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BOLETÍN BIMENSUAL DE INVESTIGACIÓN DE LA ETSIDI

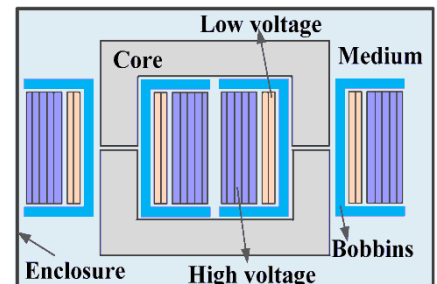
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Este boletín informativo electrónico de periodicidad bimestral tiene como objetivo informar de las actividades de investigación desarrolladas en la ETS de Ingeniería y Diseño Industrial y recopilar los resúmenes de los artículos publicados en la Web of Science (WoS) de los que son autores o coautores investigadores de la Escuela.

PUBLICACIONES.

Partial Discharge Analysis in High-Frequency Transformer Based on High-Frequency Current Transducer.

High-frequency transformers are the core components of power electronic transformers (PET), whose insulation is deeply threatened by high voltage (HV) and high frequency (HF). The partial discharge (PD) test is an effective method to assess an electrical insulation system. A PD measurement platform applying different frequencies was set up in this manuscript. PD signals were acquired with a high-frequency current transducer (HFCT). For improving the signal-to-noise (SNR) ratio of PD pulses, empirical mode decomposition (EMD) was used to increase the SNR by 4 dB. PD characteristic parameters such as partial discharge inception voltage (PDIV) and PD phase, number, and magnitude were all analyzed as frequency dependent. High frequency led to high PDIV and a smaller discharge phase region. PD number and magnitude were first up and then down as the frequency increased. As a result, a suitable frequency for evaluating the insulation of high-frequency transformers is proposed at 8 kHz according to this work.



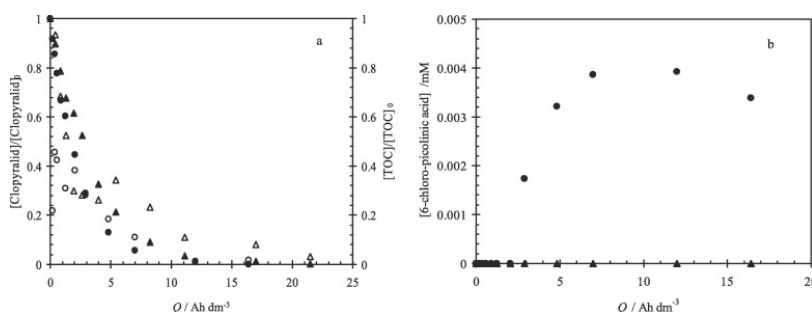
Autores:

1. Jian, J – Nanjing Univ Aeronaut & Astronaut, Jiangsu Key Lab New Energy Generat & Power Conver, Nanjing 211106, Jiangsu, Peoples R China.
2. Zhao, MX - Nanjing Univ Aeronaut & Astronaut, Jiangsu Key Lab New Energy Generat & Power Conver, Nanjing 211106, Jiangsu, Peoples R China.
3. Zhang, CH – Nanjing Univ Aeronaut & Astronaut, Jiangsu Key Lab New Energy Generat & Power Conver, Nanjing 211106, Jiangsu, Peoples R China.
4. Chen, M – State Grid Zhejiang Elect Power Co Ltd, Res Inst, Hangzhou 310014, Zhejiang, Peoples R China
5. Liu, HJ - State Grid Zhejiang Elect Power Co Ltd, Res Inst, Hangzhou 310014, Zhejiang, Peoples R China
6. Albarracín, R – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.

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Radiation-assisted electrochemical processes in semi-pilot scale for the removal of clopyralid from soil washing wastes.

This work focuses on the scale-up of irradiated-assisted electrochemical processes with diamond anodes for the removal of clopyralid from washing soil wastes. In particular, it is studied the influence of the ratio electrochemical power/total power in the performance of conductive diamond photoelectrochemical oxidation (CDPEO) and conductive diamond sonoelectrochemical oxidation (CDSEO) at high and low ultrasounds frequencies. The comparison is carried out in terms of mineralization, clopyralid decay, reaction intermediates and inorganic speciation. The CDPEO-7.7 W tests carried out in a single cell and in a stack of cells show that the stack seems to be less efficient in terms of clopyralid removal and mineralization than the single cell. The ratio electrochemical energy/photoelectrochemical energy is more favorable in small devices, where the photolytic energy is not only a complement but a primary treatment. Regarding inorganic speciation, chloro-species show a similar behavior in absence and presence of US or UV irradiation. Opposite, irradiation seems to inhibit the reduction of nitrate to ammonium, independently on the irradiation power used. In terms of energy efficiency, an increase of the radiation power does not entail a high efficiency/energy consumption ratio, and CDPEO-7.7 W and CDSEO-24 kHz-100 W show efficiency/energy consumption ratios 3.7 and 2.3 times higher than that of CDSEO-10 MHz-450 W.



Autores:

1. Martín De Vidales, MJ – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Castro, MP – Dept Chem Engrn, Univ Castilla La Mancha, Enrique Costa Novella Bldg, E-13071 Ciudad Real, Spain
3. Saez, C – Dept Chem Engrn, Univ Castilla La Mancha, Enrique Costa Novella Bldg, E-13071 Ciudad Real, Spain
4. Canizares, P – Dept Chem Engrn, Univ Castilla La Mancha, Enrique Costa Novella Bldg, E-13071 Ciudad Real, Spain
5. Rodrigo, MA - Dept Chem Engrn, Univ Castilla La Mancha, Enrique Costa Novella Bldg, E-13071 Ciudad Real, Spain

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Core polarization effects: Oscillator strengths, transition probabilities and radiative lifetimes of levels in Bi IV.

In this work a systematic analysis of Bi IV atomic properties is presented. Ab initio relativistic Hartree-Fock calculations in an intermediate coupling (IC) formalism and taking into account Core Polarization Effects (CPE) are used. We use for the IC calculations the standard method of least square fitting of experimental energy levels by means of computer codes from Cowan which was modified in order to include CPE. Our calculations have been made from 17 configurations of Bi IV: $5d^{10}6s^2$, $5d^{10}6p^2$, $5d^{10}6sns$ ($n = 7-10$) and $5d^{10}6snd$ ($n = 6-9$) for even parity and $5d^{10}6snp$ ($n = 6, 7$), $5d^{10}6snf$ ($n = 5, 6$), $5d^96s^26p$ and $5d^96s^2nf$ ($n = 5, 6$) for odd parity. Transition probabilities and oscillator strengths for 100 lines and some radiative lifetimes of Bi IV have been calculated. Besides a comparison of our results with the scarce experimental values available in the bibliography are presented. The presence of spectral lines of bismuth in stellar atmospheres has been reported in different stars. This is the motivation by this work can be very interest in astrophysical area. Recently the Bi IV is taking importance because it is considered as the main dopant in the prospective used for the design and synthesis of new scintillators.

