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UTB
EXCELENCIA CARIBE

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CARTAGENA DE INDIAS

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PRESENTACIÓN

Actualmente, el fomento de la investigación y la innovación en muchos países se ha convertido en un factor de aceleración y desarrollo económico para la búsqueda de sociedades más sostenibles y conscientes de la importancia de un mejor uso de los recursos naturales y el medio ambiente.

Colombia no es ajena a esta realidad y para la Universidad Tecnológica de Bolívar es de gran importancia seguir adelantando esfuerzos para generar una cultura de investigación e innovación dentro de la institución, invirtiendo recursos en sus investigadores e infraestructura, y al mismo tiempo procurando un relacionamiento a nivel local, regional e internacional, que propicie un ecosistema de trabajo productivo en el campo de la investigación e innovación, teniendo como prioridad el impacto sobre la Región Caribe.

En los últimos años, ha surgido un enfoque político e industrial basado en los resultados económicos del conocimiento académico, generando una creciente demanda hacia las universidades con la intensión de reformar sus prácticas institucionales y evaluar la relevancia de la investigación y la educación para la sociedad en general. Es así como la academia enfrenta la tarea de integrar la primera y segunda misión tradicional de la universidad con los objetivos de la tercera misión, como lo es la investigación aplicada, la transferencia de tecnología, la innovación y el espíritu empresarial, basados en el conocimiento como motores del crecimiento económico.

En el marco de su tercera misión, la investigación, la innovación y el emprendimiento se convierten en el motor para generar actividades que contribuyan al desarrollo regional y nacional. Gracias a esto podemos entregar la edición 2019 del Anuario de Investigaciones de la UTB, una compilación de Artículos y Conference Papers, resultado de actividades concretas de innovación, que forman parte del modelo de transferencia tecnológica de la Universidad a la sociedad, siendo la innovación una característica inherente del ser humano y especialmente importante en el surgimiento de una sociedad del conocimiento donde la creación y la transferencia impulsan el desarrollo de las regiones.

Jairo F. Useche Vivero
Director de Investigación, Innovación y Emprendimiento

La información consignada en este anuario fue recopilada y actualizada el día 30 del mes de enero de 2020, los artículos y conference publicados posteriormente a esa fecha en Wos o Scopus no harán parte de esta publicación.

FACULTAD DE INGENIERÍA

A convex OPF approximation for selecting the best candidate nodes for optimal location of power sources on DC resistive networks

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Abstract
This paper proposes a convex approximation approach for solving the optimal power flow (OPF) problem in direct current (DC) networks with constant power loads by using a sequential quadratic programming approach. A linearization method based on the Taylor series is used for the convexification of the power balance equations. For selecting the best candidate nodes for optimal location of distributed generators (DGs) on a DC network, a relaxation of the binary variables that represent the DGs location is proposed. This relaxation allows identifying the most important nodes for reducing power losses as well as the unimportant nodes. The optimal solution obtained by the proposed convex model is the best possible solution and serves for adjusting combinatorial optimization techniques for recovering the binary characteristics of the decision variables. The solution of the non-convex OPF model is achieved via GAMS software in conjunction with the CONOPT solver; in addition, the sequential quadratic programming model is solved via quadprog from MATLAB for reducing the estimation errors in terms of calculation of the power losses. To compare the results of the proposed convex model, three metaheuristic approaches were employed using genetic algorithms, particle swarm optimization, continuous genetic algorithms, and black hole optimizers.

Publication: *Engineering Science and Technology, an International Journal, Article in press*. Julio, 2019, pp. 1-7

A potential function for the power flow in DC microgrids: an analysis of the uniqueness and existence of the solution and convergence of the algorithms

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Abstract
The power flow equations in DC microgrids are nonlinear due to the presence of constant power terminals. In this context, a rigorous demonstration of the convergence and uniqueness of the solution for Newton's method is required. This problem is particularly important in islanded microgrids, where

the power flow method determines the equilibrium point, which in turn is used for other analyses such as stability, optimal operation, and reliability. In this paper, we present a new concept associated with power flow equations, namely the potential function of the power flow. This function allows transforming the power flow problem into an optimization model and uses convex analysis for determining its convergence and the uniqueness of the solution. Being a scalar function, the potential of the power flow can give valuable geometrical insights on the problem. In addition, the optimization approach can be used to solve the power flow problem considering inequality constraints. Simulation results demonstrate the applicability of this approach in practice.

Publication: *Journal of Control, Automation and Electrical Systems*. Volume 30, Issue 5, October 2019, pp 794–801

A submersible printed sensor based on a monopole-coupled split ring resonator for permittivity characterization

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Abstract
This work presents a non-invasive, reusable and submersible permittivity sensor that uses a microwave technique for the dielectric characterization of liquid materials. The proposed device consists of a compact split ring resonator excited by two integrated monopole antennas. The sensing principle is based on the notch introduced by the resonators in the transmission coefficient, which is affected due to the introduction of the sensor in a new liquid material. Then, a frequency shift of the notch and the Q-factor of the proposed sensor are related with the changes in the surrounding medium. By means of a particular experimental procedure, commercial liquids are employed to obtain the calibration curve. Thus, a mathematical equation is obtained to extract the dielectric permittivity of liquid materials with unknown dielectric properties. A good match between simulated and experimental results is obtained, as well as a high Q-factor, compact size, good sensitivity and high repeatability for use in sensing applications. Sensors like the one here presented could lead to promising solutions for characterizing materials, particularly in determining material properties and quality in the food industry, bio-sensing and other applications.

Publication: *Sensors*. Volume 19, Issue 8, pp. 1936, 2019 (Switzerland)

Active and reactive power conditioning using SMES devices with PMW-CSC: a feedback nonlinear control approach

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Abstract
The active and reactive power conditioning using superconducting magnetic energy storage (SMES) systems for low-voltage distribution networks via feedback nonlinear control is proposed in this paper. The SMES system is interconnected to ac grid using a pulsed-width modulated current source converter (PWM-CSC). The dynamical model of the system exhibits a nonlinear structure, which is eliminated by the application of a nonlinear feedback controller based of the expected behavior of the closed-loop system. The steady state analysis under time-domain reference frame to verify the stability properties on the proposed controller is used. The general control rules allow improving different objectives. The robustness and applicability of the proposed controller is tested considering unbalance and harmonic distortion in the voltage provided by the ac grid. It is also considered the possibility to use the SMES system with the proposed controller to compensate the active power oscillations of a wind-generator system.

Publication: *Ain Shams Engineering Journal.* Volume 10, Issue 2, pp. 369-378, June 2019

An EPQ inventory model considering an imperfect production system with probabilistic demand and collaborative approach

Authors: Katherinne Salas-Navarro, Jaime Acevedo Chedid, Gina Mora Árques, Whady F. Florez, Holman Ospina Mateus, Shib Sankar Sana, Leopoldo Eduardo Cárdenas-Barrón
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Abstract
Purpose The purpose of this paper is to propose an economic production quantity (EPQ) inventory model considering imperfect items and probabilistic demand for a two-echelon supply chain. The production process is imperfect and the imperfect quality items are removed from the lot size. The demand rate of the inventory system is random and follows an exponential probability density function and the demand of the retailers is depending on the initiatives of the sales team. Design/methodology/approach Two approaches are examined. In the non-collaborative approach, any member of the supply

chain can be the leader and takes decisions to optimize the profits, and in the collaborative system, all members make joint decisions about the production, supply, sales and inventory to optimize the profits of the supply chain members. The calculus approach is applied to find the maximum profit related to the members of the supply chain. Findings A numerical example is presented to illustrate the performance of the EPQ model. The results show that collaborative approach generates greater profits to the supply chain and the market's demand represents the variable behavior and uncertainty that is generated in the replenishment of a supply chain. Originality/value The new and major contributions of this research are: the inventory model considers demand for products is random variable which follows an exponential probability distribution function and it also depends on the initiatives of sales teams, the imperfect production system generates defective items, different cycle time are considered in manufacturer and retailers and collaborative and non-collaborative approaches are also studied.

Publication: *Journal of Advances in Management Research*, Vol. ahead-of-print No. ahead-of-print.

An exact MINLP model for optimal location and sizing of DGs in distribution networks: a general algebraic modeling system approach

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Abstract
This paper addresses the classical problem of optimal location and sizing of distributed generators (DGs) in radial distribution networks by presenting a mixed-integer nonlinear programming (MINLP) model. To solve such model, we employ the General Algebraic Modeling System (GAMS) in conjunction with the BONMIN solver, presenting its characteristics in a tutorial style. To operate all the DGs, we assume they are dispatched with a unity power factor. Test systems with 33 and 69 buses are employed to validate the proposed solution methodology by comparing its results with multiple approaches previously reported in the specialized literature. A 27-node test system is also used for locating photovoltaic (PV) sources considering the power capacity of the Caribbean region in Colombia during a typical sunny day. Numerical results confirm the efficiency and accuracy of the MINLP model and its solution is validated through the GAMS package.

Publication: *Ain Shams Engineering Journal, Article in press*, November 2019

Analysis of the behavior of daily maximum rainfall within the department of Atlántico, Colombia

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Abstract
In the Colombian Caribbean region, there are few studies that evaluated the behavior of one of the most commonly used variables in hydrological analyses: the maximum daily rainfall (Pmax-24h). In this study, multiannual Pmax-24h time series from 19 rain gauges, located within the department of Atlántico, were analyzed to (a) determine possible increasing/decreasing trends over time, (b) identify regions with homogeneous behavior of Pmax-24h, (c) assess whether the time series are better suited under either a stationary or non-stationary frequency analysis, (d) generate isohyetal maps under stationary, non-stationary, and mixed conditions, and (e) evaluate the isohyetal maps by means of the calculation of areal rainfall (Pareal) in nine watersheds. In spite of the presence of both increasing and decreasing trends, only the Puerto Giraldo rain gauge showed a significant decreasing trend. Also, three regions (east, central, and west) with similar Pmax-24h behavior were identified. According to the Akaike information criterion test, 79% of the rain gauges showed better fit under stationary conditions. Finally, statistical analysis revealed that, under stationary conditions, the errors in the calculation of Pareal were more frequent, while the magnitude of the errors was larger under non-stationary conditions, especially in the central–south region.

Publication: *Water*. Volume 11, Issue 12, pp. 2453, November, 2019

Anthropic impact assessment of coastal ecosystems in the municipality of Puerto Colombia, NE Colombia

Authors: Marianella Bolívar, Germán Rivillas-Ospina, William Fuentes, Andrés Guzmán, Luis Otero, Gabriel Ruiz, Rodolfo Silva, Edgar Mendoza, Mauro Maza, Lina García, Yeison Berrio
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Abstract
Human activity, mainly associated with the construction of coastal infrastructure, has caused ecological degradation to the coastal zone at Puerto Colombia, Colombia. Severe erosion attacked the ancient sandy spit that protected the municipality from wave energy to an extent that it completely disappeared.

The groins constructed thereafter, with the aim of protecting the coast, have exacerbated the sediment imbalance, affecting the Balboa coastal wetland. At present, the coastline around Puerto Colombia is highly vulnerable; the remaining ecosystems are under severe pressure, and the population is at risk. Restoring the marine and terrestrial connectivity is key to improving this situation.

Publication: *Journal of Coastal Research*, Special Issue No. 92, pp. 112–120

Bibliometric analysis in motorcycle accident research: a global overview

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Abstract
770 million motorcycles are estimated on the roads. Motorcyclists represent more than 380,000 annual deaths worldwide. 28% of the global fatalities in the roads in 2016. With the increase of the accident rate, studies have been developed within the scientific literature. Bibliometric analysis is applied in the field of motorcycle safety in order to identify relevant publications on risk factors of road crashes and their implications. The information in this research was extracted from Web of Science and Scopus databases between 1947 and May 31, 2018. The study identified the key bibliometric indicators such as publications, authors, journals, countries, institutions, citation and co-citation analysis, subject categories, and co-occurrence of terms. EndNote, Microsoft Excel, Statgraphics Centurion and VOS-viewer software were used for the analysis. In total, 1813 articles were considered. The publications from 2000 to 2017 exhibits an average growth of 9%. The journal "Accident Analysis and Prevention" was the key issue in the publication and citation. The top institutions were the University of California, Universiti Putra Malaysia, and Monash University. The average citation of the top 10 articles was 134. A network visualization map showed that 'vehicle', 'model', 'system', 'road', 'safety', and 'behavior' were the most commons key terms. Bibliometric analysis demonstrates a high collaboration between authors and institutions. Two growing trends were identified. First, studies on the protection of the motorcyclist and the safe design considering the performance. Second, studies in analysis, characterization, and prevention of accidents. These studies are more related to the generation of strategies for the protection of road safety for motorcyclists.

Publication: Scientometrics. Volume 121, pp. 793–815, 2019

Computational fluid dynamics for sub-atmospheric pressure analysis in pipe drainage

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Abstract
The occurrence of sub-atmospheric pressure in the drainage of pipelines containing an air pocket has been known as a major cause of several serious problems. Accordingly, some system malfunction and pipe buckling events have been reported in the literature. This case has been studied experimentally and numerically in the current research considering objectives for a better understanding of: (i) the emptying process, (ii) the main parameters influencing the drainage, and (iii) the air-water interface deformation. Also, this research demonstrates the ability of a computational fluid dynamic (CFD) model in the simulation of this event. The effects of the air pocket size, the percentage and the time of valve opening on the pressure variation have been studied. Results show the pipeline drainage mostly occurs due to backflow air intrusion. The worst case scenario is associated with a fast valve opening when a tiny air pocket exists in the pipeline.

Publication: *Journal of Hydraulic Research*. Volume 57, 2019

Application of genetic algorithm to job scheduling under ergonomic constraints in manufacturing industry

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Abstract
This research proposes a mathematical model of the problem of job rotation considering ergonomic aspects in repetitive works, lifting tasks and awkward postures in manufacturing environments with high variability. The mathematical model is formulated as a multi-objective optimization problem integrating the ergonomic constraints and is solved using improved non-dominated sorting genetic algorithm. The proposed algorithm allows the generation of diversified results and a greater search convergence on the Pareto front. The algorithm avoids the loss of convergence in each border by means of change and replacement of similar solutions. In this strategy, a single similar result is preserved and

the best solution of the previous generation is included. If the outcomes are similar, new randomly generated individuals are proposed to encourage diversity. The obtained results improve the conditions of 69% of the workers. The results show that if the worker rotates starting from a high risk, his variation in risk always decreases in his next assignment. Within the job rotation scheme, no worker is exposed simultaneously to high ergonomic risk thresholds. The model and the algorithm provide good results while considering ergonomic risks. The proposed algorithm shows the potentiality to generate a set of quality of response (Pareto Frontier) in a combinatorial optimization problem in an efficient computational time.

Publication: *Journal of Ambient Intelligence and Humanized Computing*. Volume 10, pp. 2063–2090, May 2019

Construct validation of the narcissistic admiration and rivalry questionnaire in spanish-speaking countries: assessment of the reliability, structural and external validity and cross-cultural equivalence

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Abstract
A recent re-operationalisation of grandiose narcissism has resulted in the distinction of two narcissistic strategies based on the cognitive, affective-motivational and behavioural dynamics: admiration (assertive self-enhancement) and rivalry (antagonistic self-protection). The Narcissistic Admiration and Rivalry Questionnaire (NARQ) was developed to assess this model with two higher-order dimensions. However, cross-validations of the NARQ have not been extensively conducted across diverse population groups and languages. This study aimed to test the internal and external validity (through the relation with envy and self-esteem), reliability and cross-cultural equivalence of the Spanish version of the NARQ. The psychometric properties were evaluated in a Spanish sample (N = 310), and cross-cultural equivalence was tested in participants from Chile (N = 234) and Colombia (N = 256). The results supported the reliability and validity of the Spanish NARQ, as well as the cross-cultural equivalence across Spanish-speaking countries. In addition, we discuss obtained differences across Spanish, Chilean and Colombian sample within two narcissistic strategies.

Publication: *International Journal of Psychology*. June 2019

Economic dispatch of BESS and renewable generators in DC microgrids using voltage-dependent load models

Authors: Oscar Danilo Montoya, Walter Gil-González, Luis F. Grisales-Noreña, César Orozco-Henao, Federico Serra
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Abstract
This paper addresses the optimal dispatch problem for battery energy storage systems (BESSs) in direct current (DC) mode for an operational period of 24 h. The problem is represented by a nonlinear programming (NLP) model that was formulated using an exponential voltage-dependent load model, which is the main contribution of this paper. An artificial neural network was employed for the short-term prediction of available renewable energy from wind and photovoltaic sources. The NLP model was solved by using the general algebraic modeling system (GAMS) to implement a 30-node test feeder composed of four renewable generators and three batteries. Simulation results demonstrate that the cost reduction for a daily operation is drastically affected by the operating conditions of the BESS, as well as the type of load model used.

