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FACULTAD POLITÉCNICA
DIRECCIÓN DE INVESTIGACIÓN

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PRODUCCIÓN CIENTÍFICA DE LA FP-UNA 2022

ABSTRACT BOOK

CAMPUS DE LA UNA
SAN LORENZO, PARAGUAY

PRODUCCIÓN CIENTÍFICA DE LA FP-UNA 2022

Abstract Book

Volumen 1

UNIVERSIDAD NACIONAL DE ASUNCIÓN
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Campus de la UNA, San Lorenzo
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UNIVERSIDAD NACIONAL DE ASUNCIÓN
Facultad Politécnica
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PRODUCCIÓN Y EDICIÓN
María Elena Torres

RECOPILACIÓN
María Elena Torres
María del Rosario Rodríguez

DISEÑO DE TAPA Y CONTRATAPA
Claudia Maldonado

PUBLICACIÓN FP-UNA
Dirección de Investigación
Campus de la UNA San Lorenzo – Paraguay
investigacion@pol.una.py
https://www.pol.una.py/investigacion/
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CONTENIDO

PRESENTACIÓN

El desarrollo de una sociedad se alcanza con los aportes positivos de la ciencia y la tecnología, ya sea desde los espacios de la educación, los centros de investigación, la industria u otros ámbitos de investigación, donde la curiosidad, el deseo de descubrir y encontrar respuestas converjan.

La FP-UNA es una institución académica que apuesta al desarrollo educativo de alto nivel, tanto en grado como en posgrado. Al mismo tiempo, realiza actividades de investigación a través de los grupos de investigación en los sectores de Electrónica, Electricidad, Energía, Aeronáutica, Producción Industrial, Informática y Computación, Hotelería y Turismo, Bioinformática, Ciencias de la Información y Biomateriales.

Se cuenta con 2 núcleos de investigación, 13 grupos de investigación consolidados, 6 grupos de investigación en formación y 3 laboratorios de investigación con servicios activos.

Este documento tiene por objeto exponer a toda la comunidad educativa parte del conocimiento generado por los investigadores de la Facultad Politécnica durante el año 2022. Está organizado en tres grandes capítulos:

*Artículos publicados en revistas científicas

*Trabajos completos y resúmenes publicados en eventos internacionales, y

*Capítulos de libros

En las páginas de cada capítulo de este material se podrán encontrar, debajo de los títulos, organizados por orden alfabético, los autores de los trabajos, el DOI (si lo tuviere), el link que redirecciona al artículo original o, al menos, a la información original; el título de la publicación, y el abstract o resumen.

A través de la revisión de este libro, invitamos a disfrutar de una agradable lectura de las diferentes contribuciones y hallazgos desarrollados en las áreas de ciencia y tecnología por los investigadores de la FP-UNA durante 2022.

Artículos publicados en revistas científicas

Bounds on the spectral sparsification of symmetric and off-diagonal nonnegative real matrices

Mercado, Sergio; Villagra, Marcos

DOI: https://doi.org/10.1142/S1793830921501093
Link: https://www.worldscientific.com/doi/10.1142/S1793830921501093

Discrete Mathematics, Algorithms and Applications

Abstract

We say that a square real matrix *M* is *off-diagonal nonnegative* if and only if all entries outside its diagonal are nonnegative real numbers. In this paper, we show that for any off-diagonal nonnegative symmetric matrix *M*, there exists a nonnegative symmetric matrix *M* which is sparse and close in spectrum to *M*.

Cloud architecture for electronic health record systems interoperability

Gómez, Derlis; Romero, Jesús; López, Pablo; Vázquez, José; Cappo, Cristian; Pinto, Diego; Villalba, Cynthia

DOI: https://doi.org/10.3233/thc-212806
Link: https://pubmed.ncbi.nlm.nih.gov/34511519/

Technol Health Care

Abstract

Background: Current Electronic Health Record (EHR) systems are built using different data representation and information models, which makes difficult achieving information exchange.
Objective: Our aim was to propose a scalable architecture that allows the integration of information from different EHR systems.
Methods: A cloud-based EHR interoperable architecture is proposed through the standardization and integration of patient electronic health records. The data is stored in a cloud repository with high availability features. Stakeholders can retrieve the patient EHR by requesting only to the integrated data repository. The OpenEHR two-level approach is applied according to the HL7-FHIR standards. We validated our architecture by comparing it with 5 different works (CHISTAR, ARIEN, DIRAYA, LLPHR and INEHRIS) using a set of selected axes and a scoring method.
Results: The problem was reduced to a single point of communication between each EHR system and the integrated data repository. By combining cloud computing paradigm with selected health informatics standards, we obtained a generic and scalable architecture that complies 100% with interoperability requisites according to the evaluation framework applied.
Conclusions: The architecture allowed the integration of several EHR systems, adapting them with the use of standards and ensuring the availability thanks to cloud computing feat.

