óscar Quevedo Teruel, Zvonimir Sipus, Eva Rajo Iglesias

In this paper an analysis of mutual coupling between stacked patches has been developed. Firstly, the level of this mutual coupling has been related with the working regions derived from different substrate thicknesses. These regions are defined depending on the gain and the width of the obtained band, as well as the shape of the radiation pattern. Secondly, an exhaustive study of the appearance of a dip of mutual coupling near the parasitic resonant frequency, has been realized. Finally, the relation of the coupling with the distance between elements of an assumed array has been shown. Both simulations and measurements are supplied for this study, and they corroborate the obtained conclusions.

Antenas III

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 1

Medida de antenas de baja directividad en entornos no anecoicos

Germán León Fernández, Susana Loredo Rodríguez, Sergio Zapatero Delgado, Fernando Las Heras Andrés

The measurement of an antenna in a reverberant chamber includes the effect of multipath propagation, disturbing the measured radiation pattern. In this work, two different methods to eliminate those multipath contributions have been studied and compared. The first one is a technique based on the well known FFT algorithm, which allows the undesired echoes to be detected in the time domain. The second method uses the Matrix Pencil algorithm to identify the direct path and the reflected waves. Both methods provide good results in all frequency bands and in the three reverberant scenarios that were configured for this experiment.

Evaluación de las prestaciones de las guías con paredes de postes para su uso en arrays de ranuras

David Morote Rodríguez, Alejandro Valero Nogueira, José Ignacio Herranz Herruzo, Esperanza Alfonso Alós

This paper evaluates the performance of rectangular waveguides manufactured out of a perforated copper-clad laminate. Waveguide's top and bottom walls are the copper layers on both sides of the substrate while the sidewalls are made setting rows of via-holes. Proper operation of the waveguide in terms of mode transmission and isolation between adjacent waveguides is studied and discussed. A perturbed waveguide etching a slot is also studied and compared with regular waveguides.

Análisis de incertidumbres en medida de antenas

Silvia Urosa López, Lara Orgaz Blanco, Sara Burgos Martínez, Manuel Sierra Castañer, José Luis Besada Sanmartín

The exact measurement of a quantity is a theoretical concept which cannot be obtained in practical measurements. In every measurement a difference exists between the true value and the measured value. Uncertainty is that part of the expression of the result of a measurement which states the range of values within which the true value is estimated to lie. This paper details the characteristics of a simulator based on spherical near-field measurement to evaluate the effect of the uncertainties in the antenna parameter (i.e. far-field radiation pattern, directivity, beamwidth, side lobe levels).

Antena impresa dual para aplicaciones WiFi y WiMAX

Ernesto Ávila Navarro, José Antonio Carrasco Hernández, Cándid Reig Escrivá

In this paper, a new design of a dual frequency compact printed antenna is presented. The antenna consists on two dipole bands, with different number of printed dipoles, distributed on both faces of the substrate. As example, a low-cost dual antenna, useful for WiFi and WiMAX applications, is designed, simulated (by an in house developed FDTD algorithm), fabricated and measured. Calculated and measured return losses and radiation patterns are presented. The antenna, designed with two dipoles in each band, presents two frequency operation bands with great bandwidth (more than 25%). The measured absolute gain was 3.3 dBi at 2.5 GHz and 7.9 dBi at 5 GHz, with radiation patterns slightly directional.

Conformado de reflectores para la síntesis de haces contorneados linealizando la relación distorsión-campo dispersado

Borja González Valdés, José Ángel Martínez Lorenzo, Antonio García Pino, Carey Rappaport

This work presents a new method to synthesize contoured beams by means of shaped reflector antennas. The method is based on finding a linear relationship between the local surface distortion and the difference of the undistorted and target scattered farfield patterns. Then, by solving and inverse problem, an iterative process allows to calculate the reflector distortions in order to achieve determined gain levels in prescribed control points. The smoothness of the solution is ensured by using surface interpolation with Polynomial Fourier Series in each iteration. As design example, two shaped reflectors to produce coverage in the continental United States and Brasil are designed, showing the fast and accurate results of the method.

Antenas IV

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 2

Síntesis rápida de diagramas footprint utilizando arrays con un gran número de elementos

Marcos Álvarez Folgueiras, Juan Antonio Rodríguez González, Francisco José Ares Pena

A new antenna pattern synthesis technique that allows the design of large planar antenna arrays radiating footprint patterns of a specified boundary with controlled ripple and side lobe levels is presented. The method synthesizes the desired footprint as a composition of a set of circular Taylor patterns appropriately weighted with the samples of the pattern obtained after stretching or shrinking a continuous circular aperture distribution developed by the Elliott-Stern method. A footprint of continental Europe radiated by a planar array with a large number of elements will show the technique's performance. The synthesis procedures were completed in about 1 second using a desktop computer.

Antenas resonadoras dieléctricas cilíndricas para sistemas MIMO: fundamentos y evaluación

Michel Allegue, Francisco Reinerio Marante Rizo, Reinel Marante, José Ángel García García, Ángel Mediavilla Sánchez

The analysis and preliminary evaluation of different configurations provided by slot-coupled cylindrical dielectric resonator antenna arrays at one side of ground plane for MIMO systems is the main purpose of this paper. Appropriate envelope correlation values are obtained, and therefore spatial diversity, especially when cross polarization is used.

Diseño, simulación y prototipado de un transmitarray reconfigurable en banda Ku

Alfonso Muñoz Acevedo, Pablo Padilla de la Torre, Manuel Sierra Castañer

The aim of this paper is to introduce some theory as well as prototype results of a Ku-band active transmitarray. Its architecture is based in two bi-dimensional radio interfaces interconected by a multiport microwave circuit. This makes the system reconfigurable through a driver device acting on the microwave circuit, which is based in analog phase shifters. The development of the prototypes implies the design of broadband multilayer antenna patches and a novel high-performance reflection analog phase shifter.

GEODA: distribución de la celda unitaria, composición de los arrays y funcionamiento

Ignacio Montesinos Ortego, Manuel Sierra Pérez, José Luis Fernández Jambrina, Jesús López Risco, José Luis Masa Campos

Nowadays, satellite communications are basic for the human lifestyle. In this way, a smart, conformal and multiarray antenna (GEODA) is being developed in order to receive signals from several satellites simultaneously in the 1.7 GHz working band. An adaptive beam system is able to follow the signals from the satellite constellation. The complex structure of the antenna is based in similar arrays of triangular shape. These arrays are divided in sub-arrays of three elements called Cells composing the single control element for the arrays main beam direction management. Fifteen cells, forty-five radiating elements, compose each triangular array of the GEODA antenna. In this paper, the working properties and the design of one cell will be shown and discussed.

Nueva estación terrena para seguimiento de satélites LEO

Miguel Alejandro Salas Natera, Ramón Martínez Rodríguez-Osorio, Ignacio Montesinos Ortego, Leandro de Haro y Ariet

Since earth stations for downloading data from LEO (Low Earth Orbit) satellites use large reflector antennas has a number of impairments in terms of cost and mechanical complexity; furthermore, reflector antennas can track only one satellite at a time, so the efficiency of the earth segment is reduced. In order to improve the performance of traditional earth stations the feasibility of other antenna technologies must be evaluated, such conformal adaptive antennas based on multiple planar arrays like geodesic antenna array (GEODA). This antenna has a number of advantages over large dishes and the efficiency to track several satellites simultaneously depends on the number of antenna elements, beamforming algorithm and the correct calibration of the antenna arrays. In this paper a brief introduction of the development of the new generation of earth station is presented.

Antenas V

Sesión V: Martes 23, 12:00 - 13:45 h Aula 2

Elimination of scan impedance anomalies in ultra-wide band phased arrays of differentially fed tapered slot antenna elements

Luis Emilio García Castillo, Eloy de Lera Acedo, Daniel Segovia Vargas, Vicente González Posadas, José Antonio López Fernández

Scan impedance anomalies are associated to phased arrays. There are different phenomena in order to explain these scan blindnesses produced when the array scans at one frequency and one angle. The most popular technique for eliminating these scan blindnesses is based on the use of electric walls in the grid of the two dimensional array. In this paper we present a dual polarized ultra-wide band array based on “bunny ears” antennas from 0.3 GHz to 1 GHz which presents scan blindness. We analyze the cause of the anomaly and present a technique non based on electric walls in order to avoid the scan blindness with a small increase in the noise figure of the array.

Aplicación de técnicas de diagnóstico de agrupamiento de antenas para aumentar el margen visible y cancelar reflexiones

Francisco José Cano Fácila, Lara Orgaz, Sara Burgos Martínez, Manuel Sierra Castañer, José Luis Besada Sanmartín

A new method of array antenna diagnosis is proposed. The method uses far field information which it is possible to reconstruct the excitations of the elements and the field over the aperture of the array antennas, providing the module and the phase. A simple study of this

module and this phase can detect errors, for example, errors in the alignment of the phase, connections or general structure of the array antennas. So, without a similar technique for antenna diagnosis, it would be necessary to check that elements, connections or structure. Therefore, when there are a lot of elements it would be a waste of time.

Diseño automatizado de antenas de parches apilados en cavidad mediante descomposición de dominio en el MEF, redes neuronales y optimización global

Juan Córcoles Ortega, Miguel Ángel González de Aza, Juan Zapata Ferrer

This work reports the development of a computera-ided-design methodology consisting of three steps for probe-fed cavity-backed, stacked microstrip patch antennas. In the first step, the rigour of a numerical technique such as the finite element method (FEM) to describe the electromagnetic behavior of these structures is incorporated. The application of the FEM is carried out on a highly efficient basis through a sophisticated domain decomposition approach. From these results, a neural network (NN) is trained to output the desired response of the antenna according to the value of design parameters. Thanks to the versatily of this NN, a global optimization through simulated annealing or genetic algorithms is lastly executed to obtain a final design. The proposed methodology is validated through a real design whose numerical results are compared with measurements with good agreement.

Generador automático de malla no-uniforme para FDTD conformada Dey-Mittra

Gary Junkin, Josep Parrón Granados

This paper describes the implementation of an improved non-uniform mesh generator for Dey-Mittra Conformal Finite Difference Time Domain. An improved technique for computing the Dey-Mittra FDTD grid intersections and areas for arbitrarily complex geometries is presented. The new technique has the additional capability of generating the volume material coefficients for dielectric and metallic objects described by an arbitrary set of polygon surfaces.

Aplicación de la expansión en modos esféricos y segmentación al diseño y optimización de arrays ESPAR

Jesús García Jiménez, Miguel Ángel González de Aza, Jesús Rubio Ruiz, Juan Zapata Ferrer

In this work it is addressed design and optimization of Electronically Steerable Passive Array Radiator (ESPAR) of circular patches. The patches are individually characterized by its GSM (Generalized Scattering Matrix) using spherical mode expansion in the radiation volume. From the GSM of the patches, it is obtained analytically, in a very fast procedure, a global GSM for the whole array. At this point it is possible to calculate, analytically as well, the

resulting power pattern obtained from the connection of reactive loads to a number of patches. Prescribed power pattern may be obtained by optimizing the loads by using a genetic algorithm.

Antenas VI

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 1

Antena microstrip basada en metamateriales para transpondedores RFID

Eduardo Ugarte Muñoz, Francisco Javier Herraiz Martínez, Javier Montero de Paz, Daniel Segovia Vargas

In this paper a self-diplexed antenna is proposed for a RFID transponder application. The development cycle is divided into two stages: antenna design and filters design. The antenna is based on a square microstrip patch filled with metamaterial structures. The inclusion of these structures allows simultaneous operation over several frequencies, which can be arbitrarily chosen. The antenna working frequencies are chosen to be 2.45 GHz (receiver) and 1.45 GHz (transmitter). In addition, the antenna is fed through two orthogonal coupled microstrip lines, what provides higher isolation between both ports. Some filters based on metamaterial particles are coupled or connected to the antenna feeding microstrip lines to avoid undesired interferences. This approach avoids using of an external filter or diplexer, providing larger size reduction and a compact self-diplexed antenna.

Diseño de antena de guía de onda utilizando estructuras denominadas *Electromagnetic Bandgap* (EBG)

Abdelhamid Tayebi, Josefa Gómez, Iván González Diego, José Gómez, Manuel Felipe Cátedra Pérez

This work presents the design of antennas formed by EBG (Electromagnetic Bandgap) structures that enhance the directivity of a simple aperture antenna (an open circular waveguide operating in TE11 mode). A square ground plane is situated on the circular waveguide aperture flanges and the EBG periodic structures are over the metallic ground plane at specific distances. The design has been carried out using a Moment Method code called Monurbs. We have made a parametric study of the antenna dimensions to obtain the best polarization purity. Optimum physical dimensions have been found in order to achieve desirable radiation characteristics at 9.1 GHz.

Análisis de antena tipo *Space-Filling* para comunicaciones inalámbricas en entornos móviles

Pedro Luis Carro Ceballos, Jesús de Mingo Sanz

The Moore antenna is an interesting radiating element, which is based on the ``space-filling'' geometric curves, deeply related to fractal structures. Large bandwidths may be achieved by means of these elements, feature which is often required in wireless communication systems. In this paper results corresponding to an antenna focused in the frequency band from 5 to 6 GHZ are presented, analyzing not only its behaviour when it works in wireless environments, but also its reliability in order to achieve polarization diversity in terminals. This is done applying concepts such as Mean Effective Gain (MEG) and the complex correlation coefficient, and IE3D and HFSS as electromagnetic full-wave simulators. In addition, some results will be validated experimentally.

Errores en medidas de campo cilíndrico próximo

Alcino Castelo Boso, Leandro de Haro y Ariet

An approximate general formula to calculate the directivity of an array of antennas by a cylindrical near field acquisition is proposed. We demonstrate the role of and scan area truncation effects. The derivation is based on the theory of cylindrical wave expansion of electromagnetic fields.

Caracterización de la celda unidad de una lente zurda plana para la excitación de antenas planas de ranuras

Andrés García Aguilar, José Manuel Fernández González, Manuel Sierra Castañer

“Metamaterials” are artificially engineered structured materials exhibiting novel properties due to their special architecture and not because of the constituent homogeneous materials used to manufacture them. This enables to design new materials with characteristics not available in conventional materials, as a negative refractive index. A new form of excitation for parallel plate slot antennas based in a planar “left handed” lens is proposed. This excitation allows enhancing the efficiency of these kinds of antennas. The lens is constructed using the well known “mushroom” structure. Here the characterization of the left handed lens with the mushroom structure in terms of their geometrical parameters (lattice constant, diameter of via, height of substrate) is presented using the dispersion diagram of the unit cell. Some simulations results are shown.

Compatibilidad Electromagnética y Efectos Ambientales I

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 2

Modelo circuital multimodal para el análisis de transiciones asimétricas microstrip acoplada de tres líneas con impedancia en paralelo

Pablo Rodríguez Cepeda, Miquel Ribó i Pal, Francisco Javier Pajares, Joan Ramon Regué, Albert Miquel Sánchez, Antonio Pérez

In PCB circuits, signal traces are routed close to other signal traces. This situation originates the appearance of coupled strip sections. Since coupled strips sections behave as multimodal transmission lines, several electromagnetic modes are propagated simultaneously. Any asymmetry in the circuit will generate an energy exchange among the propagating modes which will lead to signal integrity problems. In this paper, a new multimodal circuit model for a Three-Line-Microstrip Asymmetric Shunt Impedance Transition is presented. The model allows a rigorous and quantitative analysis of the transition. The model is successfully applied to the analysis of a PCB configuration where a clock signal trace is routed in the presence of two other close signal traces. The good agreement between measurements and circuit simulations validates the proposed multimodal circuit model.

Avance sobre compatibilidad electromagnética en telemedicina móvil personal

Nohemí Carranza Herrezuelo, Jorge García Pérez, José Luis Monteagudo Peña, Victoria Ramos González

A very fast development of new technological systems for mobile telemedicine bio monitoring is being carried out in order to allow patient home care. On the other hand, the electromagnetic conditions where these systems are being installed are more complex, due to the increasing use of electromagnetic devices. Although International and National bodies have set limit values for permissible electromagnetic radiation, the electromagnetic compatibility with mobile home telemedicine systems is not assured. Measures of electric fields are being performed in several locations. Results show some peaks above the baseline level. These peaks are under the standard ICNIRP-98 but above the minimum immunity level of 3V/m established by the standard IEC 60601-1-2 for non-life supporting devices. With the increased use of radio networks in the proximity of home medical devices, it would be necessary a local assessment and risk analysis prior to the installation of a home telemedicine application.

Cálculo de SAR y corrientes inducidas en la exposición de niños y adultos a campos electromagnéticos de dispositivos electrónicos de vigilancia

Aránzazu Sanchís Otero, Mercedes Martínez Búrdalo, Agustín Martín Muñoz, Raimundo Villar Gómez

In this work, the compliance of international guidelines, in the human exposure to Electronic Article Surveillance (EAS) devices, is assessed by using the finite-difference time-domain (FDTD) method. The device assumed for the calculations is a 10 MHz pass-by panel-type EAS consisting of two overlapping current-carrying coils. Calculations of B field near the EAS device will be made, to be compared with reference levels from the guidelines, and both, induced currents and specific absorption rates (SARs) will also be calculated in high resolution numerical phantoms, simulating adult, 10- and 5-year-old children bodies, to be compared with basic restrictions. Results are presented.

Estudio de una cabeza humana expuesta a radiofrecuencia

Miguel Ángel García Fernández, David Agapito Sánchez Hernández

The rationale for deriving basic restrictions to electromagnetic field exposure and their associated safety margins is not fully standardized and diverse values are employed depending upon the thermal effect being considered. With the recent capabilities of modern computers, hybrid Maxwell's and heat-transfer equations have been solved for the human exposure to electromagnetic field problem. In this contribution, a human head is exposed to 125 mW of power at 1800 MHz (corresponding to a GSM-Power Class 1, divided by 8 slots of time). Peak SAR values along a coronal plane containing the Ear Reference Point, and its effects on temperature increase, have been observed. A matching effect and the skull being a protection for thermal stress due to intense electromagnetic field exposure have been confirmed, validating previous studies suggesting that a combined electromagnetic-thermal basic restrictions would represent more accurate safety limits, reducing the uncertainties for deriving the reference levels.

Compatibilidad Electromagnética y Efectos Ambientales II

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 2

Niveles de radiación electromagnética en espacios sensibles de Mérida

Jesús Manuel Paniagua Sánchez, Ángel María Cid Díez, María Montaña Rufo Pérez, Antonio Jiménez Barco, Alicia Antolín Salazar

The objective of this study was to evaluate electromagnetic field levels in the urban area of Mérida, mainly in the so-called sensitive sites like schools, hospitals and parks. Wide band electromagnetic field measurements were carried out in the frequency range 100 kHz - 3 GHz, which includes radio broadcasting AM/FM, television and cellular base stations signals. In

order to achieve this objective we first identified both sensitive sites and electromagnetic radiation emitters in the city. Then we performed an electromagnetic site survey campaign using a wide band meter equipped with an isotropic electric field probe. Statistical treatment of data below the detection limit and the use of geographic information systems for the storage, management and analysis of georeferenced data are two relevant points of this work. Results showed that power density levels in sensitive places of Mérida are well below the lowest reference level for human safety according the Spanish standard.

Impacto de los sistemas ultra-wide band (UWB) en los sistemas WiMAX a 3.5 GHz

Bazil Taha Ahmed, José Luis Masa Campos

In this work, results of the analytical analysis to assess the effect of the UWB emissions on the WiMAX systems are presented. The WiMAX range is evaluated with and without the UWB interference. Free space propagation model is used to calculate the UWB signal power that interferes with the WiMAX systems. It is shown that, for the case of single UWB transmitter, the WiMAX system can easily tolerate UWB interference when the UWB EIRP is -83 dBm/MHz or less for a distance between the UWB transmitter and the WiMAX receiver of 1m or higher at 3.5 GHz frequency in order to have only 5% range reduction. To make this possible, Multi Band UWB should not transmit in the first and the second bands. This will have a mortal effect on the UWB technology.

Interferencias de los parques eólicos en el servicio de TV

Alejandro Calo Casanova, Miguel Calvo Ramón, Leandro de Haro y Ariet, Pedro Blanco González

This paper analyzes the problematic of the interferences created by wind farms. Wind turbines may cause interferences to television and microwave signals due to reflections and diffractions of those signals from both the tower (stationary) and the blades (non-stationary). The ITU Radiocommunication Assembly, on the BT 805, specifies a simplified model of impairment caused to television reception by a single wind turbine considering only free space propagation. This paper shows the extensions to a multiple turbine case, the inclusion of other propagation models (plain earth and ITU-R P.1546) and presents more accurate models to obtain the scattering produced by a wind turbine, as well as their implementation on friendly-use software.

Respuesta citostática de células humanas NB69 a señales pulsadas en la banda de 2 GHz

María Antonia Martínez, María Ángeles Trillo, María Antonia Cid, Juan Enrique Page de la Vega, Alejandro Úbeda

We have investigated the response of NB69 human neuroblastoma cells to the in vitro exposure to 5-µs pulse modulated signals in the 2 GHz band. The obtained results indicate that a 24-hour exposure to the RF radiation induced a significant cytostatic response. These data are not supportive of the hypothetical carcinogenic effects exerted by RF signals. However, the cellular and molecular mechanisms involved in the observed response need to be identified and characterized in order to determine its potential relevance to the human health.

Componentes y Circuitos Activos de Microondas I

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 3

Modelado de dispositivos activos de microondas utilizando código Verilog-A

José María Zamanillo Sainz de la Maza, Sergio Rivera, Pablo Luis López Espí, José Campelo Ortíz, Raquel Torres, Ángel Mediavilla Sánchez, Constantino Pérez Vega

The long term impact of microwave communication technologies will be functionality simulated and design on traditional computing and usual RF and microwave communication simulators such us: PSPICE, Agilent ADS, Agilent GENESYS, AWR Microwave Office, etc. This ability, allows making possible the enabling of the digital computer interaction and simulation with the designer and the world around it. This paper shows the simplicity and friendly-to-use technique of modelling active microwave devices using Verilog-A language. Several examples have been studied under different commercial simulators: Agilent ADS and GENESYS.

Emitter length effects in SiGe and GaAs heterojunction bipolar transistors

Juan Miguel López González, Joaquín Portilla Rubín

This paper studies the effect of emitter length in DC and AC performance of SiGe and InGaP/GaAs Heterojunction Bipolar Transistors, HBTs. Physic based device numerical modeling is used for comparison of emitter-base designs of HBTs. InGaP/GaAs HBTs analysed have unity current gain frequencies of 94 GHz and SiGe HBTs around of 200 GHz. Differences in the DC current gain, offset collector-emitter voltage, base-emitter on voltage, cutoff frequency and maximum stable gain are presented. The results show that it would be possible to optimize the HBT design, keeping the semiconductor device total area utilized. Moreover, the scaling rules of bipolar compact models should be carefully revised when they are applied to state-of-the-art of Heterojunction Bipolar Transistors.

Amplificador multibanda con bajo ruido en tecnología SiGe HBT

Joaquín Portilla Rubín, Nagore Garmendia Llanos, Francisco Javier Casas Reinares, Juan Miguel López González

A study concerning the trade off between gain, noise, linearity and power consumption in a multiband amplifier based on HBT SiGe technology is presented. Circuit design procedure is described and experimental results are reported, corresponding to an amplifier implemented in hybrid technology that works in the 2.4 GHz and 3.5 GHz frequency bands.

Detector de banda ultraancha en tecnología microstrip hasta 40 GHz

Luis Ángel Tejedor Álvarez, José Ignacio Alonso Montes, Jorge González Martín

Detectors designing is a key aspect for the development of the new millimeter wave systems. In this paper two detectors in microstrip technology are presented. They use zero bias Schottky diodes to detect signals from low frequency to 40 GHz. High sensibility, flat frequency response and ultrabroadband are the main features of these designs. They are also cheap and easy to mount because they have been built using microstrip technology. This paper explains most technological questions which must be taken into account to design such detectors.

Modelado y simulación realista del módulo posterior de un radiómetro: aplicación al instrumento a 31 GHz del experimento QUIJOTE

Francisco Javier Casas Reinares, Joaquín Portilla Rubín, Juan Pablo Pascual Gutiérrez, María Luisa de la Fuente Rodríguez, Beatriz Aja Abelán, Eduardo Artal Latorre, Enrique Martínez González

In the reported work, an efficient modelling method is applied to the circuits of the 30 GHz Back End Module of the QUIJOTE experiment radiometer. In particular, efficient models of two LNAs, a band pass filter and a detector has been obtained. These models allow realistic time-domain BEM simulation by using Gaussian noise excitation signals. Simulation results have been reported, showing good agreement with the BEM expected operation. On the other hand, time-domain realistic simulations will provide valuable information about BEM behaviour previously to the receiver definitive implementation.

Componentes y Circuitos Activos de Microondas II

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 3

Amplificador MMIC de alto IP3 para aplicaciones S-DMB embarcadas

Yolanda Jato Llano, Amparo Herrera Guardado, Rocío García

This paper presents the design and simulation of a monolithic high linearity amplifier in GaAs high electron-mobility transistor technology for the S and UHF bands. A specific topology has been chosen in order to achieve a high OIP3 value as well as good input and output return losses. Due to the wide bandwidth of operation an off-chip matching network has been adopted for each operation band. An on-chip active matching circuit has also been included in order to simplify the passive matching network configuration. A gain of approximately 19 dB has been achieved in simulation, as well as good values of input/output matching. The output third order intermodulation point takes a value of 29.3 dBm in the UHF band and 27.4 dBm in the S-band.

Modelo electrotérmico gran señal de la fuente de corriente I_{ds} de los transistores GaAs MESFET y HEMT

Mohamed Chaibi, Tomás Fernández Ibáñez, Mohamed Aghoutane

This paper describes an accurate approach to modelling the effect of ambient temperature (from -70ºC to +70ºC) on the I/V characteristics of the drain to source I_{ds} current source of Gallium Arsenide (GaAs) MESFET and HEMT transistors under DC and/or pulsed operation. The proposed approach can be applied to any existing DC drain to source current models to increase their accuracy and rang of operation. Starting from a single-current source model, based on the I/V DC and pulsed measurements, a new model allows the user to simulate both DC and large signal behaviour of the device over a range of temperature is presented. This model takes into account all the second order effects (frequency dispersion, self-heating due to the operating point and ambient temperature effect) present in this kind of devices. The accuracy of the proposed approach will validate when comparing the simulation with experimental results.

Extracción y estudio de la dependencia con la polarización y la temperatura del modelo pequeña señal para transistores encapsulados GaAs MESFET

Mohamed Chaibi, Alberto Chico, Tomás Fernández Ibáñez, Abdelwahed Tribak, Ángel Mediavilla Sánchez, Mohamed Aghoutane

An extraction technique of the small signal equivalent circuit parameters of GaAs MESFET packaged transistor and their dependence on both bias and temperature are presented. This method is based on four steps which are: 1) extrinsic elements (package elements not included) are extracted form S parameters measurements of the transistor biased under cold and pinch-off condition, 2) package effects parameters are then determined through optimisation from S parameters measurements of the transistor under pinch-off condition, 3) the optimal extrinsic parameters, including package parameters, are searched through optimization algorithm from S parameters measurements of the transistor biased at normal condition (hot transistor) using the starting values already obtained. This step allows us to obtain independent intrinsic elements of frequency and finally 4) the temperature and bias-dependent intrinsic elements are directly extracted from multi-bias S parameters measurement over a wide rang of temperature (from -30ºC to +70ºC). The validity of the proposed method and the small signal model is verified by comparing the simulated wide band S parameters, over a wide bias and temperature range, with measured data of a GaAs MESFET transistor.

Método de medida de dispositivos para banda milimétrica usando transiciones coplanares de banda ancha

Enrique Villa Benito, Beatriz Aja Abelán, María Luisa de la Fuente Rodríguez, Eduardo Artal Latorre

A wideband coplanar to microstrip transition without via holes has been used for device testing at millimeter wave frequencies (from 20 to 40 GHz), in order to have an accurate characterisation of the tested devices. Circuits under tests are built on 0.254 mm thick Alumina substrate. Test method, with a coplanar probe station, has been checked with different devices, and validated by comparison with commercial coplanar to microstrip transitions with via holes.

Filtros banda eliminada con control preciso de frecuencia central y ancho de banda

Zabdiel Brito Brito, Ignacio Llamas Garro, Lluís Pradell Cara, Alonso Corona Chávez

In this paper two switchable bandstop filters are presented. One filter topology allows precise control over the central frequency while maintaining a fixed bandwidth. The second filter topology allows precise control over the central frequency with a variable bandwidth. The central frequency control was obtained by modifying resonator length. Bandwidth control was achieved by modifying the normalized reactance slope parameter of a decoupling resonator. Both filters were designed to have center frequencies of 2 and 1.5 GHz, where one topology presents a fixed 8% fractional bandwidth at both center frequencies. On the other hand the second topology presents a variable bandwidth of 9% and 7% at the filter central frequencies respectively.

Componentes y Circuitos Activos de Microondas III

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 3

Filtro banda eliminada con reconfigurabilidad continua en selectividad, ancho de banda y frecuencia central

Carles Musoll Anguiano, Ignacio Llamas Garro, Zabdiel Brito Brito, Lluís Pradell Cara, Alonso Corona Chávez

In this paper we report a reconfigurable bandstop filter able to reconfigure central frequency, bandwidth and selectivity. The filter has four poles with a quasi-elliptic response. The filter is tuned by varactors located at different positions on the filter topology. The varactors are voltage controlled in pairs due to filter symmetry for central frequency and bandwidth control. An additional varactor is placed on a crossing line to move a pair of transmission zeros, closer of farther to the filter central frequency, which tunes filter selectivity. The filter has a tuneable

fractional stopband bandwidth range from 4% to 14%, a tuneable central frequency range from 1.3 GHz to 2.1 GHz and a selectivity range from 1.27 to 1.83 dB/MHz approximately.