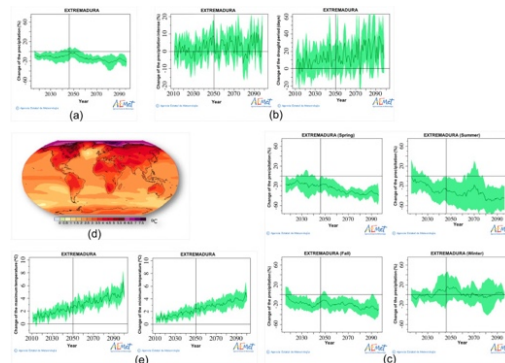
Autores:

1. Moreno-Díaz, C - Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.
2. Alonso-Medina, A - Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.

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Design of spatial PGIS-MCDA-based land assessment planning for identifying sustainable land-use adaptation priorities for climate change impacts.

Climate change is an obvious worldwide phenomenon closely related to human development, growth and consumption patterns, and it threatens land use, development, people and the environment. Due to its characteristics, Spain is among the most vulnerable countries to climate change in the European Union (EU). Thus, spatial planning is considered one of the main instruments available to manage sustainable adaptation to climate change. This article presents an assessment framework for exploring climate change impacts using participatory geographic information systems (PGISs)-multi-criteria decision analysis (MCDA) spatial planning with the preference ranking organization method for enrichment of evaluations (PROMETHEE) in sustainable land-use adaptation. Assessment planning applies to any agroforestry system at a regional level for a municipality with higher vulnerability. An indicator-based model with five categorical values was developed to assess twelve possible impacts from climate change and the main threats of climate change to water sources, agriculture, soil, and land management. This model is available to manage sustainable land-use adaptation priorities for climate change in a spatial context. The model discusses the likelihood of implementing and adopting strategies for climate change adaptation as assessed by a sensitivity analysis and a professional online survey. Among the five strategies, scenario A (suitability map) accounts for 8.84% of the priority areas (v) and 2.13% of the hot spots (i) and was the scenario most supported by professionals, while scenario D (priority to socioeconomic) accounts for 3.07% of the priority areas and 10.12% of the hotspots, and the lowest number of professionals supported this scenario. The results summarize foreseeable problems derived from climate change effects that require urgent adaptation activities through spatial land assessment planning. Thus, this study provides some recommendations and limitations from which decision-makers can select the most suitable arrangement for an agroforestry system to make it climate-resilient, and the study is applicable to similar geographical and spatial locations.



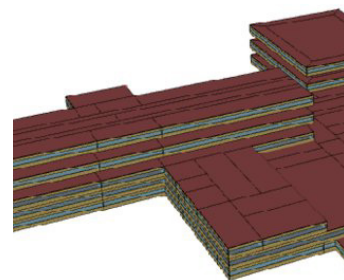
Autores:

1. Jeong, JS - Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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A SOLAR AIR-COOLED HIGH EFFICIENCY ABSORPTION SYSTEM IN DRY HOT CLIMATES Reduction of Water Consumption and Environmental Impact.

A solar cooling system with an optimized air-cooled double-effect water/LiBr absorption machine is proposed as a sustainable alternative to meet cooling demands in dry hot climates. This system allows eliminating the cooling towers in those regions of the planet where water is scarce. This work analyses the environmental benefits of this air-cooled system, as well as its environmental footprints, compared to a solar water-cooled single effect. In this regard, a methodology has been applied to calculate the annual saving in water consumption produced in a case study: a hospital located in Almeria, in South of Spain. Furthermore, the reduction in energy consumption and CO₂ emissions is also quantified since this machine can be driven by solar energy and with higher efficiency than those of single effect.



Autores:

1. Marcos, JD – Dept Energy Engn, Univ Nacl Educ Distancia, Madrid, Spain.
2. Lizarte, R – Dept Thermal & Fluids Engn, Carlos III Univ Madrid, Madrid, Spain.
3. Varela, F – Dept Energy Engn, Univ Nacl Educ Distancia, Madrid, Spain.
4. Palacios-Lorenzo, ME – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
5. Blanco-Marigorta, AM – Dept Proc Engn, Univ Las Palmas Gran Canaria, Las Palmas Gran Canaria, Spain.

DOI: 10.2298/TSCI171204218M

The Rubric as a Self-Assessment Tool, Permanent, Participatory and Thoughtful Process for the Permanent Training of the Student: a Practical Case.

The inclusion of artistic-creative subjects in the Degree in Industrial Design Engineering and Product Development at the Polytechnic University of Madrid leads us to think about evaluation methods that can reinforce the concept of objectivity.

The rubric of assessment is introduced in order to facilitate the concepts that are going to be evaluated. Students will know in advance these concepts so they will work with the objective of acquiring the best marks for their proposals.

We consider that the rubric will appear to the student as an objective tool for them to be evaluated. The student will work knowing all the criteria so they will think about the aims previously shown.

We also want them to collaborate in their assessment in a thoughtful way. We want them to be trained in a critical vision of their work. During this study we have worked with two subjects of the degree in engineering in industrial design and product development and the double degree in engineering in industrial design and mechanics during the 2017-2018 school year and the participation of 210 students.

Autores:

1. Nuere, S – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Díaz-Obregón, R – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Control Design for an Articulated Truck Wil Autonomous Driving in an Electrified Highway.