Publication: *Energies*. Volume 12, Number 23, pp. 1-20, November 2019

Programas de vacunación infantil en América Latina, 2000-2015

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Resumen
La cobertura de los programas de vacunación infantil está asociada con la probabilidad de supervivencia de los infantes y es una medida de desempeño de los sistemas nacionales de inmunización. Objetivo: Caracterizar los programas de vacunación infantil en países latinoamericanos a partir de la supervivencia de infantes durante el periodo 2000-2015. Método: Se realizó un estudio descriptivo retrospectivo del programa de inmunización de 21 países de América Latina soportado en la metodología del análisis envolvente de datos con ventanas de tiempo. Las variables asociadas son: vacunas (Bacillus calmette-Guérin, difteria, Bordetella pertussis y el tétanos, sarampión, polio) y tasa de supervivencia (menores de 1 año, menores de 5 años). Resultado: Durante el periodo de estudio, 2000-2015, la eficiencia de los programas de vacunación varió entre el 77 % y el 99 %. y la ineficiencia se comportó entre el

rango de valores del 1 % al 23 %. Se pudieron identificar cuatro grupos de países con una clasificación correcta del 95,2 %. Conclusiones: En América Latina los programas de vacunación infantil tienen comportamientos diferentes en cada país. El conjunto formado por Argentina, Brasil, Cuba, México y Uruguay son referentes en este tipo de programa, debido a la tasa de cobertura de vacunación y tasa de supervivencia de niños menores a cinco años de edad, de acuerdo a los resultados de eficiencia, este grupo podría obtener iguales tasas de supervivencia con menor tasa de cobertura.

Publicación: *Cubana Salud Pública*. Volumen 45, Número 3, Octubre 2019

Direct power control for VSC-HVDC systems: an application of the global tracking passivity-based PI approach

Authors: Walter Gil-González, Oscar Danilo Montoya, Alejandro Garcés
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Abstract
This paper proposes a direct power control (DPC) for a high-voltage direct-current system using voltage source converters (VSC-HVDC) by applying passivity-based control theory. This system allows doing an efficient and reliable integration of electrical network from renewable energy sources. The DPC model permits instantaneous control of the active and reactive power without employing the conventional inner-loop current regulator and the phase-locked loop, thus diminishing investment costs and increasing the reliability of the system. The proportional-integral passivity-based control (PI-PBC) is chosen to control the direct power model of the VSC-HVDC system since this system exhibits a port-Hamiltonian formulation in open-loop and as PI-PBC can exploit this formulation to design a PI controller, which guarantees asymptotically stable in closed-loop based on Lyapunov's theory. Passivity-based control is an active research subject in the control community which has gained a reputation of being a very theoretical subject. Nevertheless, it can have advantages from a practical point of view including an implementation similar to the conventional controls for power systems applications. The paper is oriented to the power & energy systems community, taking into account this practical approach. The proposed controller is assessed by simulations in a two-terminal VSC-HVDC system and compared with a PI direct power controller. Four simulation conditions using MATLAB/SIMULINK were conducted to verify the effectiveness of PI-PBC against a PI controller and a perturbation observer-based adaptive passive control under various operating conditions.

Publication: *International Journal of Electrical Power & Energy Systems*. Volume 110, pp. 588-597, September 2019

Control for EESS in three-phase microgrids under time-domain reference frame via PBC theory

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Abstract
This brief presents a general form of designing passivity-based controllers for electrical energy storage systems (EESS) in three-phase microgrids (TP-MGs) under time-domain reference frame. The control strategy proposed in this brief use the Clark's transformation known as αβ reference frame, avoiding to use phase-locked loop systems, which allows improving the dynamical performance in the energy storage devices. Passivity-based control guarantees stable operating conditions in the sense of Lyapunov for each EESS for different grid operation scenarios in the TP-MG. The design of the controllers is made by using passivity-based control (PBC) theory in conjunction to the dynamics of the error approach. A comparison to classical proportional-integral control method is used to show the applicability of the PBC approach presented in this brief. Simulation results are conducted via MATLAB/Simulink software.

Publication: *IEEE Transactions on Circuits and Systems II: Express Briefs*. Volume 66, Issue 12, pp. 2007 – 2011, December 2019

Cultural participation in the main Colombian cities, 2008-2015

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Abstract
This paper aims to explain the evolution of the cultural participation in Colombia between 2018 and 2015, and to empirically analyze the factors associated to the decision of participating in cultural activities in the five main cities during this period. In Bogota, Cali, Medellin, Barranquilla and Cartagena, half of the urban population resides. The effects of a set of individual variables, household and context are evaluated, exploring alongside the traditional determinants, a set of new variables such as the kind of education that children receive, the poverty situation and others concerning the habitat, the social capital and macroeconomic ones. Microdata from households from the Quality of Life Survey – from programmes of citizen monitoring- are used, with which a binomial model is estimated. The

results highlight the importance of including the context variables so as to widen the knowledge of the individual decisions of participation.

Publication: *Scientific Annals of Economics and Business*. Volume 66, Issue 1, pp. 37-58, 2019

Effectiveness of a visual noise warning system on noise levels in a surgical ICU: a quality improvement programme

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Abstract
The effects of noise are harmful to patients in the ICU environment, and the latter are particularly noisy places. High noise levels seem to be a factor in sleep disturbance, which can, in turn, result in increased morbidity. LOCAL PROBLEM High noise levels are a recognized problem in ICUs worldwide. OBJECTIVE(S) The goal was to estimate the effect of a visual noise-warning system on noise levels in a surgical ICU before and after its implementation. DESIGN a quality improvement initiative. SETTING A 12-bedded surgical ICU in a tertiary care university hospital. PATIENTS A total of 148 adult nonintubated and nonsedated patients completed the study, during a 6-week period. INTERVENTION Noise levels were continuously recorded using a Type II sound level meter for 6 weeks. The study was divided into three phases. The first 2 weeks, baseline noise levels were measured (phase I). In week 3 of the study, a visual noise warning system (SoundEar II) that changed colour depending on noise levels within the ICU was installed and implemented (phase II). The alarm system was set to light up green at levels below 55 dBA, orange at levels between 55 and 60 dBA and red at levels above 60 dBA. The device was switched off at the beginning of week 5 and the sound level meter continued recording noise levels for another 2 weeks (phase III). RESULTS Mean night-time noise level was 55.98 dBA in the preintervention phase, 54.14 dB during the intervention, and 54.98 dBA in the postintervention phase. Mean noise level was reduced statistically significantly by 1.35 dBA, and there was a sustained reduction of 0.86 dBA from the baseline noise level 2 weeks after SoundEar II was switched off. CONCLUSION Visual noise warning systemscan be effective in achieving a reduction in noise levels in critical care units.

Publication: *European Journal of Anaesthesiology*. Volume 36, Issue 11, pp. 857–862, November 2019

Direct power control of electrical energy storage systems: A passivity-based PI approach

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Abstract
This paper proposes a direct power control for electrical energy storage systems (EESS) in ac microgrids. This strategy allows managing instantaneous active and reactive power without using a conventional inner-loop current regulator and without a phase-locked loop, increasing the reliability of the system while reducing investment costs. PI passivity-based control (PI-PBC) is selected to control the direct power model of EESS. This is because their models exhibit a port-Hamiltonian formulation in open-loop, and PI-PBC exploits this formulation to design a PI controller, which guarantees global asymptotically stability in closed-loop in the sense of Lyapunov. Simulations tested the proposed model in a microgrid and compared with conventional vector oriented controls in a dq reference frame and a direct power model controlled via feedback linearization (FL). PI-PBC has a better performance than other two controllers in all considered scenarios. Simulation results have conducted through MATLAB/SIMULINK software by using the SimPowerSystem toolbox.

Publication: *Electric Power Systems Research*. Volume 175, Article 105885, October 2019

Distributed energy resources integration in AC Grids: a family of passivity-based controllers

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Abstract
This paper presents the design and application of passivity–based control theory for distributed energy resources (DERs) integration through voltage source converters (VSC) in ac single–phase grids. The Hamiltonian representation of these grids facilitates the development of passive controllers that guarantee stability in the sense of Lyapunov for their closed–loop operation. The non– autonomous dynamic modeling of these systems is transformed into an incremental model, which allows solving the tracking as a regulation problem. The main contribution of this paper is in the ability to control the

active and reactive power transference between DERs and the ac single–phase grid depending on the availability of the primary energy resource and the capacity of the converters. Simulations results show that all proposed controllers attain the control objective, reaching the same dynamic performance as classical proportional–integral controllers and guaranteeing asymptotic stability. All simulations are developed under the MATLAB/Simulink environment through the SimPowerSystems tool.

Publication: *Revista Iberoamericana de Automática e Informática Industrial*. Volume 16, pp. 212-221, 2019

Humor styles across 28 countries

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Abstract
Responses to a measure of the four humor styles of affiliative, aggressive, self-enhancing, and self-defeating from the Humor Styles Questionnaire (HSQ; Martin et al. Journal of Research in Personality, 37(1), 48–75, 2003) were collected from individuals (N = 8361) in 28 countries encompassing 21 different languages. The purpose of this global collaboration was to examine both differences and similarities of humor styles across nations at the descriptive level. Across the countries, typically the highest scores were for the affiliative humor style. When each humor style was examined, some country samples demonstrated differences in mean scores. For example, the samples from Hungary, Indonesia, South Africa, and Serbia had high self-enhancing scores and Japan scored the lowest. In contrast to mean differences, almost all of the countries demonstrated positive inter-scale correlations, similar sex differences, and similar correlations with age, suggesting more similarities than differences. As discussed, some of the samples had low internal consistency values and poorly fitting factor structures for the humor style scales, suggesting that those results should be interpreted with caution.

Publication: *Current Psychology*. pp. 1-16, December 2019

Distributed energy resources integration in single-phase microgrids: An application of IDA-PBC and PI-PBC approaches

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Abstract
This paper presents a unified Hamiltonian formulation for controlling distributed energy resources (DERs) in ac single-phase microgrids (SP-MGs) via proportional-integral passivity-based control (PI-PBC), and interconnection and damping assignment passivity-based control (IDA-PBC). The proposed Hamiltonian formulation allows us to consider both pulse-width modulated voltage source converters (PWM-VSC) and pulse-width modulated current source converters (PWM-CSC) under a unified model. Renewable generation and supercapacitor energy storage systems are integrated via PWM-VSC technologies, while superconducting coils are integrated through PWM-CSC technologies. IDA-PBC and PI-PBC theories enable us to design control strategies begin that consider Lyapunov's stability theory combined with the well-known advantages of proportional and integral control actions. Our simulation's results corroborate the applicability of the proposed control approaches under stability paradigm. MATLAB/Simulink is employed for computational implementations via begin the SimPowerSystems toolbox.

Publication: *International Journal of Electrical Power & Energy Systems*. Volume 112, pp. 221-231, November 2019

Economic dispatch of energy storage systems in dc microgrids employing a semidefinite programming model

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Abstract
A mathematical optimization approach for the optimal operation focused on the economic dispatch for dc microgrid with high penetration of distributed generators and energy storage systems (ESS) via semidefinite programming (SDP) is proposed in this paper. The SDP allows transforming the nonlinear and non-convex characteristics of the economic dispatch problem into a convex approximation, which

is easy for implementation in specialized software, i.e., CVX. The proposed mathematical approach contemplates the efficient operation of a dc microgrid over a period of time with variable energy purchase prices, which makes it a practical methodology to apply in real-time operating conditions. A nonlinear autoregressive exogenous (NARX) model is employed for training an artificial neural network (ANN) for forecasting solar radiation and wind speed for renewable generation integration and dispatch considering periods of prediction of 0.5 h. Four scenarios are proposed to analyze the inclusion of ESS in a dc microgrid for economic dispatch studies. Additionally, the results are compared with GAMS commercial optimization package, which allows validating the accuracy and quality of the proposed optimizing methodology.

Publication: *Journal of Energy Storage*. Volume 21, pp. 1-8, February 2019

Effect of a commercial air valve on the rapid filling of a single pipeline: a numerical and experimental analysis

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Abstract
The filling process in water pipelines produces pressure surges caused by the compression of air pockets. In this sense, air valves should be appropriately designed to expel sufficient air to avoid pipeline failure. Recent studies concerning filling maneuvers have been addressed without considering the behavior of air valves. This work shows a mathematical model developed by the authors which is capable of simulating the main hydraulic and thermodynamic variables during filling operations under the effect of the air valve in a single pipeline, which is based on the mass oscillation equation, the air–water interface, the polytropic equation of the air phase, the air mass equation, and the air valve characterization. The mathematical model is validated in a 7.3-m-long pipeline with a 63-mm nominal diameter. A commercial air valve is positioned in the highest point of the hydraulic installation. Measurements indicate that the mathematical model can be used to simulate this phenomenon by providing good accuracy.

Publication: *Water*. Volume 11, Article 1814, 2019

Heuristic approach for optimal location and sizing of distributed generators in AC distribution networks

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Abstract
This paper addresses, from a heuristic point of view, the problem of the optimal location and sizing of distributed generators (DGs) in alternating-current distribution networks with radial topology. A master–slave optimization approach is followed to place and size the DGs. In the master stage, a simple recursive search method based on sequential searching is proposed. In the case of the slave algorithm, we present an emerging metaheuristic for solving the optimal power flow problem. This metaheuristic is called the vortex search algorithm. It works with a Gaussian distribution and a variable radius function for exploring and exploiting the solution space. Numerical simulations of 33- and 69-node test feeders show its efficiency, simplicity and robustness in comparison to other methods in the literature.

Publication: *WSEAS Transactions on Power Systems*. Volume 14, pp. 113-121, 2019

Large scale integration of renewable energy sources (RES) in the future Colombian energy system

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Abstract
The diversification of the energy matrix, including larger shares of Renewable Energy Sources (RES), is a significant part of the Colombian energy strategy towards a sustainable and more secure energy system. Historically, the country has relied on the intensive use of hydropower and fossil fuels as the main energy sources. Colombia has a huge renewables potential, and therefore the exploration of different pathways for their integration is required. The aim of this study was to build a model for a country with a hydro-dominated electric power system and analyses the impacts of integrated variable RES in long-term future scenarios. Energy PLAN was the modelling tool employed for simulating the reference year and future alternatives. Initially, the reference model was validated, and successively

five different scenarios were built. The results show that an increase in the shares of wind, solar and bioenergy could achieve an approximate reduction of 20% in both the CO2 emissions and the total fuel consumption of the country by 2030. Further, in the electricity sector the best-case scenario could allow an estimated 60% reduction in its emission intensity.

Publication: *Energy*. Volume 186, Article 115805, November 2019

Hydraulic modeling during filling and emptying processes in pressurized pipelines: a literature review

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Abstract
Filling and emptying processes are common maneuvers while operating, controlling and managing water pipeline systems. Currently, these operations are executed following recommendations from technical manuals and pipe manufacturers; however, these recommendations have a lack of understanding about the behavior of these processes. The application of mathematical models considering transient flows with entrapped air pockets is necessary because a rapid filling operation can cause pressure surges due to air pocket compressions, while an uncontrolled emptying operation can generate troughs of sub-atmospheric pressure caused by air pocket expansion. Depending on pipe and installation conditions, either situation can produce a rupture of pipe systems. Recently, reliable mathematical models have been developed by different researchers. This paper reviews and compares various mathematical models to simulate these processes. Water columns can be analyzed using a rigid water column model, an elastic water model, or 2D/3D CFD models; air–water interfaces using a piston-flow model or more complex models; air pockets through a polytropic model; and air valves using an isentropic nozzle flow or similar approaches. This work can be used as a starting point for planning filling and emptying operations in pressurized pipelines. Uncertainties of mathematical models of two-phases flow concerning to a non-variable friction factor, a polytropic coefficient, an air pocket sizes and an air valve behavior are identified.

Publication: *Urban Water Journal*. Volume 16, Issue 4, pp. 299-311, September 2019

Metodología de análisis envolvente de datos (DEA) - GLMNET para la evaluación y pronóstico de eficiencia financiera en una zona franca industrial – Colombia

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Resumen
Se propone una metodología de evaluación y pronóstico para las empresas de la Zona Industrial del Puerto de la ciudad de Barranquilla - Colombia. Basado en un análisis empírico y racional, soportado en los conceptos de la eficiencia técnica, puramente técnica, la eficiencia aditivita, eficiencia de escala y de mezcla, así como en el algoritmo de Aprendizaje Automático GLMNET. Se trabajó con 29 empresas que presentaron sus estados financieros del año 2017 en la Cámara de Comercio de Barranquilla. Como resultado se encontró una eficiencia técnica promedio de 72.79%, una eficiencia puramente técnica de 82,54% y una eficiencia aditiva de 59,45 %. Adicionalmente se aportan las proyecciones requeridas para lograr que las organizaciones ineficientes alcancen la eficiencia. Del estudio también se puede observar que 11 empresas se constituyeron en referentes evaluativos para medir las empresas de la Zona franca del Puerto de Barranquilla. El algoritmo GLMNET arrojó un buen resultado en la clasificación de empresas eficientes y no eficientes del 93.1% de precisión.