Módulo posterior de un receptor en banda Ka para aplicaciones de radioastronomía

Juan Luis Cano de Diego, Beatriz Aja Abelán, Enrique Villa Benito, María Luisa de la Fuente Rodríguez, Eduardo Artal Latorre

This paper presents the design, simulation and measurement of the Back-End Module (BEM) first prototype for the QUIJOTE project, which is a new ground-based experiment for characterizing the Cosmic Microwave Background (CMB) polarization. The system is a broadband direct conversion receiver based on low noise amplification, band pass filtering and Schottky diode detection working in the Ka band. System simulations have been carried out combining individual subsystem measurements and non-linear models to validate the proposed configuration. Measurements show more than 30 dB of RF gain over the 26 to 36 GHz band with a noise figure around 3.5 dB. Detected voltage is in the range 1-10 mV which meets the application specifications.

Mejora de la sensibilidad en la identificación polo-cero para el análisis de estabilidad de circuitos de microondas

Natanael Ayllón Rosas, Aitziber Anakabe Iturriaga, Jon Santiago Fernández, Juan Mari Collantes Metola, Geoffroy Soubercaze Pun, Stéphane Forestier

In this work the employment of a dual Current-Voltage (I-V) probe is proposed in order to improve the sensitivity of pole-zero identification based stability analyses. The benefits of this approach are shown in a simple series resonator, as an illustrative example. The dual analysis is then applied to an X-band multi-stage MMIC power amplifier and to a commonly biased Fujitsu's FET transistor implemented in hybrid microstrip technology, where the interest of the procedure is demonstrated. The enhancement in sensitivity minimizes the risk of missing an instability hidden in the rest of circuit dynamics. This improvement can be especially useful for designers when checking circuit stability through broadband analyses.

Diseño de amplificadores diferenciales de bajo ruido para antenas UWB en la banda baja del proyecto SKA

Óscar Alberto García Pérez, Vicente González Posadas, José Luis Jiménez Martín, José Manuel Serna Puente, Luis Enrique García Muñoz, Daniel Segovia Vargas, José Antonio López Fernández

Differential amplifiers can be an appropriate solution in the implementation of radio astronomy receivers, due to their efficient interference and harmonic isolation. In this paper, two different topologies are presented. The first one consists of two single ended amplifiers in a balanced topology. The second one is formed by cascading two simple differential stages.

Both circuits operate in the 300 MHz to 1 GHz bandwidth. Firstly, gain and noise characterizations of each amplifier have been done. Lastly, noise analysis of the whole reception system, formed by the antenna and the differential amplifiers, is presented.

Receptor SiGe de conversión directa para WLAN 802.11a

Leticia Hernández García, Yolanda Jato Llano, Amparo Herrera Guardado

This paper presents a MMIC direct conversion receiver for WLAN manufactured in SiGe: C BiCMOS technology for the IEEE 802.11a/HiperLAN WLAN standard. Direct conversion architecture was chosen because it eliminates the need for bulky external image reject filters, resulting in a compact, low power and low cost front-end. The direct conversion receiver must incorporate quadrature downconversion as both lateral bands contain different information that will be distorted if they are superimposed.

Componentes y Circuitos Activos de Microondas IV

Sesión V: Martes 23, 12:00 - 13:45 h Aula 3

Conmutadores de fase 180º de banda ancha con transiciones coplanares

Enrique Villa Benito, Beatriz Aja Abelán, María Luisa de la Fuente Rodríguez, Eduardo Artal Latorre

The design, assembly and characterization of three different phase switches in millimetre wave frequencies based on PIN diodes is presented. These phase switches provide wide bandwidth, from 10 GHz to 40 GHz, and a phase shift around 180º. The phase switches have been designed with broadband coplanar to slot-line transitions and made on Alumina substrate with commercial PIN diodes HPND-4005, from Agilent, as switching devices. Three different phase switches are presented in order to compare different coplanar to slotline transitions and transmission paths.

Limitadores selectivos en frecuencia basados en circuitos paramétricos

Franco Ramírez, Robert Melville, Almudena Suárez Rodríguez, James Stevenson Kenney

A parametric circuit based on varactor-diodes is presented for its application as a frequency selective limiter. A simplified analytical model is initially derived for a general understanding of the circuit performance. The power limitation is due to the frequency division of above threshold signals, leading to a reduction of the output power at the input frequency. Next, harmonic-balance simulation is applied to analyze the limiter behavior in presence of a strong and a weak signal. A matching technique is derived to increase the input power range with high limitation level. Cascaded detuned stages are used to limit multiple above-threshold signals. An in-depth analysis of the behavior under two interferers is also presented, showing

that each stage enables the frequency division of a different interferer. The techniques have been successfully applied to a frequency selective limiter in the 850 MHz band.

Agrupación activa conformadora de haz

Lorena Cabria de Juan, José Ángel García García, Teresa María Martín Guerrero

In this paper, a high linearity power amplifying active antenna is proposed. Taking advantage of a large signal regime device-level bias-adaptation technique, a low radiated distortion level with independence of the radiated power is assured, improving the linearity-efficiency trade-off. Two PHEMT-based power amplifiers excite the perpendicular input ports of an aperture coupled patch antenna in a quadrature-phase configuration achieving amplitude control of the radiated field with circular polarization. Beamforming capabilities of the designed antenna have also been considered for different amplitude distributions employing such studied bias-adaptation technique. An specific test set-up has been implemented to completely characterize the antenna behavior using digital modulated signals.

Amplificador MMIC de potencia y banda ancha (2-6 GHz) en tecnología HEMT de GaN

María Ángeles González Garrido, Jesús Grajal de la Fuente

In this paper, we report the design of a GaN-based broad-band power amplifier using as active devices GaN high electron mobility transistors (HEMTs) grown on SiC substrates. The circuit is a 2-stage amplifier with microstrip corporative division/combination networks. Using devices with 0.5 μm gate length and 1 mm gate width, a small-signal gain higher than 15 dB was obtained with 2-6 GHz bandwidth. An output power of 12.5 W at 25 V is achieved in broadband and a saturation power of 18 W at 4.5 GHz is reported. The measured power-added efficiency is about 25-30% at 25 V.

Antena activa multiplicadora con capacidad de modulación ASK y monitorización de temperatura

Teófilo Aballo Onyonkiton, Lorena Cabria de Juan, José Ángel García García, Tomás Fernández Ibáñez, Francisco Reinerio Marante Rizo

In this paper, a frequency multiplying active antenna with ASK modulation and temperature sensing capabilities is proposed. Aimed for its use as RF transponder, it integrates a dual-gate FET and a Schottky diode frequency multipliers into a multi-band and dual-polarization patch antenna. Measurement results in a backscatterer test set-up validate the solution.

Componentes y Circuitos Pasivos de Microondas I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 3

Nueva estructura convertidor de modos ancha banda TM01-a-TE11

Abdelwahed Tribak, Ángel Mediavilla Sánchez, Mohamed Boussouis, Mohamed Chaibi

A novel mode converter that transforms circular waveguide transverse magnetic *(TM01)* to transverse electric *(TE11)* circular waveguide is investigated, providing over 48% bandwidth of extraneous-mode-free operation at a conversion loss of less than 0.05 dB. The design philosophy is based upon the unique use of two intermediate modes: coaxial TEM and a rectangular waveguide *(TE10)*, which provide input to output isolation of converter modes.

Full-band OMT turnstile en tecnología de guía de onda de altura reducida para aplicaciones satélite

Abdelwahed Tribak, Ángel Mediavilla Sánchez, Nora Fernández, Mohamed Boussouis, Mohamed Chaibi

An orthomode transducer with a circular waveguide input and two rectangular waveguide outputs is described. The design utilizes a reduced height turnstile and two identical reduced height E-plane power combiners. A Ku band version of this device has been constructed and tested. The inputs and outputs return losses were less than -30 dB, the isolation between the two rectangular outputs is > 60 dB and the transmission loss was 0.1 dB. Moreover a yield analysis has been done for various tolerances assuring a precision of ± 0.05 mm that indicate a high stability of the possible errors of the values of the designing variables.

Circuitos pasivos de microondas en tecnología plana para el conformado de pulsos UWB

Israel Arnedo Gil, Joshua David Schwartz, Iván Arregui Padilla, Miguel Ángel Gómez Laso, Txema Lopetegi Beregaña, José Azaña, David Plant

We propose and demonstrate a new technique for generating customized pulse-shapes intended for use in ultra-wideband (UWB) applications. The technique employs tailored microstrip lines that have been designed using an exact analytical series solution of the synthesis problem derived from the coupled mode theory. This solution permits the synthesis of waveguides and transmission lines with *arbitrary* impulse responses limited only by the principles of causality, passivity and stability. Time-domain measurements are performed demonstrating the generation of two pulse-shapes using microstrip circuits and satisfying pre-established UWB mask requirements.

Sistema de retardo sintonizable continuo para señales UWB en el rango de los nanosegundos

Joshua David Schwartz, Israel Arnedo Gil, Iván Arregui Padilla, Miguel Ángel Gómez Laso, Txema Lopetegi Beregaña, José Azaña, David Plant

We propose and demonstrate an electronic system achieving continuously tunable time-delays with nanosecond-scale delay excursions for ultra-wideband signals. Our demonstration system yields an adjustable delay of up to 1.6 ns for input signals spanning 3 to 7 GHz. The key component is a dispersive length of microstrip line created by etching a chirped electromagnetic bandgap structure in the conducting strip. We test the proposed system with two different signals. The fist one is a 3 Gbps pulse train of 13 bits ('1010000010101'), centered on a 5 GHz carrier and the second one is a more properly call UWB signal consisted of a train of shaped-impulses with content in the 3-7 GHz range generated by passing a 70-ps impulse (generated by a Picosecond Pulse Labs 3600D) through a specially synthesized EBG microstrip designed using a synthesis algorithm for creating customized UWB pulse shapes.

Técnica eficiente para la conexión en serie de múltiples matrices de dispersión de dos puertos

Carmen Bachiller Martín, Héctor Esteban González, Ángel Belenguer Martínez, José Vicente Morro Ros, Vicente Enrique Boria Esbert

There are several practical applications in microwave engineering that require the cascade connection of multiple two-port scattering matrices. Traditionally the conversion of the scattering matrices to ABCD or T matrices has been used in order to perform the cascade connection. An alternative to this procedure is to perform a recursive connection by pairs of the scattering matrices. In this paper we present a new technique for the efficient cascade connection of N monomodal or multimodal scattering matrices that reduces the computation time by 50% when compared to the cascading by pairs, and by 75% when compared with the use of ABCD matrices.

Análisis eficiente de la excitación de guías rectangulares mediante sonda coaxial con geometría arbitraria

Ángel Antonio San Blas Oltra, Fermín Mira Pérez, Ángela Coves Soler, Vicente Enrique Boria Esbert, Benito Gimeno Martínez, Marco Bressan

An efficient full-wave method based on the 3D BIRME (Boundary Integral-Resonant Mode Expansion) technique for the accurate design of generalized probe-excited rectangular waveguides is presented. The flexibility of the developed CAD tool allows to analyze two common configurations frequently used in modern coaxial-fed microwave devices: conventional and discended coaxial probe excitation. This last configuration is used to drastically improve the electrical response of the classical coaxial probe excitation. The

proposed approach is fully validated by comparing the obtained numerical results with theoretical and experimental data extracted from the available technical literature.

Componentes y Circuitos Pasivos de Microondas II

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 4

Nuevos filtros multicapa basados en trisections empleando nodos no resonantes

Mónica Martínez Mendoza, David Cañete Rebenaque, Juan Sebastián Gómez Díaz, Francisco Javier Pérez Soler, Alejandro Álvarez Melcón

This work presents novel filter topologies implemented in microstrip technology. The topologies combine printed line resonators with non resonating nodes (NRNs) to implement transmission zeros in a very flexible way. Broadside couplings are introduced to increase the capabilities for cross coupling topologies. Depending on the number of resonators and NRN, the filtering response exhibits a single transmission zero either below or above the passband, or two transmission zeros, one at each side of the passband. Several examples are designed and validated, using the new proposed structures.

Consideraciones sobre el montaje de conectores para optimizar su respuesta en bandas milimétricas

Luis Ángel Tejedor Álvarez, José Ignacio Alonso Montes, Jorge González Martín, Pablo Almorox González

Connectors are essential in many circuits to communicate with exterior world. When working in millimeter wave frequencies, connectors require very tight tolerances and being mounted exactly in the correct way. Main problems which use to appear when working with millimeter wave connectors have been collected in this article. Besides that, some basic guidelines to get optimal connector performance are given. To illustrate how these advices can improve connector operation, they have been used in a real case.

Simulación 3D de estructuras compuestas por resonadores acústicos

Jordi Verdú Tirado, Pedro de Paco Sánchez, Óscar Menéndez Nadal, Edén Corrales López

Structures based on acoustic resonators are being widely used. The Mason model is the most straightforward way to simulate these structures. However, this model only considers the propagation of the acoustic wave in the thickness direction. Taking into account that the piezoelectric materials are not isotropic, 3D simulations become essential to predict the behavior of the lateral modes, and how the electrical impedance of the acoustic resonators can be affected. In this paper, some basic considerations for 3D simulation using the finite

element method (FEM) are given. The 3D-simulation result of a stacked crystal filter (SCF) based on acoustical resonators is shown.

Diseño de híbridos en cuadratura acoplados por ranura

Álvaro Moscoso Mártir, Juan Gonzalo Wangüemert Pérez, Íñigo Molina Fernández, Enrique Márquez Segura

We present a single section quadrature hybrid based on slot-coupled directional coupler, which operates over a bandwidth from 3.1 to 4.85 GHz and a three-section quadrature hybrid based on slot-coupled directional couplers, which extends its behaviour from 3.1 to 10.6 GHz. The methods we propose to design and fabricate these hybrids can be easily extended to other slot-coupled directional couplers with different number of sections, coupling levels and bandwidths. Two prototypes have been fabricated by a conventional PCB process. The first one, exhibits a return loss and isolation better than 24 dB from 3.1 to 4.85 GHz. The second one, exhibits a return loss better than 20 dB, isolation around 20 dB, an amplitude difference between output ports of less than ±0.75 dB and a phase imbalance between +1º and -3º across the 3.1-10.6 GHz band.

Herramienta para el análisis modal en guías de onda cargadas con superficies selectivas en frecuencia

María García Vigueras, José Luis Gómez Tornero, George Goussetis, David Cañete Rebenaque, Alejandro Álvarez Melcón

We present an analysis procedure to obtain the modal dispersion curves of complex structures based on the introduction of metallodielectric frequency-selective surfaces (FSS) inside rectangular waveguides excited with TE0 modes. This type of structures can be used to conceive novel Electromagnetic-Band Gap (EBG) waveguides and low-profile high-gain leaky-wave antennas (LWAs). The analysis technique is divided in several steps, which have been implemented in a software tool using MATLAB®, and which are explained in detail in this work. The advantages and limitations of the proposed method are also described. Comparisons with full-wave simulations are presented to validate this analysis tool.

Componentes y Circuitos Pasivos de Microondas III

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 4

Diseño, fabricación y medida de un filtro paso banda dual GPS-Galileo

Óscar Menéndez Nadal, Pedro de Paco Sánchez, Mónica Rámirez Acedo, Jordi Verdú Tirado, Edén Corrales López

This paper presents the design, manufacture and measurement of a microstrip dual-passband filter for GPS-Galileo applications. The applied design methodology is based on a frequency

transformation of the Chebyshev low-pass prototype, and allows us to design filters as classical multiple-coupled filters. The measured response fulfills the required bandwidth specifications. Insertion loss are about 2 dB in the lower band, and 3.5 dB in the higher band. Lower insertion loss are possible using resonators with higher unloaded quality factor, for example cavity resonators, but on the other hand this type of resonator presents higher size and weight.

Modelo circuital de un filtro BAW basado en resonadores acoplados acústicamente

Edén Corrales López, Pedro de Paco Sánchez, Óscar Menéndez Nadal, Jordi Verdú Tirado

Using the Stacked Crystal Filter (SCF) concept a Coupled Resonator Filter (CRF) can be interpreted as a device in which two piezoresonators are stacked on top of each other in such a way that a certain degree of acoustic interaction occurs. The work presented in this paper reports a novel all-electrical model for the Coupled Resonator Filter. The model associates acoustical coupling with an equivalent electrical coupling between resonators. The resulting equivalent circuit makes it possible to directly apply classical filter synthesis techniques based on the coupling control between resonators. It complements with a synthesis approach the analysis approach of the Mason model.

Híbrido criogénico de 3 dB 90º para la banda de 4-12 GHz

Inmaculada Malo Gómez, Juan Daniel Gallego, María del Carmen Díez, César Briso

Modern ultra low noise receivers used for Radio Astronomy have evolved to provide very wide instantaneous bandwidth. Some of the configurations used in present cryogenic Front Ends, like sideband separating mixers and balanced amplifiers need 90º hybrids at the IF, typically in the 4-12 GHz band. There are commercially available devices covering this band with good ambient temperature characteristics, but their cryogenic performance drops to unacceptable levels. This paper describes the design, construction and measurement of a multioctave stripline hybrid for the 4-12 GHz band specially conceived to survive and fulfill accurate specifications when cooled to 15K (-258ºC). The materials and mechanical construction have been specially selected and the result is a very compact, reliable and low thermal mass device, able to survive extreme thermal cycling. The coupling and reflection show very little temperature dependence. Finally, the comparison of the results of a typical commercial unit with the new design presented clearly shows its advantages at cryogenic temperature.

Filtros polifase en tecnología CMOS para aplicación a receptores Galileo

José Francisco Calvo San Martín, José Domingo Alonso Vega, Yolanda Jato Llano, Amparo Herrera Guardado

A passive polyphase filter for GALILEO receivers has been designed, fabricated and characterized. I, Q, IB and QB input signals are needed to obtain the filtered output signals, Io, Qo, Ibo and QBo. This filter has been designed to reject the image signal that appears in Low-IF systems which can cause interference. As a compact and lightweight design is needed for portable receivers, the device occupies an approximate area of 0.25 mm^2. The attenuation in the undesired band is higher than 20 dB. Therefore, the filter satisfies the rejection requirement in the image band and makes the signal reception possible.

Resonadores de anillos divididos (SRR) para filtros de dos bandas

Alejandro García Lampérez, Magdalena Salazar Palma

This work proposes the use of split rings resonators (SRRs) as basic blocks for planar filters with dual-band bandpass frequency response. This application requires some geometrical modifications on the original SRRs used as metamaterial particles, so that they can be coupled to each other. An additional modification allows the control of the relative bandwidth of each band. The resonance frequencies and their dependence on the dimensions are analytically derived using a simple coupledline model, and the field distribution on each SRR is studied in order to design the coupling and tuning mechanisms. The measurements of a manufactured prototype show the validity and potential of the proposed elements.

Componentes y Circuitos Pasivos de Microondas IV

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 4

Divisor Wilkinson de banda ultraancha en milimétricas

Ana María Peláez Pérez, Pablo Almorox González, José Ignacio Alonso Montes, Jorge González Martín

Nowadays, millimeter-wave systems are being a key factor to develop wide band applications. In many microwave applications it is necessary to cover bandwidths up to 50%. In this paper, a two sections Wilkinson power divider in millimeter-wave band to increase the bandwidth is presented. This leads us to technology aspects, in Wilkinson power divider design, are key points to achieve the proper response of the circuit. The power divider proposed in this paper covers the 15 – 45 GHz band and its response has a ripple amplitude of 2 dB and a reflection coefficient better than 10 dB.

Nueva técnica para el diseño de divisores en anillo en banda ancha

Ana María Peláez Pérez, Pablo Almorox González, José Ignacio Alonso Montes

Nowadays, millimeter-wave systems are being a key factor to develop wide band applications. In many microwave applications it is necessary to cover bandwidths up to 50%. In this paper, a novel broadband hybrid ring design technique is presented. The broadband hybrid ring proposed in this paper covers the 3.2 – 6.8 GHz band, and its response has a ripple amplitude of 2 dB and a reflection coefficient better than 10 dB.

Diseño de acopladores Wiggly y acopladores no uniformes en la banda de milimétricas

Almudena Antón Leal, Ana María Peláez Pérez, José Ignacio Alonso Montes, Jorge González Martín

Directional couplers are the key elements in many wideband millimeter wave systems. In this case, the coupler must provide a broadband flat frequency response to another millimeter wave circuit. Therefore, two types of directional couplers have been designed in order to achieve a constant level of weak coupling over a wide frequency band from 20 to 40 GHz. The fist one was obtained by employing two cascaded sections, one of which, has a wiggly (sawtooth) conductor-edge geometry between adjacent conductors. The second one is a nonuniform coupler. Both couplers were implemented in microstrip technology on alumina substrate. Results of measurements are also presented in this paper.

Diseño de un filtro con doble banda de paso mediante resonadores SIR modificados

María del Castillo Velázquez Ahumada, Jesús Martel Villagrán, Francisco Medina Mena, Francisco Luis Mesa Ledesma

The aim of this paper is to introduce a new quasi-lumped resonator which is based on the modification of the well-known folded SIR resonator by means of the addition of a quasi-lumped stub. The new structure allows the independent design of the central frequencies of each of the two passbands of the filter (dual band filters). The frequency of the first passband corresponds to the resonance of the odd mode, which is not affected by the presence of the stub. Thus, this frequency only depends on the dimensions of the external resonator. However, the frequency of the second band is associated with the the resonance of the even mode, which is strongly influenced by the stub. Additional flexibility can be added by allowing the stub to be located at an arbitrary position along the high impedance line section of the SIR. Some designs are reported to illustrate the possibilities of the structure.

Diseño y caracterización de cargas adaptadas desde DC a 20 GHz para circuitos planares de microondas

Benito López Berrocal, José de Oliva Rubio, Íñigo Molina Fernández

Matched loads are fundamental elements to characterize multiport devices (couplers, oscillators, hybrids, …) with two port Vector Network Analyzers (VNA). However, the implementation of broadband microwave planar matched loads is limited by resistor parasitics, whose inductive behaviour produce increased return losses at high frequencies. In this paper we present a novel technique to design matched loads from DC to 20 GHz for planar microwave circuits. The technique is based on matching SMD resistors, so that implementation is easy and inexpensive. With a simple surface mounted matching network, return losses better than 20 dB have been experimentally demonstrated in the complete frequency range.

Filtros paso banda selectivos utilizando tecnología coplanar BC-CPW y técnicas interferenciales

Miguel Ángel Sánchez Soriano, Germán Torregrosa Penalva, Enrique Bronchalo Bronchalo, Ángela Coves Soler

In this work a new type of wideband bandpass coplanar filter with abrupt skirt and large stop band is proposed. The filter exhibits a flat response in the pass band, and a steep slope and a high rejection in the stop band. The filter design is based on the use of a broadside-coupled (BC) coplanar-waveguide (CPW) directional coupler as a transversal filtering section (TFS). This is performed by conveniently loading two of the ports of the coupler with shunt stubs, so that in the output port the signals interfere in a way that a bandpass filter response is obtained. The suggested filter scheme has been experimentally validated through the design, fabrication and measurement of a wideband bandpass coplanar filter centered at 2.0 GHz, formed by the cascade of two TFS.

Componentes y Circuitos Pasivos de Microondas V

Sesión V: Martes 23, 12:00 - 13:45 h Aula 4

Diseño de dispositivos microconmutadores RF-MEMS capacitivos con metalización flotante

Marco Antonio Llamas Morote, David Girbau Sala, Esther Pausas, Lluís Pradell Cara, Flavio Giacomozzi, Carlos Calaza

In this paper, the design of a capacitive RF-MEMS switch is presented. In order to have precise control of the downstate capacitance value a floating metal technique is used. As RF MEMS switches represents new design challenges, electrical modelling is addressed with

2.5D and 3D full wave electromagnetic software. More specifically, ADS-momentum (2.5D) and EMDS (3D) from Agilent Technologies are used. The switch was fabricated at FBK-IRST foundry in Trento, Italy. Characterization and simulation results are compared and conclusions are extracted. The designed capacitive switch presents a maximum isolation of 38 dB at 15 GHz

Divisor de banda ultraancha basado en líneas *taper*

Beatriz Mencía Oliva, Ana María Peláez Pérez, Pablo Almorox González, José Ignacio Alonso Montes

Nowadays, there is a great interest to develop systems which cover wide frequency bands. Power dividers are key elements in these systems. In this paper, an ultra-wide band (UWB) power divider based on taper lines is presented. The taper lines perform wider bands. To improve this 3-port circuit response, resistive elements are used. In order to validate this technique, a power divider based on taper lines has been designed in the band 3-12 GHz (UWB communications band). The measurements show a good performance.

Diseño de filtros *dual-mode* longitudinales en guía de onda rectangular

Jorge Alfonso Ruiz Cruz, Yunchi Zhang, José Ramón Montejo Garai, Jesús María Rebollar Machain, Kawthar Zaki

Dual-Mode filters are used in applications where low mass and volume are required. In this paper, the Computer Aided Design of a new rectangular waveguide filter structure is proposed for achieving the *dual-mode* operation. It preserves the longitudinal inline topology used in the classical circular waveguide configuration, which can provide quasi-elliptic function responses. However, it has no coupling or tuning screws and it is exclusively made up of sections of aligned rectangular waveguides. This leads to a very efficient full-wave analysis based on the Mode-Matching method. The proposed CAD is illustrated with a four order prototype, whose results are compared with other numerical technique.

Optimización multiobjetivo aplicado al diseño de filtros evanescentes con resonadores dieléctricos

Antonio Marco Aguilar, José Vicente Morro Ros, Héctor Esteban González, Carmen Bachiller Martín, Vicente Enrique Boria Esbert

The development of new structures for the implementation of high frequency filters in communication systems is motivated by some of these reasons: reduction on mass and volume, increase on thermic stability or increase on out of band rejection. These new design specifications require a new set of additional design objectives. So, it is necessary to apply a multiobjective design strategy. In this work a new implementation of the Goal Attainment method is presented, and its performance is compared with the Goal Attainment method of MATLAB. Besides, the Goal Attainment algorithm is used to create a new multi-objetive

design strategy that allows the automated and efficient design of H plane evanescent waveguide filters with cylindrical dielectric resonators.

Diseño de OMTs (Ortho-Mode Transducers) con la unión turnstile

Ignacio Izquierdo Martínez, Jorge Alfonso Ruiz Cruz

This paper presents the design of an orthomode transducer (OMT) based on the Turnstile junction with two main characteristics: a) the routing branches for each polarization are made in both E- and H-plane configuration, and b) the used Turnstile junction has an optimized internal profile inspired on mitered bends. These branches are made up of wellknown waveguide elements, such as E- and H-plane bends and height transformers, which can be efficiently analyzed by specialized codes or available commercial software. The proposed structures are illustrated with the design of a complete OMT. The numerical simulations of the OMT elements and the performance of the overall structure in the band 13-19 GHz are presented in this communication, obtaining return losses better than 24 dB in a 37% fractional bandwidth for both polarizations.

Comunicaciones Móviles y por Satélite I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 4

Análisis del estado de una red HSDPA a partir de medidas de campo

Joaquín Matamales Casañ, David Martín-Sacristán Gandía, José Francisco Monserrat del Río, Narcís Cardona Marcet

The introduction of High Speed Downlink Packet Access (HSDPA) implies an enormous challenge for all mobile industry agents. All network operators must ensure complete availability of services by diligently planning and tuning their networks. Call tracing tools significantly help to assess the user plane performance but they can be also useful for troubleshooting potential problems in the cellular roll out. This paper offers some measurement results for HSDPA network obtained with a conventional drive test tool in the campus of the Polytechnic University of Valencia. Using these measurements, a set of processing methods are proposed to detect some of the most important concerns of HSDPA networks, such as poor coverage level, interfering coverage, pilot pollution, pilot overshooting, missing neighbours or pilot surprise. Application examples of all these methods are provided and analysed.

Análisis funcional de las prestaciones de transmisión de paquetes de alta velocidad en enlace ascendente HSUPA/UMTS

Carmen Azpillaga Alsasua, Enrique Bretón Cristóbal, Daniel Quecedo Montoya, Francisco Javier Falcone Lanas

In this paper, the features of packet based data transmission for an operating third generation UMTS network with HSPA (downlink as well as uplink) technology has been analysed. Some parameters have been selected in order to see the quality and behaviour of an urban network, as well as an indoor environment, placed both of them in Pamplona. The results shown in this paper have been obtained by analyzing network statistics and performing drive test measurements as well as network protocol analysis. The results reveal increased throughput for both uplink and downlink directions.

Estudio de algoritmos de conformación sobre Test-Bed para seguimiento de satélites LEO

Alberto Antón Sánchez, Miguel Alejandro Salas Natera, Ramón Martínez Rodríguez-Osorio, Alberto Torre

Nowadays, earth stations for downloading data from LEO (Low Earth Orbit) satellites use large reflector antennas, which pose a number of impairments. In that context, arraying techniques and smart antennas appear as an improvement in performance. This paper presents a comparative study of several beamforming algorithms on a Test-Bed platform, ideas about calibration, robustness topics and some specifics to satellite communications systems such as

orbital propagators. All of which will be comprised in a Software Defined Radio (SDR) platform whose description is hereby summarized. For our simulations and measures we will consider the NOAA (National Oceanic and Atmospheric Administration) satellites and more specifically the APT (Automatic Picture Transmission) signal.

MedNET: los satélites inteligentes al servicio de la telemedicina

Raúl Muñoz Martínez, Inés Sanz Rodríguez, Cristina Arias Pérez

During the recent years, space communications have favoured the deployment of new functionalities and services in different sectors, always trying to increase the end user quality of life. Furthermore, the use of satellite data links enables to provide communications in isolated areas. In particular, access to medical care is sometimes very difficult to be reached from people living in rural and underserved areas. This problem is very well known in rural areas in Latin America. This paper offers an overview of MedNET project, a seventh frame program project, which tries to improve this access using intelligent satellite systems. In fact, thanks to the on board processor of Amazonas satellite, it is possible to offer advanced e-medicine applications with the required quality of service. Hispasat, a relevant satellite operator with a strong activity in Latin American market, will develop new solutions enhancing Amazonas satellite functionalities and adapting the on-board processor, AmerHis, to these special applications.