The basis of an electrified highway or eHighway is an intelligent current collector combined with a hybrid drive system, where the eHighway trucks collect power from the overhead cables. The first prototype for these vehicles has been developed by Siemens, but these vehicles need drivers. This paper presents a conceptual model that is an evolution of this approach, proposing a fully electrical vehicle with autonomous driving. This idea has been analyzed through simulations by using a model composed by an articulated truck and its electrical powertrain system, including a control system as well, based the on the model predictive control (MPC), widely used in autonomous vehicles. The vehicle model consists of a 2D model with 10 degrees of freedom, corresponding to the longitudinal and lateral displacements of the tractor, the tractor yaw angle, the semi-trailer yaw angle, and the rotations of the six equivalent wheels. Besides, an electric powertrain system, batteries, and a regenerative brake have been integrated into the model. Several simulation cases have been developed corresponding to an adaptive cruise control, a trajectory tracking, and an overtaking maneuver. The aim of these simulations is also to obtain the minimum size of the battery and its autonomy for an overtaking maneuver, since it is necessary to disconnect the truck from the overhead contact line during this maneuver. The simulations show the viability of this conceptual proposal, obtaining results similar to those expected.



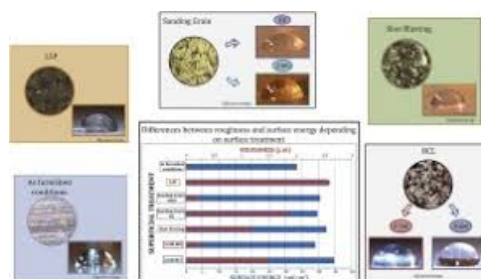
Autores:

1. Felez, J – Dept Mech, Univ Politecn Madrid, Madrid, Spain.
2. García, Sánchez, C – Dept Mech, Univ Politecn Madrid, Madrid, Spain.
3. Lozano, JA – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain

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Influence of surface treatment on the surface energy of an aluminium substrate

The mechanisms by which adhesion occurs are known. In all cases, the search for an adequate surface condition is decisive in achieving a good adhesion. For this reason, the researches usually work on modifying the surface roughness or improving the thermodynamic characteristics of the surface. The objective on this work is to analyse influence of different attack types (chemical, mechanic, with laser ...) which are used to improve surface finish, roughness and surface energy. We have analysed the effects that have produced in the contact angle, measuring the surface energy by the Zisman method. The results revealed that the method of attack has more influence on the value of surface energy than the values of roughness obtained, which can make rethink the type of surface treatment to improve adhesion.



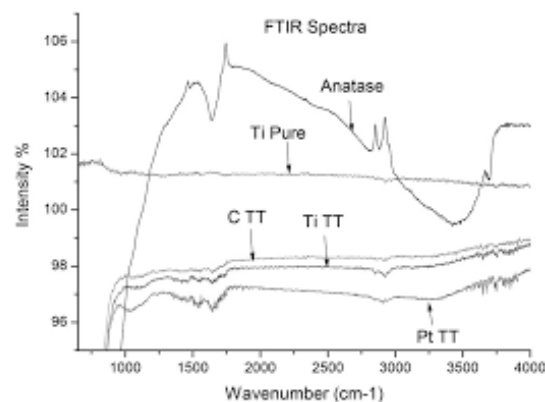
Autores:

1. Narbón, JJ – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Moreno-Díaz, C – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Arenas, JM – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Photocatalytic behaviour of anodised titanium using different cathodes

In the last decades, titanium dioxide (TiO_2) has been widely researched because of its applications in photocatalytic environmental pollution removal and in hydrogen generation. Hence, this work deals with the synthesis of titanium dioxide by anodising titanium sheets, however using different cathodes, which may induce differences in the composition and structure of the obtained oxide layers so that these suspected differences can be observed. All specimens were equally thermally treated after anodising to enhance their photocatalytic activity, since this step allows the titanium dioxide to crystallise. Their morphology and crystal structure were characterised by X-ray diffraction and Fourier transform infrared, and optical properties were characterised by ultraviolet-visible absorption spectroscopy. Furthermore, tests of their photocatalytic properties in the degradation of organic dyes were performed in order to have a first evaluation. Indeed, differences in the photocatalytic behaviour of the anodised specimens using different cathodes were found and evaluated.



Autores:

1. Gonzalez-Moran, I – Univ Politecn Madrid, Tech Sch Bldg Engn, Ave Juan de Herrera 6, E-28040 Madrid, Spain.
2. Fernandez-Martínez, F – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Del Río Merino, M – Univ Politecn Madrid, Tech Sch Bldg Engn, Ave Juan de Herrera 6, E-28040 Madrid, Spain.
4. Diamanti, MV – Dept Chem Mat & Chem Engn G Natta, Milan, Italy.
5. Pedferri, M – Dept Chem Mat & Chem Engn G Natta, Milan, Italy.
6. Chen, XB – Dept Chem, Univ Missouri, Kansas City, MO 64110 USA

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Test Cells to Generate Reference Partial Discharge Series.

This paper describes the design and characterization of test cells developed to generate a reference data bank of partial discharge (PD) series. The reference PD signals reproduced in these cells are useful for the evaluation of AC and DC PD diagnosis instruments. Technical functionalities such as PD sensitivity, PD clustering and PD source recognition can be checked using these test cells. A testing procedure to detect the existence of a specific defect in HVDC installations is proposed. This work is part of a task of the European co-funded project on metrology 15NRM02-UHV-EMPIR, which is focused in the achievement of valuable results for the IEC/CENELEC standardization.

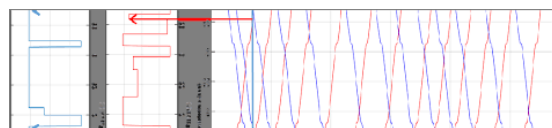
Autores:

1. Garnacho, F - FFII, LCOE, C Eric Kandel 1, Madrid 28906, Spain.
2. Ramirez, A - Univ Politecn Madrid, ETSIDI, C Ronda Valencia 3, Madrid 28012, Spain.
3. Alvarez, F - Univ Politecn Madrid, ETSIDI, C Ronda Valencia 3, Madrid 28012, Spain..
4. Khamlichi, A - FFII, LCOE, C Eric Kandel 1, Madrid 28906, Spain.
5. Rovira, J - FFII, LCOE, C Eric Kandel 1, Madrid 28906, Spain.

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Modeling, simulation and analysis of an advanced mono-voltage DC converter-based electrical railway power supply system for high speed lines.

The so-called advanced DC converter-based railway power supply system is presented as a very promising configuration capable of overcoming the principal drawbacks of conventional systems whilst providing additional advanced functionalities. The main objective of this paper is twofold. Firstly, to introduce a simulation model capable of determining the steady state operation of advanced and traditional systems. Secondly, to conduct an analysis and comparison of the system performance for a high speed railway line.