Publicación: *Información Tecnológica*. Volumen 30, Número 5, pp. 263-270, Octubre 2019

Logistic regression models for predicting daily airborne Alternaria and Cladosporium concentration levels in Catalonia (NE Spain)

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Abstract
Alternaria and Cladosporium are the most common airborne fungal spores responsible for health problems, as well as for crop pathologies. The study of their behavior in the air is a necessary step for establishing control and prevention measures. The aim of this paper is to develop a logistic regression model for predicting the daily concentrations of airborne Alternaria and Cladosporium fungal spores from meteorological variables. To perform the logistic regression analysis, the concentration levels are binarized using concentration thresholds. The fungal spore data have been obtained at

eight aerobiological monitoring stations of the Aerobiological Network of Catalonia (NE Spain). The meteorological data used were the maximum and minimum daily temperatures and daily rainfall provided by the meteorological services. The relationship between the meteorological variables and the fungal spore levels has been modeled by means of logistic regression equations, using data from the period 1995–2012. Values from years 2013–2014 were used for validation. In the case of Alternaria, three equations for predicting the presence and the exceedance of the thresholds 10 and 30 spores/m3 have been established. For Cladosporium, four equations for the thresholds 200, 500, 1000, and 1500 spores/m3 have been established. The temperature and cumulative rainfall in the last 3 days showed a positive correlation with airborne fungal spore levels, while the rain on the same day had a negative correlation. Sensitivity and specificity were calculated to measure the predictive power of the model, showing a reasonable percentage of correct predictions (ranging from 48 to 99%). The simple equations proposed allow us to forecast the levels of fungal spores that will be in the air the next day, using only the maximum and minimum temperatures and rainfall values provided by weather forecasting services.

Publication: *International Journal of Biometeorology*. Volume 63, pp. 1541–1553, 2019

Integration of energy storage systems in AC distribution networks: Optimal location, selecting, and operation approach based on genetic algorithms

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Abstract
This paper presents a method to find the optimal location, selection, and operation of energy storage systems (ESS- batteries-) and capacitors banks (CB) in distribution systems (DS). A mixed-integer non-linear programming model is proposed to formulate the problem. In this model, the minimization of energy loss in the DS is selected as an objective function. As constraints are considered: the active and reactive energy balance, voltage regulation, the total number energy storage devices that can be installed into network, as well as the operative bounds associated with the ESS (time of charge-discharge and energy capabilities). Three operating scenarios for the DS are analyzed by adopting the method proposed in this work. The first scenario is an evaluation of the base case (without batteries and CB), in which the initial conditions of the DS are determined. The second scenario considers the location of the ESS composed by redox flow batteries. Finally, the third scenario includes the installation of REDOX flow batteries with CB in parallel to correct operating problems generated

by battery charging, and improve their impact on the grid. A master-slave strategy is adopted to solve the problem here discussed, implementing a Chu & Beasley genetic algorithm in both stages as an optimization technique. The proposed method is tested in a 69-node test feeder, where numerical results demonstrate its effectiveness.

Publication: *Journal of Energy Storage*. Volume 25, Article 100891, October 2019

ISeeU: Visually interpretable deep learning for mortality prediction inside the ICU

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Abstract
To improve the performance of Intensive Care Units (ICUs), the field of bio-statistics has developed scores which try to predict the likelihood of negative outcomes. These help evaluate the effectiveness of treatments and clinical practice, and also help to identify patients with unexpected outcomes. However, they have been shown by several studies to offer sub-optimal performance. Alternatively, Deep Learning offers state of the art capabilities in certain prediction tasks and research suggests deep neural networks are able to outperform traditional techniques. Nevertheless, a main impediment for the adoption of Deep Learning in healthcare is its reduced interpretability, for in this field it is crucial to gain insight into the why of predictions, to assure that models are actually learning relevant features instead of spurious correlations. To address this, we propose a deep multi-scale convolutional architecture trained on the Medical Information Mart for Intensive Care III (MIMIC-III) for mortality prediction, and the use of concepts from coalitional game theory to construct visual explanations aimed to show how important these inputs are deemed by the network. Results show our model attains a ROC AUC of 0.8735 ($\pm$ 0.0025) which is competitive with the state of the art of Deep Learning mortality models trained on MIMIC-III data, while remaining interpretable. Supporting code can be found at https://github.com/williamcaicedo/ISeeU.

Publication: *Journal of Biomedical Informatics*. Volume 98, Article 103269, August 2019

Isohyetal maps of daily maximum rainfall for different return periods for the colombian Caribbean Region

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Abstract
In Colombia, daily maximum multiannual series are one of the main inputs for design streamflow calculation, which requires performing a rainfall frequency analysis that involves several prior steps: (a) requesting the datasets, (b) waiting for the information, (c) reviewing the datasets received for missing or data different from the requested variable, and (d) requesting the information once again if it is not correct. To tackle these setbacks, 318 rain gauges located in the Colombian Caribbean region were used to first evaluate whether or not the Gumbel distribution was indeed the most suitable by performing frequency analyses using three different distributions (Gumbel, Generalized Extreme Value (GEV), and Log-Pearson 3 (LP3)); secondly, to generate daily maximum isohyetal maps for return periods of 2, 5, 10, 20, 25, 50, and 100 years; and, lastly, to evaluate which interpolation method (IDW, spline, and ordinary kriging) works best in areas with a varying density of data points. GEV was most suitable in 47.2% of the rain gauges, while Gumbel, in spite of being widely used in Colombia, was only suitable in 34.3% of the cases. Regarding the interpolation method, better isohyetals were obtained with the IDW method. In general, the areal maximum daily rainfall estimated showed good agreement when compared to the true values.

Publication: Water. Volume 11, Issue 2, Article 358, February 2019

Metodología de aprendizaje automático para la clasificación y predicción de usuarios en ambientes virtuales de educación

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Resumen
Se desarrolla una metodología para clasificar y predecir usuarios en ambientes virtuales de educación, estudiando la interacción de los estudiantes con la plataforma y su desempeño en los exámenes. Para esto se utilizaron las herramientas de aprendizaje automático, componentes principales, clusterización,

lógica difusa, y el algoritmo del K vecino más cercano. La metodología relaciona los usuarios según las variables de estudio, para así implementar un análisis de clúster que identifica la formación de grupos. Finalmente utiliza un algoritmo de aprendizaje automático para clasificar los usuarios según su nivel de conocimiento. Los resultados muestran como el tiempo que un estudiante permanece en la plataforma no está relacionado con pertenecer al grupo de conocimiento alto. Se identificaron tres categorías de usuarios, aplicando la metodología Fuzzy K-means para determinar zonas de transición entre niveles de conocimiento. El algoritmo K vecino más cercano presenta los mejores resultados de predicción con un 91%.

Publicación: *Información Tecnológica*. Volumen 30, Número 1, pp. 247-254, Febrero 2019

Light-induced control of the spin distribution on Cu-dithiolene Complexes: a correlated ab initio study

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Abstract
Metal dithiolene complexes—M(dmit)2—are key building blocks for magnetic, conducting, and optical molecular materials, with singular electronic structures resulting from the mixing of the metal and dmit ligand orbitals. Their use in the design of magnetic and conducting materials is linked to the control of the unpaired electrons and their localized/delocalized nature. It has been recently found that UV–Vis light can control the spin distribution of some [Cu(dmit)2]−2 salts in a direct and reversible way. In this work, we study the optical response of these salts and the origin of the differences observed in the EPR spectra under UV–Vis irradiation by means of wave function-based quantum chemistry methods. The low-lying states of the complex have been characterized and the electronic transitions with a non-negligible oscillator strength have been identified. The population of the corresponding excited states promoted by the UV–Vis absorption produces significant changes in the spin distribution, and could explain the changes observed in the system upon illumination. The interaction between neighbor [Cu(dmit)2]−2 complexes is weakly ferromagnetic, consistent with the relative orientation of the magnetic orbitals and the crystal packing, but in disagreement with previous assignments. Our results put in evidence the complex electronic structure of the [Cu(dmit)2]−2 radical and the relevance of a multideterminantal approach for an adequate analysis of their properties.

Publication: *Molecules*. Volume 24, Issue 6, Article 1088, March 2019

Nonlinear analysis and control of a reaction wheel pendulum: Lyapunov-based approach

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Abstract
This paper presents a nonlinear analysis, control, and comparison of controllers based on the dynamicalmodel of the reaction wheel pendulum (RWP) in a tutorial style. Classical methodologies such as propor-tional integral derivative (PID) control and state variables feedback control are explored. Lyapunov's method is proposed to analyze the stability of the proposed nonlinear controllers, and it is also used to design control laws guaranteeing globally asymptotically stability conditions in closed-loop. A swing up strategy is also included to bring the pendulum bar to the desired operating zone at the vertical upperposition from an arbitrary initial location. Simulation results show that it is possible to obtain the same dynamical behavior of the RWP system adjusting the control gains adequately. All simulations were con-ducted via MATLAB Ordinary Differential Equation packages.

Publication: *Engineering Science and Technology, an International Journal.* Article in Press, May 2019

Modular architecture principles–MAPs: a key factor in the development of sustainable open architecture products

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Abstract
Modularity is one of the most useful tools employed in the product development process. Regarding functionality, the use of modules is common to generate flexible platforms to manufacture products and product families that require functional variations. In the current globalized market, the mass individualization or personalization is the preferred production model that delivers cost-effectiveness and satisfaction at the level of the market of one. In this model, the modularity is employed as a powerful concept applied not only for the manufacture but also for the use and final disposal stages, in which the design of modules provides functionalities and features that satisfy a variety of specifications for different market segments. Despite the existence of approaches in modularity and its usefulness in product development, it is possible to identify a lack of analysis of modular and open architecture to

enhance the sustainability performance of products regarding strategies to diminish adverse impacts during their lifecycle. This paper provides an analysis of the influence and potential of Modular Architecture Principles – MAPs in the sustainable design of open architecture products. Additionally, lifecycle considerations are analyzed to identify and propose strategies that enforce the sustainability performance of products concerning personalization from early design stages.

Publication: *International Journal of Sustainable Engineering*. June 2019

Understanding the impact of physical fatigue and postural comfort experienced during motorcycling: A systematic review

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Abstract
This literature review examines reports on the effects of fatigue and comfort on the motorcycle driving experience and evaluates studies of associated relevant risk factors for musculoskeletal disorders. Methods: This systematic review of literature employed a synthetic approach using best evidence to address the question: "Does fatigue and postural comfort contribute to the development of musculoskeletal conditions and disorders presented by motorcyclists?" The initial search identified 9,024 academic articles published from 1970 to date, in 13 databases. After screening, a total of 35 articles met the criteria and were included. Twelve were found to be of high quality, 18 of medium quality, and five of low quality. Results: In this systematic review, postural and anthropometric factors, as well as techniques and tools for the muscular analysis of motorcyclists were identified. The tools identified were classified into direct assessment techniques (anthropometry, electromyography, dynamometry, vibration evaluation, seat pressure analysis, heart rate and blood pressure, and fatigue of the pupillary muscles) and observational or indirect assessment techniques (self-reports and questionnaires). Most of the reviewed studies (83%) included evidence that physical fatigue and postural discomfort affect the performance and are related to musculoskeletal conditions; 17% (six) of the studies evaluated provided neutral evidence. The lower back was the area of the body most affected by discomfort and fatigue in motorcyclists (63% of the studies), followed by the shoulder and forearm (51% of studies). Other affected areas were the neck, and the buttocks reported by 34 to 43% of the included studies. Conclusion: Our review shows that the different muscles affected due to motorcycle driving and the techniques used for assessment need to be comprehensively evaluated. Thus, proper selection and design of motorcycles is imperative for improving the comfort of motorcyclists.

Publication: *Journal of Transport & Health*. Volume 12, pp 290-318, February 2019

On linear analysis of the power flow equations for DC and AC grids with CPLs

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Abstract
This express brief presents an approximation of the power flow problem for alternating-current (ac) and direct-current (dc) distribution networks by using a linear representation of the hyperbolic constraints i= p/v ↔I⋆=S/V related to the power balance at each constant power load node. Taylor or Laurent's series expansion methods are not required to obtain an equivalent linear power flow model. The proposed linear method allows us to achieve a high quality approximation of the power flow modeling without iterative procedures. Our simulation results show the accurate estimation of the voltage profile in distribution networks by the proposed linear approach in comparison to existing methods in specialized literature for ac and dc networks, including linear estimators or classical numerical methods, such as Gauss–Seidel and Newton–Raphson approaches. Numerical implementation of those approaches is carried out in the MATLAB 2017 a programming environment.

Publication: *IEEE Transactions on Circuits and Systems II: Express Briefs*. Volume 66, Issue 12, pp. 2032 – 2036, December 2019

Optimal design of transmission shafts: a continuous genetic algorithm approach

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Abstract
This paper presents an analysis of the optimal design of transmission shafts by adopting the approach of a novel continuous genetic algorithm. The optimization case study is formulated as a single-objective optimization problem whose objective function is the minimization of the total weight that results from the sum of all the sections in the shaft. Additionally, mechanical stresses and constructive characteristics are considered constraints in this case. The proposed optimization model corresponds to a nonlinear non-convex optimization problem, which is numerically solved with a continuous

variant of genetic algorithms. SKYCIV® and Autodesk Inventor® were used to verify the quality and robustness of the numerical results in this paper by means of simulation tools and analysis. The results obtained demonstrates that the methodology proposed reduce the complexity and improving the results obtained in comparison to conventional mechanical design.

Publication: *Statistics, Optimization & Information Computing*. Volume 7, Issue 4, pp. 802 – 815, December 2019

Optimal power flow in direct-current power grids via black hole optimization

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Abstract
This paper addresses the Optimal Power Flow (OPF) problem in DC power microgrids via a combinatorial optimization technique known as Black Hole Optimization (BHO). Such optimization method allows to solve OPF problems via algorithmic strategies trough a master-slave formulation. In the master stage, the total power generated by each Distributed Generator (DG) is determined by the BHO, while the slave strategy is entrusted with solving the resulting conventional power flow problem via a classical Gauss-Seidel (GS) numerical method. For comparison purposes, this work uses nonlinear optimization methods available in General Algebraic Modeling System (GAMS) as well as continuous metaheuristic optimization techniques. Two test feeders with 21 and 69 nodes were considered for validating the proposed hybrid BHO-GS optimization method, which enables to demonstrate its applicability, robustness and efficiency compared to conventional approaches. The results of all the simulations were obtained via MATLAB 2017a.

Publication: *Advances in Electrical and Electronic Engineering*. Volume 17, Issue 1, pp. 24 – 32, March 2019

On the use of the p-q theory for harmonic currents cancellation with shunt active filter

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Abstract
Discussion and mathematical proof on necessary and sufficient conditions for the application of the p-q theory for compensating the harmonic currents consumed by non-linear load using a shunt active filter are presented. These conditions over instantaneous active and reactive powers were not addressed before and must be considered on the design of new control strategies based on p-q theory. Theoretical demonstration is proposed and an application example with simulations results is used to validate the theoretical results.

Publication: *Advances in Electrical and Electronic Engineering*. Volume 17, Issue 3, pp. 262 – 269, September 2019

Numerical approximation of the maximum power consumption in DC-MGs with CPLs via an SDP model

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Abstract
This brief addresses the numerical approximation of the maximum power consumption in direct-current microgrids (DC-MGs) with constant power loads through a convex optimizing model. The convex formulation is developed via a semidefinite programming model and is solved by using a MATLAB/CVX package. For comparison purposes the exact nonlinear model is solved in a GAMS package to compare the accuracy and quality of the results obtained with the proposed convex reformulation. Numerical testing is made with a small three-node DC-MG test system as well as DC-MGs from 10 to 150 nodes.

Publication: *IEEE Transactions on Circuits and Systems II: Express Briefs*. Volume 66, Issue 4, pp. 642 – 646, April 2019

Organic versus conventional: a comparative study on the shelf life of passion fruit (Passiflora edulis Sims) crops

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Abstract
Yellow passion fruit (Passiflora edulis Sims) is one of the most appetising fruits worldwide due to its intense flavour. There have been few published studies comparing the evolution of storage quality parameters and shelf life of organic and conventional tropical fruit crops. The aim of the present work was therefore to compare the temporal changes in various physicochemical parameters and commercial shelf life of fresh organic passion fruit (OPF) and conventional passion fruit (CPF), under the same storage (20.0 ± 1.0°C, 85.0 ± 2.0% relative humidity) and initial maturity conditions. Colour measurements and total soluble solid contents showed significant differences between OPF and CPF. Increasing colour difference (ΔE) and decreasing hue angle values were observed during the storage in both crops. Nonetheless, the rate of growth of ΔE in CPF was higher than that in OPF. In contrast, the initial temporal rate of reduction in the hue angle was more rapid in CPF. Total solid soluble content remained almost unaltered during the observation period, and there were insignificant differences in the measured values between OPF and CPF. Firmness and active acidity did not manifest significant differences between the crops. The same loss of weight (30.0% ± 1.0%) was observed in both crops at the end of the storage period.