DVB-SH: hacia la TV del futuro

Raúl Muñoz Martínez, Jorge Rodríguez López, Inés Sanz Rodríguez

Broadcasting of multimedia contents has experimented last years a great advance thanks to the design and deployment of information technologies that facilitate the access to these kind of services through mobile terminals. For many users, the need of broadband access in indefinite places, in any time and in a transparent way independent of the technology, increases every year. This paper presents the results of the research works developed by Hispasat and other companies involved in the Furia and B21C projects, offering a general perspective of the new DVB-SH system definition, that is able to offer broadcasting services through hybrid coverage and technology systems: terrestrial and satellite.

SIMBAD: a new concept for *Satcoms - on the Move*

Álvaro Aynos Ambite, Antonio Arana Castro, Inés Sanz Rodríguez, Beatriz Quijano

The project SIMBAD is an Innovative Research & Development project that studies and develops a satellite communication system from vehicles in movement, presenting a concrete case of implementation for the communications between a car in movement and an helicopter in flight. In this paper, first an overview of the current state of the art about the communication by satellite technologies involving vehicles in movement is presented. One of the main objectives of Simbad Project is the investigation and development of a new satellite

antenna system based on the "Satcoms on the Move" concept adapted to commercial and civil application, within new technological approach in order to reach light materials and low costs. Then, a summary of the main tasks done in the project is presented, including a description of the proposed scenario, and some brief notes about the developed activities in the project: the satellite network design, the pointing and antenna mechanic system and the radio link between the vehicle and the helicopter.

Comunicaciones Móviles y por Satélite II

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 5

InterRural: internet rural mediante redes heterogéneas e itinerantes

José Abad Molina, Albert Anglès Vázquez, Álvaro Aynos Ambite, Albert Bel, Óscar Chabrera Villareal, José López Vicario, Raúl Muñoz Martínez, Cristina Peña, Félix Santiago, Inés Sanz Rodríguez, Gonzalo Seco Granados, Diego Soro

In this paper, results obtained in the first stage of the National Project InterRural are presented. The main objective of this project is to provide isolated rural areas with broadband Internet access by means of a hybrid network. In particular, a hybrid architecture based on the integration of a satellite system with terrestrial access networks is proposed, being the access networks based on WiMAX, WiFi and PLC technologies. Experimental results obtained in a live demostration carried out at the campus of the Universitad Autónoma de Barcelona are provided, showing that the proponed strategy is a low-cost and viable solution to facilitate the Internet access in rural areas.

Sincronización y demodulación en IR-UWB

Mónica Navarro, Montse Nájar

This paper addresses the problem of synchronization and data demodulation for Impulse Radio Ultrawideband systems. A novel non-coherent non-data aided joint synchronization and data demodulation algorithm is proposed. The scheme consist of a coarse estimation phase which is performed over a single symbol period, followed by a fine synchronization stage that estimates the timing with high accuracy based on a frequency domain ToA estimation algorithm. In turn, the demodulator exploits the high time resolution characteristics of UWB signals by taking decisions directly over the timing estimates.

Optimización de técnicas de transmisión adaptativas para sistemas de comunicaciones vehiculares

Ramón Bauzá, Miguel Sepulcre Ribes, Javier Gozálvez Sempere

The adoption of wireless vehicular communication technologies would strongly depend on the technologies transmission reliability, required by QoS demanding traffic safety

applications, and the system's scalability as the technology is gradually introduced. To this aim, this work proposes the use of opportunistic transmission policies that dynamically adapt the transmission parameters based on the operating conditions and potential traffic safety risks. The work analyses different configuration proposals with the aim at meeting the strong traffic safety QoS requirements while maximising robustness and channel efficiency, crucial to guarantee the future system's scalability.

Técnicas CRRM para la gestión coordinada de recursos radio en redes móviles heterogéneas

Javier Gozálvez Sempere, María Carmen Lucas Estañ, Joaquín Sánchez Soriano, Javier Gimeno Blanes

A key aspect of Beyond 3G heterogeneous wireless systems is the definition of Common Radio Resource Management (CRRM) techniques capable to efficiently manage the radio resources from different Radio Access Technologies physically coexisting. This work proposes and evaluates a set of CRRM policies based on bankruptcy theory that simultaneously assigns to each user an adequate combination of RAT and number of radio resources within such RAT, aimed at maximising the resource's efficiency and guaranteeing user QoS fairness.

Caracterización del comportamiento de RAB HSDPA y su interrelación con transmisión de paquetes R99 en redes UMTS

Enrique Bretón Cristóbal, Carmen Azpillaga Alsasua, Daniel Quecedo Montoya, Francisco Javier Falcone Lanas

The characteristics of third-generation system, defined as UMTS in 3GPP R99, and its evolution towards HSDPA defined in 3GPP Release5, are studied in this paper. In order to check the theoretical improvements in terms of throughput and traffic load achieved with HSDPA compared to UMTS, in this paper we analyse statistics from different RAB's (Radio Access Bearers) of R99 and from HSDPA, obtained in a real and operative network under different conditions. The results reveal enhanced behaviour in data transmission as evolution of release 5 is present in the network.

Componentes y Semiconductores I

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 5

Estudio de linealidad para transistores DG MOSFETs

Antonio Ramón Lázaro Guillén, Antonio Cerdeira, Magali Estrada, Bogdan Nae, Benjamín Iñíguez

A compact explicit model for undoped Double-Gate (DG) SOI MOSFET including velocity saturation is presented. Using this model, intermodulation linearity obtained from device level Harmonic Balance (HB) simulation and Integral Function Method (IFM) is compared.

Estudio y modelado de la fiabilidad en transistores GaN

Judit Arroyo Díez, Tomás Fernández Ibáñez, Fernando Sánchez Sanz, Marina Verdú Herce, Antonio Tazón Puente, Asmae Mimouni

In this paper, reliability prediction models will be proposed, from different measurements obtained in a Life Test using as test vehicle six GaN HEMT's from wafer AEC1147 provided by III-V Labs. The dependence on stress time of four different magnitudes have been studied (saturated current, gate-source biasing voltage, gate current and transconductance) when monitoring versus time at 175 ºC channel temperature. As a result, mathematical expressions to simulate this dependence have been obtained. The aim of these models is to serve as a tool to circuit designers and manufacturers when studying failure mechanisms.

Códigos y Teoría de la Información I

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 2

Análisis de la precisión de posicionamiento alcanzable con un GPS monofrecuencia

Ana María Torres Aranda, Joaquín Cascón López, Jorge Mateo Sotos

The main purpose of the project is the cartographic and topographic improvements made by GPS techniques and sub-metrics accuracy. Once the work is completed and after the respective transformation, we will get UTM coordinate in the cartographic system of ED-50 reference of all the points-used. Subsequently, depending of the available cartography and of the found reality a replant was carried out to analyse the maximum precisions obtained, using together an equipment monofrequency GPS (GLOBAL POSITIONING SYSTEM) and a Permanent Reference Station GPS 1200. Taking into account the mentioned techniques, we'll try to know the causes of the errors between the measurements. There is claimed that these results were useful to other works developed in the future, using the mentioned set of instruments.

Códigos multinivel para la transmisión de fuentes correlacionadas a través de canales de difusión

Aitor Erdozain Ibarra, Pedro Miguel Crespo Bofill, Javier Del Ser Lorente

In densely deployed sensor networks, the measurements registered by nearby sensors often appear to be correlated. In this context, we propose to use multilevel codes to efficiently transmit the information from correlated sensors through broadcast channels. Focusing on this multiuser channel with independent users, T. M. Cover proved in 1972 that a superposition-based coding scheme is theoretically capable of approaching its capacity region as long as the distribution of the codewords is gaussian. In our work we follow a different approach by using multilevel LDPC (Low Density Parity Check) codes where, instead of superposing the codewords from different users, such coded symbols are mapped onto a high order constellation based on block partitioning. The multilevel decoder is then modified to take into account the correlation between the information symbols. As shown by intensive computer simulation results, our proposed multilevel scheme outperforms standard superposition-based techniques, and its performance gets close to the (suboptimal) fundamental limits assuming separation between source and channel coding.

Técnicas avanzadas de retransmisión para redes de múltiple acceso con fuentes correlacionadas

José Ángel Esteban Matellanes, Javier Del Ser Lorente, Pedro Miguel Crespo Bofill, Babak Khalaj

We consider the non-cooperative multiple access relay channel, where 2 users transmit their information to a common receiver aided by a shared relay. Recently, it has been showed that, for independent sources and dual-frequency operation, enhanced diversity gain can be attained by solely switching the transmit frequency bands between users at the relay site. In this paper we extend this previous work to the case where the sources are spatially correlated. Under a Detect-and-Forward (DF) relay approach, and using a Maximum Likelihood (ML) detector, we prove that the performance of the aforementioned dual-frequency scheme can be enhanced by preprocessing the detected symbols and properly designing the constellation mapping at the relay site. Simulation results show that our system outperforms the scheme when the relay is close to the sources.

Solución aproximada de ecuaciones modulares lineales

Ismael Jiménez Calvo

A modification of the Extended Euclidean Algorithm is presented which allows to search for small approximate solutions of a modular linear equation $ax \equiv n \pmod b$. In fact, it finds solutions to the diophantine equation $ax - by = n + r$ in $O(\log(b/n))$ steps. The size of r is $O(n)$ and the size of x is $O(b/n)$. The algorithm can be applied to the local search for small quadratic residues of the size $O(b^{2/3})$.

On single and double burst-correcting shortened cyclic codes

Luis Javier García Villalba, Mario Blaum, Bruce Wilson, Shaohua Yang

We consider shortened cyclic codes that are capable of correcting either single or double bursts of errors. We present tables with the generator polynomials of shortened cyclic codes capable of correcting either ogne burst or two bursts. We consider shortened cyclic codes that can correct all-around bursts as well as codes that cannot do so, and we study under which conditions it is advantageous to use one or the other. We also consider the problem of correcting bursts together with random errors.

Educación: Nuevas Tecnologías y Herramientas I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 5

Diseño y construcción de una fuente sonora omnidireccional de bajo coste

Alan Antich Durán, Salvador Luna Ramírez

The design and characterisation of an omnidirectional acoustic source for academic purposes is presented here. A dodecaedric model has been used, following international recommendations. Its need is widely justified for Sound and Image Technical Telecommunication Engineering studies, where acoustic measures and experiments are presented in several subjects. This device becomes a must in any practical acoustic laboratory, and allows complete experiments in a teaching environment. With a low budget, around 300 euros, the dodecaedric source complies with ISO 140-4 standard, which is widely referenced in national and international acoustic environmental laws. ISO standards observance, mainly concerning directivity, allows the use of this device as an omni-directional sound source in real acoustic measuring.

Academia global de heridas: una iniciativa de formación virtual universidad-empresa

Cristina Castanedo Pfeiffer, José María Zamanillo Sainz de la Maza

This paper shows a novel and valuable e-learning project developed between the University of Cantabria, and the pharmaceutical company Smith & Nephew. For first time in our country, a complete master course about chronic wounds has been carrying out by professionals, for professional and post-graduated in the nursing and sanitary areas. This course is the result of three years effort between two Spanish universities: University of Cantabria and Complutense University of Madrid and the above mentioned company. Authors, show in the paper the importance of the communication and information technologies CITs to properly fit and complete the formation of the sanitary professionals, using e-learning platforms, as well as guaranteeing that the offered formation achieves the required degree of quality education.

Aplicación de realidad aumentada para la educación y difusión del patrimonio

José Manuel Peula Palacios, Francisca Torres Aguilar, Cristina Urdiales García, Francisco Sandoval Hernández

Nowadays, new technologies are getting more and more important each day. They are used in very different ways. For example in education provides an interactive and friendly way for students to get closer to cultural heritage. In this short paper we present a new tool for cultural heritage diffusion and education in general. We present a versatile interaction system based in pattern recognition from images captured from a web cam. The system only needs a personal

computer with a web cam and a landmark, which is the torch/pointer for the application. The screen of the system could present different scenarios, such us a picture of an artist through X-Ray, an expedition in an Egyptian chapel or the inner of a human body. With the torch/pointer, the user can examine the screen getting information about what he/she is watching, so it is a funny way to learn different subjects.

Aplicación de la simulacion electromagnética en el estudio de filtros paso banda en microstrip

Pablo Luis López Espí, José María Zamanillo Sainz de la Maza, Rocío Sánchez Montero, José Félix Pasamon Marigil, Francisco Calvo Díaz, Carlos Pérez

In this paper we present the study of electromagnetic simulation as an educational tool for microwave filters. We have started from the classic coupled lines filter, simulated both by traditional and electromagnetic methods. This way, we can obtain the frequency response and also the electric field distribution. Later, we have introduced ladder line and SIR structures into the classic filter to show the variations in the filter behaviour. These structures have been used to reduce filter size. Finally, we have combined both techniques in the same device. Several filters have been constructed and measured to validate the results obtained by simulation. The proposed designs let us verify concepts such as field distribution, phase velocity and resonator shape influence.

Arquitectura de servicios web en Agrega

Antonio Sarasa Cabezuelo

Agrega is a federation of learning repositories which is aimed to be used by 19 educational authorities in Spain. Each single educational authority will have its own repository loaded with curricular learning objects created according to standards, and each single repository will be able to integrate and interoperate with other learning systems locally and worldwide. One of the principles, that were set in order to create a sustainable learning federation was to develope a service oriented architecture (SOA) and promote a technical architectural style whose goal is to achieve loose coupling among heterogeneous interacting software agents. Agrega uses Web Services to get this objective. In this paper, we describe its Web Services Architecture.

Educación: Nuevas Tecnologías y Herramientas II

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 5

Receptor de FM controlado mediante PIC

Alejandro José Ayala Alfonso, Silvestre Rodríguez Pérez, Oswaldo González Hernández, Beatriz Rodríguez Mendoza, Eduardo Magdaleno Castelló

The purpose of the present work is the design and implementation of an electronic device that allows us to demodulate an FM signal using the integrated circuit TDA 7000. The FM receiver was designed to operate within the commercial band and a PIC was used for the automatically controlling of the carrier frequency. The student should understand the basic operation principles of the FM techniques in order to carry out the implementation. It may be conceived as a practical problem of laboratory for a team project of 2-3 students. During the hardware development, students learn the use of digital to analog converters, signal conditioning and modulation techniques. Therefore, the design and development of the system can serve as aid to better understand the described devices and their use to solve a specific problem.

Herramienta didáctica para el aprendizaje del código morse

Ana María Barbancho Pérez, Juan Ayas Sánchez

In this paper, an educational application for learning morse code is presented. The selected learning method consists in associating each letter with its sound, without counting explicitly the number of dots and lines that form each letter. The system includes a very easy to use graphical interface, aids for blind people and the possibility to use a standard vertical morse handle. The main novelty of this application is that it includes a complete and effective morse code learning method. The evaluation of the application shows that morse code can be easily learned with the designed tool.

Innovación docente en prácticas de laboratorio tradicionales en electromagnetismo

Alfonso Salinas Extremera, Juan Antonio Morente Chiquero, Jorge Andrés Portí Durán, Cédric Blanchard, Margarita Rodríguez Sola, Jesús Francisco Fornieles Callejón

Nowadays new technologies in Education sometimes forget about real laboratories in favour of virtual laboratories. In this communication we present improvements in traditional electromagnetic laboratory practices such as: Ohm Law and Thevenin theorem, Charge and Discharge of a Capacitor, and Transformer. The strategy is based in two learning tools: Moodle as a Learning Management System (LMS) that provides resources, tasks and a easier way of teacher-student communication and MATHEMATICA through data templates in notebook format and programed tools to obtain and analyze results from individual laboratory data. The new learning topics included are: statistical study of systematic errors, Discrete

Fourier Transform, digital data acquisition, circuit model of the transformer, induction coefficient measurements and magnetic circuits.

Análisis del comportamiento y las prestaciones de una red HFC

María Consuelo Part Escrivá, David Ponce López

In 1999, Ministries from 29 European countries signed the Bologna Declaration - involving now about 50 countries-, which aims at the establishment of a European area of higher education. The guidelines to build the European Space of Higher Education or, in Spanish, EEES (Espacio Europeo de Educación Superior), focus on a new system of easily readable and comparable degrees essentially based on two main cycles, undergraduate and graduate, and a new system of credits called ECTS (European Credit Transfer System). This paper discusses specific tools to face up this new concept to teach and learn: we use a software to evaluate theoretical concepts and to bring students near real HFC networks. In this way, we arouse students' curiosity and they learn more and better because they "see and touch". It is an important change in students and educators' attitude and work: on the one hand, students have to be more independent and responsible, on the other, educators have to be open-minded to success in new learning and educational technologies.

Diseño preliminar de una estación terrena basada en software radio para aplicaciones docentes

Ramón Martínez Rodríguez-Osorio, Sergio Rafael Díaz-Miguel Coca

Most of student satellite missions are based on the design, construction and launch of a picosatellite (cubesat) including the design of the ground station (GS). Traditional GS are based on commercial elements and are designed to support only one mission. These stations access the mission data very inefficiently, as only contact the satellite during short visibility periods. In this paper, we present a novel GS concept based on software defined radio technology that can be integrated in a global network for satellite tracking. The station will be implemented by a group of students as a part of a space project under the supervision of a faculty coordinator. The design must fulfil the requirements of low cost, remote operation, and flexibility to operate in different frequency bands. The set-up of this mid-term educational space project to build an operational GS will hopefully motivate Telecommunication Engineering students to participate and gain real hands-on experience in an international space environment.

Análisis comparativo de la implementación de un sistema de transmisión digital con parámetros definidos en la capa física del estándar IEEE 802.16 utilizando Matlab y Simulink

Gerardo Agni Medina Acosta, José Luis Cuevas Ruiz, José Antonio Delgado Penín

In this article one of the proposed schemes for Coding and Modulation to be used in the physical layer of the IEEE 802.16 standard is simulated using both MATLAB (M-file) and SIMULINK (Blocks) where the BER is shown. The analysis has been evaluated considering three conditions, first by using the modulation scheme 16-QAM, then by adding the Reed-Solomon codification RS (64,48) and finally by adding a second codification scheme corresponding to the convolutional coding CC (2/3,7). The obtained results considering the two different methodologies (MATLAB/SIMULINK) based on the same logical structure are compared to validate the implementation of this model, which can later be used to evaluate the several modulation and codification schemes defined by the IEEE 802.16 standard as well as other channels.

Educación: Nuevas Tecnologías y Herramientas III

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 3

LAVICAD: laboratorio virtual de comunicaciones analógicas y digitales

Margarita Cabrera Beán, Xavier Giró Nieto, Francesc Rey Micolau

The presented experience consists on the “design of” and “experimentation with” a virtual laboratory of analog and digital communications: LAVICAD. It has been result a useful tool to verify the performance of different communication systems and signal processing techniques, topics typically integrated in undergraduated courses of the curriculum of telecommunications engineering. The communication systems have been implemented and designed as Java applets and are free access. They can be run at the e-learning platform: comweb.upc.edu. The different communication systems present different levels of user interactivity and when students execute a system integrated in a comweb course, the obtained results can be supervised by the professor as an evaluation and assessment tool. From a pedagogical point of view, the main advantages of using a virtual laboratory supposes, can leads to facilitate the learning of certain matters, acting as a connection between the model of knowledge based on concepts and theories, and their practical understanding and experimentation.

Aplicación de nuevas tecnologías en la enseñanza de la estadística aplicada: experiencia en un curso piloto

Javier Portela García-Miguel, María Villeta López

The teaching of Statistics at the University level is one of the situations where the new technologies application can improve dramatically the student's achievement. The nature of the discipline is theoretical as well as practical, and the material to study (data) can be used in teaching without costs or expensive tools. In this work we briefly study the effect of new technology tools over teaching statistics and provide an experience in their application on a Sampling Survey course at the University level.

Experiencias docentes en la asignatura fundamentos de informática en el marco del EEES

María Isabel Riomoros Callejo

In this paper the experiences of the teaching of Computer Science within European Space of Higher Education in the School of Statistics of the Complutense University of Madrid (UCM) are presented. This paper shows the new opportunities of learning tools such as Campus Virtual UCM: https://www.ucm.es/campusvirtual/CVUCM/index.php.

Implementación de un sonómetro con Matlab

Emilio Satorre Miralles, Andrés Camacho García, Raúl Llinares Llopis

The subject of this paper is a Graphical User Interface created using Matlab which represents the operation of the conventional sound level meter used to analyze acoustic pollution in cities, sound insulation in the walls of a building, etc. The purpose of this software is to introduce to the student the basic concepts of wave propagation and sound measurement. This software consist of a main window with different options, a central area for representing the different graphics and secondary windows to show the different answers depending on the user request.

Influencia de los foros de internet en ejercicios no presenciales

José Luis Fernández Jambrina, Manuel Sierra Pérez, Manuel Sierra Castañer, Belén Galocha Iragüen

A web based agent for personalized e-learning exercises was presented at past editions of this Symposium. Since then, the use of web forums has been spreading between student's leading to bad practices. This influence in analyzed, the solution applied is described and other solution is proposed.

Electromagnetismo I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 6

Cálculo eficiente de la función de Green en cavidades multicapa con sección transversal de tipo triángulo rectángulo-isósceles

Juan Sebastián Gómez Díaz, Mónica Martínez Mendoza, Fernando Daniel Quesada Pereira, Alejandro Álvarez Melcón

In this paper, an efficient calculation of the Green's functions inside multilayered shielded cavities with right isosceles-triangular cross-section is presented. The method is entirely developed in the spatial domain and it is based on image theory. The idea is to use the Green's functions inside a multilayered shielded square box in order to accurately obtain the Green's functions of the triangular structure. It is shown that the new algorithm is very robust, with limited computational effort. Cut-off frequencies and potential patterns of a triangular cavity have been calculated and compared to those obtain by other techniques showing very good agreement. Finally, a transversal filter inside a multilayered triangular shaped cavity is designed, manufactured and tested using the developed technique.

Incorporación de dispositivos activos en simuladores FDTD a partir de parámetros S medidos y de técnicas de ajuste racional

Óscar González, José Antonio Pereda Fernández, Ana María Grande Sáez, Amparo Herrera Guardado, Ángel Vegas García

The equivalent circuit approach is the most common choice to account for lumped components in the finite-difference time-domain (FDTD) method. However, when dealing with active devices, equivalent circuit models are not easy to obtain and, even, some components are not described reliably by such an approach. In this work, we combine the two-port lumped-network FDTD method with rational fitting techniques to incorporate active devices characterized by *S*-parameters into FDTD simulators. To this end, the *Y* -parameters are approximated by rational functions of the complex frequency *s*. Finally, the polynomial coefficients of the rational functions are used directly as input parameters of the TP-LN-FDTD method. This tecnique is applied to the calculation of the *S*-parameters of a hybrid structure including a field effect transitor as active device. The results obtained are compared with those provided by a commercial simulator and with measurements.

Determinación de la permitividad de mezclas dieléctricas con el método TLM

Jorge Andrés Portí Durán, Cédric Blanchard, Juan Antonio Morente Chiquero, Alfonso Salinas Extremera, Enrique Navarro, Margarita Rodríguez Sola

In this paper, the effective permittivity of two-phase dielectric mixtures is numerically modeled by using the TLM method. Two TML schemes have been considered: a hybrid one, which combines TLM method with capacitor circuits to define details below the grid size, and a purely TLM scheme, with no additional assumption. A comparison of both algorithms has been carried out by modeling a canonical geometry. Numerical results presented are in good agreement with effective medium formulas, especially at low volume fraction, and with Wiener and Hashin-Shtrikman bounds. The effect of size is considered, resulting in a lower deviation around the mean value for the case of small insertions. Regarding the shape effect, a clear deviation towards the wiener limits is observed when inclusions swap, which is related with the similarity between the resulting geometry and parallel plate geometries. A special case is observed for square insertions, which tend to the Hashin-Shtrikman bounds, which is explained in terms of coated insertions.

Método de elementos finitos *hp* con adaptabilidad automática orientada a un objetivo para problemas abiertos en 2D

Ignacio Gómez Revuelto, Luis Emilio García Castillo, Daniel García Doñoro

In this paper, we describe a fully automatic goal oriented *hp*-adaptive Finite Element strategy, which is applied to open problems (radiation and scattering). The methodology produces exponential convergence rates in terms of an upper bound of an user-prescribed quantity of interest (in our case, the S-parameter, the far radiated field or far scattering field) against the problem size (number of degrees of freedom). We illustrate the efficiency of the method with 2D numerical simulations of open problems (radiation and scattering). Applications include the far scattering (radiated) field by an object (antenna) and the computation of mutual coupling of the antennas (S-parameters). Results show that self-adaptive goal-oriented *hp* obtains more accuracy in the quantity of interest than self-adaptive energy-norm *hp* with the same number of degrees of freedom.

Nueva versión de MONURBS

Josefa Gómez, Abdelhamid Tayebi, Iván González Diego, Manuel Felipe Cátedra Pérez

This paper presents an overview of the new MONURBS code based on the Moment Method (MM) with Fast Multilevel Multipole (FMLMP) with a number of levels fitted the electrical size of the problem to be solved. This code is a powerful tool to analyze complex antennas, on board antennas and electromagnetic compatibility. The structure under analysis is defined by means of NURBS that can be generated by the most used computer aided geometrical design (CAGD) tools. The program includes a friendly graphics user-interface. The user can

visualize the geometry under analysis from any point of view, build geometries, set options, see the results with different options, etc. MONURBS works in any modern PC with Windows, but there are versions for others operating systems and platforms including highly parallelized versions for multiprocessor computers or clusters. MONURBS is very flexible and can be adapted to the needs of each user.

Medidas de propiedades dieléctricas de materiales de construcción utilizando una guía rectangular

José María Rodríguez Martín, Alexia López Gil, Noelia López Alcelay, Vicente González Posadas, Carlos Rueda Frías, Ignacio Gómez Revuelto, José Enrique González García

A set of measurements of electromagnetic properties of building materials is presented in this work. The method is based on an open-ended rectangular waveguide that radiates into the material under study. Measurements were done by using two waveguides with different size for obtaining the results in two ranges of frequencies. The values of the dielectric constant are deduced from the measured reflection coefficient or admittance of the waveguide radiating into the material. A relatively simple model can be used to deduce the values of the dielectric constant from the experimental data. This method can be used for other type of materials and its main advantage is the non-destructive character and the ease implementation.

Electromagnetismo II

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 6

GiDtohp: interfaz basada en preprocesador *GiD* para modelado geométrico con adaptatividad automática *hp*

Daniel García Doñoro, Luis Emilio García Castillo, Ignacio Gómez Revuelto

This document presents an interface between *GiD* and *GMP*, the Geometrical Modeling Package of the fully automatic *hp*-adaptive FE (Finite Element) software, developed at ICES (University of Texas at Austin). *GiD* is used to construct a tessellation of the problem domain into FE-like regions (blocks in *GMP* terminology), and the interface obtains and transfers all the topological and geometrical information to *GMP*. Then, *GMP* automatically constructs a parameterization for each FE-like region of the *GMP* mesh, which later can be used to generate the actual FE-mesh and support geometry updates during mesh refinements.

Cálculo de la función de Green 3-D con periodicidad 1-D mediante la transformación de Kummer

Ana María López Fructos, Rafael Rodríguez Boix, Francisco Luis Mesa Ledesma

The 3-D homogeneous Green's function with 1-D periodicity can be expressed as spatial and spectral infinite series that are slowly convergent. This work presents an efficient algorithm to speed up the convergence of the spatial series. In the algorithm, which is based on Kummer's transformation, the spatial series is split into a first series with algebraic convergence of arbitrarily large order and a second series for which quasi-closed form expressions are derived. Since this second series does not depend on the coordinates of the source and observation points, it only has to be computed once in the Method of Moments analysis of a periodic problem, which leads to considerable CPU time savings. The obtained numerical results show that when the number of asymptotic terms retained in the spatial Kummer's tranformation is sufficiently large, the new algorithm is always faster than alternative acceleration algorithms based on the spectral Kummer-Poisson's method and Ewald's method.

Resolución de la TD-MFIE mediante el MoM con funciones base espaciales RWG y temporales polinomios de interpolación

Antonio Méndez Montoro de Damas, Jesús Francisco Fornieles Callejón

In this work the magnetic field integral equation (MFIE) has been solved in time domain (TD) using the method of moments (MoM). Rao-Glisson triangular functions have been chosen as spatial basis functions, and lagrangian interpolation polynomials of second order have been employed as temporal basis functions. The results obtained in this way are compared with those ones given by other methods appearing in the bibliography. In particular, a sphere and a caped cylinder have been studied. There is a great agreement among our results, the results provided by the algorithms DOTIG 2 and DOTIG 4, and the theoretical results, when they are available.

Medios quirales basados en circuito impreso: Análisis numérico en el dominio del tiempo

Ismael Barba García, Ana Cristina López Cabeceira, Álvaro Gómez Gómez, José Benito Represa Fernández

The common design of artificial chiral media for microwave frequencies is based on the inclusion of particles with chiral symmetry (i.e. specular symmetry or handedness) into a host medium. Recently, we have considered new fabrication techniques based on the Printed Circuit Board (PCB) technology, because the use of the via holes gives us a great additional flexibility to select the type of chiral inclusions from helix to cranks. In this work, a numerical study in the time domain of the EM wave propagation through such structures is achieved

using the commercial software MEFiSTo^{TM}, a time-domain electromagnetic simulator based on the Transmission Line Matrix (TLM) method.

Método multi-híbrido FEM-MoM-PO para el análisis de problemas de dispersión y radiación

Jesús Álvarez González, Ignacio Gómez Revuelto, José Manuel Alonso Rodríguez, Luis Emilio García Castillo, Magdalena Salazar Palma

A general fully coupled multi-hybrid method in three dimensions (3D) combining the Finite Element Method (FEM), the Method of Moments (MoM), and a high frequency asymptotic technique, Physical Optics (PO), is presented. Complex radiating structures are analyzed with FEM (which easily handles complex geometries, permeable materials, anisotropy, and so on) while small and medium size perfect electric conductor (PEC) objects are rigorously analyzed using MoM; large PEC objects can be efficiently analyzed with PO. Furthermore, different regions of the same object can be modeled with MoM and PO. That provides the possibility, for instance, of taking into account the edge effects of PEC objects without the need of introducing artificial line currents at the edges, as the Physical Theory of Diffraction (PTD) does. Several numerical results are presented showing the validity of the method.