Clustering-based multipopulation approaches in MOEA/D for many-objective problems

Von Lücken,Christian ;Brizuela, Carlos; Barán,Benjamín

DOI: https://doi.org/10.1007/s10589-022-00348-0
Link: https://link.springer.com/article/10.1007/s10589-022-00348-0

Computational Optimization and Applications

Abstract

This work presents a new multipopulation framework for the multiobjective evolutionary algorithm based on decomposition (MOEA/D). In this case, clustering methods are used to reinforce mating restrictions by splitting the MOEA/D evolutionary population into multiple subpopulations of similar individuals for independent evolution. Using subpopulations leads to a natural parallel implementation by assigning each subpopulation to a different processor. The proposed multipopulation MOEA/D (mpMOEA/D) is evaluated using three clustering methods: k-Means, spectral-based clustering, and a method based on the shape of objective vectors. Additionally, a random partitioning approach is tested. Metrics measuring convergence, diversity and computation time are used to compare the results of the mpMOEA/D alternatives and the original MOEA/D using DTLZ and WFG problems with 3, 4, 8 and 10 objectives. Evaluation using the Wilcoxon test and the Friedman rank reveals the importance of using clustering procedures for population division, especially in cases with many objectives. The results show the viability of the clustering-based multipopulation approach in enhancing the performance of evolutionary methods for many-objective problems.

Comportamento da produção científica de pesquisadores categorizados no Nível III do Programa Nacional de Incentivo a Pesquisadores do Paraguai: Período 2010-2020

Researchers scientific production behavior in the Category Level III of the National Incentive Program for Researchers of Paraguay: Period 2010-2020

Báez Escalante, Mónica; Cáceres Ruiz Díaz, Mariana; Sena Correa, Emilce.

DOI: https://doi.org/10.20396/rdbci.v20i00.8668672
Link: https://periodicos.sbu.unicamp.br/ojs/index.php/rdbci/article/view/8668672/29469

RDBCI – Revista Digital de Biblioteconomia e Ciência da Informação

Abstract

Introduction: The measurement and characterization of scientific production allows to scope the degree and direction of science advancement. Objective: The objective of this study is to describe the researchers scientific production behavior categorized in the Level III of the National Research Incentive Program of Paraguay in the period 2010-2020. Method: A quantitative, descriptive, non-experimental, cross-sectional study was proposed. The scientific production data were taken from SCOPUS and SciELO. It was evident that about 80% of the scientific production studied corresponded to SCOPUS. The largest production was presented in 2015, 2017 and 2019. The publications were mostly written in English and they were mainly scientific articles. Results: The study revealed that publications made by male researchers corresponded to 75% concentrated within the age range of 55 to 59. Medical and Health Sciences was the most outstanding area of publications. Conclusion: Findings indicate that the researchers scientific production studied is channeled to attain themselves journals high impact positions. They use English as the main language and the scientific article as the preferred medium for publication aiming towards an international visibility. However, there is a need to apply actions targeting equity for the participation of female researchers at the highest level of categorization and to increase the visibility of the least representative areas of science.

Resumo

Introdução: A mensuração e caracterização da produção científica permite medir o grau e a direção do avanço da ciência. Objetivo: Descrever o comportamento da produção científica de pesquisadores categorizados no Nível III do Programa Nacional de Incentivo a Pesquisadores do Paraguai, no período 2010-2020. Método: Proposto um estudo quantitativo, descritivo, não experimental, transversal. Os dados de produção científica foram obtidos do SCOPUS e SciELO. Evidenciou-se que cerca de 80% da produção científica estudada correspondia ao SCOPUS. A maior produção foi apresentada nos anos de 2015, 2017 e 2019. As publicações foram em sua maioria escritas em inglês e foram principalmente artigos científicos. Resultados: Revelou-se que 75% das publicações correspondiam a pesquisadores do sexo masculino e que a faixa etária de 55 a 59 anos concentrava aproximadamente 35% das publicações. A área de publicações que mais se destacou foi a de Ciências Médicas e da Saúde. Conclusão: Os achados indicam que a produção científica dos pesquisadores estudados está canalizada para se posicionar em periódicos de alto impacto, utilizando o inglês como idioma principal e o artigo científico como meio preferencial de publicação, visando, assim, visibilidade internacional. No entanto, há a necessidade de implementar ações que visem a equidade na participação de mulheres pesquisadoras ao mais alto nível de categorização e a aumentar a visibilidade das áreas menos representativas da ciência.

Correlation Between Quality Evaluation Metrics and Teeth Detection Results in Panoramic X-Rays Using Deep Learning

Giardina, Claudia L.; Legal, Horacio; Vázquez Noguera, José Luis; Fretes, Vicente R. , Defazio, Diego

DOI: 10.3233/SHTI220165
Link: https://pubmed.ncbi.nlm.nih.gov/35673104/

PubMed

Abstract

Panoramic images are one of the most requested exams by dentists for allowing the visualization of the entire mouth. Interpreting X-ray images is a time-consuming task in which misdiagnoses can occur due to the inexperience or fatigue of professionals. In this work, we applied different image enhancement techniques as a pre-processing step to determine which image features correlate with improvements in teeth detection in panoramic images using deep learning architectures. We contrasted the performance of five object-detection architectures using 300 panoramic images of a public dataset. We evaluated the enhancement in the pre-processing step and the detection performance. Quality and detection metrics were considered, and the cross-correlation between them was computed for every object-detection method contemplated. We observe the dependence of the detection performance with some image enhancement techniques, especially those that introduce less noise and preserve the global contrast of the image.