Publication: *International Food Research Journal*. Volume 26 Issue 2, pp. 393-399, April 2019

Trends and perspectives of sustainable product design for open architecture products: facing the circular economy model

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Abstract
The purpose of this paper is to perform the analysis of literature review regarding the design of open architecture products (OAP) and their potential benefits within the circular economy (CE) model. The analysis involved studying more than 80 research articles during the last two decades in engineering journals. The articles were gathered through a bibliometric analysis using the most relevant keywords

concerning product design, sustainability, OAP, and CE. Main trends, challenges and future scopes of research opportunities and development were identified. The study provides a framework to designers and researchers involved in the design of OAP to enhance their sustainability performance for a CE model, which integrates lifecycle considerations (reuse, remanufacturing, repair, and recycle), resource optimization, and emissions reduction. The findings include the need for design methods focused on the design of OAP to guarantee an effective circularity of resources during the whole lifecycle of products and the need of integrating manufacturing processes and material analysis to design products capable of adapting to the CE model.

Publication: *International Journal of Precision Engineering and Manufacturing-Green Technology*. Volume 6, Issue 2, pp 377–39, April 2019

Power flow analysis in DC grids: two alternative numerical methods

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Abstract
This express brief proposes two new iterative approaches for solving the power flow problem in direct current networks as efficient alternatives to the classical Gauss-Seidel and Newton-Raphson methods. The first approach works with the set of nonlinear equations by rearranging them into a conventional fixed point form, generating a successive approximation methodology. The second approach is based on Taylors series expansion method by using a set of decoupling equations to linearize the problem around the desired operating point; these linearized equations are recursively solved until reach the solution of the power flow problem with minimum error. These two approaches are comparable to the classical Gauss-Seidel method and the classical Newton-Raphson method, respectively. Simulation results show that the proposed approaches have a better performance in terms of solution precision and computational requirements. All the simulations were conducted via MATLAB software by using its programming interface.

Publication: *IEEE Transactions on Circuits and Systems II: Express Briefs*. Volume 66, Issue 11, pp. 1865 – 1869, January 2019

Optimal power flow on DC Microgrids: a quadratic convex approximation

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Abstract
This express brief shows a convex quadratic approximation for the optimal power flow (OPF) in direct-current microgrids (dc-μGrid) via Taylor's series expansion. This approach can be used for solving OPF problems on radial and meshed dc-μGrids with multiple constant power terminals, allowing to cover a wide range of configurations. Two test dc-μGrids with 10 and 21 nodes were used to validate the proposed model. Nonlinear large-scale solvers were employed to compare the proposed linearization with the conventional nonlinear nonconvex model.

Publication: *IEEE Transactions on Circuits and Systems II: Express Briefs*. Volume 66, Issue 6, pp. 1018 – 1022, June 2019

Counting integers representable as images of polynomials modulo n

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Abstract
Given a polynomial f(x1, x2, . . . , xt) in t variables with integer coefficients and a positive integer n, let α(n) be the number of integers $0 \leq a < n$ such that the polynomial congruence f(x1, x2, . . . , xt) ≡ a (mod n) is solvable. We describe a method that allows us to determine the function α associated with polynomials of the form $c1x_k 1 + c2x_k 2 + \cdots + ctx_k t$. Then, we apply this method to polynomials that involve sums and differences of squares, mainly to the polynomials $x 2 + y 2$, $x 2 - y 2$, and $x 2 + y 2 + z 2$.

Publication: *Journal of Integer Sequences*. Volume 22, Issue 1, Article 19.6.7, 2019

Power flow approximation for DC networks with constant power loads via logarithmic transform of voltage magnitudes

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Abstract
This paper proposes a logarithmic transformation of voltages (LTVM) for the power flow in DC grids. This problem is non-linear due to the presence of constant power loads (CPLs), which also introduce a negative resistance effect that can create numerical instability for conventional algorithms. The proposed methodology is applied to dc-microgrids, dc-distribution and multi-terminal high voltage DC transmission (MT-HVDC). Two main approximations are presented and compared in terms of computational performance and the accuracy of the solution. Simulation results performed in Matlab/Octave demonstrate the advantages of the proposed methodology using a complete set of test systems, from low to high voltage applications. The proposed methodology does not require any consideration about the topology of the grid (radial or meshed) or the number of constant power loads.

Publication: *Electric Power Systems Research*. Volume 175, Article ID 105887, October 2019

Sequential quadratic programming models for solving the OPF problem in DC grids

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Abstract
In this paper, we address the optimal power flow problem in dc grids (OPF-DC). Our approach is based on sequential quadratic programming which solves the problem associated with non-convexity of the model. We propose two different linearizations and compare them to a non-linear algorithm. The first model is a Newton-based linearization which takes the Jacobian of the power flow as a linearization for the optimization stage, and the second model uses the nodal currents as auxiliary variables to linearize over the inequality constraints. Simulation results in radial and meshed grids demonstrate the efficiency of the proposed methodology and allow finding the same solution given by the exact nonlinear representation of the OPF-DC problem.

Publication: *Electric Power Systems Research*. Volume 169, Pages 18-23, April 2019

Stability analysis of single-phase low-voltage AC microgrids with constant power terminals

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Abstract
This express brief presents the stability analysis of single-phase microgrids (SP-MG) operating under master-slave connection with constant power terminals. The SP-MG is composed of linear elements, nonlinear loads, and distributed generators modeled as PQ constant terminals interconnected through power electronic converters. Lyapunov's direct method through a Hamiltonian representation of the grid is used to demonstrate stability. The non-autonomous model of the SP-MG is transformed into an autonomous equivalent model based on the dynamics of the error. The proposed analysis shows that if there is an admissible trajectory x* solution of the power flow equations, then the SP-MG is stable in the sense of Lyapunov.

Publication: *IEEE Transactions on Circuits and Systems II: Express Briefs*. Volume 66, Issue 7, pp. 1212 – 1216, July 2019

Transient phenomena during the emptying process of a single pipe with water-air interaction

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Abstract
Emptying pipelines can be critical in many water distribution networks because subatmospheric pressure troughs could cause considerable damage to the system due to the expansion of entrapped air. Researchers have given relatively little attention to emptying processes compared to filling processes. The intricacy of computations of this phenomenon makes it difficult to predict the behaviour during emptying, and there are only a few reliable models in the literature. In this work, a computational model for simulating the transient phenomena in single pipes is proposed, and was validated using experimental results. The proposed model is based on a rigid column to analyze water movement,

the air–water interface, and air pocket equations. Two practical cases were used to validate the model: (1) a single pipe with the upstream end closed, and (2) a single pipe with an air valve installed on the upstream end. The results show how the model accurately predicts the experimental data, including the pressure oscillation patterns and subatmospheric pressure troughs.

Publication: *Journal of Hydraulic Research*. Volume 57, Issue 3, pp. 318-326, 2019

Women's perceived risk of sexual harassment in a Bus Rapid Transit (BRT) system: the case of Barranquilla, Colombia

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Abstract
Sexual harassment in public transportation is a growing concern, particularly among women. Over the years, there have been several programs and policies to mitigate sexual harassment while using public transport. However, there is little evidence of the effectiveness of these strategies, especially in Latin America. This investigation aims to determine the factors that influence women's perceived risk of sexual harassment while using public transport in Colombia. In this study, the authors designed an image-based stated preferences survey based on the current bus rapid transit (BRT) system in Barranquilla, Colombia. Several variables were considered in this experiment including the time of the day, surveillance, and crowding, among others. For each scenario, participants reported whether they felt safe or not. Then, a logistic regression analysis was conducted to identify the factors that influence women's perceived risk of sexual harassment while using the BRT system. The results show that more than 60% of respondents have been a victim of sexual harassment while using the BRT system. Also, overcrowded buses proved to have the most negative effect on the perceived risk of sexual harassment. Travelling at night, lighting and being alone were all significant variables as well. Sexual harassment could potentially influence use of the BRT. The findings of this research can be used to develop countermeasures and increase public transport ridership.

Publication: *Journal of Transport & Health*. Volume 14, Article 100598, September 2019

Willingness to change car use to commute to the UPTC main campus, Colombia: A hybrid discrete choice modeling approach

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Abstract
This paper studies the willingness to change car use when commuting to a university campus. We estimated a hybrid discrete choice (HDC) model to test the hypothesis that, in addition to traditional tangible attributes, the willingness to change car use to more sustainable transportation modes also depends on the pro-environmental attitude and the perceived convenience of each transportation alternative. We found that teachers have better pro-environmental attitudes than students and administrative staff, but senior individuals and people who own an above-average priced car have negative effects on this attitude. We concluded that in addition to car ownership, the price of a car is also a decisive factor in the willingness to change car use. On-campus parking fees were identified as a key variable for reducing car use when commuting to campus and for financing more sustainable transportation modes. This paper contributes to the literature on sustainable mobility on university campuses and is the first based on an HDC modeling approach that integrates tangible attributes and latent variables into this context.

Publication: *Journal of Transport and Land Use*. Volume 12, Issue 1, pp. 335–35

Creación de perfiles empresariales para compañías exportadoras mediante aprendizaje no supervisado

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Resumen
En esta investigación se presenta un método para la creación de perfiles empresariales de compañías exportadoras en la ciudad de Barranquilla, en Colombia. El método esta soportado por el desarrollo de las técnicas de aprendizaje no supervisado de datos, Análisis de Componentes Principales y análisis de Clúster. La base de datos utilizada corresponde a información financiera primaria de 107 empresas registradas en la Cámara de Comercio de Barranquilla. En primer lugar, se presenta una revisión del contexto de las exportaciones global y local. Seguidamente, el análisis de componentes principales

permitió la creación de nuevas variables no correlacionadas y la visualización conjunta de variables y empresas en un espacio de dos dimensiones. Posteriormente, en el análisis de clúster se interpretaron los patrones de agrupación de las empresas según los rubros financieros estudiados. El trabajo muestra que la metodología empleada permite identificar el tipo de servicio que requieren las empresas para lograr mejores niveles de desempeño, lo que facilita la implementación de planes de desarrollo y de políticas públicas y privadas de fomento empresarial

Publicación: *Información Tecnológica*. Volumen 30, Número 6, Diciembre 2019

Posicionamiento y estado de las revistas numismáticas españolas en bases de datos científicas

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Resumen
El siguiente artículo plasma la situación actual en la que se encuentran las revistas científicas españolas cuya temática se centra en la numismática y su posicionamiento en las principales bases bibliográficas internacionales (Latindex, Web of Science y Scopus) y españolas (Dialnet y CIRC) a través de un análisis comparativo de sus características distintivas y de sus métricas fundamentales (el índice H5 de Google Académico y sus puntuaciones en MIAR). Los resultados obtenidos determinan que dentro de este colectivo ha sobresalido de forma destacada la Revista Numismática Hécate, la única publicación española que ha conseguido estar indexada en bases de datos de alto impacto como la Web of Science y Scopus.

Publicación: *Revista Numismática Hécate*. Número 6, pp. 236-246, 2019

FACULTAD DE CIENCIAS BÁSICAS

Biocontrol of Phytophthora root and stem rot disease in papaya (Carica papaya) plants by Photorhabdus, the symbiont bacterium of Heterorhabditis amazonensis

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Abstract
The effect of two strains of Photorhabdus spp. from Heterorhabditis amazonensis and their metabolites was tested against Phytophthora in laboratory conditions and in planta using papaya plants. The in vitro experiments showed that both Photorhabdus strains (LPV-499 and LPV-900) have a clear antagonist effect on Phytophthora sp. by suppressing the pathogen growth in more than 62% at 120 h. The bacterial broth was more effective (c.a. 20% better) than the cell free cultures (metabolites) in controlling the oomycete. In planta experiments revealed the biological control potential of both Photorhabdus strains. The most important feature was time of application after pathogen inoculation. During the first two weeks post-infection, bacteria were capable to reduce the pathogenic effect in such a scale that plants recovered up to 89% by curing the necrosis produced in the wounds where the inoculation of the oomycete was done. The number of collapsed stems was reduced to none when the bacteria were applied within the first week post pathogen infection. Agronomic variables such as plant height, fresh and dry weight of stems and roots showed no statistical differences when the curative treatment was applied in the first week post-infection.

Publication: *BioControl*. Volume 64, pp. 595–604, 2019

Local stable and unstable manifolds for Anosov families

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Abstract
Anosov families were introduced by A. Fisher and P. Arnoux motivated by generalizing thenotion of Anosov diffeomorphism defined on a compact Riemannian manifold. In addition to present-ing several properties and examples of Anosov families, in this paper we build local stable and localmanifolds for such families.

Publication: *Hokkaido Mathematical Journal*. Volume 48, Number 3, pp. 513-535, September 2019

C-3 matching for asymptotically flat spacetimes

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Abstract
We propose a criterion for finding the minimum distance at which an interior solution of Einstein's equations can be matched with an exterior asymptotically flat solution. It is based upon the analysis of the eigenvalues of the Riemann curvature tensor and their first derivatives, implying C^3 differentiability conditions. The matching itself is performed by demanding continuity of the curvature eigenvalues across the matching surface. We apply the C^3 matching approach to spherically symmetric perfect fluid spacetimes and obtain the physically meaningful condition that density and pressure should vanish on the matching surface. Several perfect fluid solutions in Newton and Einstein gravity are tested.

Publication: *Classical and Quantum Gravity*. Volume 36, Number 13

Colombian Andean thermal springs: reservoir of thermophilic anaerobic bacteria producing hydrolytic enzymes

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Abstract
Anaerobic cultivable microbial communities in thermal springs producing hydrolytic enzymes were studied. Thermal water samples from seven thermal springs located in the Andean volcanic belt, in the eastern and central mountain ranges of the Colombian Andes were used as inocula for the growth and isolation of thermophilic microorganisms using substrates such as starch, gelatin, xylan, cellulose, Tween 80, olive oil, peptone and casamino acids. These springs differed in temperature (50–70 °C) and pH (6.5–7.5). The predominant ion in eastern mountain range thermal springs was sulphate, whereas that in central mountain range springs was bicarbonate. A total of 40 anaerobic thermophilic bacterial strains that belonged to the genera Thermoanaerobacter, Caloramator, Anoxybacillus, Caloranaerobacter, Desulfomicrobium, Geotoga, Hydrogenophilus, Desulfacinum and Thermoanaerobacterium were isolated. To investigate the metabolic potential of these isolates, selected strains were analyzed for enzymatic activities to identify strains than can produce hydrolytic enzymes. We demonstrated that

these thermal springs contained diverse microbial populations of anaerobic thermophilic comprising different metabolic groups of bacteria including strains belonging to the genera Thermoanaerobacter, Caloramator, Anoxybacillus, Caloranaerobacter, Desulfomicrobium, Geotoga, Hydrogenophilus, Desulfacinum and Thermoanaerobacterium with amylases, proteases, lipases, esterases, xylanases and pectinases; therefore, the strains represent a promising source of enzymes with biotechnological potential.

Publication: *Extremophiles*. Volume 23, pp. 793–808, September 2019

Robust automated reading of the skin prick test via 3D imaging and parametric surface fitting

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Abstract
The conventional reading of the skin prick test (SPT) for diagnosing allergies is prone to inter-and intra-observer variations. Drawing the contours of the skin wheals from the SPT and scanning them for computer processing is cumbersome. However, 3D scanning technology promises the best results in terms of accuracy, fast acquisition, and processing. In this work, we present a wide-field 3D imaging system for the 3D reconstruction of the SPT, and we propose an automated method for the measurement of the skin wheals. The automated measurement is based on pyramidal decomposition and parametric 3D surface fitting for estimating the sizes of the wheals directly. We proposed two parametric models for the diameter estimation. Model 1 is based on an inverted Elliptical Paraboloid function, and model 2 on a super-Gaussian function. The accuracy of the 3D imaging system was evaluated with validation objects obtaining transversal and depth accuracies within ± 0.1 mm and ± 0.01 mm, respectively. We tested the method on 80 SPTs conducted in volunteer subjects, which resulted in 61 detected wheals. We analyzed the accuracy of the models against manual reference measurements from a physician and obtained that the parametric model 2 on average yields diameters closer to the reference measurements (model 1:-0.398 mm vs. model 2:-0.339 mm) with narrower 95% limits of agreement (model 1: [-1.58, 0.78] mm vs. model 2: [-1.39, 0.71] mm) in a Bland-Altman analysis. In one subject, we tested the reproducibility of the method by registering the forearm under five different poses obtaining a maximum coefficient of variation of 5.24% in the estimated wheal diameters. The proposed method delivers accurate and reproducible measurements of the SPT.

Publication: *PLoS ONE*. Volume 14, Issue 10, e0223623, October 2019

Perchlorate-reducing bacteria from hypersaline soils of the colombian caribbean

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Abstract
Perchlorate (ClO4−) has several industrial applications and is frequently detected in environmental matrices at relevant concentrations to human health. Currently, perchlorate-degrading bacteria are promising strategies for bioremediation in polluted sites. The aim of this study was to isolate and characterize halophilic bacteria with the potential for perchlorate reduction. Ten bacterial strains were isolated from soils of Galerazamba-Bolivar, Manaure-Guajira, and Salamanca Island-Magdalena, Colombia. Isolates grew at concentrations up to 30% sodium chloride. The isolates tolerated pH variations ranging from 6.5 to 12.0 and perchlorate concentrations up to 10000 mg/L. Perchlorate was degraded by these bacteria on percentages between 25 and 10. 16S rRNA gene sequence analysis indicated that the strains were phylogenetically related to Vibrio, Bacillus, Salinovibrio, Staphylococcus, and Nesiotobacter genera. In conclusion, halophilic-isolated bacteria from hypersaline soils of the Colombian Caribbean are promising resources for the bioremediation of perchlorate contamination.