Fotónica y Comunicaciones Ópticas I

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 6

Reuso de señales autocorreladas en redes ópticas pasivas basadas en conmutación de etiquetas

Waldimar Alexander Amaya Ocampo, Daniel Pastor Abellán, José Capmany Francoy

We propose an all passive re-use of the autocorrelation signal of OC-label recognition process to encode the new OC-label. This approach can reduce the complexity and cost of OC-label based optical packet or burst networks. Prove of concept experiments have been carried out employing SSFBG devices up to four network node hops (8 SSFBG devices in cascade). Optical-Code label recognition capabilities between auto-correlation and cross-correlation signals remain after the successive hops.

Conformado de pulsos ópticos mediante el efecto Talbot en fibra

Santiago Tainta, Waldimar Alexander Amaya Ocampo, Raimundo García, María José Erro Beltrán, María José Garde Alduncín, Daniel Pastor Abellán, Miguel Ángel Muriel Fernández

We propose and experimentally demonstrate a novel scheme for the shaping of optical pulses, based on spectral line-by-line adjustment of a frequency comb generated by a Mode Locked Laser. To avoid the use of bulk optics, the desired modification of the frequency spectrum of the optical signal is performed in the time domain. However, the use of the temporal self-imaging (Talbot) effect allows us to employ slow electrooptical modulators and a single chromatic dispersion stage, resulting in a simpler set-up compared to conventional temporal optical shapers. The technique is illustrated by experimentally generating a flat-top pulse and a pulse repetition rate multiplier.

Política de reconfiguración para reducir la probabilidad de pérdida de paquetes en redes WRON

Ramón José Durán Barroso, Noemí Merayo Álvarez, Rubén Mateo Lorenzo Toledo, Ignacio de Miguel Jiménez, Patricia Fernández Reguero, Juan Carlos Aguado, Evaristo José Abril Domingo

Traffic in communication networks is continuously varying. Wavelength-routed optical networks (WRON) are excellent alternatives for the establishment of backbone networks as they provide high bandwidth and offer the possibility of reconfiguring the logical topology to adapt the network to traffic conditions. In this paper we propose a new policy to decide when reconfigure depending on the estimate of the packet loss ratio. This policy can be used with any of the previously proposed algorithms to design the logical topology but when it is combined with two algorithms that we have proposed before in other papers, the advantages are significant. A simulation study is presented to show how the combination of these

algorithms and the new policy can reduce in more than one order of magnitude the packet loss ratio in stationary state and two order of magnitude when networks face abrupt variation.

Optimización de parámetros intrínsecos de láseres modulados directamente para su uso en sistema WDM

Carmina del Río Campos, Paloma Rodríguez Horche

Direct modulation schemes have attracted increased attention during the past few years because of their intrinsic simplicity and cost-effectiveness, especially when applied to WDM metro and access networks. However, the output power waveform from directly modulated laser is not an exact replica of the modulation current and their instantaneous optical frequency varies with time depending on the changes in optical power (an effect also known as frequency chirp) and the values of intrinsic parameter of laser. In this work, by means of an Optical Communication System Design Software, we researched a directly modulated WDM 2.5 Gb/s system at ~ 1.55-µm wavelength. We demonstrated that the transmission performance depends strongly on DML characteristics. Furthermore, simulation results provide more details about the effects of DML type (adiabatic or transient chirp dominated) as well as the effects of the optical output power. These details can provide useful design guidelines for building a WDM metro network.

Fotónica y Comunicaciones Ópticas II

Sesión V: Martes 23, 12:00 - 13:45 h Aula 5

Acceso múltiple sobre canales ópticos no guiados basado en códigos ópticos aleatorios

Oswaldo González Hernández, Jesús Ángel Martín González, Enrique Poves Valdés, Silvestre Rodríguez Pérez, Francisco José López Hernández

In this paper, an adaptive optical codes-based system is proposed for communications over the indoor wireless optical channel when large numbers of users access to the channel simultaneously. The designed system uses a code-division multiple access scheme based on the named random optical codes (ROCs). The characteristics of this kind of optical codes are described. Several results about its performance over noisy indoor wireless optical channels are also presented. Finally, a code-division multiple access system which is able to adapt its data rate to the number of users which are accessing simultaneously the channel in each moment is described. The obtained results show as the proposed system is able to maintain a target bit error rate adapting its data throughtput when the number of users in the optical environment changes.

Efectos del algoritmo de ensamblado basado en tamaño sobre el tráfico de vídeo en redes OBS

Tito Raúl Vargas Hernández, Juan Carlos Guerri Cebollada, Salvador Sales Maicas

Optical Burst Switching (OBS) has been proposed to be a technology for implementing the next generation optical Internet. In this architecture, burst assembly algorithms have an important influence in the pattern traffic that characteristic this optical networks. On the other hand, traffic coming from applications that have real time and bandwidth constraints (VOD, VoIP, P2P, Grid Services), has been experimented a rapid increment. Consequently, we consider important to evaluate the performance of traffic from real time applications over OBS networks. In this paper, we evaluate the effects of implementing a size-based burst assembly scheme at the edge node on the performance of video transmissions (MPEG4/RTP/UDP) over OBS networks. Through event driven simulation, we conclude about the optimal configuration values for the assembly algorithm in order to guarantee high quality video transmissions. We analyse PSNR, delay, data loss, taking into account the amount of traffic sources and the maximum burst size.

Generación de pulsos ópticos a 1,5 µm mediante conmutación de ganancia en láseres de cavidad vertical

Antonio Consoli Barone, Ignacio Esquivias Moscardó, Francisco José López Hernández

Optical pulses with duration below 60 ps were generated by gain-switching a Vertical Cavity Surface Emitting Laser (VCSEL) at 1535 nm. We used a radio frequency (RF) sinusoidal signal to modulate the device near threshold. Relaxation oscillations or pulse train generation were observed depending on the gain switching conditions. Repetition rates between 100 MHz and 2 GHz were tested. The dependence of the pulse width and amplitude was investigated in relation with the bias current and excitation frequency and amplitude. The optimal configuration of the current bias and RF modulating signal provided the shortest pulse duration of 57 ps at repetition rate of 800 MHz.

Sistema de comunicaciones ópticas bidireccional en espacio libre basado en retromodulador de cristales líquidos

Guillermo del Campo Jiménez, Morten Geday, Alberto Carrasco Casado, Francisco José López Hernández, Puri Munuera

A wireless optical bidirectional communication system between a ground station and an airborne terminal based on a liquid crystal retromodulator is presented. The use of the retromodulator relocates the tracking mechanism and power laser to the ground station, so reducing the mass and the power consumption in the airborne. The retromodulator device is made of two cascaded liquid crystals cells mounted on a retroreflector. The uplink uses a carrier constant envelope FSK modulation while the downlink utilizes a Polarization Shift

Keying (PolSK) modulation which is less sensitive to the atmosphere effects. Theoretical principles, mounted devices and results of this novel technique are discussed.

Metamateriales I

Sesión VI: Miércoles 24, 09:30 - 11:30 h Aula 7

Estudio de la radiación de antenas CRLH leaky-wave excitadas por pulsos temporales

Juan Sebastián Gómez Díaz, Shulab Gupta, Mónica Martínez Mendoza, Alejandro Álvarez Melcón, Christophe Caloz

A new time-domain Green's function approach is used to characterize a composite right/left handed (CRLH) leaky-wave structure as a function of time under ultra-short modulated pulse excitation. This analysis is efficiently performed in the far-field region for both, a single CRLH element and for an array. Several novel broadband applications, such as a real-time spectrum analyzer (RTSA) (which exploits the unique frequency-space mapping conversion of the CRLH) or an instantaneous radar scanning (based on the time-frequency relation of chirp-modulated pulses), are presented and discussed. Full-wave simulations and measurements are provided to validate the results. The semi-analytical formulation developed is compact, flexible and fast, avoiding stability conditions as in other completely numerical time-domain methods.

Estudio y diseño de un AMC de tres capas a 2.5 GHz

Ana María Rodríguez Pérez, Teresa Pérez Iglesias, Anselmo Seoane, Marko Sonkki

In this work a design of an AMC for the band of 2.5 GHz is proposed. The design presented is based on Sievenpiper mushroom-like structure, being more precise, in its three layer version. The equivalent effective model and the commercial simulation tool Ansoft HFSS were used in order to get the final parameters for the implementation of the structure with LTCC technology. The purpose of this study is to obtain a structure suitable for working as ground-plane of low-profile antennas. Hence, the total thickness of structure and the unit cell period cannot exceed reasonable dimensions and relative resonant bandwidth has to be at least 10%.

Actividad electromagnética de medios quirales basados en manivelas

Gregorio José Molina Cuberos, Ángel Joaquín García Collado, José Margineda Puigpelat , Ernesto Martín, María José Núñez

Materials with electromagnetic activity are usually made by spreading helices inclusions into a host medium. In previous work, a new manufacturing technique based on the inclusion of few three segment wire hooks (cranks) was presented and the rotation of the polarisation angle in circular waveguide discussed. Here we present that the random inclusion of many cranks into a host medium produces electromagnetically active materials. Based on a free-wave experimental system, we have found that the transmitted wave through the material is rotated with respect to the incident one. First results seem to be in agreement with the typical behaviour of chiral media at the resonant frequency.

Diseño de un filtro paso banda con resonadores de anillos abiertos duales (DOSRRs)

Juan de Dios Ruiz Martínez, Juan Hinojosa Jiménez

The open split ring resonator (OSRR) connected in series with microstrip line has shown a great interest for the design of compact bandpass filters. The performance of the passband filter is principally related with the number of cascaded OSRRs, which give the pole order of the filter. In this paper, we propose a bandpass filter, named DOSRR, based on a microstrip line loaded in series with open split ring resonators (OSRRs) and dual OSRRs in the ground structure. It allows to add a transmission zero to the OSRR filter. Compact size and high attenuation in the rejection bands are realized with this type of filter structure.

Amplificadores clase CE de doble banda con estructuras basadas en líneas CRLH y ECRLH

José Luis Jiménez Martín, Vicente González Posadas, Francisco José Arqués Orobón, Daniel Segovia Vargas

In this paper the use of Composite Right/Left Hand (CRLH) and Extended Composite Right/Left Hand (ECRLH) transmission lines in dual band power amplifiers is proposed. The CE class power amplifier presents advantages over conventional amplifier such as larger efficiency and low bias supply and what it is more, the fact that it is the fundamental class in bipolar transistor. The design procedure and the design equations are presented. The non-linear phase response of a CRLH and ECRLH transmission line has been utilized to design arbitrary dual-band amplifiers. A design in dual-band CE class power amplifier illustrates the synthesis procedure.

Metamateriales II

Sesión VII: Miércoles 24, 12:00 - 13:45 h Aula 7

Barrido electrónico del haz de una ranura larga en una guía basada en metamateriales

María Navarro Tapia, Jaime Esteban Marzo, Carlos Camacho Peñalosa

Frequency-scanning capabilities of continuous-type leaky-wave antennas have been usually restricted to radiation directions within the forward quadrant. With the appearance of metamaterial-based waveguides it has been possible to spread the spatial range of scanning angles to the backward quadrant, including broadside. This paper presents the improved scanning capabilities of a long-slot leaky-wave metamaterial antenna. Analytical and simulated results are in reasonable agreement. They confirm not only the frequency-scanning

capabilities of such a type of antennas, but also the validity of the numerical analysis technique employed.

Amplificador metadistribuido *dual-fed*

Francisco Yak Ng Molina, Carlos Camacho Peñalosa, Teresa María Martín Guerrero

A dual-fed meta-distributed amplifier design has been proposed in which the conventional RH-TLs have been replaced by CRLH-TLs. This amplifier configuration shows a gain increment of 6 dB compared to the conventional distributed amplifier. Moreover the proposed amplifier, which exhibits a band-pass behavior, provides an optimum solution for combining the output power delivered by an arbitrary number of class A amplifying devices. Some limitations of a real implementation have been assessed by simulating the small and large signal performance of a GaN-based dual-fed meta-distributed amplifier.

Miniaturización de divisores de potencia de banda estrecha usando líneas de transmisión CPW zurdas

Francisco Aznar Ballesta, Jordi Bonache Albacete, Alexandre Valcárcel, Ferrán Martín Antolín

It is demonstrated that planar microwave circuits and components can be compacted by using artificial left-handed transmission lines in their designs. This size reduction is due to the possibility to control the electrical characteristics of these lines (phase and characteristic impedance). It consists of a Coplanar Wave Guide line section with shunts strips to ground and loaded with split ring resonators etched under the slots of the line. To demonstrate the viability of the approach, a power divider using a -90º impedance inverter has been designed. A 60% size reduction, as compared to conventional devices, has been achieved in a conventional low loss microwave substrate. This size reduction can be enhanced by using others topologies that allow the resonators used in the left-handed cell to be smaller.

Superlentes basadas en resonadores tipo split-ring para aplicaciones en imagen por resonancia magnética

Manuel José Freire Rosales, Ricardo Marqués Sillero

In this work, metamaterial superlenses made of split-ring resonators working in the MHz range are analyzed for its possible application in magnetic resonance imaging. The specific goal consists of increasing the penetration depth of the surface coils commonly used in magnetic resonance imaging. Surface coils are placed adjacent to the body patient and have a good signal-to-noise ratio for tissues adjacent to the coil. In general, the sensitivity of these coil drops off as the distance from the coil increases. The superlenses will focus on the coil the radiofrecuency magnetic field coming from the tissue and will operate placed between the skin and the surface coil, in order to increase the penetration depth of the coil.

Estudio y estrategias de diseño para amplificadores de doble banda de alto rendimiento. Estructuras con líneas CRLH y ECRLH

Vicente González Posadas, José Luis Jiménez Martín, Francisco José Arqués Orobón, Francisco Javier Herraiz Martínez, Daniel Segovia Vargas

In this paper two methods to design dual band and high efficiency power amplifiers using Composite Right/Left Hand (CRLH) and Extended Composite Right/Left Hand (ECRLH) transmission lines are described. The CRLH and ECRLH transmission lines, design procedure and design equations are presented. As example of application the design of an CE class amplifier appears. The non-linear phase response of a CRLH and ECRLH transmission line has been utilized to design arbitrary dual-band amplifiers. The simulations results are presented at the end of the paper, demonstrating the validity of the use of this type of lines in the design of amplifiers.

Metamateriales III

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 4

Transmisión extraordinaria a través de arrays 2D de pequeños agujeros

Francisco Medina Mena, Francisco Luis Mesa Ledesma, Ricardo Marqués Sillero

Extraordinary transmission (ET) of electromagnetic waves through metal plates periodically perforated with very small holes has been exhaustively analyzed since the seminal work by Ebbesen et al.. The first theoretical explanation was based on the excitation of surface plasmons along the metalair interfaces. However, since perfect conductor and dielectric slabs also exhibit ET, dynamical diffraction by a periodic array of scatterers was later considered as the underlying physical phenomenon. Nevertheless, it is obvious that ET structures are very closely related to frequency selective surfaces (FSS). In this work we use simple concepts from the theory of FSS, waveguides, and transmission lines to explain ET for both thin and thick periodically perforated perfect conductor plates. It will be shown how a a simple transmission line equivalent circuit accounts for ET and satisfactorily explains the main features of the observed transmission spectra.

Modelo de circuito para la transmisión extraordinaria a través de ranuras

Francisco Medina Mena, Diana Carina Skigin, Francisco Luis Mesa Ledesma

Extraordinary transmission (ET) of electromagnetic waves through periodically perforated metal screens using electrically small apertures has attracted a lot of attention from many researchers working in the fields of optics, solid state physics and microwave engineering. Some controversial explanations have been given to this phenomenon. A relatively simple explanation based on well known concepts coming from waveguide theory has been reported by some of the authors for the case of 2D arrays of small holes. However, the case of 1D

arrays of slits on a metallic slab is different because they can support TEM modes at any frequency. This contribution gives satisfactory explanation to many facts observed in the transmission of electromagnetic waves through slits in metal screens using simple modeling and physical interpretation. Apart from providing a new point of view on the ET phenomenon, our explanation is simpler than others and suitable for educational purposes.

Diplexor TETRA-GSM basado en líneas D-CRLH

Vicente González Posadas, José Luis Jiménez Martín, Ángel Parra Cerrada, Luis Enrique García Muñoz, Daniel Segovia Vargas

In this paper the use of Dual-Composite Right/Left Hand (D-CRLH) transmission lines is proposed for the design of diplexers. The D-CRLH diplexers present advantages over conventional diplexers such as smaller size. The design procedure and the design equations are presented in this paper. The non-linear phase response of a D-CRLH transmission line has been used to design arbitrary diplexers. An example illustrating the synthesis procedure is presented. Finally, the simulation results are compared with the measurement showing good agreement. These results confirm the excellent performance of the proposed circuit. These types of diplexers are particularly useful at the low microwave and UHF bands.

Línea Tri-CRLH para aplicaciones en tres bandas e híbrido Tri-CRLH (TETRA-GSM900-GSM1800)

Ángel Parra Cerrada, Vicente González Posadas, José Luis Jiménez Martín, Luis Enrique García Muñoz, Daniel Segovia Vargas

In this paper a new Tri-CRLH metamaterial transmission line is presented. This transmission line exhibits simultaneous negative μeff and ?eff, it can be used into triband applications and it can be balanced or unbalanced. This Tri-CRLH has a low frequency Left-handed behaviour, a Right-handed behaviour at medium frequency and a new Left-handed behaviour at high frequency. The use of this Tri-CRLH into periodical radiofrequency elements allows the design of arbitrary frequency elements. The design of a TETRA-GSM900-GSP1800 hybrid using Tri-CRLH lines is shown in this paper.

Nuevos Servicios de Comunicaciones I

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 6

Sistema cooperativo sobre redes inalámbricas globales

José Miguel Torres, Luis Velarde, Miguel Ángel Muñoz, Fenando de la Cruz, Ignacio Santamaría Caballero

Strategies for cooperation between terminals have been proposed to improve the spatial coverage, reliability and throughput of ad hoc and cellular wireless communication systems. In this paper, we consider a scenario (rather common in practice) in which a given user has access to several wireless terminals (laptop, PDA and mobile phone, for instance), all of them located in a close neighborhood. For this scenario we propose the architecture and signaling protocols of a new cooperative system, which increases the overall throughput of the user. The cooperative system consists of a Bluetooth-based local network between the source and the cooperating terminals, which is connected through a *Resources Sharing Gateway* with the IP network core or IP service provider.

Análisis de un transmisor digital de HF basado en la técnica de eliminación y recuperación de envolvente

Alejandro Gimeno Martín, José Manuel Pardo Martín, Francisco Javier Ortega González, César Benavente Peces

An HF EER (Envelope Elimination and Restoration) Digital Transmitter simulation is presented in this paper. Effects that increase the IMD (Intermodulation Distortion) levels in an EER system are described and simulated. Basically, the main effects are the limitation of the envelope bandwidth, AM-AM distortion and AM-PM distortion at the power amplifier stage, and the delay between the envelope and phase branches. These effects deteriorate the EER Digital Transmitter linearity. By means of this simulation, it is shown the contribution of every effect to the global IMD. The system was tested with a DSB (Double Side Band) signal. As a result, with an envelope bandwidth of 2 kHz and a delay between branches smaller than 5 μs, more than 60 dB of intermodulation product rejection was achieved. It has also been developed an algorithm which determines the delay between branches with an error smaller than 0.035^{o} when the signal is a non-modulated tone.

Control de dispositivos domóticos X10 mediante reconocimiento facial

Lorena de Fátima Rivera García, Raquel Barco Moreno

Domotics has experienced an important development during the last few years, and nowadays it draws a great interest and attention from developers and users. Likewise, face recognition is a hot topic because of its potential applications. In this context, this paper puts together both domotics and face recognition in a prototype application. Thus, the system developed in this work, integrates several blocks and softwares, in principle independent, with the aim of

controlling X10 devices in response to face recognition. The result is a low cost and easy-to-install domotic system, controlled from a computer by a face recognition module.

Influencia de los eventos de traspaso en la calidad subjetiva de voz en redes WLAN

Mariano Molina García, José Ignacio Alonso Montes

Although networks based on IEEE 802.11 was originally intended to transport best-effort data traffic, the incorporation of new standards like IEEE 802.11e has brought about the opportunity of supplying real time voice communications with strict requirements of quality of service. In WLAN IEEE 802.11 networks, the handover process follow a "break-before-make" mechanism, provoking discontinuities in the communication, which have associated a variation of the packet loss rate, and, therefore, changes in the subjective quality of voice perceived by the user along the communication. It will be necessary to take into account this effect in the planning and sizing process of WLAN networks which have to deal with conversational services. With this purpose, in this paper is illustrated the influence of the horizontal handover events on the evolution of the conversational quality for different VoIP codecs and several handover decision algorithms.

Contenidos personalizados para televisión digital

Antonia María Sanz Fernández, César Benavente Peces

This paper analyses the implementation of interactive digital TV based on the use of user profiles to provide users with a personalized service and personalized content. Furthermore, it is described the different ways in which user profiles should be applied in diverse contexts to optimize service characteristics and user definitions. Besides, it is demonstrated that the definition of user profile provides a service quality enhancement over the current service provided by digital television. Additionally a description of the different agents that get into play in this system are identified and described, with an study of the role performed and the points where they act along the system architecture.

Antenas impresas para redes de localización Zigbee

Carlos Cayuelas, Baldemoro Coll, Jonatan Muñoz, Pablo Corral González, Ernesto Ávila Navarro

In this paper, three different printed antennas for wireless sensor networks applications in ISM band are presented. Our location system, based on Zigbee network, needs different kind of antennas depending on the environment. In this article, we design and implement antennas for general purpose. For free space situations, we simulate and implement omnidirectional antennas, based on dipole, named evolved dipole and another one, called tridentity. For rooms, we design and experiment directional antennas, 180º antenna called thin slot with

recessed microstrip-line feed and 90º antenna, especially useful in corners, named dipole with only one reflector. Finally, we compare theoretical results with the practical implementation.

Procesado de Sonido I

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 7

Diseño de un método sistemático para la obtención de la respuesta al impulso de guitarras acústicas

Miguel Romá Romero, Luis González Ulíbarri, Francisco Briones Aroca

Public Address amplification of acoustic guitars live performance by means of its piezoelectric transducer simplifies the practical set-up but delivers a poor sound quality. Real time convolution of the piezoelectric signal with the impulse response of the guitar acoustic radiation can bring back the whole sound quality of the instrument. A systematic method for easily obtaining impulse responses of acoustic guitars has been developed by exciting guitar body with actuators used in Distributed Mode Loudspeakers (DML) panels.

Algoritmos genéticos con búsqueda restringida para la selección de características en audífonos digitales

Arturo Paniagua Tineo, Enrique Alexandre Cortizo

Hearing loss may disqualify many people from leading a normal life, though the majority do not make use of hearing aids. This is because most hearing aids on the market cannot automatically adapt to the changing acoustical environment the user faces daily. This paper focuses on the development of an automatic sound classifier for digital hearing aids that aims to enhance listening comprehension when the user goes from one sound environment to another. Given the strong complexity constraints of these devices, reducing the number of signal-describing features which feed the automatic classifier is of great importance and becomes a challenging topic. Thus, the use of genetic algorithms with restricted search is explored for the mentioned feature selection. The restricted search driven by the implemented genetic algorithm allows a subset of signaldescribing features with lower cardinality to be selected. This may permit these selected features to be programmed on the digital signal processor that the hearing aid is based on, and to make efficient use of its limited computational facilities.

Clasificación automática de sonido biaural en audífonos digitales

Ángela Mejías Pérez, Roberto Gil Pita, Enrique Alexandre Cortizo

This paper focuses on the development of an automatic sound classifier for digital hearing aids that aims to enhance listening comprehension when the user goes from one sound environment to another. In addition to the use of the information from only one ear, this paper explores the possibility of taking advantage of the information from both ears to improve the results of the classifier. Some preliminary results will be shown, demonstrating that the use of binaural information may lead to an improvement in the performance of the system.

Algoritmo de crecimiento para perceptrones multicapa para la clasificación voz / no-voz en audífonos digitales

Lorena Álvarez Pérez, Enrique Alexandre Cortizo, Manuel Rosa Zurera

Growing algorithms offer an attractive approach for the incremental construction of near-minimal neural-network architectures for pattern classification. This paper explores the feasibility of using a growing algorithm for neural networks (NNs) applied to the problem of speech/non-speech classification in digital hearing aids. When properly designed and trained, NNs are able to generate an arbitrary classification frontier with a relatively low computational complexity. This paper will focus on the design of a growing algorithm for NNs which attempts to converge to the minimum complexity network for the given problem. The results obtained will be compared with those cases in which the growing algorithm is not considered.

Estimación polifónica de señales musicales utilizando Harmonic Matching Pursuit

Francisco Jesús Cañadas Quesada, Pedro Vera Candeas, Nicolás Ruiz Reyes, Raúl Mata Campos, Julio José Carabias Orti

The goal of multi-pitch estimation is to determine the fundamental frequencies (F0s) of all sounds present in a polyphonic signal. In a music context, the most difficult situation occurs when the overlapping partial problem is presented. This problem is caused by the spectral collision of harmonic components from concurrent notes. In this paper, we present a signal processing algorithm which allows to estimate the polyphonic richness in a mixture signal. The proposed algorithm is based both harmonic atoms from an atomic decomposition, specifically Harmonic Matching Pursuit (HMP) and the smoothness principle which supposes that the spectral envelope of the harmonic components of each sound changes gradually. This combination of information atom-smoothness shows promising results for polyphonic music estimation.

Procesado de Sonido II

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 7

Separación espectral para solventar el solapamiento de parciales en el marco de la transcripción musical de piano polifónico

Julio José Carabias Orti, Pedro Vera Candeas, Nicolás Ruiz Reyes, Raúl Mata Campos, Francisco Jesús Cañadas Quesada

In this paper, we pursue a method to solve the overlapping partial problem applied to polyphonic piano transcription. Spectral features are obtained individually for each note. To

distribute the energy along the escales, we apply spectral separation by estimating the spectral envelope for each note. For classifying task, we propose a scheme of one-versus-all (OVA) SVM classifiers trained on the spectral energy inferred from these spectral features. To decrease the high frequency notes residual energy due to the shared partials with the downward notes, a method to cancel the interferences from the downward notes to the upward notes has been developed. Finally, we filter classifier output with a hidden Markov model to add temporary information to the system. Our approach has been tested with synthesized and real piano recordings obtaining very promising results.

Técnicas de separación de audio estéreo aplicadas a la resíntesis de escenas sonoras

Máximo Cobos Serrano, José Javier López Monfort, Emanuel Aguilera Martí

Source Separation is a topic of intense research in digital signal processing. Its applications are widespread, ranging from speech enhancement to biomedical signal processing. An interesting and new field for source separation is audio processing for high realism sound scene resynthesis, because high quality scene creation needs independent tracks for different auditory events. In this paper, we propose the use of source separation methods based on time-frequency masking with the aim of processing stereo music and adapting this material to surround spatial audio systems.

Clasificación de entornos sonoros en audífonos empleando coeficientes Mel-Cepstrum

Imanol Viana Sánchez, Carlos Urbina Ortega, Roberto Gil Pita

Sound signal classification consists of determining the typology of an acoustic environment using the information obtained by a microphone. This technique allows the implementation of several environment dependent algorithms in new generation hearing aids, so that the hearing aid automatically selects the best algorithm for each environment. In the literature, both Mel-frequency Cepstral Coefficients, and mean and deviation based features have been successfully used for this purpose. In this paper we combine these two feature extraction techniques for implementing a sound signal classification system able to distinguish between three different environments: speech, music and noise. So, the mean and the standard deviation of the Mel-frequency Cepstral Coefficients have been used as features by a least square linear classifier. Results demonstrate the effectiveness of this strategy.

Pruebas de funcionamiento de la plataforma cooperativa para la separación de sonidos AnClaS3

Antonio Pena Giménez, Norberto Degara Quintela, Manuel Sobreira Seoane, Soledad Torres Guijarro

Blackboard modelling provides a great flexibility in structuring complex problems and a robust adaptation to the conditions of the signal to be analyzed, adding both bottom-up and top-down capabilities to the system. AnClaS3 (Analysis, Classification and Synthesis for Sound Separation) is a cooperative project where five research groups collaborate integrating algorithms and developing new separation methods. This contribution defines a blackboard-agent based framework where four blackboard-agents interact to integrate the expertise of independent research groups in order to solve a sound separation problem.

Características basadas en la estimación de la frecuencia fundamental para la clasificación automática de sonidos en audífonos digitales

Pedro Vera Candeas, Francisco Jesús Cañadas Quesada, Enrique Alexandre Cortizo, Manuel Rosa Zurera, Nicolás Ruiz Reyes

This paper proposes the use of some musicalinspired features for the automatic classification of sounds in digital hearing aids. This kind of application is characterized by very strong constraints in terms of computational complexity. The proposed features are based on fundamental frequency estimation and exhibit a low computational complexity while providing good results in terms of probability of correct classification. The performance of the system will be tested using an 1-NN classifier being the goal to distinguish among speech, noise and music. For the experiments, a sound database well-designed for the application and a hearing aid simulator will be used.

Procesado de Sonido III

Sesión V: Martes 23, 12:00 - 13:45 h Aula 6

Líneas de investigación actuales en procesado de sonido

José Javier López Monfort, Máximo Cobos Serrano

In this paper we have tried to give an overview of the current research lines in the sound processing field from a point of view based in the human being: a complex machine capable of perceiving stimuli and react against them. The paper starts with an introduction where the different usages of the human hearing are classified, taking into account the differences in complexity as they have been appearing in the history of evolution, from the simplest but basic localization of hazards in the environment to music comprehension. Next, the current research lines in audio are analyzed, emphasizing the new advances and aims that are coming. Moreover, the advantages and commercial applications that these will provide are discussed.