Autores:

1. Serrano-Jimenez, D - Dept Elect Engn, Carlos III Univ Madrid, Leganes, Spain.
2. Sanz-Feito, J - Dept Elect Engn, Carlos III Univ Madrid, Leganes, Spain.
3. Castaño-Solís, S - Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.

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Improvements in Testing Pole Slipping Protection Relays (ANSI 78)

This paper researches on the difficulty of adapting the protection parameters from different pole slipping protection (ANSI 78) relays to the state of the art test units with the task of improving the performance of the commissioning jobs and make sure for the protection engineer that the protection relay has been tested successfully and is ready for operation.

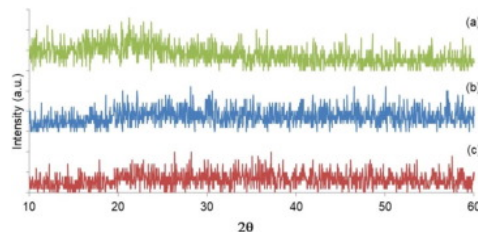
Autores:

1. Granizo, R – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.
2. Platero, CA – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSII UPM, Madrid, Spain.
3. Alvarez, F– Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.
4. Marchesi, E– Euro SMC SA, Engn Div, Madrid, Spain

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Feasibility of the use of mineral wool fibres recovered from CDW for the reinforcement of conglomerates by study of their porosity

Mineral wool is currently the most used insulation in the European Union, and quantities of this waste have increased alarmingly in the last decade, making it essential to recycle or reuse the material, which is not current practice. This study aims to verify the feasibility of compounds of a cement base with additives of insulating mineral fibre residues recovered from the recycling of construction and demolition waste (CDW). For this purpose, experiments were designed to classify the physical-chemical behaviour of architectural mineral wool waste, and that of mortars incorporating them to determine their porosity due to the effects of these fibres on the properties of the compounds. The results obtained show that both the structure and chemical composition as well as the microstructure of the reinforced mortars are viable, and that they would therefore be a sustainable alternative to the current mortars of composite materials. (C) 2018 Elsevier Ltd. All rights reserved.



Autores:

1. Pina-Ramirez, C – Dept Construcc Arquitecton & Control, Escuela Tecn Super Edificac, UPM, Madrid, Spain.
2. Sánchez, EA – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Del Río Merino, M – Dept Construcc Arquitecton & Control, Escuela Tecn Super Edificac, UPM, Madrid, Spain.
4. Vinas-Arrebola, C – Dept Tecnol Edificac, Escuela Tecn Super Edificac, Univ Politecn Madrid, Madrid, Spain.
5. Vidales-Barriguete, A – Dept Tecnol Edificac, Escuela Tecn Super Edificac, Univ Politecn Madrid, Madrid, Spain.

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Evolving spin periodicity and lock-in transition in the frustrated ordered ilmenite-type beta-Mn₂InSbO₆.

Polar magnets are promising materials for applications such as multiferroics or in spintronics. In double-corundum-related oxides, the cation ordering imposes a polar structure and the use of high pressure facilitates the insertion of magnetic cations into the compounds. Here we present the high-pressure synthesis of a polar and ferrimagnetic corundum derivative of Mn₂InSbO₆, which adopts the ordered-ilmenite-type structure. Neutron powder diffraction reveals that the high-temperature nearly collinear ferrimagnetic phase evolves to an incommensurate helical structure with $k(\delta) = [0 \ 0 \ k(z)]$ propagation vector, which then locks to the commensurate value of $k(z) = 1/8$. This complex magnetic behavior is likely to be related to magnetic frustration and the polar nature of the ordered double-corundum structure.

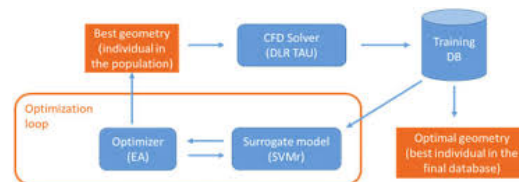
Autores:

1. Arévalo-López, AM - Univ Lille, CNRS, Cent Lille, ENSCL, Univ Artois, UMR UCCS 8181, F-59000 Lille, France
2. Solana-Madruga, E - Ctr Sci Extreme Condit & Sch Chem, Univ Edinburgh, Edinburgh EH9 3FD, Midlothian, Scotland
3. Arévalo-López, EP – Univ Nacl Autonoma Mexico, Fac Ciencias, Fis Atom & Mol, Ciudad Univ, Mexico City, DF, Mexico
4. Khalyavin, D – ISIS Facil, Rutherford Appleton, Didcot OX11 0QX, Oxon, England
5. Kepa, M – Ctr Sci Extreme Condit & Sch Chem, Univ Edinburgh, Edinburgh EH9 3FD, Midlothian, Scotland
6. Dos Santos-García, AJ – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain
7. Sáez-Puche, R – Dept Quim Inorgan. Fac Quim, Univ Complutense Madrid, E-28040 Madrid, Spain
8. Attfield, JP – Ctr Sci Extreme Condit & Sch Chem, Univ Edinburgh, Edinburgh EH9 3FD, Midlothian, Scotland

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Obtaining minimum-drag shapes through surrogate-based global optimization: An application to the aerodynamic shape design of the landing gear master cylinder.

Nowadays, one of the priorities of the European Commission is to reduce the environmental impact of aviation through the advanced design of novel aircraft configurations. This is of utmost importance in order to decrease the environmental footprint of aviation and to reduce fuel consumption and make airlines more profitable. This implies that new methods and tools for aerodynamic shape optimization will have to be developed, allowing aircraft configurations that cannot be obtained with traditional strategies. This paper focuses on the application of enhanced methods in aerodynamic shape design optimization to enable advanced aircraft configurations. In particular, this work aims to demonstrate the feasibility of the proposed strategy to reach optimal configurations that are far away from its baseline geometry. For this purpose, evolutionary algorithms are combined with support vector machines and applied to the optimization of a baseline geometry for different flow conditions. In particular, the selected application is based on the shape optimization problem of the landing gear master cylinder. Results pointed out the feasibility of the mentioned strategy to enable novel configurations within an aerodynamic shape optimization process.