Publication: *International Journal of Microbiology*. Volume 2019, Article ID 6981865, February 2019

Robust 3D surface recovery by applying a focus criterion in white light scanning interference microscopy

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Abstract
White light scanning interference (WLSI) microscopes provide an accurate surface topography of engineered surfaces. However, the measurement accuracy is substantially reduced in surfaces with low-reflectivity regions or high roughness, like a surface affected by corrosion. An alternative technique called shape from focus (SFF) takes advantage of the surface texture to recover the 3D surface by using a focus metric through a vertical scan. In this work, we propose a technique called SFF-WLSI, which consists of recovering the 3D surface of an object by applying the Tenegrad Variance (TENV) focus metric to WLSI images. Extensive simulation results show that the proposed technique yields

accurate measurements under different surface roughness and surface reflectivity, outperforming the conventional WLSI and the SFF techniques. We validated the simulation results on two real objects with a Mirau-type microscope. The first was a flat lapping specimen with Ra=0.05 μm for which we measured an average value of Ra=0.055 μm and standard deviation σ=0.008 μm. The second was a metallic sphere with corrosion, which we reconstructed with WLSI versus the proposed SFF-WLSI technique, producing a better 3D reconstruction with less undefined depth values.

Publication: *Applied Optics*. Volume 58, Issue 5, pp. 101-111, February 2019

Role of VEGF in the differential growth between the fetal and placental ends of the umbilical cord

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Abstract
The umbilical cord (UC) is a vital structure; its alterations affect the newborn and neurological impact can be permanent. Paradoxically, factors that determine it remain unknown. We explore the differential VEGF protein expression in the UC´s proximal and distal portions in relation to the hypothesis that the UC has differential growth and that VEGF plays a role in it. METHODS: An observational analytical study was performed. One UC segment was taken proximal to fetus and another distal; both were randomly processed; VEGF immunohistochemical analysis was performed; two blinded pathologists read results. RESULTS: Forty-eight newborns were included. Protein expression between the two edges of the umbilical cord, in any kind of cells, was interpreted. Endothelium, amnion, and stromal cells expressed VEGF; the first two were not different between opposite ends. Stromal cells had differential expression: higher in the proximal to the fetus portion. CONCLUSION: Knowledge of molecular factors is necessary. UC cells widely expressed VEGF, possibly contributing to UC growth. Even though stromal cell expression was different, the interaction with activity close to the fetus must be explored.

Publication: *Journal of Neonatal-Perinatal Medicine*. Volume 12, Issue 1, pp. 47-56, 2019

The origin of Humboldt and Bonpland's holotype of Oncidium ornithorhynchum, clarified using +200-year-old DNA

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Abstract
Oncidium ornithorhynchum, an epiphytic orchid characterized by erect, pyramidal inflorescences and small yellow flowers, is found in the northern Andes. However, according to the protologue, the type was collected in Mexico during Humboldt and Bonpland's American expedition (1800–1804). To clarify this problem, we extracted DNA from the ancient holotype. Short-range PCRs for plastid (matK-trnK, trnH-psbA, ycf1) and nuclear (nrITS) markers were established and used to infer its phylogenetic placement with several related Central American and Andean orchid species. This provided well-supported and close relationships of the holotype with other North Andean orchids, proving that the locus classicus was confounded. In addition, O. sotoanum from Mexico, with which O. ornithorhynchum has often been confused, was only distantly related.

Publication: *Taxon*. Volume 68, Issue 3, pp. 471-480, June 2019

Validación de instrumentos como garantía de la credibilidad en las investigaciones científicas

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Resumen
La validación de instrumentos, es considerada, por el alcance de su rigor científico, un tipo de estudio con sus características y procedimientos. Este trabajo tiene como finalidad proponer una metodología para la validación de un instrumento científico. Se utilizaron métodos teóricos como el histórico lógico y el analítico sintético, y desde la empírea, al análisis de documentos, los cuales permitieron arribar a la metodología propuesta. Los resultados fundamentales están asociados con una estructura secuencial, de estricto cumplimiento para asegurar que el instrumento esté validado y así obtener resultados avalados desde la ciencia.

Publicación: Revista Cubana de Medicina Militar. Volume 48, Issue 2, July 2019

FACULTAD DE CIENCIAS SOCIALES Y HUMANIDADES

Características tempranas y predictores de la severidad del cuadro clínico en el trastorno del espectro autista

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Resumen
A nivel mundial se han realizado esfuerzos importantes para detectar el Trastorno del Espectro Autista (TEA) durante los primeros años de vida, dado los efectos positivos en el pronóstico del desarrollo de los niños diagnosticados. Objetivo. Describir los antecedentes del desarrollo y características tempranas de un grupo de niños colombianos con diagnóstico de TEA, y comparar estas características tempranas con las de un grupo de niños con desarrollo típico. Adicionalmente, relacionar variables del desarrollo con la severidad de los signos de TEA y analizar su valor predictivo. Método. Estudio no experimental de corte transversal en el que se aplicó el Q-CHAT a 40 padres de niños con diagnóstico temprano de autismo y 40 padres de niños con desarrollo típico, y se evaluó el desarrollo psicomotor de los menores, entre los 18 y 40 meses de edad, mediante el Inventario del Desarrollo Battelle Screening. Resultados. La primera preocupación de los padres del grupo de niños diagnosticados con TEA respecto al desarrollo de sus hijos fue alrededor de los 25 meses y la edad promedio de diagnóstico fue de 34,6 meses. Los signos tempranos de TEA más frecuentes y que mejor discriminan entre niños con desarrollo típico y con diagnóstico son aquellos que involucran atención conjunta. Adicionalmente, existe correlación negativa estadísticamente significativa entre la severidad de los signos de TEA y el desarrollo infantil en las áreas personal-social, cognitiva y comunicación expresiva; por lo cual, dificultades en el desarrollo de estas áreas serían predictores importantes de la severidad de los signos de TEA a edades tempranas.

Publicación: *Revista Ces Psicología*. Volume 12, Número, pp. 12-25, Agosto 2019

Rasch analysis of the Q-CHAT in colombian toddlers with autism spectrum disorder

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Abstract
The objective of this study was the validation of the Colombian version of The Quantitative Checklist for Autism in Toddlers (Q-CHAT) by means of the Rasch Rating Scale Model. The Q-CHAT was

applied to parents of 100 typically developing toddlers and 40 toddlers and preschoolers with Autism Spectrum Disorder (ASD). The Q-CHAT scores showed some limitations. The questionnaire did not meet the condition of unidimensionality. Two dimensions were detected. The first dimension, with 13 items and 4 response categories (13i-4c), showed good psychometric properties: the items fit the Rasch Rating Scale model, the reliability of persons and items was appropriate, and scores adequately discriminate between children with and without ASD. The second dimension is a measure of traits that are usually associated with ASD, but that have shown validity problems. Thus, it is proposed that dimension 1 of the Q-CHAT (13i-4c) be used as the screening tool for ASD in Colombia.

Publication: *Current Psychology*. Volume 38, Issue 1, pp. 116–120, February 2019

Fotografía en América Latina. imágenes e identidades a través del tiempo y el espacio

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Resumen
El Instituto de Estudios Peruanos publicó en el verano de 2018 -bajo la coordinación editorial de las antropólogas Gisela Cánepa Koch e Ingrid Kummels-esta recopilación de estudios de caso que exploran el redescubrimiento, las resignificaciones y los nuevos usos otorgados en la actualidad por parte de una variedad de actores -antropólogos, historiadores, museos u organizaciones de derechos humanos, entre otros- a diversos corpus de fotografías históricas procedentes en su mayor parte de investigaciones antropológicas realizadas en Perú, Colombia, Brasil y México entre 1880 y 1980.Dos grandes temas están presentes en este trabajo. Por un lado, la reflexión sobre el papel que tiene en el presente la fotografía histórica en las políticas de la memoria y las negociaciones contemporáneas de la identidad. Por otro, la transformación de las relaciones entre los custodios tradicionales de estas fotografías (museos, archivos, universidades o colecciones privadas) y la ciudadanía digital del siglo XXI. Unas transformaciones debidas a los nuevos usos asignados a las fotografías históricas, algunos de cuyos ejemplos se explican en la obra. Las editoras recuerdan como el acceso a las fotografías históricas ha sido históricamente inequitativo y excluyente para con las comunidades de donde procedían esas imágenes, y cómo en los últimos años se ha producido en el ámbitoacadémico un debate sobre los derechos de propiedad cultural.

Publicación: *Chungara Revista de Antropología Chilena*. Volumen 51, Número 4, pp. 711-714, Diciembre 2019

El temprano retiro de las presentadoras de telediarios en Colombia y España: El repudio a la vejez femenina

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Resumen
La televisión actual, como un medio de comunicación de masas basado en la imagen pública, mantiene una serie de estereotipos sexuales que también son transmitidos en los telediarios informativos. En el siguiente artículo de investigación se introduce un estudio de género transcultural de corte descriptivo acerca las características físicas y la edad de las presentadoras de los noticieros de televisión más relevantes de Colombia y España, en función de la audiencia obtenida por este tipo de programas. Resultados y conclusiones: Las conclusiones más evidentes de este trabajo, es que en este específico contexto laboral, salvo contadas excepciones, la edad de las mujeres a diferencia de sus pares varones, no se asocia con una mayor credibilidad, rigurosidad o seriedad, siendo un claro elemento discriminatorio que asocia a la mujer con un simple complemento de indudable atractivo físico.

Publicación: *Estudios Sobre El Mensaje Periodístico*. Volumen 25, Issue 2, pp. 1171-1189, Junio 2019

Posicionamiento y estado de las revistas numismáticas españolas en bases de datos científicas

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Resumen
El siguiente artículo plasma la situación actual en la que se encuentran las revistas científicas españolas cuya temática se centra en la numismática y su posicionamiento en las principales bases bibliográficas internacionales (Latindex, Web of Science y Scopus) y españolas (Dialnet y CIRC) a través de un análisis comparativo de sus características distintivas y de sus métricas fundamentales (el índice H5 de Google Académico y sus puntuaciones en MIAR). Los resultados obtenidos determinan que dentro de este colectivo ha sobresalido de forma destacada la Revista Numismática Hécate, la única publicación española que ha conseguido estar indexada en bases de datos de alto impacto como la Web of Science y Scopus.

Publicación: *Revista Numismática Hécate*. Número 6, pp. 236-246, 2019

La noción de conciencia kierkegaardiana como una implicación del mundo exterior: Una crítica al planteamiento cartesiano

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Resumen
Este artículo pretende mostrar cómo el filósofo dans S0ren Kierkegaard, mediante su concepto de conciencia, establece una crítica al escepticismo cartesiano al afirmar la imposibilidad de la duda del mundo exterior, puesto que la misma posibilidad de la duda supone de antemano la existencia de una conciencia que produce y es producida por la relación tricotómica entre idealidad y realidad, o, con otras palabras, mediatez e inmediatez. Para ello se realizar en primer lugar la explicación del planteamiento cartesiano, a saber: la postulación de los tres niveles de duda y el cogito ergo sum; luego se explicar la noción de conciencia y posibilidad ideal de la duda del autor dans, y por último se expondrá cómo, bajo la óptica de esa noción de conciencia, Kierkegaard realiza una fuerte crítica a la duda metódica y al cogito cartesiano como demostración de la existencia.

Publicación: *Eidos*. Número 30, pp. 211-237, 2019

CONFERENCE PAPERS

Conventional and advanced exergoeconomic analysis in a nitric acid production plant

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Abstract
An advanced exergoeconomic analysis (AEA) allows determining the part of Exergy Destruction and total investment costs that can be avoided. The results of the advanced analysis show the economic costs to be reduced and improvements that can be achieved for the system in terms of the overall efficiency. A Nitric Acid Production Plant of 350 tons/day was taken as case of study to implement a conventional and advanced exergoeconomic analysis. In this work, the investment costs and exergy destruction of the components of the system were divided into 2 groups such as endogenous/exogenous and avoidable/unavoidable parts to obtain accurate information about the performance of the plant. Conventional exergoeconomic analysis showed that 58.5% of the total cost of the exergy destruction is caused by the catalytic converter with a cost rate of 687.84 $/h. The highest values of the exergoeconomic factor were for Tail Gas Desuperheater (99.01%), Condenser (96.35%) and Tail Gas Heater (87%). The costs of the production process can be improved by reducing the total investment of these three components. The lowest value of exergoeconomic factor was calculated for the Catalytic Converter (15.25%) which implies that thermodynamic efficiency of this equipment must be enhanced. Based on AEA results, most exergy destruction of the Catalytic Converter is avoidable and exogenous. The destruction cost of the avoidable exergy for this component was 54.4 $ / h, which means that more than 50% of the total cost of the exergy destruction of the Catalytic Converter can be minimized to improve the performance of other equipment of the plant. Most exergy destruction costs for Tail Gas Heater, Absorption Tower and Air Heater, are unavoidable and endogenous and they cannot be reduced by improving the performance of these equipments. In addition, the cost of the exergy destruction of the Tail Gas Desuperheater is largely unavoidable (66.9 $ / h). In particular, 85%, 88% and 83% of the investment cost of the Tail Gas Desuperheater, the Absorption Tower and the Catalytic Converter, respectively, are exogenous; that is, it is only affected by the structure of the plant and the operation of the other components, but not by its internal thermodynamic inefficiencies.

Publication: International Mechanical Engineering Congress and Exposition. Volume 6: Energy, 11–14, November 2019

A flexible and simplified calibration procedure for fringe projection profilometry

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Abstract
Fringe Projection Profilometry (FPP) is a widely used technique for optical three-dimensional (3D) shape measurement. Among the existing 3D shape measurement techniques, FPP provides a whole-field 3D reconstruction of objects in a non-contact manner, with high resolution, and fast data processing. The key to accurate 3D shape measurement is the proper calibration of the measurement system. Currently, most calibration procedures in FPP rely on phase-coordinate mapping (PCM) or back-projection stereo-vision (SV) methods. The PCM technique consists in mapping experimental metric XYZ coordinates to recovered phase values by fitting a predetermined function. However, it requires accurately placing 2D or 3D targets at different distances and orientations. Conversely, in the SV method, the projector is regarded as an inverse camera, and the system is modeled using triangulation principles. Therefore, the calibration process can be carried out using 2D targets placed in arbitrary positions and orientations, resulting in a more flexible procedure. In this work, we propose a hybrid calibration procedure that combines SV and PCM methods. The procedure is highly flexible, robust to lens distortions, and has a simple relationship between phases and coordinates. Experimental results show that the proposed method has advantages over the conventional SV model since it needs fewer acquired images for the reconstruction process, and due to its low computational complexity the reconstruction time decreases significantly.

Publication: *Proceedings Volume 11057, Modeling Aspects in Optical Metrology VII*. 110571R (2019)

A methodology for driving behavior recognition in simulated scenarios using biosignals

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Abstract
The recognition of aggressive driving patterns could aid to improve driving safety and potentially reduce traffic fatalities on the roads. Driving behavior is strongly shaped by emotions and can be

divided into two main categories: calmed (non-aggressive) and aggressive. In this paper, we present a methodology to recognize driving behavior using driving performance features and biosignals. We used biosensors to measure heart rate and galvanic skin response of fifteen volunteers while driving in a simulated scenario. They were asked to drive in two different situations to elicit calmed and aggressive driving behaviors. The purpose of this study was to determine if driving behavior can be assessed from biosignals and acceleration/braking events. From two-tailed student t-tests, the results suggest that it is possible to differentiate between aggressive and calmed driving behavior from biosignals and also from longitudinal vehicle's data.

Publication: *Communications in Computer and Information Science*. Volume 1052, pp 357-367, October 2019

A structure-from-motion pipeline for generating digital elevation models for surface-runoff analysis

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Abstract
Digital Elevation Models (DEMs) are used to derive information from the morphology of a land. The topographic attributes obtained from the DEM data allow the construction of watershed delineation useful for predicting the behavior of systems and for studying hydrological processes. Imagery acquired from Unmanned Aerial Vehicles (UAVs) and 3D photogrammetry techniques offer cost-effective advantages over other remote sensing methods such as LIDAR or RADAR. In particular, a high spatial resolution for measuring the terrain microtopography. In this work, we propose a Structure from Motion (SfM) pipeline using UAVs for generating high-resolution, high-quality DEMs for developing a rainfall-runoff model to study flood areas. SfM is a computer vision technique that simultaneously estimates the 3D coordinates of a scene and the pose of a camera that moves around it. The result is a 3D point cloud which we process to obtain a georeference model from the GPS information of the camera and ground control points. The pipeline is based on open source software OpenSfM and OpenDroneMap. Encouraging experimental results on a test land show that the produced DEMs meet the metrological requirements for developing a surface-runoff model.