Distribution level electric current consumption and meteorological data set of the east region of Paraguay

Velázquez, Gustavo; Morales, Félix; García-Torres, Miguel; Gómez-Vela, Francisco; Divina, Federico; Vázquez Noguera, José Luis; Daumas-Ladouce, Federico; Sauer Ayala, Carlos; Pinto-Roa, Diego P.; Gardel-Sotomayor, Pedro E.; Mello Román, Julio César.

DOI: https://doi.org/10.1016/j.dib.2021.107699
Link: https://www.sciencedirect.com/science/article/pii/S2352340921009744

Data in Brief

Abstract

This paper presents a data set with information on meteorological data and electricity consumption in the department of Alto Paraná, Paraguay. The meteorological data were registered every three hours at the Aeropuerto Guarani, Department of Alto Paraná, which belongs to the Dirección Nacional de Aeronáutica Civil of Paraguay. The final data consists of a total of 22.445 records of temperature, relative humidity, wind speed and atmospheric pressure. On the other hand, the electrical energy consumption data set contains a total of 1.848.947 records, all of them coming from the one hundred and fifteen feeders located throughout the Alto Paraná region of Paraguay. Electrical energy consumption data was provided by Administración Nacional de Electricidad (ANDE). The analysis of this data can yield insights regarding the energy consumption in the area.

Dynamics of suspended sediment transport: A Direct Numerical Simulation study

Shin, Hyun Ho; Portela, L.M.; Schaerer, C.E.; Mangiavacchi, N.

DOI: https://doi.org/10.1016/j.ijmultiphaseflow.2022.104165
Link:
https://www.sciencedirect.com/science/article/abs/pii/S0301932222001525

International Journal of Multiphases Flow

Abstract

The dynamics of suspended sediment transport in horizontal open channel flow is analysed using point-particle one-way coupling Direct Numerical Simulations (DNS), with a virtual wall as a simple particle resuspension model. In sediment transport, the bed-load is dominated by the inter-particle interactions, but the suspended sediments are transported essentially in a one-way coupling situation. The validity of one-way coupling DNS with point-particle approach for the transport of suspended sediment is analysed, by comparing the simulations with existing well-designed experiments performed under very similar conditions. The range of the relevant non-dimensional parameters of the simulations is roughly the same as in actual sediment transport, except for the flow Reynolds number. Good agreement is observed between the simulations and the experiments; furthermore, the simulation results of the motion of the suspended sediment are insensitive to the position of the virtual wall, provided this wall is placed in a region where the fluid velocity fluctuation in the wall-normal direction is comparable to the particle settling velocity. Using the simulation results, the interplay between the different fluid–particle interaction forces is analysed, with and without gravity. In the absence of gravity, the dynamics is dominated by the balance between the stress-gradient force and the turbophoretic effects; as the particle-to-fluid density ratio for the sediment particles is on the order of one, the situation is quite different when compared to the dynamics with a density ratio on the order of 1000. When gravity is included, the dynamics is dominated by the interplay between the drag and gravitational forces, and they balance each other. Both with and without gravity, the lift and added-mass forces have only secondary effects and do not play an important role.

Evaluación De Funcionamiento De Equipos De Mamografía

Yegros, César; Núñez, José; Recalde, Luciano.

DOI: 10.22533/at.ed.3172192223089v
Link: https://atenaeditora.com.br/catalogo/artigo-revista/evaluacion-de-funcionamiento-de-equipos-de-mamografia

Journal of Engineering Research

Abstract:

According to the WHO, each year there are 1.38 million new cases and 458,000 deaths from breast cancer; this being the most frequent in women. The majority of deaths (269,000) occur in low- and middle-income countries, where they are diagnosed at advanced stages due to obstacles in accessing health services and equipment. In Paraguay, cancer is the second leading cause of death in women. For the early detection of breast anomalies, it is essential to have biomedical equipment and guarantee its operation, in this way it will be possible to perform mammographic studies with the highest quality and the lowest possible dose rate; and establish verification programs and quality controls for mammography.

Paraguay count with few health institutions that have adequate equipment and infrastructure to carry out preventive check-ups (1 mammographer every 50,000 women), therefore, the operability of existing equipment is important. To guarantee the reliability of these studies, verification programs and quality controls for mammograms are necessary. This project implements performance and quality controls for mammograms, through the development and implementation of a parameter control checklist based on technical standards established by the local regulatory authority and the IAEA.