Autores:

1. Andrés-Pérez, E - Natl Inst Aerosp Technol INTA, Fluid Dynam Branch, Ingn Sistemas Def Espana ISDEFE, Madrid, Spain & - Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.
2. González-Juárez, D - Natl Inst Aerosp Technol INTA, Fluid Dynam Branch, Dept Aerodynam & Prop, Madrid, Spain.
3. Martín-Burgos, MJ - Natl Inst Aerosp Technol INTA, Fluid Dynam Branch, Dept Aerodynam & Prop, Madrid, Spain.
4. Carro-Calvo, L - Dept Signal Theory & Commun. Univ Alcala UAH, Alcala De Henares, Spain.
5. Salcedo-Sanz, S - Dept Signal Theory & Commun. Univ Alcala UAH, Alcala De Henares, Spain.

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Impact of aerosols on the spatiotemporal variability of photovoltaic energy production in the Euro-Mediterranean area.

The increase in the photovoltaic energy installed capacity over the world leads to the need of a better understanding of solar resource and its variability. The aim of this work is to assess the influence of aerosols on photovoltaic energy production from seasonal to multi-decadal time scales. For this purpose we use various coupled aerosol-climate simulations that take into account the complex spatial and temporal patterns of natural and anthropogenic aerosols over the Euro-Mediterranean domain.

The results show that aerosols strongly influence the spatial pattern, seasonal cycle and long-term trend of PV production. The most affected area is Central Europe where sensitivity of PV production to aerosols is higher. The annual production loss due to aerosols ranges from no impact to -16% in The Netherlands, with variation depending on the area and on the typology of the tracking system. The summer production loss can even reach -20% over regions of Africa and Syria-Iraq. We conclude that aerosols cannot be neglected in the assessment of PV production at large time scales over the Euro-Mediterranean area. Besides, the potential increase in energy due to reduction in the anthropogenic aerosols is shown in the simulation of the brightening period over Europe, with an increase of 2000 kwh/kwp in a PV lifetime for the most affected areas. It illustrates the evolution that PV potential could follow in highly polluted areas through the effective implementation of pollution control measures.



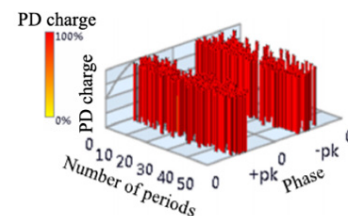
Autores:

1. Gutiérrez, C – Univ Castilla La Mancha, Inst Ciencias Ambientales, Avda Carlos 3 S-N, Toledo 45071, Spain.
2. Somot, S – Univ Toulouse, CNRS, Meteo France, CNRM, Toulouse, France.
3. Nabat, P – Univ Toulouse, CNRS, Meteo France, CNRM, Toulouse, France.
4. Mallet, Marc – Univ Toulouse, CNRS, Meteo France, CNRM, Toulouse, France.
5. Gaertner, MA – Univ Castilla La Mancha, Fac Ciencias Ambientales & Bioquem, Avda Carlos 3 S-N, Toledo 45071, Spain
6. Perpiñán, O – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.

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Improving the Error of Time Differences of Arrival on Partial Discharges Measurement in Gas-Insulated Switchgear.

Partial Discharge (PD) detection based on Ultra-High-Frequency (UHF) measurements in Gas-Insulated Switchgear (GIS) is often used for fault location based on extraction of Time Differences of Arrival (TDoA), and the core technique is to obtain the precise time difference of each UHF signal. Usually, TDoA extraction algorithms can be categorized as cross-correlation function method (CCF), minimum energy method (ME), and threshold value method (TV) are not qualified to analyze the time difference with high accuracy and efficiency, especially the complicated UHF PD signals in the field. In this paper, multiple tests were carried out based on the real GIS UHF signals. Three typical algorithms (CCF, ME, and TV) were used to extract and calculate the TDoA of UHF signals. Afterwards, depending on the disassembly of equipment, the accuracy and effective range of the algorithms are analyzed by means of error and variance. To minimize the error and the variance, an average method with the combination (CA) and portfolio of traditional algorithms is proposed and verified in different situations. The results demonstrate that the improved algorithm could increase the accuracy of time difference extraction, less than 4.0%.



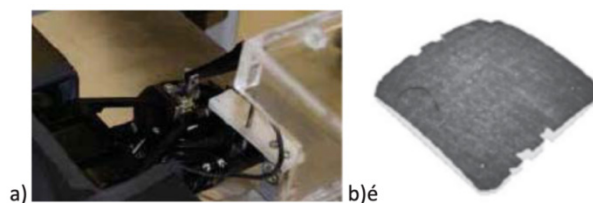
Autores:

1. Jian, J – Nanjing Univ Aeronaut & Astronaut, Jiangsu Key Lab New Energy Generat & Power Conver, Nanjing 211106, Jiangsu, Peoples R China.
2. Wang, K - Nanjing Univ Aeronaut & Astronaut, Jiangsu Key Lab New Energy Generat & Power Conver, Nanjing 211106, Jiangsu, Peoples R China.
3. Zhang, CH – Nanjing Univ Aeronaut & Astronaut, Jiangsu Key Lab New Energy Generat & Power Conver, Nanjing 211106, Jiangsu, Peoples R China.
4. Chen, M – State Grid Zhejiang Elect Power Co Ltd, Res Inst, Hangzhou 310014, Zhejiang, Peoples R China
5. Zheng, H - Hangzhou Kelin Elect Power Equipment Co Ltd, Hangzhou 310014, Zhejiang, Peoples R China
6. Albarracín, R – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.

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Measurement capabilities for ball bearing wear assessment.

Wear measurement for research, control and minimization is mostly accomplished traditionally through gravimetric methods. An experimental study is developed to evaluate the alternative dimensional metrology capabilities. Standardized wear ball-on-flat tests are conducted for a set of steel balls against titanium alloy plates. Dimensional results are obtained through contact metrology of the parts and their surfaces, as well as contactless optical microscopy. Both volumetric and surface roughness metrology are analyzed. Results discussion shows the capability of dimensional metrology for wear assessment and the uncertainty behavior associated with the different methodologies. The complex wear process seems to be independent from conventional surface roughness measurement, but the experimental trials in areal methods suggest some parameters candidates for further research in relation with the coefficient of friction. (C) 2017 The Authors. Published by Elsevier B.V.



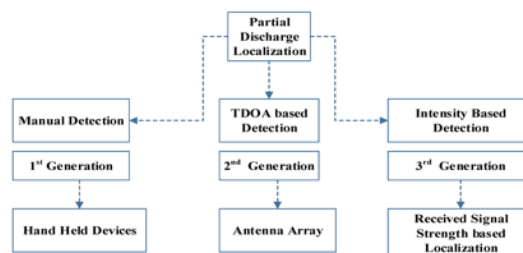
Autores:

1. D'Amato, R – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Calvo, R – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Ruggiero, A – Dept Ind Engn, Univ Salerno, Via Giovanni Paolo 2,132, I-84084 Fisciano, SA, Italy
4. Gomez, E - Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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An Efficient Algorithm for Partial Discharge Localization in High-Voltage Systems Using Received Signal Strength.