Publication: *Journal of Physics: Conference Series*. Volume 1247, conference 1, 2019

A proposal for an air quality monitoring system for Cartagena de Indias

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Abstract
This paper presents an Air Quality Monitoring System for the city of Cartagena de Indias, named Caeli. The goal of this system is to monitor the air quality in the city and to establish the current state of the air Cartagena's citizens breathe. Data is going to be acquired through a sensor network, and the information is going to be displayed on web or mobile application allowing access from anywhere in the world to anyone that may be interested. It is expected that the availability of this information allows research centers, educational institutions, and government to design plans for prevention and improvement of the air quality in the city based on historical and real-time data.

Publication: *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology*. 2019.

A sequential quadratic programming model for the economic-environmental dispatch in MT-HVDC

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Abstract
This paper addresses the economic-environmental dispatch problem for thermal plants on a Multi-terminal HVDC power grid. A multi-objective optimization approach is used for modeling the compromise between fuel costs and the greenhouse gas emissions by the thermal plants. The grid topology is also considered by proposing a convex reformulation of the power balance equations through Taylor's series expansion method. To eliminate the error introduced by this linear approximation a sequential quadratic programming approach is applied by solving the multi-objective problem by a single-objective equivalent via weighting factor approach. A standard 6-node HVDC system is used to validate the proposed convex formulation. All simulations are performed in MATLAB with the quadprog optimization package.

Publication: *IEEE Workshop on Power Electronics and Power Quality Applications*. 30-31 May 2019

A small vocabulary database of ultrasound image sequences of vocal tract dynamics

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Abstract
This paper presents a new database consisting of concurrent articulatory and acoustic speech data. The articulatory data correspond to ultrasound videos of the vocal tract dynamics, which allow the visualization of the tongue upper contour during the speech production process. Acoustic data is composed of 30 short sentences that were acquired by a directional cardioid microphone. This database includes data from 17 young subjects (8 male and 9 female) from the Santander region in Colombia, who reported not having any speech pathology.

Publication: *XXII Symposium on Image, Signal Processing and Artificial Vision*. 2019

Controller design for VSCs in distributed generation applications: An IDA-PBC approach

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Abstract
This paper presents an asymptotically stable global controller design for distributed energy integration in electrical distribution networks using a three-phase voltage source converter (VSC). An invariant Park's transformation is used to obtain the mathematical representation of the VSC in dq0 reference frame. To design of the proposed controller, interconnection and damping assignment passivity-based control (IDAPBC) theory is applied via a Hamiltonian representation for the open-loop dynamic as well as the desired closed-loop dynamic of the system. The control law obtained allows guaranteeing asymptotic stability properties in the sense of Lyapunov for closed-loop operation. To verify the robustness and effectiveness of the proposed controller a classic connection of a distributed generator with a VSC converter using an ideal voltage source in its DC side is employed. Simulation results show the capability of the proposed controller to support active and reactive power independently under

unbalance voltage conditions and harmonic distortion as well as the possibility of using the VSC as a dynamic power factor corrector. Additionally, all simulation scenarios are compared to classic PI controllers to show the good dynamic performance of the proposed controller using IDA-PBC theory. MATLAB/SIMULINK software is employed as simulation environment.

Publication: *2018 IEEE International Autumn Meeting on Power, Electronics and Computing*. March 2019

Diseño de un modelo de evaluación y medición de la madurez organizacional en gestión de proyectos y aplicación a compañías de armadores de Colombia

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Resumen
Los modelos de madurez organizacional en gestión de proyectos se consideran una herramienta útil para evaluar la capacidad actual de las organizaciones de administrar y llevar a cabo proyectos exitosos, incluyendo su alineación con la estrategia organizacional. A través de la revisión de la literatura, se ha construido un nuevo modelo de madurez organizacional en gestión de proyectos llamado "Análisis Natural del Ambiente Institucional Sistematizado" ANAIS M2. Este nuevo modelo se basa en los modelos de madurez OPM®, P3M3®, KPM3, P2M, CP3M©; y es soportado por 189 elementos de valoración que componen el nuevo modelo. Generando el plan de acción a seguir, basado en los elementos de valoración que no se han logrado como resultado de la evaluación. Luego, el nuevo modelo es probado con las compañías de armadores de Colombia, quienes entre 2013 - 2017 realizaron 907 proyectos y se clasificaron en el nivel de madurez 2: medio, según el modelo de madurez ANAIS M2.

Publicación: *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology*. 2019

Analysis of power losses in electric distribution system using a MATLAB-based graphical user interface (GUI)

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Abstract
This paper describes a graphical user interface (GUI) developed in MATLAB that provides a user-friendly environment for analyzing the power loss behavior in distribution networks with radial configurations. This GUI allows power systems analysts an easier understanding of the effect of the power dissipation in conductors. The implementation of this GUI implements three radial test feeders using 10, 33 and 69 nodes. As power flow methodology, the successive approximation power flow method was employed. The proposed GUI interface allows identifying the power loss performance in the distribution networks by including a distributed generator (DG) into the grid, operating with unity power factor. This DG is connected to each node to determine which connection provides with the optimal power loss minimization. Numerical results supported by the graphical analysis validate the applicability and importance of user-friendly GUI interfaces for analyzing power systems.

Publication: *Communications in Computer and Information, 6th Workshop on Engineering Applications*. pp. 565-576, 16–18 de October 2019

Alternative power flow method for direct current resistive grids with constant power loads: A truncated Taylor-based method

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Abstract
The power flow in electrical system permits analyzing and studying the steady-state behavior of any grid. Additionally, the power flow helps with the proper planning and management of the system. Therefore, it is increasingly necessary to propose power flows with fast convergence and high efficiency in their results. For this reason, this paper presents an alternative power flow approach for direct current networks with constant power loads based on a truncated Taylor-based approximation. This approach is based on a first-order linear approximation reformulated as a recursive, iterative method. It works with a slope variable concept based on derivatives, which allow few iterations and low processing times.

Numerical simulations permit identifying the best power flow approaches reported in the specialized literature for radial and mesh dc grids, including the proposed approach. All the simulations were conducted in MATLAB 2015a.

Publication:: *Journal of Physics: Conference Series*. Volume 1403, Number 1, 2019

Element Free Galerkin (EFG) sensitivity study in structural analysis

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Abstract
The present study shows a parametric analysis of the meshfree method, Element Free Galerkin (EFG), on the elastic analysis of a cantilever beam. This study allows us to determine the best convergence conditions of the solutions varying characteristic. EFG is based on the construction of Moving Least Squares (MLS) approximations using the weighted residual method on the weak formulation, with MLS form functions as the same weighting functions. We consider the parameters of the method such as the order of the basic functions of MLS functions, the size of the support domain of the local MLS functions and the density of Gauss points against errors calculated according to the L 2 norm and processing time. It is shown that by increasing the order of basic functions it is possible to obtain more precise results, however, a larger support diameter and Gauss point's higher density are required in order to stabilize the solution, considerably increasing processing times. Therefore, it is only advisable to use high-order base functions when the precision in the results is the priority and a high computational resource is available.

Publication: IOP Conference Series: Materials Science and Engineering. Volume 519, Number 1, 2019

Determination of the voltage stability index in DC networks with CPLs: A GAMS implementation

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Abstract
This paper addresses the voltage collapse analysis in direct-current (DC) power grids via nonlinear optimization approach. The formulation of this problem corresponds to an optimization problem, where the objective function is the maximization of the loadability consumption at all the constant power loads, subject to the conventional power flow balance equations. To solve this nonlinear non-convex optimization problem a large-scale nonlinear optimization package known as General Algebraic Modeling System (GAMS) is employed. Different nonlinear solvers available in GAMS are used to confirm that the optimal solution has been reached. A small 4-node test system is used to illustrate the GAMS implementation. Finally, two test systems with 21 and 33 nodes respectively, are used for simulation purposes in order to confirm both the effectiveness and robustness of the nonlinear model, and the proposed GAMS solution methodology.

Publication: Computer Sciences in Engineering, 6th Workshop on Engineering Applications. Proceedings, pp.552-564, 16–18 October 2019

Computation of electromagnetic fields for 220 kV power line in Cartagena de Indias

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Abstract
The growth of the cities towards the suburban areas has caused that the buildings are construct near the lines of high voltage. This has led to detailed studies of the electric and magnetic fields generated by these lines to determine the potential impact on the health of people within their area of influence. Therefore, it is necessary to calculate the profiles of the electric and magnetic fields, near the high voltage lines as a function of the distance to the center of the same and determine if the values are within the exposure limits accepted by national and international organizations. To achieve this, a program was written in Matlab that performs the calculation of the electric and magnetic field

profiles under the power transmission lines based on fundamental laws. The results were validated by measurements made in accordance with the procedures established by IEEE in a 220 kV electric transmission line located in the city of Cartagena de Indias.

Publication: *Communications in Computer and Information Science*. pp 616-627, October 2019

Hybrid metaheuristic optimization methods for optimal location and sizing DGs in DC networks

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Abstract
In this paper is proposed a master-slave method for optimal location and sizing of distributed generators (DGs) in direct-current (DC) networks. In the master stage is used the genetic algorithm of Chu & Beasley (GA) for the location of DGs. In the slave stage three different continuous techniques are used: the Continuous genetic algorithm (CGA), the Black Hole optimization method (BH) and the particle swarm optimization (PSO) algorithm, in order to solve the problem of sizing. All of those techniques are combined to find the hybrid method that provides the best results in terms of power losses reduction and processing times. The reduction of the total power losses on the electrical network associated to the transport of energy is used as objective function, by also including a penalty to limit the power injected by the DGs on the grid, and considering all constraints associated to the DC grids. To verify the performance of the different hybrid methods studied, two test systems with 10 and 21 buses are implemented in MATLAB by considering the installation of three distributed generators. To solve the power flow equations, the slave stage uses successive approximations. The results obtained shown that the proposed methodology GA-BH provides the best trade-off between speed and power losses independent of the total power provided by the DGs and the network size.

Publication: *Communications in Computer and Information Science*. pp 214-225, October 2019

Avoidable and unavoidable exergetic destruction analysis of a nitric acid production plant

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Abstract
Exergy analysis for Nitric acid production plants are very few and many are outdated. This study aims to support existing scientific studies and incite new investigations of exergy analysis in modern times. An advanced exergy analysis was applied to a production plant with a capacity to process 350 tons/day of nitric acid at a concentration of 55%. The catalytic oxidation of ammonia, condensation and absorption of nitrous gases are considered as the principal process in the nitric acid production. The total destroyed exergy was 46772, 55 KW. The component with the greatest impact was the catalytic converter, which presented 75.1% of the total avoidable exergy destruction rate of the plant. These findings are relevant as they can potentially reduce costs of nitric acid production.

Publication: *ASME 2018 International Mechanical Engineering Congress and Exposition*. January 15, 2019

Análisis de la gestión de proyectos de ciencia, tecnología e innovación bajo los principios del PMI

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Resumen
Los proyectos de Ciencia, Tecnología e Innovación presentan retos importantes desde el punto de vista de su gestión. En este artículo se realiza un análisis de la gestión de este tipo de proyectos basada en los principios de gestión de proyectos publicado por el Project Management Institute. El análisis se aplica al caso de los proyectos financiados por el Sistema General de Regalías de Ciencia, innovación y Tecnología en el departamento del Atlántico en Colombia. Con los resultados presentados pretendemos que las instituciones de ciencia y tecnología y los investigadores directores de los proyectos puedan tener mejores herramientas de gestión en la ejecución de este tipo de proyectos.

Publicación: *17th LACCEI International Multi-Conference for Engineering, Education, and Technology: "Industry, Innovation, and Infrastructure for Sustainable Cities and Communities"*. 24-26 Julio 2019

Evaluating features selection on NSL-KDD data Set to train a support vector machine-based intrusion detection system

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Abstract
The integrity of information and services is one of the more evident concerns in the world of global information security, due to the fact that it has economic repercussions on the digital industry. For this reason, big companies spend a lot of money on systems that protect them against cyber-attacks like Denial of Service attacks. In this article, we will use all the attributes of the data-set NSL-KDD to train and test a Support Vector Machine model. This model will then be applied to a method of feature selection to obtain the most relevant attributes within the aforementioned data-set and train the model again. The main goal is comparing the results obtained in both instances of training and validate which was more efficient.

Publication: *IEEE Colombian Conference on Applications in Computational Intelligence*. 5-7 June 2019

Developing a robust acquisition system for fringe projection profilometry

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Abstract
Since Fringe Projection Profilometry (FPP) is an intensity-based coding strategy, it is prone to improper optical setup arrangement, surface texture and reflectance, uneven illumination distribution, among others. These conditions introduce errors in phase retrieval, which lead to an inaccurate 3-D reconstruction. In this paper, we describe a dynamic approach toward a robust FPP acquisition in challenging scenes and objects. Our aim is to acquire the best possible fringe pattern image by adjusting the object closer to an ideal system-object setup. We describe the software implementation of our method and the interface design using LabVIEW. Experimental results demonstrate that the proposed method greatly reduces sources of error in 3-D reconstruction.

Publication: *Journal of Physics: Conference Series*. Volume 1247, conference, 2019

Current PI control for PV systems in DC microgrids: A PBC design

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Abstract
This paper proposes a passive PI control for applications of photovoltaic (PV) systems integrated with boost DC-DC converters. The proposed controller guarantees asymptotically stability in closed-loop for the boost DC-DC converter using Lyapunov theory. In addition, the proposed controller is robust to parametric uncertainties and unmodeled dynamics since it does not depend on the system parameters. The current control mode is selected for the PV system since it is modeled as a current source, where its current is computed as a function of solar irradiance and the cells temperature. The current reference is calculated to a perturbing and observe MPPT algorithm with a current-mode controlled to extract the maximum power available in this solar source. The PI-PBC applied to the boost DC-DC converter is compared with a classical PI approach for validating its effectiveness and the robustness. Simulation results are performed in MATLAB/Simulink with a switching frequency of 5 kHz.

Publication: *IEEE Workshop on Power Electronics and Power Quality Applications*. 30-31 May 2019

VSC with direct PI power control for frequency compensation in a microgrid: A PBC approach

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Abstract
The power systems with low inertia such as microgrids require advanced control strategies to improve their performance. These type of grids use voltage source converters to interconnect renewable energy sources and storage devices. The converters can present complementary ancillary services such as grid frequency response support. This paper uses a passive control strategy for power electronic converters based on direct power control model and presents the strategy to mitigate the fast changes of the dynamic grid frequency response. The real-time simulations validate the application of the method.

Publication: *IEEE XXVI International Conference on Electronics Electrical Engineering and Computing*. 12-14 August 2019

Generational diversity and quality of work life: case study in the Colombian logistic sector

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Abstract
Drawing upon generational differences in work values and attitudes, this article examines perception of quality of work life of three generational cohorts using survey data collected from 522 employees of the logistic sector of the Colombian Caribbean region. Results of ANOVA indicate that variables of quality of work life significantly differ depending on the generational membership of the employees. For example, Millennials were found to be a more distinct cohort from Gen Xers and Baby Boomers in terms of their relationship between promotion and career. However, the results suggest that employees in the older generations are likely to be more dedicated to, engrossed in, and even vigorous at work. Keywords: Quality of work life, Generational differences, Baby boomers, Generation X, Millennials or Generation Y.

Publication: *33rd International Business Information Management Association Conference, Education Excellence and Innovation Management through Vision 2020*. 10-11 April 2019

How to manage generations? an approach based on the quality of work life

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Abstract
The objectives of this research are to examine whether there are significant differences in the perception of quality of work life among employees of three generational cohorts (i.e., Baby Boomers, Generation Xers and Millennials) and to propose some strategies from HRM in order to manage these differences. We used survey data collected from 522 employees of the logistic sector in Colombia and conducted internal consistency analysis, correlation analyses and one-way ANOVA. Results of ANOVA indicate that variables of quality of work life significantly differ depending on the generational membership of the employees. For example, Millennials were found to be a more distinct cohort from Gen Xers and Baby Boomers in terms of their relationship between promotion and career. However, the results

suggest that employees in the older generations are likely to be more dedicated to, engrossed in, and even vigorous at work. For future studies, we recommend discussing how the knowledge on each generation in the workplace can inform specific HRM practices, such as how to train each generation effectively or to encourage each generation to improve work performance.

Publication: *IBIMA Business Review*. Volume 2019, Article ID 493697, 2019

Influence of vehicular traffic on environmental noise spectrum in the tourist route of Santa Marta City

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Abstract
Transportation demands large amounts of fuel. In particular, road transport greatly contributes to both criteria air pollutants and noise within cities. The influence of vehicular traffic on the environmental noise spectrum (as an indirect indicator of energy emission) was measured and assessed in the tourist route of Santa Marta along a 12-km road segment where five points were selected (three in the peripheral urban and two in the suburban areas). The number and type of vehicles as well as the noise levels were recorded at thirds of octave twice per day during two different weekdays. The traffic flow was composed of automobiles, with higher values in the peripheral urban area. According to the ANOVA, the noise spectrum indicated that low frequencies both had more energy than those with high frequencies and were influenced by the time of day. Low frequencies were influenced by all type of vehicles during the day, while high frequencies at both day and night, except for trucks (which were influenced in all spectrum). The results agreed with both the high velocities reached and the vehicle distribution.