Verifications and controls were carried out in different mammography services in the country, and information was obtained on the operating status of the equipment, the quality of the image, the dose rate and possible solutions to avoid unnecessary stops of operation were verified, with the in order to facilitate decision makers the tasks of planning and justifying the renewal or maintenance of said biomedical equipment, in a country with scarce and deficient infrastructure and biomedical equipment.

Experimental verification of smart grid control functions on international grids using a real-time simulator

Rajkumar Palaniappan, Oleksii Molodchyk, Mahdi Shariati-Sarcheshmeh, Marilyn Winifred Asmah, Jiayan Liu, Tobias Schlichtherle, Frank Richter, Ekow Appiah Kwofie, Daniel Rios Festner, Gerardo Blanco, Anna Mutule, Olegs Borscevskis, Shady S. Rafaat, Yong Li, Ulf Häger, Christian Rehtanz

DOI: https://doi.org/10.1049/gtd2.12486
Link: https://ietresearch.onlinelibrary.wiley.com/doi/10.1049/gtd2.12486

IET Generation, Transmission & Distribution

Abstract

The drastic increase in distributed energy resources (DERs) leads to challenges in the operation of distribution systems worldwide. While several solutions for grid monitoring and control are available on the market and in literature, this research is the first of its kind aiming to supervise the grid by providing a modular configurable unified hardware and software architecture. The control algorithms are configured using data models according to IEC 61850-7-3 and IEC 61850-7-4. The novel system architecture is a portable, modular and flexible architecture that aggregates smart grid control functions onto a standardised hardware platform, emphasising the need for hardware independence. The central controller contains several smart grid control functions and the various field devices are distributed across the distribution grid. This paper deals with the simulation of different real-world distribution grids 23on the Real-Time Simulator (RTS) and experimental verification of the control algorithms. Smart grid control functions such as Coordinated Voltage Control (CVC) and Optimal Power Flow (OPF) are experimentally verified on a German grid. The grid dynamics are compared when the central controller executes the CVC against the OPF implementations. The experimental results, advantages and challenges of each control are presented here. The results also showed the variation in grid behaviour when the control parameters were varied. The paper also shows that the algorithm and the choice of the control parameters depend upon the distribution grid's complexity and the system operator's individual needs. The results illustrate the potential of such a universal distribution automation solution for system operators worldwide.

Guidelines for the negotiation of benefits distribution of harnessing shared energy resources according to the experiences of negotiators and the approach of regional specialists. Case study of Itaipu binational hydropower plant

Ortigoza, Eduardo; Ríos, Richard; Jiménez, Noel; Oxilia, Victorio

Link: https://enerlac.olade.org/index.php/ENERLAC/article/view/170

ENERLAC – Revista de energía de Latinoamérica y del Caribe

Abstract

In South America, in the 1970s, bilateral treaties were signed for the use of the shared hydroelectric potential. These treaties were results of international negotiations among countries of the La Plata Basin, which took place in the midst of various complexities. The systematization of these negotiation experiences could support the advancement of electricity integration, given that there is still a high regional hydroelectric potential to be exploited. The main objective of this work is to systematize the lessons learned in the negotiation processes in which Paraguay participated, in order to provide elements for future decision-making. Methods were applied to systematize these lessons learned. The results of the analysis provide valuable information for strategic decision-making, implementation, monitoring and communication to stakeholders, regarding what to negotiate (considering the revision of Annex C of one the hugest hydropower plant of the world: ITAIPU scheduled for 2023) and how to organize internally to carry out the negotiations. The conclusions of this study are also valid for other region's watershed and also could be applied for the use of shared natural resources in other regions of the world.

Hybrid Incremental Deployment of HSDN Devices

Céspedes Sánchez, Pedro Pablo; Maluff, Bader; Pinto-Roa, Diego P.; Legal-Ayala, Horacio

DOI: https://doi.org/10.1109/TNSM.2021.3135122
Link: https://ieeexplore.ieee.org/document/9650571

IEEE Transactions on Network and Service Management

Abstract

Hybrid-software-defined networks (HSDN) have opened up an enormous range of functionality and benefits for network users and administrators. Many of these functionalities have been extensively studied and addressed over the past few years. However, it is not a panacea as it brings with it many design challenges to get a robust and reliable network. In this paper, we focus on one of the SDN challenges: the incremental deployment of SDN devices in HSDN treated as an optimization problem. In this context, we developed a mixed integer linear programming (MILP) and a genetic algorithm (GA) considering a hybrid deployment scheme that combines current incremental deployment and replaced deployment techniques. The proposed strategy determines which traditional devices will be replaced by SDN devices, which SDN devices will be added to the network changing its topology, and how the traffic will be routed. Consequently, the aim is to minimize the deployment cost, minimize the routing cost and maximize the traffic controlled by the SDN network simultaneously. The experiments show that the proposed hybrid deployment approach is promising compared to current techniques, and the GA is more robust and scalable than the MILP as the traffic volume increases.