The term partial discharge (PD) refers to a partial bridging of insulating material between electrodes that sustain an electric field in high-voltage (HV) systems. Long-term PD activity can lead to catastrophic failures of HV systems resulting in economic, energy and even human life losses. Such failures and losses can be avoided by continuously monitoring PD activity. Existing techniques used for PD localization including time of arrival (TOA) and time difference of arrival (TDOA), are complicated and expensive because they require time synchronization. In this paper, a novel received signal strength (RSS) based localization algorithm is proposed. The reason that RSS is favoured in this research is that it does not require clock synchronization and it only requires the energy of the received signal rather than the PD pulse itself. A comparison was made between RSS based algorithms including a proposed algorithm, the ratio and search and the least squares algorithm to locate a PD source for nine different positions. The performance of the algorithms was evaluated by using two field scenarios based on seven and eight receiving nodes, respectively. The mean localization error calculated for two-field-trial scenarios show, respectively, 1.80 m and 1.76 m for the proposed algorithm for all nine positions, which is the lowest of the three algorithms.



Autores:

1. Khan, UF - Dept Engn & Technol, Univ Huddersfield, Huddersfield HD1 3DH, W Yorkshire, England.
2. Lazaridis, P – Dept Engn & Technol, Univ Huddersfield, Huddersfield HD1 3DH, W Yorkshire, England.
3. Mohamed, H - Dept Engn & Technol, Univ Huddersfield, Huddersfield HD1 3DH, W Yorkshire, England.
4. Albarraacín, R – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.
5. Zaharis, ZD - Dept Elect & Comp Engn , Aristotle Univ Thessaloniki, Thessaloniki 54124, Greece.
6. Atkinson, RC - Dept Elect & Elect Engn, Univ Strathclyde, Glasgow G1 1XW, Lanark, Scotland.
7. Tachtatzis, C - Dept Elect & Elect Engn, Univ Strathclyde, Glasgow G1 1XW, Lanark, Scotland.
8. Glover, IA - Dept Engn & Technol, Univ Huddersfield, Huddersfield HD1 3DH, W Yorkshire, England.

DOI: 10.3390/s18114000

Marble cutting processing used in 16th century for building the "El Escorial" monastery altarpiece.

For construction of monastery of El Escorial main altarpiece at end of the 16th century, it was necessary to build an important mill to cut the marble. This mill was located next to a flour mill to take advantage of its hydraulic energy. Over time, both buildings were abandoned and came to be called "Molino Caído". There is very little documentary evidence and physical remains of these mills. For this reason, the architectural and technological reconstruction has been very difficult and required the following exhaustive analyzes: 1. Sawing and polishing technology analysis in the Renaissance; 2. Transcription and documentary analysis of data that still exist of the mills; 3. Analysis and investigation of mills physical remains; 4. Comparison between documentary data and physical remains; 5. Historical analysis of the mills drawings; 6. Technological state and constructive of the time. Based on this previous data analysis, this work presents constructive and technological characteristics and a detailed graphic reconstruction, of the marble mill, that is consistent with the existing remains and documentary evidence.



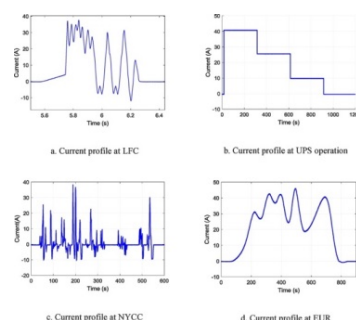
Autores:

1. Sanchez Martinez, FV - Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Arenas Reina, JM – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Recio Diaz, MM – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
4. Horcajos de Frutos, R – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Hybrid characterization procedure of Li-ion battery packs for wide frequency range dynamics applications

This paper presents a hybrid characterization procedure of battery packs capable of reproducing their behavior under different dynamic operation conditions. During the experimental procedure, both time and frequency tests are performed. These tests have been carried out on a commercial battery pack, instead of a single cell, in order to include packaging effects as well as performance of battery pack devices in real electrical applications. As a result of this procedure the battery pack model has been experimentally validated for four cases based on real electrified transportation and grid applications. Additionally, the model response has been compared with the widely used Partnership for a New Generation of Vehicles (PNGV) model. The validation tests show that the proposed battery pack model reproduces the dynamic battery response with better accuracy than the PNGV for all analyzed cases.



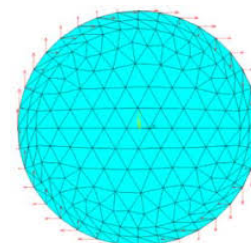
Autores:

1. Castaño-Solís, S – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.
2. Serrano-Jiménez, D – Univ Politecn Madrid, Madrid, Spain.
3. Fraile-Ardanuy, J – Dept Elec Fis, Ing Elect y Fis Aplic, ETS de Ingeniería de Telecomunicación, Madrid, Spain.
4. Sanz- Feito, J – Univ Politecn Madrid, Madrid, Spain.

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Simple filling patterns to model mechanical behaviour of FDM's test pieces under torsion.

This work presents how the finite element methodology has been applied to analyze the mechanical behaviour of PLA parts obtained by fused deposition with a 3D printer. Three different patterns of printed layers have been studied searching for the most accurate way to model the actual response of PLA parts in a torsion test. Nine different types of filaments have been used to make the torsion test specimens. Preliminary tasks to set up correctly the 3D printer as well as specific tensile tests carried out to know the elastic modulus of the PLA filaments are presented too. The conclusions are considered of interest to predict the mechanical behaviour of the pieces obtained by printing with fused deposition devices.



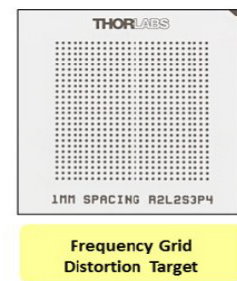
Autores:

1. Berzal, M – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Barajas, C – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Del Mazo, D – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
4. Caja, J – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
5. Maresca, P – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Considerations to the verification of optical measuring machines according to ISO 10360.