Publication: *6th International Conference on Energy and Environment Research*. 22–25 July 2019

From a home-area-network to a secure internet of things application

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Abstract
In this paper, we present a secure system to control devices at home through the web, which we implement based on the Do It Yourself (DIY) culture. We use a model based on the Goal Question Metric approach to evaluate the quality of our system. Given that, we are now in the era of the Internet of Things (IoT), security must be at the same level or even in a higher priority than other aspects such as speed, size, and power consumption. The objective of this work is to verify that acceptable levels of confidentiality, integrity, availability, access control, authentication and non-repudiation can be guaranteed in open platforms such as Arduino, Galileo, Energía, Tiva C, among others. Taking into account these platforms, we developed a system with access control that implements motion detection, light control, and generates a power consumption record. The results show a comparison between our security implementation and other authors' implementation.

Publication: *Workshop on Engineering Applications, Applied Computer Sciences in Engineering*. pp 475-486, 2019

Optimal power flow studies in direct current grids: An application of the bio-inspired elephant swarm water search algorithm

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Abstract
Colombian power system is experienced important changes due to the large scale integration of renewable power generation based on solar and wind power; added to the fact that direct current networks have taken important attention, since they are efficient in terms of power loss and voltage profile at distribution or transmission levels For addressing this problem, this paper presents the application of an emerging bio-inspired metaheuristic optimization technique known as elephant swarm water search algorithm to the optimal power flow problem in direct current networks. A master-slave hybrid optimization strategy for optimal power flow analysis is addressed in this paper by decoupling this problem in two optimizing issues. The first problem corresponds to the selection of

the power generated by all non-voltage controlled distributed generators; While the second problem lies in the solution of the classical power flow equations in direct current networks. The solution of the master problem (first problem) is made by applying the elephant swarm water search algorithm, while the second problem (slave problem) is solved by a conventional Gauss-Seidel numerical method. The proposed hybrid methodology allows solving the power flow problem by using any basic programming language with minimum computational effort and well-precision when is compared with optimizing packages such as general algebraic modeling system/CONOPT solver and conventional metaheuristic techniques such as genetic algorithms.

Publication: *Journal of Physics: Conference Series*. Volume 1403, Number 1, 2019

Integrated methodology for the planning of electrical distribution system considering the continuity of the service and the reduction of technical losses

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Abstract
This article presents a methodology that allows to obtain an optimal plan of re-configuration of the local distribution system to 13.2 kV, considering the improvement in the continuity of the service to the users and the reduction of technical losses in the network. The methodology consists of two phases: The first deals with the problem of the reconfiguration of primary distribution circuits through permanent measures and temporary measures. The second phase ad-dresses one of the main problems in the planning of the expansion of distribution networks, which consists of the location of the distribution substations, which represent the main link between transmission and distribution systems. The implementation of the methodology allows to simulate different scenarios and constitutes a tool for the planning of the distribution system of the regional operators (OR) of the local distribution systems (LDS).

Publication: *Communications in Computer and Information Science*. pp 537-551, October 2019

ioT circuit design to monitor cold chain refrigerators

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Abstract
Under the concept of the Internet of Things, was designed a PCB to monitor faults in refrigerators or freezers, which use conventional compressors or non-inverters. It should be emphasized that these equipment belong to a cold chain, where it is considered approximately 2000 refrigerators. This solution includes among its main requirements Sigfox wireless communication, to send data or alarms from refrigerators or end nodes to the server in the cloud. One of the attractions to choose SigFox technology is its low cost as a communication service. Other aspects of design are: control the compressor, alert operational failures, measure the temperature inside the freezer, measure power consumption, voltage and current. Another fundamental requirement of the design is to achieve a low cost in its production to be in the margin of the sale of conventional temperature controllers, perhaps not equal, but not be well above the commercial value. With these premises, the hardware architecture is basically composed by a Switched-Mode Power Supply (SMPS), a control unit with a PIC32, 5VDC relays to switch an output of 220V AC, NTC temperature sensor, Power meter IC, battery charger, Sigfox communication module and E-Paper Display.

Publication: *Latin American Electron Devices Conference*. 24-27 February 2019

Optimal power flow solution in direct current grids using Sine-Cosine algorithm

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Abstract
In the next years, Colombian power system will have the connection of distributed generators and constant power loads; therefore, it is necessary to propose the analysis methods that allow establishing the minimum requirements that have to be satisfied for the power system to guarantee an optimal power flow in order to preserve safe and reliable operation of it. For this purpose, in this paper presents an optimal power flow in direct current resistive grids with constant power loads and distributed

generators. The optimal power flow problem is formulated as a master-slave optimization algorithm. The master stage covers the dispatching of all the distributed generators by using the Sine-Cosine algorithm. In the slave stage, an efficient power flow method based on successive approximations is employed to determine the voltage variables and evaluate the objective function of the problem, which corresponds to the power loss minimization. A direct current distribution network composed by 21 nodes is used as test case by comparing its numerical performance with nonlinear optimization packages and two metaheuristic approaches named black-hole optimization and continuous genetic algorithm. All the simulations are conducted via MATLAB software.

Publication: *Journal of Physics: Conference Series*. Volume 1403, Number 1, 2019

Perchlorate toxicity in organisms from different trophic levels

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Abstract
Perchlorate (ClO 4-) is an emerging inorganic pollutant widely distributed in the environment, derived from natural and anthropogenic sources. It is considered a potent endocrine disruptor that affect the iodine fixation by the thyroid gland, impacting metabolism, reproduction and development in the biota. However, there are few reports of its ecotoxicological impact on wildlife. The objective of this work was to evaluate the adverse effects of perchlorate exposure on different models, HEK, N2a and 3T3 cell lines, Vibrio fischeri, Pseudokirchneriella subcapitata, Daphnia magna and Perchlorate exhibited similar toxicity against Eisenia fetida tested cell lines, with LC 50 values of 19, 15 and 19 mM for HEK, N2a and 3T3, respectively. In V. fischeri the toxicity, measured as reduction of bioluminescence, was considerably lower (EC 50 = 715 mM). The growth of the freshwater algae P. subcapitata was impaired by perchlorate with an LC 50 value of 72 mM, and the toxic response on D. magna was greater (LC 50 = 5 mM). Finally, in the earthworm E. fetida, perchlorate induced avoidance behavior, weight loss, decrease egg production and hatchling, as well as morphological and histopathological effects, such as malformations, dwarfism and necrosis, displaying an LC 50 of 56 mM in soil. In conclusion, exposure to perchlorate has a significant impact on the survival, development and reproduction of organisms from different trophic levels.

Publication: *Toxicology Letters*. September 2019

Location of FACTS devices in power systems: application to the IEEE 9 bus system

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Abstract
This paper proposes a methodology to find the location of a flexible transmission system in AC in a power system, based on a nodal order and the analysis of repetitive power flows. To check the proposed methodology, the IEEE 9 bus system was taken as a case study. Results obtained were analyzed in two moments, initially the power flow is simulated without modifications, reading of the loss variables in the transmission lines, power factor, active and reactive power and voltage in p.u. in the buses. Then the power flow is simulated again and the resulting values are taken and compared with those initially taken, finding that by locating the device in bus 5, a better response is obtained.

Publication: *IEEE XXVI International Conference on Electronics, Electrical Engineering and Computing.* 12-14 Aug. 2019

Modelo de innovación inversa: Una propuesta para el contexto colombiano

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Resumen
La innovación inversa es la generación de productos y servicios de alto impacto en el mercado a un bajo costo para las compañías de las economías emergentes, muchas de las innovaciones que bordarán las futuras décadas se diseñarán para y desde el mercado emergente, a menudo por empresas con recursos y talento humano de estos países siendo un reto en estos entornos de los principales países emergentes como lo es en el caso Colombia un mercado en crecimiento aunque con limitación de recursos y de infraestructuras estables, así como el poder adquisitivo limitado del público y con un potencial creativo bastante alto; Todos estos productos y servicios innovadores que sean capaces de triunfar en un segmento de clientes de bajo poder adquisitivo podrían ser utilizados como modelos replicables en mercados de poder adquisitivo altos. La importancia de la innovación inversa no es un tema netamente académico, por el contrario, la intención de este documento es el diseño de un modelo

en donde las empresas puedan gestionar innovación inversa en las empresas y ser empresas de talla mundial, basado en una metodología exploratoria descriptiva el cual busca y recopila los distintos modelos de innovación inversa según cada autor y a partir del constructo poder establecer un modelo que considere los elementos necesarios adaptados al contexto del mercado emergente colombiano.

Publicación: 17th LACCEI International Multi-Conference for Engineering, Education, and Technology. 24-26 Julio 2019

Robust detection and removal of dust artifacts in retinal images via dictionary learning and sparse-based inpainting

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Abstract
Retinal images are acquired with eye fundus cameras, which, like any other camera, can suffer from dust particles attached to the sensor and lens. These particles impede light from reaching the sensor, and therefore they appear as dark spots in the image which can be mistaken as small lesions like microaneurysms. We propose a robust method for detecting dust artifacts from more than one image as input and, for the removal, we propose a sparse-based inpainting technique with dictionary learning. The detection is based on a closing operation to remove small dark features. We compute the difference with the original image to highlight the artifacts and perform a filtering approach with a filter bank of artifact models of different sizes. The candidate artifacts are identified via non-maxima suppression. Because the artifacts do not change position in the images, after processing all input images, the candidate artifacts which are not in the same approximate position in different images are rejected and kept unchanged in the image. The experimental results show that our method can successfully detect and remove artifacts, while ensuring the continuity of retinal structures, such as blood vessels.

Publication: *Pattern Recognition and Tracking XXX*. Volume 10995, May 2019

LRemoving dust artifacts in retinal images via dictionary learning and sparse-based inpainting

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Abstract
In the field of ophthalmology, retinal images are essential for the diagnosis of many diseases. These images are acquired with a device called the retinal camera. However, often small dust particles in the sensor produce image artifacts that can be confused with small lesions, such as micro-aneurysms. The digital removal of artifacts can be understood as an inpainting process in which a set of pixels are replaced with a value obtained from the surrounding area. In this paper, we propose a methodology based on the sparse representations and dictionary learning for the removal of artifacts in retinal images. We test our method on real retinal images coming from the clinical setting with actual dust artifacts. We compare our restoration results with a diffusion-based inpainting technique. Encouraging experimental results show that our method can successfully remove the artifacts, while assuring the continuity of the retinal structures, like blood vessels.

Publication: *XXII Symposium on Image, Signal Processing and Artificial Vision*. 24-26 April 2019

Sine-cosine algorithm for OPF analysis in distribution systems to size distributed generators

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Abstract
This paper addresses the analysis the optimal power flow (OPF) problem in alternating current (AC) radial distribution networks by using a new metaheuristic optimization technique known as a sine-cosine algorithm (SCA). This combinatorial optimization approach allows for solving the nonlinear non-convex optimization OPF problem by using a master-slave strategy. In the master stage, the soft computing SCA is used to define the power dispatch at each distributed generator (dimensioning problem). In the slave stage, it is used a conventional radial power flow formulated by incidence matrices is used for evaluating the total power losses (objective function evaluation). Two conventional

highly used distribution feeders with 33 and 69 nodes are employed for validating the proposed master-slave approach. Simulation results are compared with different literature methods such as genetic algorithm, particle swarm optimization, and krill herd algorithm. All the simulations are performed in MATLAB programming environment, and their results show the effectiveness of the proposed approach in contrast to previously reported methods.

Publication: *Communications in Computer and Information Science book series*. Volume 1052, pp. 28-39, October 2019

Using data-mining techniques for the prediction of the severity of road crashes in Cartagena, Colombia

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Abstract
Objective: Analyze the road crashes in Cartagena (Colombia) and the factors associated with the collision and severity. The aim is to establish a set of rules for defining countermeasures to improve road safety. Methods: Data mining and machine learning techniques were used in 7894 traffic accidents from 2016 to 2017. The severity was determined between low (84%) and high (16%). Five classification algorithms to predict the accident severity were applied with WEKA Software (Waikato Environment for Knowledge Analysis). Including Decision Tree (DT-J48), Rule Induction (PART), Support Vector Machines (SVMs), Naïve Bayes (NB), and Multilayer Perceptron (MLP). The effectiveness of each algorithm was implemented using cross-validation with 10-fold. Decision rules were defined from the results of the different methods. Results: The methods applied are consistent and similar in the overall results of precision, accuracy, recall, and area under the ROC curve. Conclusions: 12 decision rules were defined based on the methods applied. The rules defined show motorcyclists, cyclists, including pedestrians, as the most vulnerable road users. Men and women motorcyclists between 20–39 years are prone in accidents with high severity. When a motorcycle or cyclist is not involved in the accident, the probable severity is low.

Publication: *Communications in Computer and Information Science*. Volume 1052, pp 309-320

Selection of a stopping criterion for anisotropic diffusion filtering in ultrasound images

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Abstract
Ultrasound imaging is a safe and cost-effective diagnostic tool, but the quality of the images is affected by speckle noise and artifacts. Anisotropic diffusion filters can be used to reduce noise and preserve the edges in the image. However, this technique is very sensitive to the number of iterations selected. This paper proposes a stopping criterion for effective noise removal without blurring the edges, based on the relative variance between the estimated denoised image and the original one. Different quality metrics were evaluated in 25 test images. The results suggest that the proposed stopping criterion can be implemented efficiently and aids in the process of automation of the filter.

Publication: *XXII Symposium on Image, Signal Processing and Artificial Vision*. 24-26 April 2019

Output voltage regulation for DC-DC buck converters: a passivity-based PI design

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Abstract
This paper presents a global tracking passivity-based proportional-integral (PI) control for output voltage regulation of a dc-dc Buck converter. The proposed controller is based on passivity formulation since dc-dc Buck converter has a passive structure in open-loop. Additionally, the controller takes advantage of the PI actions to design a control law that guarantees asymptotically stability in the Lyapunov's sense under closed-loop operation. The proposed controller does not depend on the parameters, which makes it a robust controller. The robustness of the proposed controller is checked by comparing its dynamical performance in front of a conventional PID controller. All simulation results were fulfilled via MATLAB software.

Publication: *IEEE 10th Latin American Symposium on Circuits & Systems*. 24 – 27 February 2019

Sustainable boat transportation throughout electrification of propulsion systems: Challenges and opportunities

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Abstract
Global use of carbon-based fuels increased by 1.6 % in 2017 and continued increasing in 2018, after managing to maintain emissions flat between 2014-2017. This trend deviates from the emissions trajectory required to fulfill the climate change goals to maintain the earth's temperature below 2-degrees. The transport sector accounts for about a quarter of these emissions but it is the sector with the highest dependence on fossil-fuels. In order to reduce emissions, several approaches have been taken, from increasing fuel efficiency to the use of alternative fuels altogether. The most recent trend leans towards electrifying the transport sector. High penetration of mature renewable energy technologies such as wind and solar photovoltaics as well as energy storage improvements are leading the way. While mass adoption of electric-propulsion systems for boats are still years away, recent pilot projects suggest that electrifying boats for passenger transportation may be not only a sustainable transport solution but its lower operation costs could facilitate its penetration on densely populated coastal and river cities where conventional public transport systems are reaching their full capacity.

Publication: *2nd Latin American Conference on Intelligent Transportation Systems*. 19-20 March 2019

Project management Tools and Techniques (T&T) usage in building sector companies in Cartagena City, T.C.D.

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Abstract
This research work was based on an analysis of project management tools and techniques usage and its practical application in the construction sector. It is a fact that projects currently have a high failure rate which was corroborated in this research work through a diagnosis carried out in the city of Cartagena to 22 project managers of important construction companies that currently execute housing projects and therefore, it was determined that techniques and tools of worldwide recognition and suggested by the most relevant standards and methodology are not being used in construction projects. In this work,

the deficiencies and strengths of the companies were shown when applying the project management techniques and tools; a guide was prepared to use them through specific recommendations to the construction sector.

Publication: *17th LACCEI International Multi-Conference for Engineering, Education, and Technology*. 24-26 July 2019

A machine learning approach for banks classification and forecast

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Abstract
In this research, a classification model is developed for the banking sector using the machine learning technique GLMNET. In the first place, a clustering process was developed, where 3 clearly differentiated groups were found. Subsequently, a Fuzzy analysis was performed finding the probabilities of transition of the banks to each group found, finally, the GLMNET algorithm was implemented, the automatic classification of the banks according to their financial items, obtaining a result of 95% accuracy.

Publication: *33rd IBIMA Conference*. 10-11 April 2019

Texture analysis of ultrasound images for pneumonia detection in pediatric patients

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Abstract
Pneumonia is a condition that can be life-threatening and affects a high number of children around the world. Lung ultrasound can be used for the diagnosis of pneumonia, but requires high experience. This paper presents an approach for pneumonia detection based on texture analysis of ultrasound

images. Several measures were taken in healthy tissues and pneumonia lesions, and the most significant features were identified by statistical analysis. The results of the analysis of variance and exploratory analysis suggest that detection of pneumonia is possible based on image texture features.