HIV prevalence and associated risk factors among men who have sex with men in three regions of Paraguay, 2020

Aguilar, Gloria; Samudio,Tania; Méndez, Julieta; López, Gladys; Giménez, Liliana; Schaerer, Christian; Gómez, Santiago; Báez, Teresita; Morel, Zoilo Muñoz, Sergio; McFarland, William

DOI: https://doi.org/10.1177/09564624221134138
Link: https://pubmed.ncbi.nlm.nih.gov/36257834/

International Journal of STD & AIDS

Abstract

Background: Our study aimed to measure HIV prevalence and associated risk factors among men who have sex with men (MSM) in three regions of Paraguay in 2020.
Methods: MSM were recruited for cross-sectional surveys in three regions of Paraguay using respondent-driven sampling. Interviews were conducted face-to-face to collect demographic characteristics and risk and preventive behaviors. The analysis assessed HIV prevalence and associated risk factors in the three samples of MSM within each region.

Results: A total of 1,207 MSM were recruited, including 559 in Asunción-Central, 245 in Alto Paraná, and 403 in Caaguazú. HIV prevalence was 24.2% (95% CI 20.6-27.9) in Asunción-Central, 10.2% (95% CI 6.7-14.6) in Alto Paraná, and 3.2% (95% CI 1.7-5.4) in Caaguazú. In Asunción-Central, associations with HIV were age ≥25 years (1.86, 95% CI 1.15-3.00), being employed (1.82, 95% CI 1.07-3.11), self-reporting as homosexual (1.90, 95% CI 1.06-3.43), having sex with a known HIV-positive partner acquisition (4.19, 95% CI 2.37-7.43), self-perceived as being at higher risk for HIV acquisition (4.15, 95% CI 2.54-6.77), and able to access condoms and lubricants (1.82, 95% CI 1.08-3.05). In Alto Paraná, associations with HIV were self-reporting as homosexual (4.33, 95% CI 1.19-15.65) and having higher HIV knowledge (2.53, 95% CI 0.97-6.61). In Caaguazú, associations with HIV were self-reporting as homosexual (7.06, 95% CI 1.53-32.46) and being diagnosed with depression (4.68, 95% CI 0.89-24.43).
Conclusions: HIV prevalence among MSM in Paraguay varied by region, being highest in the capital and major metropolitan area of Asunción-Central, followed by the border area of Alto Paraná. While being self-identified as homosexual was associated with HIV in all three regions, other associations differed, indicating prevention programs need to be tailored to the locale.

Measuring Interactions in Categorical Datasets Using Multivariate Symmetrical Uncertainty

Gómez-Guerrero, Santiago; Ortiz, Inocencio; Sosa-Cabrera, Gustavo; García-Torres, Miguel; Schaerer, Christian E.

DOI: https://doi.org/10.3390/e24010064
Link: https://www.mdpi.com/1099-4300/24/1/64

Entropy

Abstract

Interaction between variables is often found in statistical models, and it is usually expressed in the model as an additional term when the variables are numeric. However, when the variables are categorical (also known as nominal or qualitative) or mixed numerical-categorical, defining, detecting, and measuring interactions is not a simple task. In this work, based on an entropy-based correlation measure for *n* nominal variables (named as Multivariate Symmetrical Uncertainty (MSU)), we propose a formal and broader definition for the interaction of the variables. Two series of experiments are presented. In the first series, we observe that datasets where some record types or combinations of categories are absent, forming patterns of records, which often display interactions among their attributes. In the second series, the interaction/non-interaction behavior of a regression model (entirely built on continuous variables) gets successfully replicated under a discretized version of the dataset. It is shown that there is an interaction-wise correspondence between the continuous and the discretized versions of the dataset. Hence, we demonstrate that the proposed definition of interaction enabled by the MSU is a valuable tool for detecting and measuring interactions within linear and non-linear models.

Neuroevolution Multiclass Diabetic Retinopathy Classification of Eye Fundus Images

Pérez-Estigarribia, Pastor E.; Ayala Gómez, Jordan; Gardel-Sotomayor, Pedro E.; Castillo Benítez, Verónica E.; Castro Matto, Ingrid; Vázquez Noguera, José Luis; García-Torres, Miguel; Mello-Román, Julio César; Pinto-Roa, Diego Pedro; Aquino-Brítez, Diego; Gómez, Santiago; Facón, Jacques

DOI: https://doi.org/10.21203/rs.3.rs-1479966/v1
Link: https://www.researchsquare.com/article/rs-1479966/v1