Standard ISO 10360-7:2011 [1] establishes the principles for the acceptance and verification of coordinate measuring machines (CMMs) equipped with imaging probing systems, in order to determine the different maximum errors allowed in the measurement. By analyzing the standard, we have verified that all the potentialities that these machines present, among them the acquisition of a high number of probing points, are not used. In this paper we propose an alternative method of verification of optical measuring machines (OMMs), using the recommendations of ISO 10360-7: 2011 with some modifications to it.



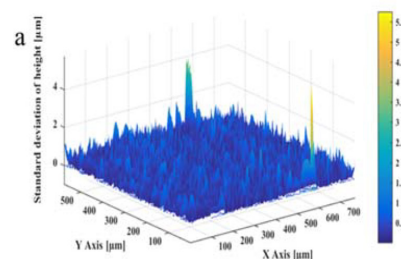
Autores:

1. Maresca, P – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Caja, J – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Martínez, V – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
4. Gómez, E – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
5. Barajas, C – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Traceable surface characterization of a hydrophobic material using confocal optical microscopy.

This work aims to develop a method to traceably characterize structured surfaces. This method includes instrument calibration considering the metrological characteristics defined by ISO 25178-602: 2010, form removal by SVD and LS method, algorithm development, definition of PDF of those input variables, estimate the height parameters S_a , S_q , S_{sk} , S_{ku} , etc. and evaluate the coverage region of 95%. Validation of this developed algorithm is based on a physical measurement standard and data provided by NIST. The first validation shows 0.0034 μm difference between the calculated S_a and certificated R_a . The second validation compared those height parameters and the differences are as small as -9.2535810(-5) nm. Finally, characterization of the surface height parameters of a hydrophobic material, calculation of the correlation coefficient of the height parameters, and reconstruction as well as histograms of those height parameters is presented.



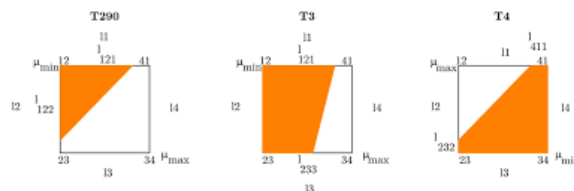
Autores:

1. Wang, C – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Caja, J – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Gómez, E – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Bayesian model for subpixel uncertainty determination in optical measurements.

Uncertainty determination can be obtained by two procedures: GUM and the Monte Carlo Method. This work presents a model that helps to evaluate the uncertainty in measurements collected by optical measuring machines when using the Monte Carlo method. Initially, the model converts intensity, using Bayesian probability, from the pixel image derived from camera into a polygonal area with three to five vertexes. The outer vertexes are fitted using least squares procedures to obtain a measurand shape approximation in a subpixel range. Algorithms have been programmed and verified into Matlab using synthetic images with different triangles. Through a detailed analysis, the usefulness of a new tool, the parameter, will be demonstrated as an alternative method for estimating uncertainty of measurements of pixel images.



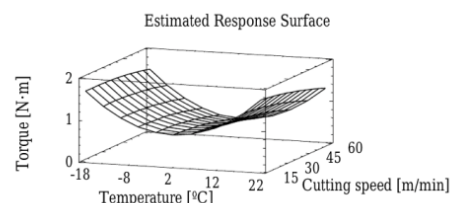
Autores:

1. Berzal, M – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Gomez, E – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. De Vicente, J – ETS Ingn Ind, Lab Metrol & Metrotecn , Univ Politecn Madrid, Madrid, Spain
4. Caja, J – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
5. Barajas, C – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Influence of tool cooling on thrust forces in tapping operations of reinforced polyamide.

The machining with compressed air cooling has been identified as an environmentally conscious process. Its good performance has been achieved in materials as titanium alloys or aluminum alloys, but composites have not been explored. This work presents a first study related to evolution of thrust forces during the tapping process in reinforced polyamide with glass fiber, in particular PA66-GF30, when the tool cooling is considered. The experimental methodology was carried out by tapping operations in plates of PA66-GF30, using a drilling center. The experimental tests were executed using compressed air cooling by means of a vortex tube cooling, in dry. Taps are of high-speed-steel with cobalt as base material and with coating; their geometry and dimensions are M12x1.75 mm. Outcomes obtained confirm that the methodology is appropriate in the tapping process of PA66-GF30. The tool cooling provides a reduction of thrust forces, although it is conditioned by type of tap and the coating.



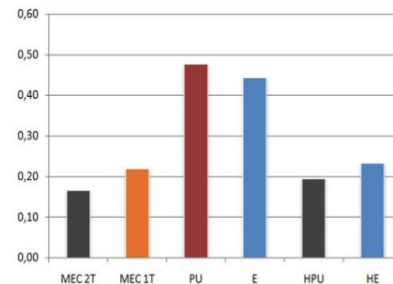
Autores:

1. Domingo, R – UNED, Dept Construct & Mfg Engn, C Juan Rosal 12, Madrid 28040, Spain.
2. Calvo, R – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Marin, MM – UNED, Dept Construct & Mfg Engn, C Juan Rosal 12, Madrid 28040, Spain.
4. De Agustina, B – UNED, Dept Construct & Mfg Engn, C Juan Rosal 12, Madrid 28040, Spain.

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Technical and economic evaluation of adhesive, screwed and hybrid joints for bonding metallic materials in industrial applications.

Currently, in many industrial sectors are used assembling systems based on adhesive joints. However, in critical industrial applications, where the safety and health of persons are compromised, the additional guarantee of adequate reliability in the resistance and tolerance to the damage of the joint is needed. In these cases, a solution that combines mechanical assembly and adhesives is usually considered (hybrid joints). The choice of one or another assembly system (adhesion, mechanical or hybrid) is a complex decision. Therefore, the objective of the present work is to propose a methodology for the evaluation and selection of assembly system of the joint that best combines mechanical performance, adequacy to the manufacturing process and manufacturing cost. For this objective, we use a methodology that combines experimental analysis (for the determination of bond strength) together with a multi-criteria decision tool, such as "Value Analysis" to select alternative that provides the best "performance/cost" ratio.



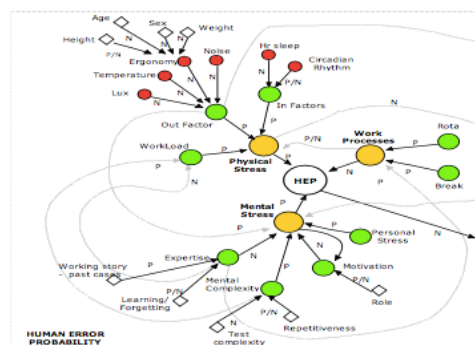
Autores:

1. Arenas, JM – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
2. Alia, C – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
3. Cañizo, C – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
4. Ocaña, R – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
5. Narbón, JJ – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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The role of human fatigue in the uncertainty of measurement.