Finally and concluding, we highlight the major role that the statistical analysis, the databases, the joint knowledge and the neuro-sciences will play in contrast to the purely mathematical methods.

Síntesis de fuentes directivas en Interpolated Digital Waveguide Mesh

José Escolano Carrasco, José Javier López Monfort, Basilio Pueo Ortega, Juan Miguel Navarro Ruiz

The use of wave methods to simulate room impulse responses provides the most accurate solutions. Recently, a method to incorporate directive sources in discrete-time methods, such as Digital Waveguide Mesh has been proposed. It is based in the proper combination of monopoles in order to achieve the desired directivity pattern in far field condition. However, this method is used without taking into account the inherent dispersion in most of these discrete-time paradigms. This paper analyzes how influent is the angular dispersion in order to get the proper directivity through different DWM implementations, such as the interpolated one.

Transcripción automática de partituras

Iris Tejón Pérez, Enrique Alexandre Cortizo

This paper explores the application of the FFT (Fast Fourier Transform) to the problem of automatic music transcription. The goal is thus to write, in musical language, the sounds played by different sorts of instruments (strings, percussion or wind). For this reason, the use of a scale like the chromatic is necessary, since it has the quality of being tempered (i.e., consecutives notes have always the same distance in terms of frequency). The proposed algorithm will be capable of obtaining both the fundamental frequency (also called natural frequency) and the length of each note. This method will facilitate the task of writing music, specially for those musicians who are unable to do it for themselves because of physical disability or just a lack of learning.

Método de Fourier para síntesis de agrupaciones de altavoces

Juan Miguel Navarro Ruiz, José Javier López Monfort, José Escolano Carrasco, Basilio Pueo Ortega

Loudspeakers arrays are often used by sound reinforcement in large concert halls and outdoor events to provide increased directivity. Unlike to what happens in the loudspeaker systems, there is an entrenched theory in antenna array synthesis, which has been used extensively over the past few years. This paper discuss several consolidates antenna's arrays synthesis method focusing on Fourier's method. Then, simulation software is implemented to show theirs behavior of using them in loudspeaker array. Finally, an efficient synthesis method is proposed to achieve the required characteristics.

Análisis subjetivo de compensación de salas mediante Wave-Field Synthesis

Laura Fuster Criado, José Javier López Monfort, Alberto González Salvador, Máximo Cobos Serrano

Wave-Field Synthesis is one of the most promising spatial audio reproduction systems available today, providing a precise spatial sound field in a wide area. However, the listening room introduces new echoes that are not included in the signal to be reproduced, altering the synthesized sound-field and reducing the spatial effect. In previous papers we proposed a room compensation method based on a multichannel inverse filter bank that corrects the room effects at selected points within the listening area. This method was evaluated with good results using a simulated field. In this paper we present an initial subjective evaluation of the compensation in order to compare the effects of the correction system in terms of the perceived quality and source localization by the subjects.

Procesado Hardware de Señal I

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 5

Arquitectura pipeline de la FFT bidimensional en FPGA

Eduardo Magdaleno Castelló, Manuel Rodríguez Valido, José Manuel Rodríguez Ramos, Alejandro José Ayala Alfonso

The purpose of the present work is the design and implementation of an electronic device that allows us to obtain pipeline 2-D fast Fourier transform (FFT) using a Field Programmable Gate Array (FPGA). The basic design methodology followed in the development of this digital system has been to create a hardware description language (VHDL) code. VHDL blocks ensure portability, scalability, configurability and technology independence. The basic advantages of FPGA technology are flexible architecture and extremely high-performance signal processing capability through parallelism. The implemented 2D-FFT architecture results faster than the architecture that Uzun et al. provide. The implemented algorithm meets current and future adaptive optics image processing frame rate requirements.

Towards a satelite beacon digital receiver

Armando Rocha, Ricardo Sousa, André Pires

The paper introduces a brief description of a satellite beacon receiver design issues taking into account the signal characteristics. A brief review of available commercial hardware for digital radio is reviewed and then a stand alone digital solution using a DSP is suggested. Experimental results, obtained with a prototype of two channels that uses a software based PLL/FLL detector and related DSP software, are discussed. The performance of the hardware is presented in open and closed loop and conclusions derived in this framework. The results obtained with a direct digital synthesizer are explored as a possible solution for local oscillator derivation in the beacon receiver chain for a versatile H/W design.

Diseño, simulación e implementación de un ecualizador de canal para *gap-fillers* de DVB-T

Mikel Mendicute Errasti, Pablo Prieto Arce, Iker Sobrón Polancos, José María Zabalegui Irizar, Ricardo Isasi

This article describes the implementation of a channel equalizer for a terrestrial digital television (Digital Video Broadcasting-Terrestrial, DVB-T) on-channel repeater or gap-filler. Two are the benefits of the inclusion of this equalizer: on one hand, the transmitted signal requires a lower dynamic range and its degradation becomes smaller at the output power amplifiers, thus allowing a higher output power for the same modulation error rate (MER); on the other hand, it eases the equalization/decoding process at the final receiver by improving its operation conditions. The steps for the development of an equalizer prototype for a domestic gap-filler are presented, from the initial Matlab and Advanced Design System

(ADS) simulations to the final hardware implementation, based on a field programmable gate array (FPGA) device and a Blackfin digital signal processor (DSP). The results confirm the system gains expected from the simulation step, proving the validity and efficacy of the equalizer to reduce the cost of the amplifiers and to obtain a better signal quality at the final user's receiver.

Implementación del algoritmo de sincronismo de Gardner en dispositivos FPGA

Javier Bermejo Parra, Jesús García Lledó, Andrés Espín Moreno

This document describes a possible implementation of a timing–error detector (TED) in a digital communications system. It is suited for QPSK signals, and has been designed using the algorithm proposed by Gardner in his article "A BPSK/QPSK Timing–Error Detector for Sampled Receivers" but making some approximations and simplifications to raise the efficiency without increasing the area. The system has been coded in VHDL language, and tested in a Xilinx FPGA device of the Virtex-4 LX family. In addition, graphics and screenshots which appear in the document have been obtained using System Generator, a Xilinx Simulink–based tool. The system was tested varying parameters such as baud-rate, and noise level, expressed as SNR ratio in dB.

Procesado Software de Señal I

Sesión V: Martes 23, 12:00 - 13:45 h Aula 7

Algoritmo KNN basado en información mutua para clasificación de patrones con valores perdidos

Pedro José García Laencina, Rafael Verdú Monedero, Jorge Larrey Ruiz, Juan Morales Sánchez, José Luis Sancho Gómez

Incomplete data is a common drawback in reallife classification problems. Missing values in data sets may have different origins such as death of patients, equipment malfunctions, refusal of respondents to answer certain questions, and so on. This work presents an effective and robust approach for classification with unknown input data. In particular, an enhanced version of the K-Nearest Neighbours algorithm using Mutual Information is proposed. Results on two classification datasets shows the usefullness of this approach.

Rendimiento del algoritmo del enjambre (PSO) aplicado a la estimación del ángulo de llegada

Borja Errasti, David Escot Bocanegra, David Poyatos Martínez, Iván González Diego, Ignacio Montiel Sánchez

Direction Of Arrival (DOA) estimation has been one of the most challenging problems in the last years and new techniques have been developed as new applications with higher constraints were designed. In the very beginning, Fourier-based methods were enough to solve most DOA problems and when better performance and accuracy were needed, superresolution methods gave answer to the new challenges. Nowadays, a great part of the efforts in solving the DOA problem concentrate in applying heuristic algorithms that need few snapshots. In that sense, an iterative method based on Particle Swarm Optimization, which solves this problem using a single snapshot, is presented in this communication and its performance analyzed. Conclusions and numerical results are also provided.

MIMO systems low complexity SVD implementation analysis

César Benavente Peces, Luis Arriero Encinas, David Osés del Campo, Francisco Javier Ortega González, José Manuel Pardo Martín

This paper analyses the implementation of the singular value decomposition (SVD) using approximation to the exact computation for MIMO systems in the case of modulation-mode and power assignment set-up. The study developed in the paper focuses on the use of low complexity algorithm with low computational load oriented to the use of devices with limited resources as FPGA, highlighting some of the advantages and drawbacks against more sophisticated devices. The implementation of the SVD is analyzed through the algorithms that efficiently perform the required computations, seeking for computationally efficient solutions that provide parallelism and low complexity. The CORDIC algorithm seems to be a good

candidate for this task since it can efficiently compute the singular value decomposition. It is shown that this algorithm provides an efficient tool for SVD computation with appropriate accuracy and the computational complexity obtained and the required resources make it feasible to be implemented on an FPGA device. System performance degradation is analyzed compared with conventional and exact method for SVD obtaining some key conclusions.

Módulo de procesado de señal de un MIMO-testbed OFDM para medidas de antenas reconfigurables

Carlos Gómez Calero, Jonathan Mora Cuevas, Luis Cuéllar Navarrete, Leandro de Haro y Ariet, Ramón Martínez Rodríguez-Osorio

Multiple-Input Multiple-Output (MIMO) systems have been considered as a solution to increase the data rate and quality of signals in the next generation wireless communication systems. The performances of these systems depend on three main aspects: channel propagation characteristics, processing algorithms and antenna array configurations. In order to obtain MIMO channel measurements at ISM band (2.45 GHz) taken into account the use of different antennas such as reconfigurables, a MIMO-testbed which uses OFDM technique has been designed and implemented in order to carry out the measurements in indoor scenarios. In this paper, the signal processing module is described which is based on Software-Radio platform.

Arquitectura multicapa distribuida para demostradores MIMO

José Antonio García Naya, Tiago Manuel Fernández Caramés, Héctor José Pérez Iglesias, Miguel González López, Luis Castedo Ribas

Testing MIMO signaling methods over a real setup involves cumbersome low-level programming to access de hardware, making difficult to easily test new methods. It is desiderable to incorporate an end-user interface to the MIMO testbed that realeases the researchers from the task of low-level programming. In this paper, we propose a distributed multilayer architecture that fills the gap between the testbed hardware and the end-user interface, making the MIMO testbed accessible through high level software. The layers of this architecture are highly decoupled among them, permitting independent extension or customisation as needed. In order to illustrate this relevant property, new testbed features such as a feedback channel, multiuser MIMO scenarios deployment or cooperative networks configuration are explained in detail.

Procesado Software de Señal II

Sesión VI: Miércoles 24, 09:30 - 11:30 h Aula 11

Precodificación TH MMSE robusta para sistemas MISO multiusuario con predicción de canal

Paula María Castro Castro, Luis Castedo Ribas, Michael Joham, Wolfgang Utschick

In this paper we investigate the robust design of a Multi-user Multiple Input Single Output (MU MISO) system with limited feedback and MMSE Tomlinson-Harashima precoding that utilizes multiple feedback vectors to improve the transmission quality. We explain how to appropriately exploit this additional past channel information to design the channel estimator, rank basis reduction and the quantizer parameters. The resulting scheme achieves better BER values without increasing the data rate in the feedback channel.

Análisis de V-BLAST a partir de medidas en un túnel

Concepción Sanchís Borras, José María Molina García-Pardo, Leandro Juan Llácer

In this work we use the experimental data from an extensive 8x8 MIMO (Multiple-Input Multiple-Output) wideband (2.8 GHz - 5 GHz) measurement campaign in a semicircular tunnel to study the impact of different multiantenna signal processing approaches such as the MMSEVBLAST algorithm. We focus in the 3 and 5 GHz bands, and at different distances from the transmitter and the receiver. Simulation results are exhibited, showing the relation between SNR (Sygnal to Noise Ratio) and SER (Symbol Error Rate).

Sistema de localización con Bluetooth mediante filtros de partículas

Javier Rodas González, Carlos José Escudero Cascón, Daniel Ismael Iglesia Iglesias

The proliferation of devices with Bluetooth technology motivates new applications for this kind of wireless sensor networks. In this paper, we take advantage of a Bluetooth sensor network for an indoor location system. In order to overcome Bluetooth limitations, it is introduced a positioning algorithm based on a Bayesian approach by using a particle filter combined with a dynamic model of the objects to be located. The performace of this algorithm is shown by using some simulations with parameters extracted from empirical measurements.

Filtros de partículas con partición del espacio de estados para el seguimiento de múltiples objetivos

Pablo Viñuelas Peris, David Luengo García, Joaquín Míguez Arenas

In this paper we consider the problem of tracking a variable number of targets using a set of power measurements obtained from a wireless sensor network. Although several algorithms

have been proposed to perform this task, the simultaneous dependence of the measurements on all the targets hinders their performance. Here we propose to use a particle filter with a partition of the state-space to solve this problem. Simulations confirm the good behaviour of the proposed approach.

Sistemas de comunicaciones digitales basados en conmutación caótica: comparación de prestaciones

David Luengo García, Manuel Asenjo Chacón

The broadband nature and noise-like appearance of chaotic signals makes them attractive for secure communications. One of the most widely used approaches, Chaos Shift Keying (CSK), consists of using chaotic signals as basis functions instead of the conventional ones (i.e. pulses or sinusoids). Many CSK systems have been proposed: COOK, DCSK, FM-DCSK, ECSK, etc. Given the nonlinear nature of their generation mechanism, evaluating their performance analytically is very difficult. Hence, this is usually done through simulations. Unfortunately, each author settles his own simulation environment (chaotic map and parameters, number of samples per symbol, etc.), making it difficult to compare rigorously different schemes. In this paper we establish a common setting in order to analyze and compare the performance of different chaotic schemes through simulation.

Procesado Software de Señal III

Sesión VII: Miércoles 24, 12:00 - 13:45 h Aula 11

Inferencia bayesiana en mezcla de distribuciones alfa-estables

Diego Salas González, Diego Pablo Ruiz Padillo, Ercan Engin Kuruoglu, María del Carmen Carrión Pérez

In this work, we propose a mixture of α-stable distributions to model multimodal, skewed and impulsive data. A fully Bayesian framework is presented for the estimation of the stable density parameters and the mixture parameters. It is important to note that the Gaussian mixture model is a special case of the presented model which provides additional flexibility to model skewed and impulsive phenomena. The algorithm is tested using synthetic and real data. Each α-stable mixture model parameter is estimated very accurately.

Separación ciega de señales de voz y audio en situaciones reales

Iván Durán Díaz, María Auxiliadora Sarmiento Vega, Pablo Aguilera Bonet, Sergio Antonio Cruces Álvarez

This paper presents a method for the blind separation of speech and audio signals in real reverberant environments. We exploit the long-term nonstationarity of these signals and work in the time-frequency domain to decouple the separation problem for each frequency. The

proposed separation algorithm performs the least squares fitting of our estimates to the second order statistics of the observations. A novel initialization procedure, suitable for those separation algorithms based in the prewhitening of the observations, is proposed. This initialization is based on the separation matrix found for the previous frequency and speeds up the convergence of the algorithms. The experiments show the good performance of this method in real and synthetic mixtures.

Estudio comparativo y prueba en un demostrador hardware de métodos de estimación ciega basados en estadísticos de orden superior

José Antonio García Naya, Héctor José Pérez Iglesias, Adriana Dapena Janeiro, Luis Castedo Ribas

This paper focuses on blind channel estimation in Alamouti coded systems restricted to one receiving antenna. We present a comparative study of several blind channel estimation techniques based on High Order Statistics (HOS) over computer simulated and realistic indoor channels. The compared methods include the well-known blind source separation (BSS) algorithm JADE and other techniques recently proposed for orthogonal space-time block coding (OSTBC). The experimental evaluation is carried out using a testbed developed at the Universidade da Coruña. It is configured to transmit at 2.45 GHz in Line Of Sight (LOS) and Non-LOS (NLOS) indoor scenarios.

Localización de onsets en señales musicales a través de filtros pasobanda complejos

José Ramón Beltrán Blázquez, Jesús Ponce de León Vázquez, Norberto Degara Quintela, Antonio Pena Giménez

In this work, we present a new technique for onset detection and localization, through a complex bandpass filtering of the signal. The high quality of the initial information in both time and frequency domain is our main advantage with other existing processes. This new technique in still in develop and the results shown are promising but not conclusive. The algorithms involved and most of the figures of this paper, have been developed in Matlab.

Preparación del µClinux para *Software Defined Radio* con BF537

Miguel Rodríguez Caudevilla, José Manuel Pardo Martín, César Benavente Peces, Francisco Javier Ortega González

The purpose of this study is to prepare the Blackfin STAMP board with a BF537 core to work as a SDR system (Software Defined Radio System) under a GNU-Linux platform. Due to all the documentation and support found in the web and the release under GPL (General Public License), the distribution used to develop SDR is µClinux. This work explains what is needed to build a SDR system in the Blackfin board, the inconveniences found in the actual µClinux distribution and all the workarounds and approaches made to start porting the software needed

to the operating system. To make it work, some codes of the linux kernel, such as device drivers, had to be reviewed so they could adjust to the application demands. In short, this work explains what has been modified in the µClinux distribution and why such changes are done to make SDR possible in the Blackfin board.

Procesado Software de Señal IV

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 6

Diseño FPGA de un emulador de canal para WiMAX

Pedro Suárez Casal, Ángel Carro Lagoa, Tiago Manuel Fernández Caramés, Luis Castedo Ribas

This paper presents an FPGA implementation of a wireless channel emulator suitable for testing communications equipments compliant with the fixed version of the wireless access standard IEEE 802.16. The selected channel models are known as SUI (Stanford University Interim) which specify different profiles to model different propagation scenarios. Although most of the channel emulator has been implemented on a Xilinx Virtex4 (model XC4VSX35), in order to simplify the design and easily modify the implemented channel model, the fading coefficients generation is performed in a host PC. After describing the design and several implementation issues, we finally show results achieved when transmitting WiMAX signals over the SUI channels.

Una panorámica de la problemática de la sincronización en receptores para OFDM

Eduardo Bonilla Menéndez

OFDM-like techniques are very sensitive to receiver synchronization carrier frequency offset. On this paper we present a general overview of the synchronization problem on the receivers of these systems. A general model to analyze the influence of real receiver synchronization imperfections on the received signal is presented. Special attention its taken on the carrier recovery system. Considering just DMT with guard interval, different alternatives and different ways to approach carrier recovery issue are introduced. Frequency deviation detector algorithms for DMT with GI are presented. Post FFT frequency offset detectors are also introduced. The performance of these frequency offset detector algorithms under the theoretical point of view and simulations results are presented.

Diseño e implementación de un módem 2-FSK Software Radio

Jesús García Lledó, Javier Bermejo Parra, Ramón García Gómez

In this paper we describe an implementation of a 2-FSK MODEM using the DSP TMS320C6416TGLZ of Texas Instruments and the FPGA Virtex-4 LX25 of Xilinx. The

architecture of the modem is based on what nowadays is known as SDR (Software Defined Radio). The base band processing is done in the DSP and the interpolation / decimation, and frequency translation is implemented in the FPGA. Sliding Goertzel algorithm is used in the 2-FSK receiver as a pass band filter. Symbol Synchronization is based on an Early – Late algorithm. Viterbi Coprocessor available in the DSP is used to implement a convolutional decoder. The architecture and most significant blocks are explained in this paper. Finally some results of the implementation are given.

Análisis para la implementación del cálculo del FP en FPGA a partir de la DAT

Alejandro Soberanis Garfias, Manuel Gracida Aguirre, Raúl Ruiz Meza

From the twentieth century, with the growth of electronic development were created various applications for electronic components that day after day were developing, this was the result of the need and requirements of the electronics industry. This necessitated the development of measurement instruments that would allow characterize the incoming and outgoing signals from each team. Since the 80's, with the advent of computers increased use of nonlinear loads and thus the need to regulate the content of harmonious flow in the lines of tension. Two of the parameters that give an idea of harmonic content and quality of energy are DAT and the FP. There are currently teams called analyzers networks that allow us to identify these parameters, digital equipment are based DSP. This article provides an analysis of the proposal for the design of the implementation of the two equations using the device as FPGA processing.

Radar I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 7

Radar sintético de alta resolución para identificación de blancos

Enrique Millán Martínez, Pilar González-Blanco García, Antonio Jurado Lucena, Ignacio Montiel Sánchez

In this document we present the stepped-frequency radar developed at the Detectability Laboratory from INTA (Spain). It is a synthetic high resolution system with optical tracking and synthetic generation of frequencies configurable between 6 and 18 GHz, built as part of a research project on non-cooperative target identification. The digital postprocessing provides information about the targets, obtaining detailed profiles and composing them in order to get ISAR images. Here we illustrate the methods used in the tests and present different examples of the applications of this radar such as the identification of small targets (where the radar resolution is shown) and the obtention of ISAR images directly from measured profiles.

Calibración radiométrica externa del RIX. Sensor SAR del INTA

Laura Ojalvo Sánchez, Javier del Castillo Mena

The RIX system is an airborne interferometric and polarimetric SAR. RIX has been conceived, built and is being operated by INTA's Radar Laboratory and it's the first prototype from INTASAR program. It operates in X-band, with a bandwidth of 75 MHz, being able to obtain a maximum resolution of 2 meters in range dimension. The system has a pair of antennas, with selectable H or V polarization and thanks to the reception switching, double pass full polarimetry is achievable. In this paper, the work developed by INTA's Radar Laboratory in SAR radiometric calibration is reviewed. Equations are given to calculate the radar backscatter coefficient (σ^0) of distributed targets and the radar cross section (σ) of point targets and a method is presented to obtain absolute radiometric calibrated images. Finally, some obtained results are showed and analyzed to validate the developed work.

Procesado para la obtención de perfiles de alta resolución (HRRPs) en la identificación de blancos mediante radar

Antonio Jurado Lucena, David Escot Bocanegra, Raúl Fernández Recio, David Poyatos Martínez, Ignacio Montiel Sánchez

Non Cooperative Target Identification by Radar (NCTI) is a complex task, due mainly to the need of a target database generation. To populate this database, predictions from RCS Computer codes can be used. These predictions are performed in the frequency domain and a processing to obtain the High Resolution Range Profiles (HRRPs) must be done. This processing will end in a set of HRRPs which should have the same information than the real measurements in order to achieve sufficient identification rates. This paper shows some of the

processing performed on predictions and anechoic chamber measurements to obtain valid HRRPs for research on NCTI.

Corregistro de imágenes SAR basado en diferentes estimadores de coherencia

José Tomás González Partida, Mateo Burgos García, Mihai Datcu

This article presents a method for the determination of the relative misregistration between two interferometric synthetic aperture radar (InSAR) images. Classical coregistration techniques are based on the maximization of the crosscorrelation coefficient, i.e. the maximum likelihood (ML) estimate of the coherence magnitude. This paper proposes an efficient algorithm to solve the coherence maximization with high accuracy, reducing the computational complexity of the classical techniques based on oversampled data. Furthermore, several coherence estimators have been proposed in the literature in addition to the ML estimate. This paper evaluates the behaviour of the algorithm using three different coherence magnitude estimators as the kernel of the optimization problem. The discrete Fourier transform (DFT) is exploited to formulate the algorithm and to explain the necessity to register the images with subpixel accuracy. The performance of the technique has been proved over simulated data of a high resolution millimeter-wave InSAR system that is currently under development.

Radar en banda S para prácticas docentes

Germán Torregrosa Penalva, Marina Herrero Castillo, Paula Mas García, Alberto Rodríguez Martínez, Miguel Ángel Sánchez Soriano

In this work it is presented the design, implementation and characterization of a complete radar scheme to be employed in undergraduate courses related to antenna design, microwave circuits and radar systems. The radar works at a design frequency of 3.0 GHz and two different operating modes can be chosen: doppler radar or frequency modulated continuous wave (CWFM) radar. In the first operating mode the velocity of moving targets can be determined, while in the second one the positions of static targets are obtained. The radar has been fabricated using low cost elements and fabrication techniques, and its configuration can be easily modified to achieve additional features.

Sistema de conmutación de antena para radar LFMCW en milimétricas

Pablo Almorox González, José Tomás González Partida, Mateo Burgos García, Blas Pablo Dorta Naranjo

Frequency modulated continuous wave (FMCW) radars offer many advantages such as low peak power, low probability of interception and low interference to other systems. However, their major drawback is the isolation required between transmitter and receiver that typically leads to the use of two separate antennas. Some schemes have been proposed to enable

FMCW radars to operate with a single antenna, such as frequency modulated interrupted continuous wave (FMICW). A Stagger procedure was proposed to overcome the problems associated to the use of the FMICW technique in medium range high resolution radars (HRR). A millimeter-wave radar sensor, in Ka-band, has been developed in the Universidad Politécnica de Madrid to validate the Stagger technique. The sensor transmits a linear FMICW, with a maximum bandwidth of 2 GHz and a transmitted power of 29 dBm. The system is low-cost, modular, compact and lightweight, so it is attractive for portable applications.

Radar II

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 11

La energía eólica y su impacto en la red de radares meteorológicos de la AEMET

Beatriz Gallardo Hernando, Félix Pérez Martínez, Fernando Aguado Encabo

The use of wind farms to generate electricity is growing increasingly due to the importance of being a renewable energy source. These installations can have over a hundred turbines of up to 120 m height each. Moreover, windmills are expected to be significantly higher in a few years, with blade tip heights reaching 200 m. This continued growing both in the number and the height of the wind farms is seriously threatening the correct performance of weather radars. In this work we will analyze the Doppler spectral content of the wind turbine clutter signal. The experiments, made with the aid of the Spanish weather radar network, had two main goals: gather data in normal operation mode and in spotlight mode. This will show the wind turbine clutter Doppler spectrum as functions of azimuth angle and time.

Método para la corrección de imágenes radar de clutter marino y su análisis mediante la DFT-3D

Francisco de Borja Cifuentes Cristóbal, María Pilar Jarabo Amores, José Carlos Nieto Borge, David Anastasio de la Mata Moya

In this work the 3-dimensional DFT is applied to study the ocean wave information spectra from sea clutter image time series acquired by ordinary X-band marine radar. A pre-processing stage is proposed to reduce the distance effect on the radar image. The used method analyzes the image structure in frequency and wave number vector of the image spectra derived from of temporal sequences of marine radar images of the sea surface. The presented data and the related results were obtained from a research platform located in the North Sea. Results prove that the preprocessing stage reduce the spectral noise due to speckle and enhances other derived contributions that can be used to characterize the clutter signal.

Aplicación de la transformada de Radon a la detección de blancos en clutter de mar

Javier Carretero Moya, Javier Gismero Menoyo, Alberto Asensio López, Álvaro Blanco del Campo

Small target detection in sea clutter is a challenging problem. This paper presents a novel and heuristic approach based on the application of the Radon Transform to a set of consecutive range profiles. The performance of the detection technique has been tested with real sea clutter data, acquired with a high resolution CWLFM (continuous wave linear frequency modulated) millimetre-wave radar demonstrator. Results show that performing the detection on the Radon domain makes the detection of very small targets possible while keeping the false alarm rate controlled.

Aplicación del algoritmo *Mean Shift* al filtrado de imágenes SAR

Leticia Duarte Pastor, Miguel Ángel Monterde Aguilar, María Pilar Jarabo Amores, David Anastasio de la Mata Moya, José Carlos Nieto Borge

Speckle noise is an undesired effect in SAR (Synthetic Aperture Radar) images which degrades their quality. In this paper a filtering technique based on the algorithm *Mean Shift* is proposed to reduce the speckle noise in SAR images, preserving their quality by maintaining textures, sharp edges and shapes. A heterogeneous SAR image is used for analyzing the influence of the parameters of the *Mean Shift* method. The quality of the filtered images is evaluated by inspection and using other objective parameters. The results are compared to those obtained using the Lee filter, which is usually considered as a standard reference for evaluating speckle filters. The proposed technique provides a greater speckle noise reduction, preserving edges and image texture, characteristics that are very important for detecting and classifying tasks.

Simulación de la sección transversal radar del avión ligero de observación (ALO)

Alejandro Girón Vara

We'll present the results of the radar cross section of observation light airplane (ALO). ALO is a unmanned aerial vehicles system that provides real-time information on missions of reconnaissance, surveillance and target acquisition. In this case we have measured and simulated the radar cross section of the flight segment, which consists of three aerial vehicles equipped with infrared or visible sensors. Each of these vehicles has a wingspan of 3,350 m and a length of 2,305 m. The simulation was carried out in INTA's cluster while the measurements were taken in a compact range, also located in INTA. The measurements were undertaken at a frecuency of 3 GHz and an elevation angle of ALO 1,9º to the ground while the simulations were undertaken with no elevation angle.

Clasificación de blancos HRR radar basada en descriptores

Jaime Calvo Gallego, Félix Pérez Martínez, José María Muñoz Ferreras

This article presents a classification technique based on the main seize properties of high range resolution radar (HRR radar), by extracting a group of descriptors. Specifically, it is proposed an automatic procedure to obtain some features of the HRR radar targets to facilitate their classification. These features are: the distance, speed and longitudinal dimension of the target, its integrated distance profile and its basic range-doppler image. Experimental results of target classification are also presented based on frames obtained with a non-coherent scanning HRR radar (HRR radar ARIES, X-band), and with frames obtained with a coherent tracking HRR radar (HRR radar sensor, millimetre-band).

Radiación y Dispersión I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 11

FMM en problemas electromagnéticos con decenas de millones de incógnitas

Luis Landesa Porras, José Manuel Taboada Varela, Fernando Obelliro Basteiro, José Luis Rodríguez Rodríguez, José Carlos Mouriño, Andrés Gómez Tato

The Finis Terrae supercomputer has been extensively used for an intensive collaboration between the Centro de Supercomputación de Galicia (CESGA), the Universidad de Vigo and the Universidad de Extremadura. The analysis of extremely large electromagnetic problems (close to the world record) and the test and tuning of the high performance new TOP supercomputer Finis Terrae have been the main objectives of this collaboration. As a result, in February 2008, an important milestone has been reached with the analysis in a few hours of a problem with more than 32 millions of unknowns; which demonstrates both the good scalability of the electromagnetic code HEMCUVE and the outstanding performances of Finis Terrae supercomputer.