Research Square

Abstract

Diabetic retinopathy is a complication of a widespread eye disease named diabetes mellitus. Diabetes mellitus, due to the increased glucose levels, may damage the retina's blood vessels and cause visual complications and eventually blindness. Therefore, early detection and adequate assessment of disease progression are crucial for adequate treatment. The most widely used method for diagnosing diabetic retinopathy is the analysis of retinal fundus images obtained by retinography. Deep Learning-based methods have shown promising results as a diagnostic tool for diabetic retinopathy, achieving, in some cases, performance close to the human inspection of images. However, the performance of these methods relies heavily on fine-tuning the algorithm hyperparameters and big data sets. In this work, we propose training a Deep Learning network with evolutionary algorithms to classify three stages of Diabetic Retinopathy: i) no sign of diabetic retinopathy, ii) Non-proliferative diabetic retinopathy, and iii) proliferative diabetic retinopathy. We propose a neuroevolution methodology for selecting the most efficient Deep Learning model. The results of the neuroevolution methodology were improved by including Simulated Annealing strategies, Population Reinitialization and ensembles. With high accuracy, sensitivity, specificity and kappa index rates, the experiments show that our neuroevolution methodology for selecting the Deep Learning model hyperparameters is a competitive alternative for training deep neural networks to classify three stages of diabetic retinopathy even with a small data set.

On-orbit electrical power system dataset of 1U CubeSat constellation

Jara Céspedes, Adolfo Javier; Lepcha, Pooja; Kim, Sankyun; Masui, Hirokazu; Yamauchi, Takashi; Maeda, George; Cho, Mengu

DOI: https://doi.org/10.1016/j.dib.2022.108697
Link: https://www.sciencedirect.com/science/article/pii/S2352340922009027

Data in Brief

Abstract

This article presents a database containing on-orbit data samples of the Electrical Power System (EPS) from 4 different 1U CubeSats belonging to the BIRDS constellation. The EPS is responsible for providing uninterrupted power to the overall satellite both during sunlight and eclipse. The satellites are based on the BIRDS open-source standardized bus designed by Kyutech for research and education. BIRDS bus was used for six satellites that were delivered to ISS on board the Cygnus re-supply spacecraft launched by Antares rocket and released from International Space Station (ISS) into ISS orbit (altitude 400 km, inclination: 51.6°, duration: 92.6 min). The dataset contains the data of voltage (mV), current (mA) and temperature (Celsius) of the battery and solar panels attached to 5 sides of the satellite. This data is collected by the on-board computer every 90 seconds in nominal operation or every 10 seconds in fast sampling mode. The data is downloaded from the satellite memory by the ground station operators. Next, space engineering experts from Kyushu Institute of Technology have analysed the dataset to classify each data sample into normal or anomaly classes. This paper provides one datafile per satellite, that includes data from solar panels and battery since their deployment into orbit until the end of its life for the UGUISU, RAAVANA, and NEPALISAT satellites, first two showing a failure in one of their panels during more than two years of operation on-orbit. The TSURU satellite dataset includes data since its deployment into orbit and will continue to be collected until the end of its life. The dataset generated will be useful for 1U CubeSat, such as BIRDS platform, users, and satellite developers by using it as a reference to compare the behaviour of their Electric Power System under different operating scenarios and align their missions according to the available power on-orbit. At the same time, the dataset can help computer science researchers to build and validate new models for fault diagnosis and outlier detection.

On-Orbit Experimental Result of a Non-Deployable 430-MHz-Band Antenna Using a 1U CubeSat Structure

Jara Céspedes, Adolfo Javier; Nakayama, Daisuke; Yamauchi, Takashi; Masui, Hirokazu; Kim, Sangkyun; Toyoda, Kazuhiro; Dayarathna Malmadayalage; Tharindu Lakmal; Cho, Mengu and The BIRDS-4 Project Team

DOI: https://doi.org/10.3390/electronics11071163
Link: https://www.mdpi.com/2079-9292/11/7/1163

Antenna Developments for Small Satellites and CubeSats

Abstract

1U CubeSats often use the 430-MHz band for communication due to their size and power limitations, and half-wavelength dipole antennas are employed. A 430-MHz-band dipole antenna requires a deployable structure for a 1U CubeSat. However, a 1U CubeSat has a small volume margin for redundant systems, so the antenna deployment system can be a single point of failure. In this paper, the 1U CubeSat structure itself was used as an antenna. As a submission of the BIRDS-4 project, three 1U CubeSats (GuaraniSat-1, Maya-2, and Tsuru) demonstrated this antenna structure. The results of the ground tests showed a maximum gain of −5.7 dBi with the flight model. These satellites were deployed from the International Space Station on 14 March 2021. Radio signals were alternately transmitted from the dipole antenna and the structure antenna onboard Tsuru for on-orbit demonstration on 15 December 2021, and the received signal strength on the ground was compared using RTL-SDR, SDR# and several codes. The ground station was able to receive both dipole and structure CW signals. The received power strength indicates that a gain of −8.1 dBi is being demonstrated with the structure antenna.

Pathological characterization and clinical outcome of penile intraepithelial neoplasia variants: a North American series

Straub Hogan, Melissa M.; Spieker, Andrew J.; Orejudos, Michael; Gheit, Tarik; Herfs, Michael; Tommasino, Massimo; Sánchez, Diego F.; Fernández-Nestosa, María José; Rodríguez Pena, María Del Carmen; Gordetsky, Jennifer B.; Epstein, Jonathan I.; Canete-Portillo, Sofía; Gellert, Lan L.; Prieto Granada, Carlos Nicolás; Magi-Galluzzi, Cristina; Cubilla, Antonio L.; Giannico, Giovanna A.