Risk of human error in measurement and testing is the result of the causal combination of factors and events that are involved in the process. This paper presents how to model technical and human errors and how these could interact in order to influence the reliability of measurement/test. Human errors were designed according with a System Dynamics approach with factors and states those are part of human's state and ability to handle with the process and procedures and instruments. Technical errors were related to the environment, its organization and suitability with standards. Human and Technical factors have been therefore integrated in order to predict states affecting the consistency of measure and uncertainty in range. Optimal combination of factors - based on a System Dynamics simulation and expert judgments - has been proposed according with a sampling analysis.



Autores:

1. Fruggiero, F – Univ Basilicata, Sch Engn, Via Ateneo Lucano 10, I-85100 Potenza, Italy
2. Fera, M – Dept Ind & Informat Engn, Univ Campania Luigi Vanvitelli, Via Roma 29, I-80131 Naples, Italy
3. Lambiase, A – Dept Ind Engn Univ Salerno, Via Giovanni Paolo II 132, I-84084 Fisciano, Sa, Italy
4. Maresca, P – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.
5. Caja, J – Dept Mech, Chem & Ind Design Eng, ETSIDI UPM, Madrid, Spain.

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Wind Turbine Multivariable Optimal Control Based on Incremental State Model.

The multivariable optimal control of a wind turbine by an approach based on incremental state model is proposed. The advantages of incremental state model in comparison with the non incremental one are that the control action cancels steady state errors and incremental state solves the problem of computing the target state, choosing zero as an objective. Linear Quadratic Regulator (LQR) and optimal state observer are applied. The effectiveness of the proposed control method, over the non incremental one, is examined by applying the linear controllers to the nonlinear wind turbine model. The results show that incremental LQR control presents good transient response and zero steady state errors, even in presence of disturbances, nonlinearities and modelling errors.

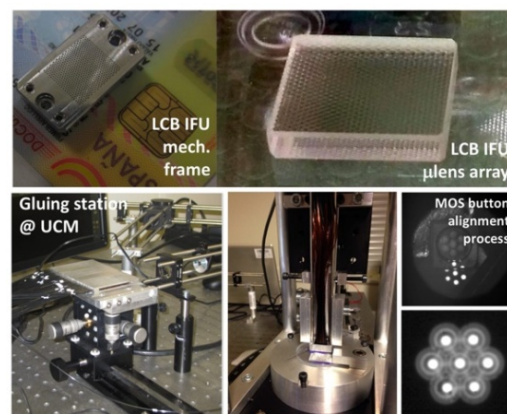
Autores:

1. Adanez, JM – Univ Politecn Madrid, Intelligent Control Grp, Ctr Automat & Robot, CSIC, Madrid, Spain
2. Al- Hadithi, BM – Univ Politecn Madrid, Intelligent Control Grp, Ctr Automat & Robot, CSIC, Madrid, Spain & Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.
3. Jimenez, A – Univ Politecn Madrid, Intelligent Control Grp, Ctr Automat & Robot, CSIC, C J Gutierrez Abascal 2, E-28006 Madrid, Spain

DOI: 10.1002/asjc.1720

MEGARA, the R=6000-20000 IFU and MOS of GTC.

MEGARA is the new generation IFU and MOS optical spectrograph built for the 10.4m Gran Telescopio CANARIAS (GTC). The project was developed by a consortium led by UCM (Spain) that also includes INAOE (Mexico), IAA-CSIC (Spain) and UPM (Spain). The instrument arrived to GTC on March 28th 2017 and was successfully integrated and commissioned at the telescope from May to August 2017. During the on-sky commissioning we demonstrated that MEGARA is a powerful and robust instrument that provides on-sky intermediate-to-high spectral resolutions R-FWHM \similar to 6,000, 12,000 and 20,000 at an unprecedented efficiency for these resolving powers in both its IFU and MOS modes. The IFU covers 12.5×11.3 arcsec² while the MOS mode allows observing up to 92 objects in a region of 3.5×3.5 arcmin². In this paper we describe the instrument main subsystems, including the Folded-Cassegrain unit, the fiber link, the spectrograph, the cryostat, the detector and the control subsystems, and its performance numbers obtained during commissioning where the fulfillment of the instrument requirements is demonstrated.



Autores:

1. Carrasco, E – INAOE, Puebla, Mexico
2. Gil de Paz, A – Univ Complutense Madrid, Madrid, Spain.
3. Gallego, J – Univ Complutense Madrid, Madrid, Spain.
4. Iglesias-Paramo, J – CSIC, Inst Astrofis Andalucia, Granada, Spain
5. Cedazo, R – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.

Y 81 autores más.

DOI: 10.1117/12.2313040

First scientific observations with MEGARA at GTC

On June 25th 2017, the new intermediate-resolution optical IFU and MOS of the 10.4-m GTC had its first light. As part of the tests carried out to verify the performance of the instrument in its two modes (IFU & MOS) and 18 spectral setups (identical number of VPHs with resolutions $R=6000-20000$ from 0.36 to 1 micron) a number of astronomical objects were observed. These observations show that MEGARA@GTC is called to fill a niche of high-throughput, intermediate-resolution IFU & MOS observations of extremely-faint narrow-lined objects. Lyman-alpha absorbers, star-forming dwarfs or even weak absorptions in stellar spectra in our Galaxy or in the Local Group can now be explored to a new level. Thus, the versatility of MEGARA in terms of observing modes and spectral resolution and coverage will allow GTC to go beyond current observational limits in either depth or precision for all these objects. The results to be presented in this talk clearly demonstrate the potential of MEGARA in this regard.

Autores:

1. Carrasco, E – INAOE, Puebla, Mexico
2. Gil de Paz, A – Univ Complutense Madrid, Madrid, Spain.
3. Gallego, J – Univ Complutense Madrid, Madrid, Spain.
4. Iglesias-Paramo, J – CSIC, Inst Astrofis Andalucia, Granada, Spain
5. Cedazo, R – Dept Ingn Elect Elect Automat & Fis Aplicada, ETSIDI UPM, Madrid, Spain.

Y 81 autores más.

DOI: 10.1117/12.2313299