Herramienta software para el análisis de la influencia de aerogeneradores en radares meteorológicos

David de la Vega Moreno, Carlos Fernández Fernández, Itziar Angulo Pita, Iñaki Eizmendi Izquierdo, Ignacio Armentia Ruiz de Austri, Amaia Arrinda Sanzberro, Juan Luis Ordiales Basterretxea

The installed wind power capacity is increasing significantly in many countries. Frequently, wind farms and telecommunication infrastructures share the same locations. As a result, telecommunication services can be affected by wind turbines when they are placed in the vicinity of the transmitter site or the receiver location. A critical situation may be found when weather radars are involved. The potential impact of wind turbines on weather radars focuses on three different scenarios: blocking of the beam, clutter and Doppler mode. In order to evaluate this possible influence, a software tool using a high-resolution digital map has been implemented. This tool is especially useful when planning a wind farm or installing a weather radar, because it is possible to take decisions to avoid this potential impact before it appears, with the consequent saving in economic terms, ensuring weather service availability and wind farm operation.

Nueva herramienta software para el cálculo de la RCS de blancos complejos considerando N-efectos

María Jesús Algar Díaz, Miguel Blanco, Lorena Lozano Plata, Iván González Diego, Manuel Felipe Cátedra Pérez

In order to improve the memory and CPU time requirements computing Radar Cross Section (RCS) of complex targets a new tool POGCROS has been developed. This computer tool analyzes the iterations between the different surfaces of the targets to compute its RCS contribution. The algorithm is based on several ray-tracing acceleration techniques, as Angular Z-Buffer (AZB) and Space Volumetric Partitioning (SVP), together an uniformed search strategies as depth-limited search strategy. With this computer tool monostatic or biestatic RCS of targets modelled with planar or parametric surfaces can be obtained. Target with different materials as metallic, dielectric and RAM (Radar Absorbing Material) can be treated with this method.

Técnica basada en MLFMM-CBFM para la resolución de problemas de radiación y dispersión

Eliseo García García, Carlos Delgado Hita, Manuel Felipe Cátedra Pérez

A parallel implementation of the CBFM-MLFMA combination is presented. This approach allows the rigorous analysis of large scattering or radiation problems reducing the burden on the available computational resources. The CBFM technique permits a noticeable reduction of the number of unknowns, while the MLFMA application entails improved efficiency in the matrix-vector calculations, as well as a very important memory saving. The Message Passing Interface (MPI) paradigm has been chosen for the distribution of the computational cost between a cluster of processors. The geometrical description considered to model the objects use Non-Uniform Rational B-Splines (NURBS) defined over a parametric domain.

Análisis de la variación temporal y frecuencial de señales radio dispersadas por un aerogenerador

Íñigo Etayo Otermin, Ananda Satrústegui Aldaz, Miguel Javier Yábar Labat, Francisco Javier de Aranzadi Menéndez, Francisco Javier Falcone Lanas

In this paper, temporary and frequency variation of radio signals scattered by wind turbine blades is analysed. Wind turbines are electrically very large structures whose form varies in time according to the rotation of the blades, therefore, is necessary to make a scattering and diffraction analysis of the electromagnetic waves in these, in which the temporary variable must be considered. The main interference problematic effect existing in the implantation of wind farms very close to radio communications receivers is the multipath, caused by wind turbines scattering. In this work, the temporary variation of the scattered signals by the wind turbine blades and frequency dispersion of these has been analysed, by considering the

Doppler effect due to the movement of the blades. In addition, diverse measures have been made in field contrasting satisfactorily the obtained theoretical results.

Estudio de la presencia del usuario en cámara de reverberación

Juan Francisco Valenzuela Valdés, Antonio Manuel Martínez González, David Agapito Sánchez Hernández

The effects of the presence of the user on MIMO performance for wireless communications systems is investigated through measurements in a reverberation chamber. Measured results have demonstrated that despite a decrement on the envelope correlation coefficient, a degradation of both diversity gain and MIMO capacity are expected when the user is present. While the validity of the correlation coefficients for predicting MIMO performance is limited in the presence of the user, the effects have also been found to be strongly dependent upon frequency, antenna topology and user characteristics. It has been demonstrated that the power absorbed in the user plays a more important role for MIMO capacity than the change on the correlation coefficients due to the user's presence.

Comparación de software para el cálculo de RCS

Antonio Luis Marco Burgos

A comparison between FASCRO, MODESP and MONURBS software is shown. These three pieces of software have been developed by The Computation Electromagnetic Group at Alcalá de Henares University (UAH) and can compute monostatic Radar Cross Section (RCS) of complex targets. The first two programs use high frequency methods, while the third is based on Method of Moments (MoM). The studied target is a Scud missile and simulation consist of a complete azimuth sweep while the missile is viewed with a 3º elevation (representing a realistic case when a missile is detected by a primary radar). Simulation frequency is 500 MHz (lambda = 0.6 m) and we consider both horizontal and vertical polarization for the incident wave.

Radiopropagación I

Sesión I: Lunes 22, 09:00 - 11:00 h Aula 12

Una solución híbrida UTD-PO para el análisis de la difracción múltiple de una serie de cilindros asumiendo incidencia de onda esférica

José Víctor Rodríguez Rodríguez, José María Molina García-Pardo, Leandro Juan Llácer

A new hybrid uniform theory of diffraction-physical optics (UTD-PO) formulation for the analysis of the multiple diffraction caused by an array of cylinders, assuming spherical-wave incidence, is hereby presented. The solution, validated with numerical data from technical literature, is mathematically less complex and computationally more efficient -for a large number of cylinders- than other existing methods, due to the fact that high-order diffraction terms (*slope diffraction*) are not considered, without such lack of terms barely entailing any loss in accuracy. Results can be applied in radiowave propagation analysis when multiple diffraction over rounded obstacles has to be considered.

Análisis del canal radio para aplicaciones UWB

Concepción García Pardo, Concepción Sanchís Borras, José María Molina García-Pardo, José Víctor Rodríguez Rodríguez, Leandro Juan Llácer

Results from a MIMO-UWB measurement campaigns are presented in this contribution. We focus in the 2-5 GHz. For immediate commercial applications UWB propagation is mainly interesting for the 3-5 GHz range. We present experimental validation of the assumption that the path gain function can be modelled independently from the distance and the frequency, as well as some results on the rms delay spread showing a positive increment with distance in the four situations studied.

Caracterización del impacto del ancho de banda sobre el margen de desvanecimiento en escenarios de interiores

Carlos Gómez Izquierdo, Lorenzo Rubio Arjona, Vicent Miquel Rodrigo Peñarrocha, Juan Reig Pascual

In this paper, the impact of the channel bandwidth on the fade depth to characterise the small-scale fading in indoor environments is analysed. The investigation is based on a measurement campaign carried out in a typical laboratory in the 3.1 - 10.6 GHz band in accordance to the UWB frequency range. A simple yet accurate empirical fade depth model in terms of the bandwidth channel is proposed. The model considers line-of-sight (LOS) and non-line-of-sight (NLOS) propagation conditions. This empirical model is very useful to predict the impact of the channel bandwidth on multipath fading, determining the optimal operation bandwidth with a desired quality of service, implementation and complexity of the wireless system.

Envío de correcciones GPS tomadas desde una estación de referencia mediante método diferencial

Ana María Torres Aranda, Jorge Mateo Sotos, Joaquín Cascón López

In this article we described the installation and service offer of a GPS reference station, that works 24 hours and 365 days on a year, to use to received free differential corrections. One of the use is post-process download the differential correction, use a internet connection. Also is possible connect with a radio-modem and download on real time the differential correction in RTCM format, and as a new emergent technology it is possible to connect on real time to use GPRS of cellular telephones.

Relaciones de aproximación entre diferentes parámetros de propagación basadas en modelos físicos de atenuación troposférica

María José Lucas Vegas, José Manuel Riera Salís

The estimation of slant-path link attenuation, in the microwave and millimetre wave bands, from other measurable propagation parameters may be of interest to modern satellite communication systems. In this paper, some results are presented regarding the possibility and accuracy of estimating attenuation, and other propagation parameters, on the basis of other ones assumed as available or measured. This approach is based on physical models of gas and cloud attenuation, and radiosounding meteorological data.

Experimento de radiometría en la banda Ka

María Encina Almorox González, José Manuel Riera Salís, Gustavo Adolfo Siles, Pedro García del Pino

A propagation experiment is being carried out in Madrid, with the objective of gaining insight on the slant-path propagation channel in the Ka band. The received level of the Eutelsat HB-6 satellite beacon at 19.7 GHz is measured with an experimental receiver, which includes a radiometer operating in the same band. The goal is the characterization of the influence of atmospheric phenomena in the millimetre-wave band and to compare beacon and radiometry measurements with propagation models. In this paper, the main results obtained from the analysis of radiometry measurements are presented. The results correspond to individual events of attenuation and brightness temperature, as well as a preliminary statistical analysis of the first complete year of data.

Radiopropagación II

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 11

Estudio de la autocorrelación del campo eléctrico para la planificación de medidas de radio digital en 26 MHz

Olaia Fernández Agüeros, José María Matías, Susana López, Unai Gil Abaunza, Iván Peña Valverde, David de la Vega Moreno

The field trials are the base of the empirical signal field strength prediction algorithms. Based on the theory of Lee, this paper calculates the correct distance between consecutive measurement points that must be applied in field trials. The study is made for digital radio (DRM) at a frequency of 26 MHz for local coverage use. This paper studies the autocorrelation of the field strength of the received signal to determine the distance between measuring points in field trials. According to Lee, if the samples are uncorrelated, the measure will be representative of the signal variability. So, the objective is to find the distance at which the samples are uncorrelated. The recorded samples in which the study is based are equally separated in time, since there is one measure per DRM frame. Therefore, the first step is to obtain equally spaced samples from the recorded data set. Then, the autocorrelation distance is calculated and is validated later using the Lee Method.

Un análisis de los espectros ELF del campo eléctrico en la atmósfera de Titán enviados por la misión Cassini-Huygens

Juan Antonio Morente Chiquero, Enrique Antonio Navarro Camba, Cédric Blanchard, Alfonso Salinas Extremera, Margarita Rodríguez Sola, Jorge Andrés Portí Durán, Jesús Francisco Fornieles Callejón

Detection of the Schumann resonance frequencies in the atmosphere of a planet or moon is an irrefutable proof of natural electrical activity in the planet or moon's atmosphere. The mutual impedance probe, included in the Huygens scientific payload, aimed to measure the Schumann power spectra through the electric field in Titan's atmosphere. A procedure is shown for extracting the weak resonances from the Titan's electric field spectra. The procedure, based on analysis of the late-time system response, confirms the signature of natural electric activity reported by preliminary data observations, bringing out the expected eigenfrequencies of the Titan-ionosphere electromagnetic cavity, known as Schumann resonances.

Nuevo algoritmo para el cálculo del diagrama de radiación de antenas embarcadas sobre cuerpos complejos considerando N-interacciones

Lorena Lozano Plata, María Jesús Algar Díaz, Santiago Cejudo, Iván González Diego, Manuel Felipe Cátedra Pérez

A new ray-tracing method has been developed for the analysis of antennas on-board complex structures and to compute the propagation at indoor/outdoor environments considering n-bounces. The structures like satellites, ships, aircrafts, or other complex bodies, are modelled by planar and/or curved surfaces defined by perfectly electrical conductors or dielectric materials (with or without losses). The structures are defined as parametric surfaces, in particular NURBS (Non-Unirform Rational B-Spline). The approach is based on the Uniform Theory of Diffraction (UTD) and Physical Optics (PO) for the field computation.

Algoritmos eficientes de localización en interiores basados en técnicas de trazado de rayos

Antonio del Corte Valiente, Óscar Gutiérrez Blanco, José Manuel Gómez Pulido, Manuel Felipe Cátedra Pérez

Detection methods play an important role in applications of high frequencies techniques for locations systems. This paper compares the use of radio frequency (RF) power levels and ray-tracing time delays as detection methods with Wi-Fi (802.11) and Wi-Max (802.16) standards to estimate the location of a mobile station using the standard fingerprint technique. The localization algorithm computes the Euclidean distance between the parameters of the samples (power and delay) received from each unknown position and fingerprint in the database obtained using the FASPRI general theory diffraction (GTD) based code. Experimental results show that more precision locations can be obtained using delay and hybrid detection instead of power detection.

Sistema de localización inalámbrica mediante mediciones de potencia sin calibración previa

Santiago Mazuelas Franco, Francisco Lago García, Daniel González, Alfonso Bahillo Martínez, Juan Blas Prieto, Patricia Fernández Reguero, Rubén Mateo Lorenzo Toledo, Evaristo José Abril Domingo

The development of location techniques in urban and indoor environments by means of received signal strength (RSS) measurements, has as a main drawback the fact that in these environments the RSS values depend on many unpredictable and changeable factors. The dependence between RSS values and distances, in each specific propagation environment, can be modeled by using a parameter known as path loss exponent (or path loss gradient). The values of this parameter vary according to the propagation conditions present at each instant. Therefore, the accuracy in the distance estimates achieved from the RSS values highly depend on using a path loss exponent which fits well the existing propagation conditions. In this

paper, we propose a novel technique in order to determine the propagation conditions of the signals used in the location process. In order to do that, the method presented estimates the path loss exponents in a dynamic and accurate way, solely by means of the RSS values, without the necessity of any previous knowledge obtained in a calibration stage, about the propagation conditions present in the environment. With those exponents, distance estimates much more accurate than the ones obtained with generic propagation models are obtained. We present the results obtained with real measurements taken in a GSM network, and the ones obtained from several simulations performed. With these results it can be realized the great precision in the distance estimates achieved with the methods presented, which will be to the advantage of the subsequent location process.

Radiopropagación III

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 7

Caracterización espacial de canal mediante sistemas multiantena con OFDM

Jonathan Mora Cuevas, Carlos Gómez Calero, Leandro de Haro y Ariet

A key point for satisfying the higher data rates that the new wireless communication services demand is to explore and apply several diversity schemes simultaneously. The frequency diversity given by OFDM (Orthogonal Frequency Division Multiplexing) systems increase information of received signals, i.e. Direction-of-arrival (DoA) profiles. In this paper, a proper spatial channel characterization in terms of DoA profiles is conducted using MUSIC algorithm. A MIMO-OFDM testbed is been designed to carried out a measurement campaign in several propagation environments. In order to facilitate the repeatability of taking measurements in the experimental campaign, an automatic positioning system is presented. Several virtual array geometries are studied in terms of DoA resolution.

Aplicación de técnicas de teledetección en la obtención de la conductividad de la tierra

Raúl Ruiz Meza, José Manuel Riera Salís, Jorge Ismael Montoya Tena

Surface wave propagation is characteristic of lower frequency bands, as LF and MF, and allows the radio coverage to extremely large areas from a single high-power transmitter. The use of these bands has gained interest in the recent years with the definition of broadcasting standards, in particular DRM and IBOC, able to provide one or several high-quality audio services and complementary data services using the RF channels currently employed for analog AM broadcasting. In this paper we present a method to obtain the conductivity of the ground by means of the use remote sensing data. The type of input data required for the process, and LANDSAT data is analysed to obtain pattern signatures and apply them to obtain

the conductivity of a region. The results of the presented approach may be verified by means of measurements.

Estudio de la influencia de un parque eólico en el nivel medio y la desviación típica de señales UHF

Ananda Satrústegui Aldaz, Íñigo Etayo Otermin, Miguel Javier Yábar Labat, Francisco Javier de Aranzadi Menéndez Menéndez, Francisco Javier Falcone Lanas

The main motivation of this analysis is to estimate accurately the signal level variation introduced by the wind turbines as a function of parameters such as the distance from the receiver antenna to the wind turbines, the terrain obstructed Fresnel zones, the working frequency and the height and materials of the wind turbines. The results of multiple site measurements are showed in this document. The paper contrasts two different types of situations, being different Fresnel zones obstructed by the terrain and not. The final aim of this paper is to help predict the interferences that the establishment of a wind farm can cause in some telecommunication systems in the surrounding area.

Efectos de distorsión presentes en el canal de propagación en un sistema de comunicaciones de banda ancha WiMAX basado en HAPS

Israel Palma Lázgare, José Antonio Delgado Penín

In the near future, high altitude platforms (HAPs) are thought to provide fast deployment, easier to scale, and more flexible wide-area broadband communications service. The effects of the broadband propagation channel become more critical for higher data rates and quality of service requirements. An accurate channel model is needed in order to optimise the design of HAP station (HAPS) systems. Two processes comprise the proposed propagation channel impairments associated with the HAP-to-ground terminal, long- and short-term fading. Furthermore, HAPS broadband channel models are being incorporated into more detailed and advanced structures, in which WiMAX broadband wireless access technology intervenes. IEEE 802.16 standard approximates the physical nature of the radio channel for use in NLOS conditions in order to offer high data rate over large areas to a large number of users where broadband is unavailable. The overall HAP-based WiMAX system is approximated by simulation tools. Principal performance outcomes show a suitable model representation of this recent system.

Emulador de canal de radio

Eddy Luis Molina Morales, Leandro de Haro y Ariet, Miguel Alejandro Salas Natera

A procedure to interact real antennas with a virtual wireless channel simulating the multipath is presented. The method permits to test the performance of the antennas in the channel. The proposed technique achieves the interaction between the channel and the antennas by means of a file with their measured directional radiation characteristics. As a result, the amplitudes and phases of the output signals resulting from the multipath channel are obtained.

Sistemas de Comunicaciones I

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 11

Codificación de fuente y señalización OFDM ad hoc para enlace HF de larga distancia

Joan Mauricio Ferré, Pau Bergadá Caramés, Joan Lluís Pijoan Vidal, Santiago Marsal Vinadé, Joan Miquel Torta Margalef

HF communication systems are a reliable alternative as a backup system for slow speed data communications. This can be achieved since the growing of the digital systems and the reduction of the equipment costs. The Research Group on Communications (GRECO) from Ramon Llull University, has been sounding the ionospheric channel between Livingston Island (Antarctica) and Ebro Observatory (Spain) for five years. In the present stage, a modem is being designed to transmit geomagnetic data on real time from Livingston Island, and cover the 12700 Km ionospherfic radio link. In this paper an ad hoc source coder design and an OFDM based signalling system are approached.

Algoritmos de enrutamiento basados en el comportamiento global del consumo de la red

Manel López de Miguel, Jordi Sabater Martí, José María Gómez Cama, Susanna Martínez Mendizábal, Atilà Herms i Berenguer

Wireless networks have received a tremendous interest from research groups. The major focal point has been the routing protocols, i.e. how to select the best route to send information from any source to any destination. In this paper, we have implemented a routing protocol based on the global state of the network. This algorithm transmit any kind of information from any source to any destination node selecting the best choice in every retransmission. We have focused in an indoor wireless sensor network. The network topology studied is a general mesh topology. Also, we have implemented software strategies to minimize the power consumption because of this is of a great importance for this kind of networks. We will show in this paper that ad hoc network must arrive to a compromise between best path and overall power consumption. This compromise will give us the best route to minimize the power consumption and maximize the transmission success probability.

Herramienta para la planificación automática de redes WLAN en interiores

Sergio Nistal Ariza, Alfonso Fernández Durán, José Ignacio Alonso Montes

This paper presents an automatic planning software tool for indoor wireless networks. As a consequence of increasing number of wireless interface based systems, automation of deployments becomes actually relevant. There are a lot of parameters that influences network performance, so designers have to take them into account. The larger the network is, the more complex its planning results. Mentioned tool looks for an optimal planning solution, in terms

of base stations distribution and frequency planning. It consist of analyzing data obtained by means of environment simulation. The user is able to decide the optimization criterion and the way of searching solutions. This tool show results such as power received at each user spatial point, interference level or traffic load for each station.

Análisis comparado de las principales soluciones dedicadas para la provisión de servicios móviles en interiores

Antolín Moral Caballero, Jorge Pérez Martínez, Arturo Vergara Pardillo, Ana Olmos Sanz

The provision of a good indoor coverage is a key issue for the success of the new mobile data services. Overlaying macro cells can provide a sufficient level of general indoor coverage for most of the cases. However, in order to be able to provide WCDMA/HSDPA indoor coverage and capacity within hot spots, such as airports, shopping malls and large office buildings, the roll-out of dedicated in-building wireless systems is required. First, this paper shows the benefits and opportunities that the roll-out of dedicated in-building wireless systems provides to the mobile operators and to the building owners. Then, a comparative analysis of the main dedicated in-building solutions is presented. In addition to the technical issues, this paper shows how important is the role of the economic and strategic issues in the technical solution finally chosen.

Comparación entre arquitecturas de RF para radio definida por software

Cristina de la Morena Álvarez-Palencia, Álvaro Martín López, Mateo Burgos García

This paper describes two RF architectures applicable to Software Defined Radios: zero-IF and low-IF. The fundamental principles, as well as the main advantages and drawbacks, are presented. Both architectures have been compared by means of simulated data, which take into account linear and no-linear distortion effects. The results show that the low-IF architecture presents better performance than the zero-IF.

Sistemas de Comunicaciones II

Sesión IV: Martes 23, 09:30 - 11:30 h Aula 12

Amplificador de potencia de envolvente clase S para transmisor EER

David Tena Ramos, Francisco Javier Ortega González, Alejandro Gimeno Martín, José Manuel Pardo Martín

A Class-S power amplifier for an EER transmitter is shown in this paper. Simulations and measurements on a circuit prototype are presented showing good agreement. The amplifier is based on MOSFET technology both for the power stage and driver. Pulse Width Modulation driving signal required by the amplifier is generated by means of a in-house designed DSP board. Up to 50 W output peak power can be delivered to the RF power amplifier (Class-S

amplifier load) at 86% power-added efficiency while harmonic distortion is below 30 dBc and third order intermodulaction products remain well below 34 dBc.

Estudio de radiopropagación en entornos RFID en banda UHF

Antonio Ramón Lázaro Guillén, David Girbau Sala, David Salinas

The Radio Frequency Identification (RFID) applications are growing rapidly, especially in the UHF frequency band that is being used in inventory management. Passive UHF tags are preferred for this application. However, the read-range is often overestimated using free space calculations. This paper presents a method to estimate the range in multipath environments. Other effects with direct impact on read-range such as cable attenuation, design of dock doors and effects of materials on tag performances are also studied.

Sistema de monitorización remota de dispositivos próximos desde una base antártica

Antonio Valverde Molina, José Manuel Riera Salís, Francisco Navarro Valero

Scientific Research in Antarctica usually needs continuous gathering of information by devices placed in the neighborhood of the stations. It would be very useful to have a system which transmits data in real time from these devices to the stations. This transmission should involve a low data flow, in order to implement a simple remote control system. It would also require low power transmitter-receiver devices, so the batteries maximize their lifetime. This article presents the study developed in the Chilean Antarctic base "General Bernardo O'Higgins" in January 2008. It compares the transmission performance of two different candidate systems which could be used for such control transmissions: standard Wi-Fi at 2.4 GHz, and FM at 434 MHz. They are compared from two different points of view: first, the radio signal propagation, by measuring power reception at different distances, and second, the expected bit-rate and consumed-power features of both of them.

Evaluación de los productos de intermodulación en redes CATV

María Consuelo Part Escrivá, David Ponce López

This paper discusses specific measurements on CATV systems: Intermodulation distortion. The most troublesome distortion generated by systems carrying over 20 channels is that created by visual carriers beating against one another to form unwanted interference signals called CSO and CTB. This kind of non linear distortion is produced by network amplifiers and must be measured and controlled, to ensure the quality of service given to customers. A large amount of video carriers in a CATV network becomes a challenge to keep intermodulation distortion under control. At the beginning, second order distortion a third order distortion measurements were unable to do without interrupting service. Nowadays, with modern spectrum analyzers using a measurement technique known as "Time-Gated", service won't be affected and enables to check TV signals over the CATV network. CSO and

CTB measurements becomes an objective evaluation to verify a good performance in a CATV system.

Modelado comportacional con memoria de amplificadores de potencia de RF

César Sánchez Pérez, Jesús de Mingo Sanz, Paloma García Ducar, Pedro Luis Carro Ceballos, Antonio Valdovinos Bardaji

Power amplifiers (PAs) are the most extended and widely used nonlinear devices in communications. Their nonlinearities generate distortion both in amplitude and phase of the PA's output signal. The use of wideband efficient modulations in the last generation systems, such as wideband code-division multiple access (WCDMA) or orthogonal frequency-division multiplexing (OFDM), adds new problems to the use of PAs, due to the memory effects associated with the bandwidth and the increase of distortion by the non-constant envelope. In this paper it is shown the need of taking into account the memory effects in order to get a more accurate model of PA operation. We compare the performance of the memoryless model with some well-known memory models based on memory polynomials and Volterra series using a novel calibration signal.

Mejora de un algoritmo de sincronización para IEEE 802.11a/g

María José Canet Subiela, Vicenç Almenar Terré, Javier Valls Coquillat, José Marín-Roig Ramón

In this paper a time synchronization algorithm for IEEE 802.11a/g OFDM-WLAN standard is evaluated and some modifications are proposed to improve its performance. The original synchronization algorithm utilizes coarse and fine estimation. In this paper fine time estimation is done using a cross-correlation as the original algorithm does, but different solutions are evaluated to cope with the problems of the coarse estimation in the original algorithm. The performance of these alternatives is tested by simulation in multipath channels, at low signal to noise ratio and with carrier frequency offset. Also, the computational cost is evaluated.

Filtro adaptativo de compensación del desbalanceo I/Q implementado en FPGA

María Asunción Pérez Pascual, Alfonso Tarazona Martínez, Trini Sansaloni Balaguer, María José Canet Subiela

Mismatches of the amplitudes and phases of the inphase and in-quadrature signal branches in quadratue receivers result in increasing of the system error probability. Particular sensitivity of the modern re-configurable transceivers reinforces the need for efficient mitigation of I/Q imbalance. This paper proposes a baseband compensation of the I/Q imbalance based on the use of an adaptive filter interference canceller implemented on a Virtex FPGA. In order to

achieve fully pipelined circuit architectures for FPGA implementation, we have use the Delayed-LMS algorithm to update the filter coefficients. The circuit has been included in a 16 QAM low-IF receiver. The results indicate that the I/Q imbalance can be effectively compensated during the normal operation of the receiver.

Sistemas de Comunicaciones III

Sesión V: Martes 23, 12:00 - 13:45 h Aula 11

Estudio y simulación de repetidores regenerativos y no regenerativos en redes de difusión DVB-T

Iker Sobrón Polancos, Javier Del Ser Lorente, Mikel Mendicute Errasti

Repeaters are widely used in terrestrial broadcast networks so as to increase the range and improve the quality of digital television (Digital Video Broadcasting-Terrestrial, DVBT) receivers. Such repeaters can be classified as regenerative and non-regenerative. In the first case, since a complete remodulation of the signal is performed, regenerative schemes are also known as digital repeaters. By using these regenerative devices, a certain quality enhancement in the retransmitted DVB-T signal is reached as long as the received signal can be demodulated. On the contrary, non-regenerative repeaters (i.e. analogue repeaters) do not improve the quality of the received signal because no re-modulation is performed in this case. In this context, our contribution in this paper is a detailed analysis of the trade-off between regenerative and non-regenerative repeaters in both single frequency (SFN) and multiple frequency networks (MFN). As explained later, regenerative repeaters in SFN are useful in scenarios where non-regenerative repeaters are not able to improve the quality of the relayed signal. However, in this case the receiver must be completely isolated from the originally sent signal, since the delay penalty incurred by digital repeaters is usually longer than the OFDM guard interval, and therefore creates inter-symbol interference (ISI). Monte Carlo simulations have been carried out in order to analyze the performance of such repeaters in indoor fading scenarios with complete isolation of the outdoor environment.

ImplanTDT: laboratorio de usabilidad y plataforma de monitorización de usuarios de TDT

Rafael Melendreras Ruiz, Gabriel Franco Martínez, Montserrat Carrión Barberá

The current paper presents ImplanTDT, a novel research project carried out in Murcia (Spain) to study the degree of knowledge and users' reaction to Digital Terrestrial Television (DTT). Analogue Terrestrial Television will definitely disappear in less than 3 years. The first stage of the project is centered on the design of two different and complementary test scenarios such as a Usability Laboratory and a Real User Bidirectional Monitoring Platform based on the development of advanced Multimedia Home Platform (MHP) software applications. Results of this project stage, will serve to improve DTT information campaigns, develop more

easy-to-use, useful and advanced interactive MHP services (T-Government, T-Learning, T-Commerce, etc.) and provide all involved parties with high quality information in order to achieve a balanced, interactive, educated and massive technological transition.

Desarrollo de una aplicación publicitaria para MHP

Gabriel Franco Martínez, Rafael Melendreras Ruiz

The current paper describes a project that has been launched to further work in one of the new added values that Digital Terrestrial Television has brought, the new interactive services available to the final user. The main goal is to analyze the european standard for interactivity, Multimedia Home Platform (MHP). Keeping this objective, the project begins analyzing the Digital Video Broadcasting - Terrestrial (DVB-T) standard and the available technology for digital interactive receivers. Next, a basic develop stage is done in order to know the features of MHP APIs, their capacity and limits. Finally, a basic interactive advertising application is developed and tested.

Herramienta para la planificación de redes WiMAX basada en sistemas de información geográfica

Jaime Calle Sánchez, Mariano Molina García, José Ignacio Alonso Montes

In this paper, a software tool for planning and dimensioning WiMAX Networks based on a geographic information system is presented. The deployment process of a communication system based on this technology in rural areas requires the use of a digital GIS database, in order to achieve trustworthy results. This geographic information is obtained from the data supplied by NASA SRTM project. The tool will allow to obtain accurate maps and numerical results associated to SNR, coverage, capacity, visibility, better server and other parameters related to radiopropagation.

Análisis comparativo de los algoritmos de planificación de ráfagas en redes OBS

Geraldine Mirkeya Brugés Barrios, David Ignacio González Samudio, José Duván Márquez Díaz

This paper presents a comparative analysis of algorithms planning bursts in networks OBS: Lauc (latest available Unscheduled Channel), Lauc-VF (latest available Unused Channel with Filling Void), Min-SV (Minimum Starting Void), Min-EV (Minimum Ending Void), Best-Fit, Max-SV (Maximum Ending Void) and Max-EV (Maximum Ending Void). The article analyzes very important and specific aspects about the operation and logic that applies each of the algorithms responsible for the planning of bursts in networks OBS and shows statistical data to assess the behavior of these algorithms. For this comparison is shown a brief process simulation of the application of each algorithm on a network NSFnet.