DOI: https://doi.org/10.1038/s41379-022-01020-y
Link: https://www.modernpathology.org/article/S0893-3952(22)00103-X/fulltext

Modern Pathology

Abstract

Penile intraepithelial neoplasia (PeIN) is classified as human papillomavirus (HPV)- and non-HPV-related. This classification is associated with distinct morphologic subtypes. The natural history and prognosis of PeIN subtypes are not well known. This study aims to evaluate clinicopathological features, HPV status, and outcome of PeIN subtypes. Eighty-two lesions from 64 patients with isolated PeIN were retrospectively reviewed. Mean age was 59 years. Lesions were multicentric in 34% of patients and affected glans (33%), shaft (26%), and foreskin (20%). Histologically, 22% of patients had coexisting lesions, classified as hybrid and mixed. HPV-related PeIN (97%) included basaloid (59%), warty (8%), warty-basaloid (8%), hybrid (19%) and mixed (3%) types. P16 and HPV positivity occurred in 99% and 82% of lesions, respectively. HPV 16 was more common in basaloid PeIN. Multiple genotypes were detected in 35%, more commonly in hybrid PeIN (P = 0.051). Positive margins occurred in 63% of excisions. PeIN recurred in 48% of excisions and 30% of overall repeated procedures, and progression to invasive carcinoma occurred in 2%. At follow-up, 86% of patients had no evidence of disease and 12% were alive with disease. Lichen sclerosus occurred in non-HPV and HPV-related PeIN (100% and 47%).In conclusion, HPV-related and, more specifically, basaloid PeIN were the predominant types and preferentially associated with HPV 16. While PeIN had a high recurrence rate, there was a slow and infrequent progression to invasive or metastatic carcinoma with multimodal treatments. Additional studies are needed to understand the biology and natural history of PeIN.

Performance Evaluation of Machine Learning Methods for Anomaly Detection in CubeSat Solar Panels

Jara Céspedes, Adolfo Javier; Bagas Pangestu, Bramandika Holy; Hanazawa, Akitoshi; Cho, Mengu

DOI: https://doi.org/10.3390/app12178634
Link: https://www.mdpi.com/2076-3417/12/17/8634

Small Satellites Missions and Applications

Abstract

CubeSat requirements in terms of size, weight, and power restrict the possibility of having redundant systems. Consequently, telemetry data are the primary way to verify the status of the satellites in operation. The monitoring and interpretation of telemetry parameters relies on the operator's experience. Therefore, telemetry data analysis is less reliable, considering the data's complexity. This paper presents a Machine Learning (ML) approach to detecting anomalies in solar panel systems. The main challenge inherited from CubeSat is its capability to perform onboard inference of the ML model. Nowadays, several simple yet powerful ML algorithms for performing anomaly detection are available. This study investigates five ML algorithm candidates, considering classification score, execution time, model size, and power consumption in a constrained computational environment. The pre-processing stage introduces the windowed averaging technique besides standardization and principal component analysis. Furthermore, the paper features the background, bus system, and initial operational data of BIRDS-4, a constellation made of three 1U CubeSats released from the International Space Station in March 2021, with a ML model proposal for future satellite missions.

Predicción del ciclo solar 25 por el método combinado

Benítez, Diego; Gómez, José

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Link: https://ciencialatina.org/index.php/cienciala/article/view/2591

Ciencia Latina Revista Científica Multidisciplinar

Resumen

En este trabajo se ha pronosticado el perfil del ciclo solar 25 actualmente en curso mediante el Método Combinado, con una predicción del máximo de amplitud suavizada del orden de los 108.3±4.7, ligeramente inferior al ciclo precedente y con una duración promedio de la fase ascendente de 61±12 meses, para una duración promedio total de 132±27 meses. Se ha aplicado el mismo procedimiento a los tres ciclos inmediatos anteriores obteniéndose buenos resultados en la parte ascendente de los mismos.

Routing, modulation level, and spectrum assignment in elastic optical networks. A route-permutation based genetic algorithms

Villamayor-Paredes, Melisa M. Rosa ;Maidana-Benítez, Luis Víctor; Colbes, José; Pinto-Roa,Diego P.

DOI: https://doi.org/10.1016/j.osn.2022.100710
Link:
https://www.sciencedirect.com/science/article/abs/pii/S1573427722000467

Optical Switching and Networking

Abstract

The routing, modulation level, and spectrum allocation (RMLSA) problem is crucial for efficient elastic optical networks. This problem has been approached by optimal-and-non-scalable and sub-optimal-and-scalable solutions. In the second approach, we can distinguish the routing-based and permutation-based meta-heuristics. These approaches explore a sub-set of the RMLSA solutions, and consequently, the calculation of high-quality solutions can be limited.