Publication: *XXII Symposium on Image, Signal Processing and Artificial Vision*. 24-26 April 2019

Application of spatio-temporal filtering for atrial activity waveforms enhancement

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Abstract
In this paper, we propose to apply patios-temporal filtering to atrial activity enhancement, prior to the detection of possible atrial arrhythmias. During normal sinus rhythm, the atrial activity is well synchronized with the ventricular one. The distances between ventricular QRS complexes and the preceding atrial P waves are approximately constant. However, during atrial arrhythmias such a synchronization does not exist. Although both atrial fibrillation (AF) and atrial flutter (AFL) are also characterized by irregularity of RR intervals, nevertheless it is this lack of atrioventricular synchronization and the associated irregularity of atrial activity (AA) that is the most straightforward symptom of atrial arrhythmias. In AFL episodes, the atrial activity tends to be more regular, whereas in AF it is almost completely unpredictable. Our objective is to enhance this activity to facilitate discrimination between the two arrhythmias. Spatio-temporal filtering (STF) was developed for detection of fetal QRS complexes in an ECG signal recorded from the abdomen of a pregnant woman. The filter can easily be applied to enhance the P waves in regular ECG signals. In this paper, however, we modify the learning phase of STF, to make it useful also for enhancement of abnormal atrial activity. The STF ability to enhance the atrial flutter waves is presented. An algorithm is proposed that allows for simple but effective discrimination between the two types of atrial irregular activity: AFL and AF. Tested on a database containing the cases of both atrial arrhythmias, the algorithm allows for their almost faultless recognition.

Publication: *2nd International Conference on Sensors, Signal and Image Processing.* pp. 67–72, October 2019

Toward an automatic 3D measurement of skin wheals from skin prick tests

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Abstract
The skin prick test (SPT) is the standard method for the diagnosis of allergies. It consists in placing an array of allergen drops on the skin of a patient, typically the volar forearm, and pricking them with a lancet to provoke a specific dermal reaction described as a wheal. The diagnosis is performed by measuring the diameter of the skin wheals, although wheals are not usually circular which leads to measurement inconsistencies. Moreover, the conventional approach is to measure their size with a ruler. This method has been proven prone to inter- and intra-observer variations. We have developed a 3D imaging system for the 3D reconstruction of the SPT. Here, we describe the proposed method for the automatic measurements of the wheals based on 3D data processing to yield reliable results. The method is based on a robust parametric fitting to the 3D data for obtaining the diameter directly. We evaluate the repeatability of the system under 3D reconstructions for different object poses. Although the system provides higher accuracy in the measurement, we compare the results to those produced by a physician.

Publication: *Dimensional Optical Metrology and Inspection for Practical Applications VIII*. Volume 10991, May 2019

Administrative efficiency of IPS providers of health Entities accredited in quality in Colombia

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Abstract
This study evaluated the efficiencies of the IPS health providers accredited in quality in Colombia. The normative framework associated with the Mandatory Quality System, the quality accreditation standards for the IPS and the Data Envelopment analysis models, related to the purely technical or administrative efficiency were used as theoretical support. As an epistemological conception, we worked

with the logical positivism paradigm, with which the scientific verification and the logical analysis for the development of all the research were sought. The research type had an evaluative approach. As a population, 27 accredited IPS health service providers were taken, which lent their financial statements to the superintendence of health in 2015 and 2016. The inductive and deductive method was used. The information generated by the health superintendence and the Ministry of Health were used as primary sources. The DEA BCC-O model focused on the optimization of outputs was used as an analysis technique. As a result of this research, a method to evaluate the efficiencies of high-quality accredited IPSs in Colombia was provided. Likewise, it could be demonstrated with empirical evidence that the implementation of high-quality standards in the IPSs studied has a significant impact on administrative efficiency. The research showed that the best IPS accredited in Colombia was the Pablo VI Hospital in Bosa.

Publication: *33rd IBIMA Conference*. 10-11 April 2019

Voice compression using discrete cosine transform and wavelet transform

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Abstract
Compressing information, such as voice, allows freeing up memory space, better utilizing bandwidth, in other words taking advantage of resources more efficiently in a time where technologies such as Voice over Internet Protocol are booming and the demand for information it requires higher speeds and quality. Therefore, this paper presents the acquisition and digital processing of voice signals, as well as the application of the discrete cosine transform and the wavelet transform using Matlab software version 2017b, licensed by the Technological University of Bolivar. Likewise, a criterion is established in order to eliminate little relevant information without affecting the quality of the output signal for which indicators such as the signal to noise ratio and the mean square error are calculated.

Publication: *Journal of Physics: Conference Series*. Volume 1403, 20–21 August 2019

Voltage and frequency regulation on isolated AC three-phase microgrids via s-DERs

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Abstract
This paper addresses the voltage regulation problem on isolated three-phase microgrids via passivity-based control (PBC) with a proportional regulator under the abc reference frame. This reference frame is employed to design the proportional controllers to support voltage and frequency profiles on time-varying loads through a combination of small distributed energy resources and battery energy storage systems. The proposed approach avoids using frequency measurements and reduces the complexity of the control problem. PBC theory exploits natural port-Hamiltonian formulations of the power electronic converters to design controllers, guaranteeing stability for closed-loop operation. Two passivity-based proportional controllers are proposed and compared with conventional proportional actions reported in specialized literature. Simulation results show the effectiveness and robustness of the proposed approach to fulfill the control tasks.

Publication: *IEEE Green Technologies Conference*. 3-6 April 2019

Vortex search algorithm for optimal sizing of distributed generators in AC distribution networks with radial topology

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Abstract
This paper proposes a vortex search algorithm (VSA) optimization for optimal dimensioning of distributed generators (DGs), in radial alternating current (AC) distribution networks. The VSA corresponds to a metaheuristic optimization technique that works in the continuous domain, to solve nonlinear, non-convex, large-scale optimization problems. Here, this technique is used to determine the optimal power generation capacity of the DGs from the top-down analysis. From the bottom-up, a conventional backward/forward power flow is employed for determining the voltage behavior and

calculate the power losses of the network, for each power output combination in the DGs. Numerical results demonstrate that the proposed approach is efficient and robust for reducing power losses on AC grids by optimally sizing the capacity the DGs, compared with other approaches found on literature reports. All the simulations were conducted using the MATLAB software.

Publication: *Communications in Computer and Information Science*. Volume 1052, pp 235-249, October 2019

A case study approach to introduce circular economy in sustainable design education

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Abstract
Finding sustainable solutions to worldwide problems has become a critical challenge for engineers. The use of natural resources and the generation of materials now degradable should be controlled when sustainable solutions are pursued. As a result, the notion of reusing materials and products for longer periods is gaining momentum in the design for sustainability, and the circular economy is becoming the new paradigm to be implemented for that purpose. In contrast to the traditional linear economy that is based on making, using and disposing of products, the circular economy is focused on remanufacturing, reusing and recycling products and materials to extend their life. However, the circular economy is not formally introduced in the academia, and future engineers are not getting prepared to incorporate it into the design for sustainability. This work aims to propose a pedagogical approach to introduce the concept of circular economy in engineering design. A case study is presented to compare the design of a product based on the linear economy model (manufacture, use, waste) and the redesign of the product using the circular economy model (remanufacture, reuse, recycle). The comparison will be attained using sustainability performance indicators considered from early design stages. The contrast between the original design based on the linear economy and the re-design using the circular economy allows illustrating the benefits of the circular economy model to enhance the sustainability performance of a product.

Publication: *Proceedings of the 21st International Conference on Engineering and Product Design Education*. 12 -13 September 2019.

Use of edge computing for predictive maintenance of industrial electric motors

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Abstract
Industrial Internet of Things has become a reality in many kind of industries. In this paper, we explore the case of high quantity of raw data generated by a machine. In the aforementioned case is not viable store and process the data in a traditional Internet of Things architecture. For this case, we use an architecture based on edge computing and Industrial Internet of Things concepts and apply them to a case of machine monitoring for predictive maintenance. The proof of concept shows the potential benefits in real industrial applications.

Publication: *Communications in Computer and Information Science*. Volume 1052, pp 523-533, October 2019

Robust adaptive control of a planar 3RRR parallel robot for trajectory-tracking applied to crouch gait cycle in children with cerebral palsy

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Abstract
This paper presents the modelling, control and simulation of a 3RRR planar parallel robot, using a robust adaptive control strategy. The objective of this work is to achieve the control over desired trajectory-tracking of the joint pattern with the end-effector of robot, considering the disturbances during the crouch gait activity in children with cerebral palsy. The kinematic analysis is based on the screw theory. A dynamical modelling by Virtual Work formulation approach is developed. The performance of the robust adaptive control law is developed using Lyapunov's Direct Method and Barbalat's lemma. Furthermore, the controller is evaluated in Matlab/Simulink simulation environment with the physic model simulated through Simscape Multibody. The angular position errors, velocity errors and output torques for each motor are calculated. Simulation results show that the proposed controller has good efficiency with stable response of the robot in performing trajectory-tracking.

Publication: *IEEE 4th Colombian Conference on Automatic Control*. 15-18 October 2019

Implementing a like-industrial process for control education

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Abstract
Nowadays, one of the main difficulties experienced by engineering students is the ability to assimilate theoretical concepts and apply them in practice, especially in the industrial field. Although there are different educational prototypes in the market, these are generally expensive and their constructive details are not accessible to the user. This paper describes the implementation of a didactic equipment for the independent control of two variables, level and flow. The equipment allows to select a type of control equipment, PLC or SLC and can also show the process variables in real time in an HMI panel.

Publication: *IEEE 4th Colombian Conference on Automatic Control.* 15-18 October 2019

PBC approach applied on a DC-DC step-down converter for providing service to CPLs

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Abstract
This paper addresses the problem of output voltage regulation for step-down converters (buck converters) for constant power load (CPL) applications. The model of the CPL corresponds to a hyperbolic constraint that introduces nonlinearities on the dynamical model. To regulate the voltage profile in this nonlinear load a passivity-based control (PBC) approach is proposed. The main advantage of the proposed control approach corresponds to the parametric independence of the controller, even if the CPL and the asymptotic stability in the sense of Lyapunov are unknown. Numerical results validate the proposed control approach in comparison to conventional PID controller.

Publication: *IEEE 4th Colombian Conference on Automatic Control.* 15-18 October 2019

Determination of the optimal range of the compressor inlet air temperature in a power plant with stig cycle through of advanced exergetic analysis

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Abstract
Conventional exergy analysis identifies the more inefficient components; however, this doesn't regard interaction between components, neither real improvement potential to each component of the system, this information is providing for the advanced exergy analysis. In this paper was developed an advanced exergy analysis to determine the optimal range of the compressor inlet air temperature, to compensate the power loss in a power plant with Stig cycle and an air cooling system. This plant without cooling system at ISO conditions produce 52 MW, while in local conditions (32 °C, 80%RH) its productions decreases to 44.3MW. The results showed that for every degree centigrade that the air temperature decreases at inlet compressor the power output increases in 0.17 MW and total destroyed exergy increases 0.23 MW. It was determined that for the optimal range of compressor inlet air temperature is between 10 and 12°C; at this range were obtained the highest power output values, and the values of the avoidable and endogenous exergy destroyed are diminished in 0.28 MW and 0.20 MW respectively compared to those given in local operating conditions.

Publication: *International Mechanical Engineering Congress and Exposition*. Volume 6: Energy, 11–14, November 2019

Acquisition and analysis of cognitive evoked potentials using an emotiv headset for ADHD evaluation in children

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Abstract
Attention-deficit/hyperactivity disorder (ADHD) is a neurological condition that affects the quality of life of the patients. It can be diagnosed using a combination of psychological tests. In addition to that, the brain activity of the patients can be analyzed using electroencephalography (EEG). The application of EEG tests requires the cooperation of the patients, which can be challenging in patients

with ADHD. This paper describes the development of a system for stimuli generation, and acquisition and analysis of cognitive evoked potentials using the commercial system Emotiv EPOC+ headset. The results show that the system allows precise and reliable measurements of the P300 waves in children, and may provide a more comfortable experience for the patients compared to medical-grade systems.

Publication: *XXII Symposium on Image, Signal Processing and Artificial Vision*. 24-26 April 2019

Bots and gender profiling on twitter using sociolinguistic features notebook for PAN at CLEF 2019

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Abstract
Unfortunately, in social networks, software bots or just bots are becoming more and more common because malicious people have seen their usefulness to spread false messages, spread rumors and even manipulate public opinion. Even though the text generated by users in social networks is a rich source of information that can be used to identify different aspects of its authors, not being able to recognize which users are truly humans and which are not, is a big drawback. In this work, we describe the properties of our multilingual classification model submitted for PAN2019 that is able to recognize bots from humans, and females from males. This solution extracted 18 features from the user's posts and applying a machine learning algorithm obtained good performance results.

Publication: *20th Working Notes of CLEF Conference and Labs of the Evaluation Forum, CLEF*. Volume 2380, September 2019

Wide-field 3D imaging with an LED pattern projector for accurate skin feature measurements via Fourier transform profilometry

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Abstract
Accurate 3D imaging of human skin features with structured light methods is hindered by subsurface scattering, the presence of hairs and patient movement. In this work, we propose a wide-field 3D imaging system capable of reconstructing large areas, e.g. the whole surface of the forearm, with an axial accuracy in the order of 10 microns for measuring scattered skin features, like lesions. By pushing the limits of grating projection, we obtain high-quality fringes within a limited depth of field. We use a second projector for accurate positioning of the object. With two or more cameras, we achieve independent 3D reconstructions automatically merged in a global coordinate system. With the positioning strategy, we acquire two consecutive images for absolute phase retrieval using Fourier Transform Profilometry to ensure accurate phase-to-height mapping. Encouraging experimental results show that the system is able to measure precisely skin features scattered in a large area.

Publication: *Dimensional Optical Metrology and Inspection for Practical Applications VIII*. Volume 10991, May 2019

Estimation of soil resistivity by the assembly of a vertical electrical sounding equipment at a university campus at Turbaco, Bolivar

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Abstract
A low-cost geoelectric equipment was implemented for academic purposes to carry out the Vertical Electrical Sounding method in order to determine the resistivity and depth of a point on the surface of a university zone and obtain the contrasts of that resistivity parameter for each type of soil. A model was reproduced at the laboratory to calibrate the equipment, and then the technique was tested in the field. Among the results, layers of sandy loam, soft limestone and dark clay with thicknesses of 0.3 m, 0.75 m and 12 m respectively were obtained; finally, a clear clay was obtained whose thickness is unknown. These were compared with reference samples by well drilling method. There was a

concordance between the results through the method of statistical confidence intervals with a normal distribution. The data behaved according to a soil model of lower-higher-lower resistivity.

Publication: *Journal of Physics: Conference Series*. Volume 1247, conference 1, 2019

STAT1 and miR155 expression in human prostate cancer tissue

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Abstract
Background: Transcription factors (TFs) and microRNAs (miRNAs) form a gene regulatory network at transcriptional and posttranscriptional level. Increasing evidence shows that miRNAs regulates molecular pathways in cancer by targeting various oncogenes and tumor suppressor genes. However, the mutual regulations between TFs and miRNAs in cancer cells have not been well characterized. Signal transducer and activator of transcription 1 (STAT1) has been reported as a tumor suppressor, but recent evidence suggests that may also play a tumor-promoting role. An STAT1-miR155 feedback loop has been identified in normal tissues. We aimed to explore the STAT1 and miR155 expression in prostate cancer by a bioinformatics analysis combined with immunohistochemical evaluation of STAT1 in normal and prostate cancer tissues.

Publication: *AACR Annual Meeting 2019*. March 29-April 3, 2019

Modeling of dynamic mass coupled system with Runge-Kutta fourth order

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Abstract
This paper shows the mathematical modeling process of a mechanical system of masses coupled by two springs and a shock absorber. The process of capture of movement of the mass system coupled

with springs was done with software Tracker video analysis and modeling tool. The motion capture of the coupled masses A and B was made with a duration of 20 seconds. A comparison of the results of the movement of the two masses will be established as a first instance, by adjusting trajectories of curves in time using Matlab software and as a second instance a numerical solution of the Mass-Spring model will be established using the Runge Kutta method of 4 order. With this last method, it is expected to achieve a better precision modeling of the initial value problem. Finally, a comparison of the two mathematical models will be made analyzing.

Publication: *IOP Conference Series: Materials Science and Engineering*. Volume 519, Number 1, May 2019

Noise-robust processing of phase dislocations using combined unwrapping and sparse inpainting with dictionary learning

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Abstract
The problem of phase unwrapping from a noisy and also incomplete wrapped phase map arises in many optics and image processing applications. In this work, we propose a noise-robust approach for processing regional phase dislocations. Our approach combines phase unwrapping and sparse-based inpainting with dictionary learning to recover the continuous phase map. The method is validated both using numerically simulated data with strong additive white Gaussian noise and phase dislocations; and experimental data from fringe projection profilometry. Comparisons with other phase inpainting method referred to as PULSI+INTERP, show the suitability of the proposed method for phase restoration even in extremely noisy phases. The error given by the proposed method on the highest level of noise (RMSE=0.0269 Rad) remains the smallest compared to the error given by PULSI+INTERP for noise-free data (RMSE=0.0332 Rad).

Publication: *XXII Symposium on Image, Signal Processing and Artificial Vision*. 24-26 April 2019

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