Seguridad en las Comunicaciones I

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 7

Cifrado basado en la identidad con tarjetas de circuito integrado

José de Jesús Ángel Ángel, Guillermo Morales Luna

Smartcards are able to provide secure communications in environments in which a central agent, say a Treasury entity, establishes a cryptographic platform for secure communications, say citizens community. Here we review Shailaja protocols for ciphering and authentication using smartcards and IBE, and we recall the main characteristics for elliptic curves suggested by Scott in order to obtain robust and efficient implementations of IBE on smartcards. We detail an elementary extension of the protocols for joint access to secure communications.

Sistemas anónimos en escenarios globales

Rodolfo Leonardo Sumoza Matos, Luis Javier García Villalba

The anonymous systems' implementation, from a practical point of view, still possesses a set of unresolved issues. The zones (countries or organizations) that censor and block the communications is one of them. This work mentions the implications related to the worldwide anonymous systems' implementation, and it proposes to use the reputation's systems and trust to manage and reach anonymous comunications in a large or global level.

Redes sociales: retos, oportunidades y propuestas para preservar la privacidad

Alejandra Silva Trujillo, Luis Javier García Villalba

Social networks sites are one of the biggest technological phenomena. The importance of these sites is because industry, entities and individuals have adopted them to share their emotions, feelings, interests, ideologies. There are several risks to expose a huge amount of private information. The combination of data mining methods and analysis social networks could lead to perform networking viral strategies. In this paper first we describe the privacy importance in social networks and then we present the state of the art of several proposals released recently in this topic.

Telemática I

Sesión V: Martes 23, 12:00 - 13:45 h Aula 12

Política de acceso a cachés web basada en el tipo de los documentos

Francisco Javier González Cañete, Alonso Ruiz Alcántara, Eduardo Casilari Pérez

In this paper we propose a new access control policy to Web caches that is based on the type of the documents as well as the size of them. To perform an evaluation of this policy we utilized two metrics specifically designed to calculate the performance of a cache with an access control policy. An improvement in the measurement of one of the parameters of these metrics in order to obtain more precise metrics is proposed. Based on the study of a trace of traffic of a real Web cache the characteristics of the traffic based on the type of the documents and size are obtained. Finally, a trace driven simulation study of the performance of the new access control policy proposed using these accurate metrics has been developed.

Diseño de un submarino de investigación de cinco grados de libertad

Carlos Barroeta Zamudio, Floriberto Ortiz Rodríguez, Juan Francisco Novoa Colín

One area that has had an increase in research in recent years either for academic research or industrial applications is the use of the submersible robots. There are two types of submersible vehicles: Vehicles Autonomous and Vehicles Non-Self (submarine research), which operate under the same principle. It is common to use these robots to perform tasks such as monitoring, inspection and maintenance of underwater structures in deep drainage and curtains in dams, aquifers, lakes funds from natural or man-made, nuclear power plants, oil platforms, and so on. In addition to that in the area of education, a prototype of this type is capable of displaying the basic principles of a submarine, and is essential for monitoring and further investigation from the lowest levels to the most advanced in the control area. It was designed and built a submarine research that has five degrees of freedom and control systems as mink system, propulsion system, variable buoyancy system, power system and the system of horizontal stabilization.

Modelado de entidades de gestión OSI

Javier Ropero Romero, Javier Poncela González

The network management systems which are used in actual networks are based, mainly, in two paradigms: OSI and Internet. The first one was conceived to provide management functionalities to OSI systems, and was adopted to carry out operation management for telecommunication systems standardized by ITU. OSI management entities belong to the application layer, and, in order to perform their tasks, use general and specific service elements which allow the communication between managers and agents. In this paper we describe the modeling of service elements ACSE and ROSE, which are used to setup and control an association via which management operations can be requested from the remote

entity and its response received. These entities have been modeled in SDL as this is the language proposed by ITU for reactive systems.

Mecanismo de recuperación de direcciones IP en MANET

Fábio Mesquita Buiati, Luis Javier García Villalba

Mobile ad hoc networks (MANET) provide a flexible way of developing ubiquitous broadband wireless access, allowing mobile networks to be readily deployed without using any previous network infrastructure. This feature involves the need to manage distributed services between the nodes of the network. Services such as the distribution and recovery network configurations, user authentication, security mechanisms, etc., should be done by all the nodes. In this article we propose a mechanism for the recovery of IP addresses in ad hoc wireless networks, where we try detail the process of self-configuration, corresponding to the arrival and departure (soft and hard) of nodes, and their respective synchronization.

Localización de servicios de información en redes 4G

Fábio Mesquita Buiati, Luis Javier García Villalba

The next generation of the wireless networks terminals is expected to support multiple wireless radio access networks as Bluetooth, Wi-Fi, Wi-Max, GSM and UMTS, in which users can maintain the connections when they switch from one network to another, in seamlessly manner. Supporting this seamless handover in heterogeneous networks requires several constraints to be considered such as radio signal strength, coverage, security, QoS, user policies, cost, etc. In order to store this information from several networks, the IEEE 802.21 specifies a Media Independent Information Service (MIIS) that support various Information Elements providing network information within a geographical area, focusing on the optimization of handover process. The main challenge is how the mobile node discovers the Information Server, mainly if there are multiples networks and operators. In this paper, the focal point is to specify a communication model framework for Information Server location in heterogeneous networks.

Telemática II

Sesión VI: Miércoles 24, 09:30 - 11:30 h Aula 12

Evaluación de la tecnología HomePlug AV para la provisión de servicios multimedia en el hogar

Juan Pedro Muñoz Gea, Josemaría Malgosa Sanahuja, Pilar Manzanares López, Juan Carlos Sánchez Aarnoutse

Local area networks based on the emerging power line communication (PLC) standards are attractive for establishing networks with no-new-wires for in-home and in-building (business) applications. The new HomePlug AV standard, deployed by the HomePlug Alliance, offers a data rate in excess of 150 Mbps. This capacity is theoretically able to transmit the most usual multimedia applications at home (IPTV and VoD). The article presents comprehensive field test results addressing such issues as packet delay, interarrival jitter and bandwidth, in order to evaluate the performance of the HomePlug AV standard for the transmission of IPTV and VoD services. The protocols used by these applications and the HomePlug AV specification are also presented.

Estimación de la capacidad y la calidad de servicio de un enlace mediante técnicas de dispersión de paquetes

Rafael Lázaro Juan Guerra, Ricardo García Gutiérrez, Pablo Corral González

It discusses the problem of estimating the bandwidth of a path under a moderate cross-traffic. In order to do this, first one we examine the main techniques based on measuring packet dispersion and determine their inconvenients. As a solution, we develop a client-server tool capable of simulating any queuing model in order to simulate all kinds of traffic. It also explains how to calculate the capacity of a path by applying methods for measuring packet dispersion trying to overcome the common disadvantages situations of cross-traffic. Finally, it creates a scene of simulation to determine how the cross-traffic affects on the bandwidth measurement with this tool.

Monitorización remota de señales respiratorias en niños

Tomás Robles Valladares, Eduardo Pico, Carlos Eduardo Nossa Medina, Miguel Villacorta, Daniel Fuentes

This paper presents a system designed for remote monitoring of children with apnea, and the early detection of apnea. The system has being designed jointly with LA PAZ Hospital in order to identify key functionalities and the most suitable medical signals in the context of this project. The final goal of the system is to improve the quality of the live of patients that require monitoring, and to increase the amount of signal records in a standard signal repository, in order to allow powerful analysis algorithms to work over them in the future. Some of those algorithms are also developed under this project. The system collects real time

data using commercial monitors in the hospital environment, allowing the local analysis for early apnea detection. In parallel such data are transferred to a central Data base, where more powerful algorithms can process them and doctor may review using standard Web browser from any enabled Internet Computer.

Diseño e implementación de un sistema de gestión y mantenimiento para el servicio velocimetro.org

Iñaki Urrutxi Etxebarria, Luis Fernando Burgos de la Flor, Ianire Taboada Puente, Eduardo Saiz Macías

This article tries to specify the basis of a project about a new system to control and manage an internet quality test that measures the access speed of Internet users. We will explain the current situation of the service to look for the necessities, and then try to propose tools to solve those necessities. These tools must be integrated in a common interface to give the administrator of the service an easy-to-use environment as long as a powerful system to manage the quality test tool. To conclude, we will propose the necessary technologies to implement the different parts of the system.

COMPLU6IX: transición a IPv6 del campus de Moncloa

Rafael Martínez Torres

On the early 2000's a vast effort was made in order to redefine and setup IPv6 backbone's infrastructures. Owadays, universities and research institutions are considered as excellent opportunities to disseminate this new technology. This paper describes a proposal to introduce IPv6 connectivity in our campus network. Underlying rationale is to achieve it in a smooth way; therefore, the intended deployment is committed in two phases: on a short term, connectivity is acquired by using a reliable technology, known as tunneling. Then native connectivity is introduced progressively.

Telemática III

Sesión VII: Miércoles 24, 12:00 - 13:45 h Aula 12

Aplicación de firmas digitales agregadas a la trazabilidad de productos

Guillermo Azuara Guillén, Joan Josep Piles, José Luis Salazar Riaño

In this paper we are presenting a system to verify that a product has passed through all stages of a production cycle and that it has fulfilled a series of minimum requirements. It is based on a RFID system which use economical tags, because they are only used as storage information and the electronic signatures of verifying agent. The use of aggregate signatures allowed to use public key cryptography in the limited memory of tags, achieving a remarkable saving of memory when compared to the introduction of a signature at each step. In addition, a single

operation can verify all signatures, allowing short processing times, which are compatible with the production times.

Generador de patrones de movilidad con obstáculos para MANET

Alicia Triviño Cabrera, Raúl Morales Berrocal, Eduardo Casilari Pérez

Due to the difficulties associated with real tests, the evaluation and comparison of the performance of ad hoc networks are usually based on simulations. Simulations require the settings of several parameters such as the traffic patterns, the radio propagation channel or the mobility model that the nodes follow. Several mobility models have already been proposed in order to describe the real behavior of mobile users. The Random WayPoint is one of the most extended mobility patterns employed in the MANET research activities. Although its popularity, some lacks are present in it. One of the main drawbacks is related to its inability to consider obstacles in order to restrict the positions of mobile devices. In this paper, we show a tool to generate mobility patterns considering obstacles. Additionally, we analyse the effect that the obstacles cause in the network performance. The results show that, although the absolute values of the different metrics employed for the computation of network performance are different, the tendencies of the general behaviour are similar.

Encaminamiento adaptativo en redes ad hoc mediante el algoritmo Ant Colony

José María Benítez Escario, Alberto Benito Peral, Ana Lucila Sandoval Orozco, Luis Javier García Villalba

This document shows a change of perspective for the designing of routing protocols in Ad hoc networks. These networks have the characteristic to present a dynamic topology, this forces to derive a number of resources elevated to capture the topology of the network to be able to realise an optimal calculation of routes. A more global vision is adopted that does not deal with a search of routes optimal exclusively if not of an optimization of resources of the network. First part of the document consists of a theoretical analysis of the problem, implications of a change of metric at the time of evaluating the routes and the minimal information necessary to carry out a good route. Previous theoretical study gets up to a guidance proposal by means of a modification of the algorithm Ant Colony Optimization.

Optimización del tráfico en redes ad hoc mediante protocolos jerárquicos

Alberto Benito Peral, Ana Lucila Sandoval Orozco, Luis Javier García Villalba

A MANET is an autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. The network is decentralized, where all network activity including discovering the topology and delivering messages must be executed by the nodes themselves, i.e., routing functionality will be incorporated into mobile nodes. Our

routing protocol tries to give a satisfactory solution to these problems. It fulfils a hierarchical routing by means of the creation of clusters using AI algorithms (neural networks, fuzzy logic) adapted to a distributed stage. These skills allow to reduce the sending of control packets, as well as to find routes of more efficient form and to adapt better to the topological changes.

Configuración DHCP en redes MANET subordinadas

José Ignacio Ruiz Núñez, Alicia Triviño Cabrera, Luis Javier García Villalba

Mobile Ad-hoc NETworks (MANET) allow different mobile devices to communicate with each other through multiple wireless links. One problem to solve is the connection of MANET to other networks including the Internet. With this purpose, the mobile devices should be provided of topologically correct IP addresses. The Dynamic Host Configuration Protocol for IPv6 (DHCPv6) is a defined standard mechanism for the configuration of IPv6 addresses in a stateful manner which works with link-local messages. Due to their multihop nature, this protocol cannot be directly applicable in MANETs. This paper proposes a solution to implement DHCPv6 on an ad hoc network. Additionally, it includes several optimizations to improve the network performance.

Telemática IV

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 11

Using multiple route metrics in a sensor networks protocol

Nelson Cárdenas Parra, Cláudia Jacy Barenco Abbas, Luis Javier García Villalba

This paper present a proposal of a novel wireless sensor network protocol. Its main goals are provide reliability of data delivery and saving energy, both are basic needs in sensor networks and particularly in monitor and control applications. To address these goals several metrics are used: battery available, link quality and number of hops to reach the target. In order to select the best path to send a message, this protocol use information about nodes with lower–metric-values in each possible path. Initial simulation results show important improvements compared with protocols like Direct Diffusion, which are used frecuently in the bibliografy.

Diseño de un protocolo metaplanificador de plataformas grid

Rodolfo Leonardo Sumoza Matos, José Lisandro Aguilar Castro

The implementations of the Grids or ubiquitous systems still have not reached to use efficient schemes of metascheduling, principally due to the complexity of this task. This work proposes a Metascheduling based on Multiagents System's Interaction Protocols, it is orientated to use economic models on the Grid's dynamic interactions.

Comercio electrónico B2C personalizado

Carla Salazar Serrudo, Luis Javier García Villalba

Although Business to Consumer (B2C) is the most popular way of making electronic commerce, still many of the steps for purchasing items on virtual markets are handy and collective for internauts. In this work is shown a proposal for automatic negotiation that supports the items purchase/sale procedures on virtual markets. To accomplish this, a case-based reasoning learning algorithm has been designed to buy or sell the item at the best possible price. This algorithm learns the purchase strategies of the human buyer and then it adapts them to new purchase procedures, this way customizing this procedure.

Diseño de un sistema de monitoreo y gestión de redes para telecentros rurales

Ronald Paucar Curasma, José Luis Muñoz Meza, Marco Cachuas Casahuamán, Jenny Vásquez Arias, Nicolás Rosales Quiñonez, Alfonso Salazar Aliaga, Rafael Domínguez Contreras, Johnny Laura Quispe

In this paper, the authors present a rural telecentre network monitoring and management development made by the INICTEL-UNI. These telecentres are located in the Region of Puno, specifically in the districts of Umachiri, Cupi, Llalli and Macarí (Huamanruro) in Peru. The development has modules that allow to monitor the operation and availabilility of internet access of the telecentres. These telecentres also have routers, switches, servers, wireless devices and an IP central with Asterix.

A study of RSSI and LQI metrics in IEEE 802.15.4 standard

Cláudia Jacy Barenco Abbas, Cristian Camacho, Carlos Goncalvez, Ana Lucila Sandoval Orozco, Luis Javier García Villalba

In wireless networks and also in Wireless Sensor Networks (WSN) the use of LQI (Link Quality Indicator) and RSSI (Receive Signal Strength Indicator) as metrics to indicate the state of links is common. The correct use of RSSI and LQI values can help in the building of the network topology, in the choosing of the best route of routing protocols and also as an estimator of distance between nodes. To know more about these metrics, in this work we studied their behavior in relation to distance and in relation to interferences of IEEE 802.15.4 standard of Moteiv TelosB WSN motes with others technologies that use the 2.4 GHz frequency band.

Tratamiento de Voz e Imagen I

Sesión II: Lunes 22, 15:30 - 17:15 h Aula 12

Implementación frecuencial de las ecuaciones de Euler-Lagrange para registro variacional de imagen

Rafael Verdú Monedero, Jorge Larrey Ruiz, Juan Morales Sánchez, Pedro José García Laencina, José Luis Sancho Gómez

In this paper, a novel theoretical framework defined in the frequency domain for variational non-parametric image registration is proposed. It provides more efficient implementations than existing theoretical approaches for the most common registration techniques. The presented frequency domain analysis adds simplicity to the variational image registration implementations and allows for an easy extension to higher dimensions by using the multidimensional Fourier transform of multidimensional signals.

Sistema de calibrado de instrumentación mediante visión artificial

Fernando Martín Rodríguez, Esteban Vázquez Fernández, Arno Formella, Higinio González Jorge, Ángel Dacal Nieto

This communication describes a computer vision system designed to automatically read the displays of digital instrumentation. The system is used in calibration sessions where many measurements have to be made and where we are interested in getting the whole series downloaded on a host computer. Before our system was running, a human operator had to inspect the instruments at the right times required by the calibration protocol and write down all the results. Note that we are speaking of very simple and sometimes old instruments that usually do not provide a digital interface or a removable memory.

Automatización de medidas morfológicas y ecogénicas de estructuras del aparato locomotor humano mediante procesado de imágenes ecográficas

María Consuelo Bastida Jumilla, Juan Morales Sánchez, Rafael Verdú Monedero, Jorge Larrey Ruiz, José Luis Sancho Gómez

The boundary detection has a relevant importance in locomotor system ecographies, mainly because some illnesses and injuries can be detected before the first symptoms appear. The images used show a great variety of textures as well as non clear edges. This drawback may result in different contours depending on the person who traces them out and different diagnoses too. This paper presents the results of applying the geodesic active contour and other boundary detection techniques in ecographic images of Aquiles tendon, such as morphological image processing and active contours. Other modifications to this algorithm are introduced, like matched filtering. In order to upgrade the smoothness of the final contour, morphological image processing and polynomic interpolation has been used with great

results. Actually, the automatization of boundary detection improves the measurement procedure, obtaining error rates under 10%.

Simulador de sistemas AER basado en eventos

José Antonio Pérez Carrasco, Carmen María Serrano Gotarredona, Begoña Acha Piñero, Teresa Serrano Gotarredona, Bernabé Linares Barranco

Address-Event-Representation (AER) is a communications protocol for transferring (visual) information between chips, originally developed for bio-inspired vision and audition systems. Such systems may consist of a complicated multi-layer hierarchical structure with many chips that transmit events among them in real time, while performing some complex processing (for example, convolutions, competitions, etc). This sensing and processing technology is capable of very high speed throughput, because it does not rely on sensing and processing sequences of frames, and because it allows for complex hierarchically structured cortical-like layers for sophisticated processing. In this paper we present an effective tool that simulates the behaviour of such kind of structures. AER stream sources are fed to the software simulation tool and AER streams at all nodes of the network are computed. The tool has been developed in MATLAB and is event driven. It has been conceived as an open tool, so that any user can add extra functional blocks easily, or provide more elaborate or more simplified descriptions of already available blocks.

Tratamiento de Voz e Imagen II

Sesión III: Lunes 22, 17:30 - 19:15 h Aula 12

Estudio de la viabilidad del parámetro grafométrico de la presión en modo off-line

Omar Santana, Carlos Manuel Travieso González, Jesús Bernardino Alonso Hernández, Miguel Ángel Ferrer Ballester

On calligraphic system and many legal aspects about document authentication, an useful parameter is the handwritten pressure. In this present work, it is developed a study for the estimation of an approximation for the stroke wide. It is worked on off-line mode, and this study has analyzed different resolutions (100, 150, 200, 300, 600 y 1200 dpi) for words binary images on Spanish language. Two estimations for the stroke wide were used, the mode and the adjusted average for the stroke. The main goal in this present work is to research if the efficiency of the handwritten pressure increases with the resolution, and which is better of the previous estimations for the stroke wide. It is worked on a database of 4 writers, with 10 samples for each writer, using a supervised classification system. In particular, it is used a neural network as classifier and the "more voted" algorithm in order to improve the classification system. The 50% of our database was employed for training mode and the

remainder for test mode. Finally, this study finds as the best resolution for writing pressure 150 dpi; therefore, a mayor resolution does not indicate a mayor success.

Formulación frecuencial de la ecuación de Euler-Lagrange para modelos deformables

Rafael Berenguer Vidal, Juan Morales Sánchez, Pedro José García Laencina, José Luis Sancho Gómez, Rafael Verdú Monedero

Deformable models, i.e., active contours and active meshes, are useful tools in image processing and computer vision, because of their ability to take the shape of real 2D/3D objects. The original formulation of the models is defined on the spatial domain and it is based on the minimization of an energy functional through the Euler-Lagrange differential equations. In this paper, a new formulation is proposed in the frequency domain, for the adaptation process of the contours and meshes to the external forces. The presented frequency approach provides an easier and more computationally efficient implementation, allowing the use of deformable models to a greater number of areas.

Reducción del vector de características en reconocimiento facial

Carlos Manuel Travieso González, Jordi Solé Casals, Vladimir Zaiats, Jesús Bernardino Alonso Hernández, Miguel Ángel Ferrer Ballester

In this present work, we are proposing a characteristics reduction system for a facial biometric identification system, using transformed domains such as discrete cosine transformed (DCT) and discrete wavelets transformed (DWT) as parameterization; and Support Vector Machines (SVM) and Neural Network (NN) as classifiers. The size reduction has been done with Principal Component Analysis (PCA) and with Independent Component Analysis (ICA). This system presents a similar success results for both DWT-SVM system and DWT-PCA-SVM system, about 98%. The computational load is improved on training mode due to the decreasing of input's size and less complexity of the classifier.

Algoritmo de regiones para la segmentación de imágenes en color basada en la distancia de color CIEDE2000

Rubén Custodio Díaz, Carmen María Serrano Gotarredona, Begoña Acha Piñero

In this paper, a new method for color image segmentation, based on a novel region-growing technique, is proposed. Seeds in the region-growing are obtained from a region of interest (selection box), that is selected by the user with the mouse. In order to calculate the similarity between pixels, which would determine whether or not a pixel is included the region being grown, CIEDE2000 distance in the L*a*b* color space is used. The tolerance step that controls the growth increases gradually, being the contrast between the inner and outer edge of the region being grown what we use to determine the optimal tolerance. An important

advantage is that this technique can be used on general images. This method has being tested on natural Color images from Corel photo stock collection with excellent results.

Tutorial

Sesión VIII: Miércoles 24, 15:30 - 17:15 h Aula 12

Agrega

Antonio Sarasa Cabezuelo, Manuel Canabal, Juan Carlos Sacristán, Raquel Jiménez

In the context digital on the Internet, and enhanced with the ideas of Web 2.0, the possibility of exchanging information or services from sites located on the internet, has become a necessity. Agrega is a federation of digital repositories of educational material, with nodes distributed in each of the regions of Spain. In this tutorial describes the main features that Agrega offers to the generators of content. These functions are grouped mainly in packaging and tagging from learning objects. The learning objects are SCORM 2004 Content Packaging and LOM-ES. For each of these features, shows screenshots from Agrega.

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Área de Comunicaciones Digitales

Martes 23		Miércoles 24	
		09:00 - 11:30	**Sesión III** TEC2006-12910 TEC2006-09109 TEC2006-03246 TEC2006-10218 TEC2006-09466
		11:30 - 12:00	**Pausa y café**
		12:00 - 13:30	**Sesión IV** TEC2006-07010 TEC2006-03883 TEC2006-01428
13:30 - 15:00	**Almuerzo**	**13:30 - 15:00**	**Almuerzo**
15:00 - 16:00	**Presentación de las Jornadas**		
16:00 - 17:15	**Sesión I** TEC2006-06481 TEC2006-12211-C02-01/02		
17:15 - 17:30	**Pausa y café**		
17:30 - 19:00	**Sesión II** TEC2006-04504 TEC2006-10459 TEC2006-08430		
20:30 - 23:00	**Cena de Gala**		

Presentación de las Jornadas

Martes 23, 15:00 – 16:00 h — Salón de Actos

El Nuevo Plan Nacional de I+D+i 2008-2011

José Ignacio Alonso Montes. Subdirector General de Planificación, Estudios y Seguimiento. Ministerio de Ciencia e Innovación

Área de Comunicaciones Digitales

Martes 23 de Septiembre Aula 1

Sesión I

16:00 - 16:30 **Proyecto: TEC2006-06481**
LÍMITES FUNDAMENTALES DE LA TEORÍA DE LA INFORMACIÓN DE REDES
Javier Rodríguez Fonollosa. Universidad Politécnica de Cataluña

16:30 - 17:00 **Proyecto: TEC2006-12211-C02-01/02**

APLICACIONES BIOMÉDICAS EN REDES HETEROGÉNEAS INALÁMBRICAS
Eduardo Casilari Pérez. Universidad de Málaga

APLICACIONES BIOMÉDICAS EN REDES INALÁMBRICAS HETEROGÉNEAS
José Antonio Gázquez Parra. Universidad de Almería

Sesión II

17:30 - 18:00 **Proyecto: TEC2006-04504**
INTERCONECTIVIDAD DE REDES HETEROGÉNEAS MALLADAS AUTOCONFIGURABLES
Jordi Casademont Serra. Universidad Politécnica de Cataluña

18:00 - 18:30 **Proyecto: TEC2006-10459**
DESARROLLO DE TÉCNICAS DE TRANSMISIÓN COOPERATIVA Y CROSS-LAYER PARA REDES DE SENSORES INALÁMBRICOS
Christos Verikoukis. Centro Tecnológico de Telecomunicaciones de Cataluña

18:30 - 19:00 **Proyecto: TEC2006-08430**
TÉCNICAS OPERATIVAS MULTIMEDIA APLICADAS A REDES ELÉCTRICAS DE SUMINISTRO
José Ignacio Escudero Fombuena. Universidad de Sevilla

Área de Comunicaciones Digitales

Miércoles 24 de Septiembre Aula 1

Sesión III

09:00 - 09:30 **Proyecto: TEC2006-12910**
EVALUACIÓN EXPERIMENTAL DE REDES DE TRANSPORTE INTELIGENTE CON CONMUTACIÓN DE CANALES ÓPTICOS DINÁMICAMENTE RECONFIGURABLES
Raúl Múñoz González. Centro Tecnológico de Telecomunicaciones de Cataluña

09:30 - 10:00 **Proyecto: TEC2006-09109**
COGNITIVE RADIO (MARCO SOFTWARE RADIO) Y REDES MÓVILES HETEROGÉNEAS
Antoni Gelonch Bosch. Universidad Politécnica de Cataluña

10:00 - 10:30 **Proyecto: TEC2006-03246**
DIMENSIONADO DE REDES IP Y REDES ÓPTICAS: APLICACIÓN A LA RED ACADÉMICA ESPAÑOLA REDIRIS
Javier Aracil Rico. Universidad Autónoma de Madrid

10:30 - 11:00 **Proyecto: TEC2006-10218**
PROCESADO COLABORATIVO Y COMUNICACIONES AUTO-ORGANIZATIVAS PARA REDES DE SENSORES INALÁMBRICOS
Baltasar Beferull Lozano. Universidad de Valencia

Sesión IV

12:00 - 12:30 **Proyecto: TEC2006-07010**
MÉTODOS EMERGENTES PARA LA OPTIMIZACIÓN MULTICAPA DE REDES DE NUEVA GENERACIÓN Y SU APLICACIÓN A REDES IP DE FUTURA GENERACIÓN (FGN)
José Antonio Portilla Figueras. Universidad de Alcalá de Henares

12:30 - 13:00 **Proyecto: TEC2006-03883**
MECANISMOS MULTINIVEL DE ASIGNACIÓN DE RECURSOS Y ENCAMINAMIENTO CON RECUPERACIÓN EN REDES TRONCALES BASADAS EN GMPLS
José Luis Marzo Lázaro. Universidad de Gerona

13:00 - 13:30 **Proyecto: TEC2006-01428**
SISTEMAS DE COMUNICACIONES INALÁMBRICAS DE BANDA ANCHA CON ALTAS PRESTACIONES
Ezio Biglieri. Universidad Pompeu Fabra

Área de Procesado de Señal y Aplicaciones

Martes 23		Miércoles 24	
		09:00 - 11:30	**Sesión III** TEC2006-12887-C02-01/02 TEC2006-13170-C02-01/02 TEC2006-12438 TEC2006-13845
		11:30 - 12:00	**Pausa y café**
		12:00 - 13:30	**Sesión IV** TEC2006-13883-C04-01/02/03/04 TEC2006-13966-C03-01/02/03
13:30 - 15:00	**Almuerzo**	**13:30 - 15:00**	**Almuerzo**
15:00 - 16:00	**Presentación de las Jornadas**		
16:00 - 17:15	**Sesión I** TEC2006-13694-C03-01/02/03 TEC2006-03617		
17:15 - 17:30	**Pausa y café**		
17:30 - 19:00	**Sesión II** TEC2006-13514-C02-01/02 TEC2006-13141-C03-01/02/03		
20:30 - 23:00	**Cena de Gala**		

Presentación de las Jornadas

Martes 23, 15:00 – 16:00 h — Salón de Actos

El Nuevo Plan Nacional de I+D+i 2008-2011

José Ignacio Alonso Montes. Subdirector General de Planificación, Estudios y Seguimiento. Ministerio de Ciencia e Innovación

Área de Procesado de Señal y Aplicaciones

Martes 23 de Septiembre Aula 2

Sesión I

16:00 - 16:45 **Proyecto: TEC2006-13694-C03-01/02/03**

TECNOLOGÍAS PARA LA TRADUCCIÓN DE VOZ: RECONOCIMIENTO, TRADUCCIÓN ESTADÍSTICA BASADA EN CORPUS Y SÍNTESIS
José Bernardo Mariño Acebal. Universidad Politécnica de Cataluña

TECNOLOGÍAS PARA LA TRADUCCIÓN DE VOZ: RECONOCIMIENTO, TRADUCCIÓN ESTADÍSTICA BASADA EN CORPUS Y SÍNTESIS
Inmaculada Hernáez Rioja. Universidad del País Vasco

TECNOLOGÍAS PARA LA TRADUCCIÓN DE VOZ: RECONOCIMIENTO, TRADUCCIÓN ESTADÍSTICA BASADA EN CORPUS Y SÍNTESIS
Eduardo Rodríguez Banga. Universidad de Vigo

16:45 - 17:15 **Proyecto: TEC2006-03617**

ANÁLISIS BIOMÉTRICO DE ACTIVIDADES ÓCULO-FACIALES CON TÉCNICAS DE MODELADO ESTADÍSTICO ROBUSTO PARA SISTEMAS DE ASISTENCIA A LA CONDUCCIÓN SEGURA DE VEHICULOS
Alejandro Frangi Caregnato. Universidad Pompeu Fabra

Sesión II

17:30 - 18:15 **Proyecto: TEC2006-13514-C02-01/02**

MONITORIZACIÓN INTELIGENTE
Antonio Artés Rodríguez. Universidad Carlos III de Madrid

MONITORIZACIÓN INTELIGENTE
Juan José Murillo Fuentes. Universidad de Sevilla

18:15 - 19:00 **Proyecto: TEC2006-13141-C03-01/02/03**

BIO-PASS: USO DE MODALIDADES TRANSPARENTES EN ESQUEMAS DE RECONOCIMIENTO MULTIBIOMÉTRICO PARA ENTORNOS DE APLICACIÓN REALISTAS DE BAJA VULNERABILIDAD Y ALTA CONVENIENCIA DE USUARIO
Miguel Ángel Ferrer Ballester. Universidad de las Palmas de Gran Canaria

SISTEMA DE IDENTIFICACIÓN BIOMÉTRICA MULTIMODAL AMIGABLE PARA EL USUARIO
Marcos Faúndez Zanuy. Patronato Municipal de la Escuela Universitaria Politécnica de Mataró

USO DE MODALIDADES TRANSPARENTES EN ESQUEMAS DE RECONOCIMIENTO MULTIBIOMÉTRICO PARA ENTORNOS DE APLICACIÓN REALISTAS DE BAJA VULNERABILIDAD Y ALTA CONVENIENCIA DE USUARIO
Javier Ortega García. Universidad Autónoma de Madrid

Área de Procesado de Señal y Aplicaciones

Miércoles 24 de Septiembre Aula 2

Sesión III

09:00 - 09:45 **Proyecto: TEC2006-12887-C02-01/02**

IDENTIFICACIÓN DEL LOCUTOR A PARTIR DE BIOMETRÍA DE LA VOZ, EN APLICACIONES PARA LA SEGURIDAD EN INFRAESTRUCTURAS
Pedro Gómez Vilda. Universidad Politécnica de Madrid

DIAGNÓSTICO ASISTIDO REMOTO POR LA VOZ A PARTIR DE MEDIDAS BIOMÉTRICAS Y OTRAS PARAMETRIZACIONES
Juan Ignacio Rodino Llorente. Universidad Politécnica de Madrid

09:45 - 10:30 **Proyecto: TEC2006-13170-C02-01/02**

RECONOCIMIENTO EFICIENTE MULTINIVEL DEL LOCUTOR Y DEL IDIOMA PARA SU USO POLICIAL OPERATIVO, COMO EVIDENCIA FORENSE Y COMO CONTROL DE ACCESO
Joaquín González Rodríguez. Universidad Autónoma de Madrid

INCORPORACIÓN DE INFORMACIÓN DE ALTO NIVEL PARA RECONOCIMIENTO DE LOCUTOR Y DEL IDIOMA
Eduardo López Gonzalo. Universidad Politécnica de Madrid

10:30 - 11:00 **Proyecto: TEC2006-12438**
ACELERADORES HARDWARE DE PREDICCIÓN Y TRANSFORMADA PARA COMPRESIÓN DE VIDEO DE ALTA DEFINICIÓN
Juan Antonio Michell Martín. Universidad de Cantabria

11:00 - 11:30 **Proyecto: TEC2006-13845**
INTEGRACIÓN DE REPRESENTACIONES NO-LINEALES PERCEPTUALES Y ESTADÍSTICAS EN RESTAURACIÓN Y CODIFICACIÓN DE IMÁGENES
Jesús Malo López. Universidad de Valencia

Sesión IV

12:00 - 12:45 **Proyecto: TEC2006-13883-C04-01/02/03/04**

CREACIÓN DE ESCENAS SONORAS 3D MEDIANTE TÉCNICAS COMBINADAS DE SEPARACIÓN DE FUENTES SONORAS Y WAVE-FIELD SYNTHESIS
José Javier López Monfort. Universidad Politécnica de Valencia

SEPARACIÓN DE FUENTES SONORAS PARA SU APLICACIÓN EN MEDIDAS ACÚSTICAS
Antonio Pena Giménez. Universidad de Vigo

INVESTIGACIÓN Y DESARROLLO DE TÉCNICAS DE CLASIFICACIÓN Y SEPARACIÓN DE SONIDOS. APLICACIÓN AL DISEÑO DE UN SISTEMA INTELIGENTE DE SEGMENTACIÓN y CODIFICACIÓN DE AUDIO ESTRUCTURADO
Nicolás Ruiz Reyes. Universidad de Jaén

ANÁLISIS Y CLASIFICACIÓN AUTOMÁTICA DE ENTORNOS ACÚSTICOS
Manuel Rosa Zurera. Universidad de Alcalá de Henares

12:45 - 13:30 Proyecto: TEC2006-13966-C03-01/02/03

MÉTODOS AVANZADOS DE PROCESADO DE SEÑAL EN NEUROIMAGEN POR RESONANCIA MAGNÉTICA Y ELECTROENCEFALOGRAFÍA. APLICACIÓN A CARTOGRAFÍA CEREBRAL E INTERFÁZ CEREBRO-COMPUTADOR EN DISCAPACITADOS

Juan Antonio Hernández Tamames. Universidad Rey Juan Carlos

MÉTODOS AVANZADOS DE PROCESADO DE SEÑAL PARA RESONANCIA MAGNÉTICA ESTRUCTURAL Y DE PERFUSIÓN DEL CEREBRO HUMANO

Salvador Olmos Gasso. Universidad de Zaragoza

INTEGRACIÓN DE RESONANCIA MAGNÉTICA Y ELECTROENCEFALOGRAFÍA. APLICACIÓN AL FUNDAMENTO Y USO DE INTERFACES CEREBRO COMPUTADOR POR DISCAPACITADOS

Luis Javier Barrios Bravo. Consejo Superior de Investigaciones Científicas

Área de Radiación, Microondas y Radiofrecuencia

Martes 23		Miércoles 24	
		09:00 - 11:30	**Sesión III** TEC2006-13067-C03-01/02/03 TEC2006-09990-C02-01/02 TEC2006-03022 TEC2006-02868
		11:30 - 12:00	**Pausa y café**
		12:00 - 13:30	**Sesión IV** TEC2006-11077-C02-01/02 TEC2006-13887-C05-01/02/03/04/05
13:30 - 15:00	**Almuerzo**	**13:30 - 15:00**	**Almuerzo**
15:00 - 16:00	**Presentación de las Jornadas**		
16:00 - 17:15	**Sesión I** TEC2006-13248-C04-01/02/03/04 TEC2006-07850		
17:15 - 17:30	**Pausa y café**		
17:30 - 19:00	**Sesión II** TEC2006-04771 TEC2006-12360 TEC2006-12687		
20:30 - 23:00	**Cena de Gala**		

Presentación de las Jornadas

Martes 23, 15:00 – 16:00 h — Salón de Actos

El Nuevo Plan Nacional de I+D+i 2008-2011

José Ignacio Alonso Montes. Subdirector General de Planificación, Estudios y Seguimiento. Ministerio de Ciencia e Innovación

Área de Radiación, Microondas y Radiofrecuencia

Martes 23 de Septiembre Aula 3

Sesión I

16:00 - 16:45 **Proyecto: TEC2006-13248-C04-01/02/03/04**

DISEÑO DE DISPOSITIVOS Y METAMATERIALES PARA APLICACIONES DE RADIOFRECUENCIA
José Parrón Granados. Universidad Autónoma de Barcelona

MINIATURIZACIÓN Y MEJORA DE CABECERAS DE RADIOFRECUENCIA MEDIANTE EL USO DE NUEVOS MATERIALES Y METAMATERIALES
Juan Carlos Collado Gómez. Universidad Politécnica de Cataluña

MINIATURIZACIÓN Y MEJORA DE LAS PRESTACIONES DE SISTEMAS RADIANTES DE CABECERAS DE RADIOFRECUENCIA MEDIANTE EL USO DE TECNOLOGÍAS DE METAMATERIALES Y EBGS
Ramón Gonzalo García. Universidad Pública de Navarra

NUEVOS MATERIALES, DISPOSITIVOS Y SISTEMAS RADIANTES PARA MINIATURIZAR Y MEJORAR LAS PRESTACIONES DE CABECERAS DE RADIOFRECUENCIA
Daniel Segovia Vargas. Universidad Carlos III de Madrid

16:45 - 17:15 **Proyecto: TEC2006-07850**

LIDARES ELÁSTICO-RAMAN Y TECNOLOGÍAS BASADAS EN LÁSER SEMICONDUCTOR PARA EL SONDEO ATMOSFÉRICO Y LA DETECCIÓN DE GASES
Francisco Rocadenbosch Burillo. Universidad Politécnica de Cataluña

Sesión II

17:30 - 18:00 **Proyecto: TEC2006-04771**

APLICACIONES DE NUEVOS CONCEPTOS DE METAMATERIALES EN EL DISEÑO DE CIRCUITOS ACTIVOS Y PASIVOS DE MICROONDAS Y MILIMÉTRICAS
Carlos Camacho Peñalosa. Universidad de Málaga

18:00 - 18:30 **Proyecto: TEC2006-12360**
FUENTES FOTÓNICAS AVANZADAS DE ESTADO SÓLIDO PARA DETECCIÓN REMOTA DE GAS EN EL INFRARROJO MEDIO
Majid Ebrahim Zadeh. Instituto de Ciencias Fotónicas

18:30 - 19:00 **Proyecto: TEC2006-12687**
INESTABILIDAD CONTROLADA EN CIRCUITOS Y SU APLICACIÓN A COMUNICACIONES UWB
Pere Pala Schonwalder. Universidad Politécnica de Cataluña

Área de Radiación, Microondas y Radiofrecuencia

Miércoles 24 de Septiembre Aula 3

Sesión III

09:00 - 09:45 **Proyecto: TEC2006-13067-C03-01/02/03**

TRANSCEPTORES MULTIELEMENTO Y MONOCIRCUITO PARA RADIOCOMUNICACIÓN MULTIMEDIA DE BANDA ANCHA Y MUY ANCHA - TRATAMIENTO DE SEÑAL
Francisco Javier Casajús Quiros. Universidad Politécnica de Madrid

TRANSCEPTORES MULTIELEMENTO Y MONOCIRCUITO PARA RADIOCOMUNICACIÓN MULTIMEDIA DE BANDA ANCHA Y MUY ANCHA: MICROELECTRÓNICA DE RF
Amparo Herrera Guardado. Universidad de Cantabria

TRANSCEPTORES MULTIELEMENTO Y MONOCIRCUITO PARA RADIOCOMUNICACIÓN MULTIMEDIA DE BANDA ANCHA Y MUY ANCHA - DISEÑO MICROELECTRÓNICO
Carlos Carreras Vaquer. Universidad Politécnica de Madrid

09:45 - 10:30 **Proyecto: TEC2006-09990-C02-01/02**

CONTROL ESPECTRAL Y TEMPORAL DE SEÑALES ÓPTICAS POR DISPOSITIVOS DE ÓPTICA NO LINEAL
Pedro Corredera Guillén. Consejo Superior de Investigaciones Científicas

GESTIÓN DEL ESPECTRO Y LA VELOCIDAD DE LA LUZ USANDO TÉCNICAS NO LINEALES / UAH
Miguel González Herráez. Universidad de Alcalá de Henares

10:30 - 11:00 **Proyecto: TEC2006-03022**

TRANSCEPTORES CMOS A RADIO FRECUENCIA PARA REDES DE SENSORES INALÁMBRICAS

Manuel Delgado Restituto. Consejo Superior de Investigaciones Científicas

11:00 - 11:30 **Proyecto: TEC2006-02868**

SISTEMA DE MEDIDA BASADO EN EL SEIS PUERTOS PARA LA CARACTERIZACIÓN DE DISPOSITIVOS ÓPTICOS DWDM

Íñigo Molina Fernández. Universidad de Málaga

Sesión IV

12:00 - 12:45 **Proyecto: TEC2006-11077-C02-01/02**

CIRCUITOS PARA CABECERAS DE RF RECONFIGURABLES

Joaquín Portilla Rubín. Universidad del País Vasco

DISPOSITIVOS HBT DE SIGE Y III-V PARA CIRCUITOS WIRELESS

Juan Miguel López González. Universidad Politécnica de Cataluña

12:45 - 13:30 **Proyecto: TEC2006-13887-C05-01/02/03/04/05**

DESARROLLO DE TÉCNICAS DE BANDA-ULTRA-ANCHA MEDIANTE PULSOS GENERADOS POR DIODOS LÁSER: APLICACIONES A LAS COMUNICACIONES ÓPTICAS INALÁMBRICAS-SP1

Francisco José López Hernández. Universidad Politécnica de Madrid

DESARROLLO DE TÉCNICAS DE BANDA-ULTRA-ANCHA MEDIANTE PULSOS GENERADOS POR DIODOS LÁSER: APLICACIONES A LAS COMUNICACIONES ÓPTICAS INALÁMBRICAS-SP2

Ángel Valle Gutiérrez. Universidad de Cantabria

DESARROLLO DE TÉCNICAS DE BANDA-ULTRA-ANCHA MEDIANTE PULSOS GENERADOS POR DIODOS LÁSER: APLICACIONES A LAS COMUNICACIONES ÓPTICAS INALÁMBRICAS-SP3

Salvador Balle Monjo. Consejo Superior de Investigaciones Científicas

DESARROLLO DE MODELOS DE PROPAGACIÓN Y DE CONTROL DE ACCESO AL MEDIO PARA SISTEMAS DE TRENES DE IMPULSOS EN COMUNICACIONES ÓPTICAS INALÁMBRICAS

Rafael Pérez Jiménez. Universidad de las Palmas de Gran Canaria

DESARROLLO DE TÉCNICAS DE BANDA-ULTRA-ANCHA MEDIANTE PULSOS GENERADOS POR DIODOS LÁSER: APLICACIONES A LAS COMUNICACIONES ÓPTICAS INALÁMBRICAS-SP5

Silvestre Rodríguez Pérez. Universidad de la Laguna

JORNADAS TEC / MIC 2008

Jornadas de Seguimiento y Evaluación de Proyectos de Investigación MICINN

Programa de Tecnología Electrónica y Comunicaciones

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Catedrático de Universidad. Universidad de Valencia

Prof. Adrián Hierro Cano
Profesor Titular Interino de Universidad. Universidad Politécnica de Madrid

Área de Avances en Materiales y Dispositivos Electrónicos

Martes 23		Miércoles 24	
		09:00 - 11:30	**Sesión III** TEC2006-10469 TEC2006-13731-C02-01/02 TEC2006-13907-C04-01/02/03/04 TEC2006-13154
		11:30 - 12:00	**Pausa y café**
		12:00 - 13:30	**Sesión IV** TEC2006-13910-C03-01/02/03 TEC2006-15722
13:30 - 15:00	**Almuerzo**	**13:30 - 15:00**	**Almuerzo**
15:00 - 16:00	**Presentación de las Jornadas**		
16:00 - 17:15	**Sesión I** TEC2006-01882 TEC2006-13273-C03-01/02/03		
17:15 - 17:30	**Pausa y café**		
17:30 - 19:00	**Sesión II** TEC2006-03698 TEC2006-06531 TEC2006-13392-C02-01/02		
20:30 - 23:00	**Cena de Gala**		

Presentación de las Jornadas

Martes 23, 15:00 – 16:00 h — Salón de Actos

El Nuevo Plan Nacional de I+D+i 2008-2011

José Ignacio Alonso Montes. Subdirector General de Planificación, Estudios y Seguimiento. Ministerio de Ciencia e Innovación

Área de Avances en Materiales y Dispositivos Electrónicos

Martes 23 de Septiembre Aula 4

Sesión I

16:00 - 16:30 **Proyecto: TEC2006-01882**
ANTENAS ÓPTICAS PARA OPTOELECTRÓNICA Y NANOFOTÓNICA
Javier Alda Serrano. Universidad Complutense de Madrid

16:30 - 17:15 **Proyecto: TEC2006-13273-C03-01/02/03**
ANÁLISIS, SIMULACIÓN, MEDIDA Y CARACTERIZACIÓN DE DISPOSITIVOS FOTÓNICOS BASADOS EN FIBRA ÓPTICA DE PLÁSTICOS DE ÍNDICE GRADUAL
Joseba Zubia Zaballa. Universidad del País Vasco

Sesión II

17:30 - 18:00 **Proyecto: TEC2006-03698**
EXPLOTACIÓN DE LA APLICABILIDAD DE ELEMENTOS INTEGRADOS MEMS-CMOS MONOLÍTICOS Y HETEROGÉNEOS PARA SISTEMAS PORTABLES DE ALTAS PRESTACIONES
Gabriel Abadal Berini. Universidad Autónoma de Barcelona

18:00 - 18:30 **Proyecto: TEC2006-06531**
CRISTALES FOTÓNICOS SINTONIZABLES BASADOS EN SILICO
Luis Francisco Marsal Garvi. Universidad Rovira i Virgili

18:30 - 19:15 **Proyecto: TEC2006-13392-C02-01/02**
DESARROLLO DE PANTALLAS BASADAS EN CRISTAL LIQUIDO ANTIFERROELÉCTRICO Y DIODOS ORGÁNICOS ELECTROLUMINISCENTES PARA APLICACIONES EN SISTEMAS PORTÁTILES ESPECIALIZADOS DE ALTO VALOR AÑADIDO
José Manuel Sánchez Pena. Universidad Carlos III de Madrid

Área de Avances en Materiales y Dispositivos Electrónicos

Miércoles 24 de Septiembre Aula 4

Sesión III

09:00 - 09:30 **Proyecto: TEC2006-10469**
NUEVAS TÉCNICAS PARA FABRICACIÓN DE ESTRUCTURAS DE GUIADO DE LUZ EN ÓPTICA ESPACIAL Y SU APLICACIÓN A DISPOSITIVOS GRIN PARA INTERCONEXIONES ÓPTICAS
Carlos Gómez-Reino Carnota. Universidad de Santiago de Compostela

09:30 - 10:15 **Proyecto: TEC2006-13731-C02-01/02**
PRESTACIONES, VARIABILIDAD E INESTABILIDADES EN DISPOSITIVOS NANOELECTRÓNICOS
Jorge Francisco Suñé Tarruella. Universidad Autónoma de Barcelona

10:15 - 11:00 **Proyecto: TEC2006-13907-C04-01/02/03/04**
INTEGRACIÓN MONOLÍTICA DE EMISORES DE LUZ Y TRANSDUCTORES OPTOQUÍMICOS CON TECNOLOGÍA DE SILICIO
Carlos Domínguez Horna. Instituto de Microelectrónica de Barcelona (IMB-CNM)

11:00 - 11:30 **Proyecto: TEC2006-13154**
DISEÑO PARA REUTILIZACIÓN DE CELDAS ANALÓGICAS Y MIXTAS RECONFIGURABLES DE ALTAS PRESTACIONES EN TECNOLOGÍA CMOS
Juan Francisco Duque Carrillo. Universidad de Extremadura

Sesión IV

12:00 - 12:45 **Proyecto: TEC2006-13910-C03-01/02/03**
MICRO/NANO DISPOSITIVOS FABRICADOS MEDIANTE TÉCNICAS LITOGRÁFICAS EMERGENTES
Francesc Pérez Murano. Instituto de Microelectrónica de Barcelona (IMB-CNM)

12:45 - 13:15 **Proyecto: TEC2006-15722**

DISEÑO DE SISTEMAS DE VISIÓN EN UN CHIP PARA APLICACIONES DE SEGURIDAD EN AUTOMOCIÓN USANDO TECNOLOGÍAS CMOS PROFUNDAMENTE SUBMICROMÉTRICAS MEJORADAS PARA CENSADO ÓPTICO

Gustavo Liñán Cembrano. Instituto de Microelectrónica de Sevilla (IMS-CNM)

Área de Sensores y Optoelectrónica

Martes 23		Miércoles 24	
		09:00 - 11:30	**Sesión III** TEC2006-10009 TEC2006-13604-C03-01/02/03 TEC2006-14186-C02-01/02 TEC2006-10316
		11:30 - 12:00	**Pausa y café**
		12:00 - 13:30	**Sesión IV** TEC2006-10665 TEC2006-12170 TEC2006-12654
13:30 - 15:00	**Almuerzo**	**13:30 - 15:00**	**Almuerzo**
15:00 - 16:00	**Presentación de las Jornadas**		
16:00 - 17:15	**Sesión I** TEC2006-03671 TEC2006-12376-C02-01/02		
17:15 - 17:30	**Pausa y café**		
17:30 - 19:00	**Sesión II** TEC2006-04123 TEC2006-04538 TEC2006-13109-C03-01/02/03		
20:30 - 23:00	**Cena de Gala**		

Presentación de las Jornadas

Martes 23, 15:00 – 16:00 h — Salón de Actos

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José Ignacio Alonso Montes. Subdirector General de Planificación, Estudios y Seguimiento. Ministerio de Ciencia e Innovación

Área de Sensores y Optoelectrónica

Martes 23 de Septiembre Aula 5

Sesión I

16:00 - 16:30 **Proyecto: TEC2006-03671**
MICROSISTEMA CONCENTRADOR-DETECTOR BASADO EN ADSORCIÓN Y DESORCIÓN TÉRMICA PROGRAMADA Y SENSORES SEMICONDUCTORES PARA LA DETECCIÓN DE TRAZAS DE GASES TÓXICOS
Francesc Xavier Correig Blanchar. Universidad Rovira i Virgili

16:30 - 17:15 **Proyecto: TEC2006-12376-C02-01/02**
DISEÑO DE SENSORES TÁCTILES AVANZADOS: ELECTRÓNICA Y ROBÓTICA
Fernando Vidal Verdú. Universidad de Málaga

Sesión II

17:30 - 18:00 **Proyecto: TEC2006-04123**
ARQUITECTURA y DISEÑO DE INSTRUMENTACIÓN DISTRIBUIDA BASADA EN REDES DE SENSORES INTELIGENTES
Carles Ferrer Ramis. Universidad Autónoma de Barcelona

18:00 - 18:30 **Proyecto: TEC2006-04538**
COMPONENTES FOTÓNICOS INTEGRADOS DE GANANCIA EN GUÍAS DE ONDA DIELÉCTRICAS NANOESTRUCTURADAS
Rosalía Serna Galán. Instituto de Óptica "Daza de Valdés" (IO)

1**8:30 - 19:15** **Proyecto: TEC2006-13109-C03-01/02/03**
MICROSISTEMAS MICROBIOLÓGICOS INTEGRADOS EN CHIP BASADOS EN ARRAYS DE MICRO-NANO-BIOSENSORES ELECTROQUÍMICOS
Francisco Javier Muñoz Pascual. Instituto de Microelectrónica de Barcelona (IMB-CNM)

Área de Sensores y Optoelectrónica

Miércoles 24 de Septiembre Aula 5

Sesión III

09:00 - 09:30 **Proyecto: TEC2006-10009**
DISPOSITIVOS FOTÓNICOS PARA COMUNICACIONES BASADAS EN CAOS
Pere Colet Rafecas. Universidad de Islas Baleares

09:30 - 10:15 **Proyecto: TEC2006-13604-C03-01/02/03**
MICROSISTEMAS BASADO EN MICRO / NANOBIOSENSORES FOTÓNICOS CON INTEGRACIÓN MICROFLUÍDICA PARA APLICACIONES EN DIAGNÓSTICO CLÍNICO (OPTOBIOSENS)
Laura Lechuga Gómez. Instituto de Microelectrónica de Madrid (IMM-CNM)

10:15 - 11:00 **Proyecto: TEC2006-14186-C02-01/02**
DESARROLLO DE MICROSISTEMAS PARA BIOMONITORIZACIÓN DE TEJIDO NERVIOSO
Jordi Aguiló Llobet. Instituto de Microelectrónica de Barcelona (IMB-CNM)

11:00 - 11:30 **Proyecto: TEC2006-10316**
NANOBIOSENSORES CON TECNOLOGÍA MEMS/NEMS PARA LA DETECCIÓN DE ADN y AGENTES INFECCIOSOS
Montserrat Calleja Gómez. Instituto de Microelectrónica de Madrid (IMM-CNM)

Sesión IV

12:00 - 12:30 **Proyecto: TEC2006-10665**
DISPOSITIVOS FOTÓNICOS NANOESTRUCTURADOS PARA APLICACIONES EN SENSORES Y EMISIÓN DE LUZ
Gonçal Badenes Guía. Instituto de Ciencias Fotónicas

12:30 - 13:00 **Proyecto: TEC2006-12170**
FABRICACIÓN DE DISPOSITIVOS OPTO-ELECTRÓNICOS BASADOS EN MATERIALES MICRO/NANOESTRUCTURADOS
Francisco Javier Arregui San Martín. Universidad Pública de Navarra

13:00 - 13:30 Proyecto: TEC2006-12654

MANIPULACIÓN DEL PULSO EN MICROSCOPÍA NO LINEAL. UNA NUEVA DIMENSIÓN PARA LA VISUALIZACIÓN DE CÉLULAS VIVAS

Pablo Loza Álvarez. Instituto de Ciencias Fotónicas

Área de Sistemas y Circuitos Electrónicos

Martes 23		Miércoles 24	
		09:00 - 11:30	**Sesión III** TEC2006-04103 TEC2006-12365-C02-01-01/02 TEC2006-13599-C02-01/02 TEC2006-06949
		11:30 - 12:00	**Pausa y café**
		12:00 - 13:30	**Sesión IV** TEC2006-08130 TEC2006-08210 TEC2006-11571
13:30 - 15:00	**Almuerzo**	**13:30 - 15:00**	**Almuerzo**
15:00 - 16:00	**Presentación de las Jornadas**		
16:00 - 17:15	**Sesión I** TEC2006-00739 TEC2006-11730-C03-01/02/03		
17:15 - 17:30	**Pausa y café**		
17:30 - 19:00	**Sesión II** TEC2006-3730 TEC2006-03863 TEC2006-12364-C02-01/02		
20:30 - 23:00	**Cena de Gala**		

Presentación de las Jornadas

Martes 23, 15:00 – 16:00 h — Salón de Actos

El Nuevo Plan Nacional de I+D+i 2008-2011

José Ignacio Alonso Montes. Subdirector General de Planificación, Estudios y Seguimiento. Ministerio de Ciencia e Innovación

Área de Sistemas y Circuitos Electrónicos

Martes 23 de Septiembre Aula 6

Sesión I

16:00 - 16:30 **Proyecto: TEC2006-00739**
OPTIMIZACIÓN DE CONSUMO Y TEMPERATURA EN ARQUITECTURAS COMPLEJAS
María Luisa López Vallejo. Universidad Politécnica de Madrid

16:30 - 17:15 **Proyecto: TEC2006-11730-C03-01/02/03**
SISTEMA DE VISIÓN MULTICHIP AER PARA PLATAFORMA ROBÓTICA II
María Teresa Serrano Gotarredona. Instituto de Microelectrónica de Sevilla (IMS-CNM)

Sesión II

17:30 - 18:00 **Proyecto: TEC2006-0373**
DISEÑO DE CONVERTIDORES ANALÓGICO / DIGITAL CMOS DE ALTAS PRESTACIONES PARA SISTEMAS DE TRANSMISIÓN DE DATOS
Jesús Arias Álvarez. Universidad de Valladolid

18:00 - 18:30 **Proyecto: TEC2006-03863**
NUEVOS ACTUADORES ELECTRÓNICOS DE ALTA POTENCIA CONECTADOS EN MEDIA TENSIÓN PARA APLICACIONES DE GENERACIÓN DISTRIBUIDA
Leopoldo García Franquelo. Universidad de Sevilla

18:30 - 19:15 **Proyecto: TEC2006-12364-C02-01/02**
NUEVAS TOPOLOGÍAS Y NUEVAS ESTRUCTURAS DE TRANSFORMADOR PARA FUENTES DE ALIMENTACIÓN DE ALTA POTENCIA Y ALTA TENSIÓN DE SALIDA
Juan Antonio Martín Ramos. Universidad de Oviedo

Área de Sistemas y Circuitos Electrónicos

Miércoles 24 de Septiembre Aula 6

Sesión III

09:00 - 09:30 **Proyecto: TEC2006-04103**
TÉCNICAS DE TEST PREDICTIVAS PARA CIRCUITOS INTEGRADOS CMOS ANALÓGICOS
Eugenio García Moreno. Universidad de Islas Baleares

09:30 - 10:15 **Proyecto: TEC2006-12365-C02-01/02**
PIBES: ALGORITMOS BIOMÉTRICOS Y METODOLOGÍA DE EVALUACIÓN
Raúl Sánchez Reillo. Universidad Carlos III de Madrid

10:15 - 11:00 **Proyecto: TEC2006-13599-C02-01/02**
ARQUITECTURAS PARA TERMINALES MULTIMEDIA PORTÁTILES, MULTIRED Y MULTIESTÁNDAR
César Sanz Álvaro. Universidad Politécnica de Madrid

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ESTUDIO Y DESARROLLO DE TOPOLOGÍAS DE CONVERTIDORES CA/CC Y CC/CC OPTIMIZADOS PARA EL EMPLEO DE TRANSFORMADORES PIEZOELÉCTRICOS
Fernando Muño García. Universidad de Oviedo

Sesión IV

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Fernando Pardo Carpio. Universidad de Valencia

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NUEVOS AMPLIFICADORES LINEALES DE RF DE ALTO RENDIMIENTO
José Antonio Cobos Márquez. Universidad Politécnica de Madrid

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Francisco del Pozo Guerrero. Universidad Politécnica de Madrid

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