This work proposes an RMLSA solution that considers the routing and request permutation simultaneously to explore a larger portion of the set of RMLSA solutions than state-of-the-art meta-heuristics. The proposed RMLSA solution is based on a genetic algorithm (GA) whose chromosome structure encodes routing and permutation genes.

Performance analysis of the proposed route-permutation-based GA (RPGA) has been compared to the state-of-the-art based on integer linear programming (ILP), route-based GA (RGA), and permutation-based GA (PGA) in offline and online traffic scenarios. Offline traffic simulations show that RPGA is promising since it obtains similar results to ILP. RGA gets worst as the traffic load increases compared to PGA and RPGA approaches. RGA, PGA, and RPGA achieve the same performance in all dynamic scenarios concerning blocking and entropy measures, given the set of requests is small.

The dual pathogenesis of penile neoplasia: The heterogeneous morphology of human papillomavirus-related tumors

Chaux, Alcides; Sánchez, Diego F. ; Fernández-Nestosa, María José; Cañete-Portillo, Sofía; Rodríguez, Ingrid M.; Giannico, Giovanna A. ; Cubilla, Antonio L.

DOI: https://doi.org/10.1016/j.ajur.2022.02.009
Link: https://www.sciencedirect.com/science/article/pii/S2214388222000388

Asian Journal of Urology

Abstract

Objective: Penile neoplasia, usually of squamous histogenesis, is currently classified into human papillomavirus (HPV)-related or -dependent and non-HPV-related or -independent. There are distinct morphological differences among the two groups. New research studies on penile cancer from Northern countries showed that the presence of HPV is correlated with a better prognosis than virus negative people, while studies in Southern countries had not confirmed, perhaps due to differences in staging or treatment.

Methods: We focused on the description of the HPV-related carcinomas of the penis. The approach was to describe common clinical features followed by the pathological features of each entity or subtype stressing the characteristics for differential diagnosis, HPV genotypes, and prognostic features of the invasive carcinomas. Similar structure was followed for penile intraepithelial neoplasia, except for prognosis because of the scant evidence available.

Results: Most HPV-related lesions can be straightforwardly recognized by routine hematoxylin and eosin stains, but in some cases surrogate p16 immunohistochemical staining or molecular methods such as in situ hybridization or polymerase chain reaction can be utilized. Currently, there are eight tumor invasive variants associated with HPV, as follows: basaloid, warty, warty-basaloid, papillary basaloid, clear cell, medullary, lymphoepithelioma-like, and giant condylomas with malignant transformation.

Conclusion: This review presents and describes the heterogeneous clinical, morphological, and genotypic features of the HPV-related subtypes of invasive and non-invasive penile neoplasia.

Thermochemical characterization and assessment of residual biomass energy in Paraguay

Rivaldi, Juan Daniel; Shin, Hyun Ho; Colmán, Federico; Sauer, Carlos; González, Javier; Rojas, Orlando; Smidt, Mario; Velázquez, Edelira; Martínez, Karen Patricia

DOI: http://dx.doi.org/10.1007/s13399-022-03155-z
Link:
https://www.researchgate.net/publication/362632649_Thermochemical_characterization_and_assessment_of_residual_biomass_energy_in_Paraguay

Biomass Conversion and Biorefinery

Abstract

Residual lignocellulosic biomass is an abundant and renewable source that plays a strategic role in energy policy in developing countries. As a result, there is a need to increase biomass participation into the energy matrix. This work reports an overview on available residual biomass from agricultural fields and agro-industries in Paraguay, which can be used to produce energy by direct combustion. The total amount of residual biomass in agricultural fields from six traditional crops (soybean, sugarcane, corn, wheat, rice, and cassava) was estimated at an average of 46.6 million tonnes per year for the period 2016–2020. In addition, the spatial distribution of estimated residual biomass for the year 2020 is presented on maps. Furthermore, thermochemical profiles of thirty-seven residual biomass samples from agro-industries, including bulk den-sity, moisture, ash content, heating values, and energy density, are reported. The high heating values (HHV) experimentally obtained ranged from 7 to 21 MJ/kg and the calculated energy l residual biomass exhibited good characteristics to be used as solid fuel. Finally, the available thermal energy from the biomass residues in Paraguay was analyzed under different scenarios of biomass utilization. The thermal energy potential (TEP) using 35% of the selected agricultural residues by direct combustion could generate 225,686 TJ/year, and the electrical energy potential (EEP) by thermoelectric power plant could generate 20,896 GWh/year.

Trabajos completos y resúmenes publicados

A Hybrid Algorithm based on Stationary and Krylov methods for Nonsymmetric Linear Systems

Marín, Sebastian; Vera, Carlos M.; Cabral, Juan C.; Schaerer, Christian E.

Link: https://cilamce.com.br/anais/arearestrita/2022/10964.pdf

XLIII Ibero-Latin-American Congress on Computational Methods in Engineering, ABMEC

Abstract

Iterative Krylov methods, like Generalized Minimal Residual (GMRES) and Full Orthogonalization Method (FOM), are normally used for the solution of sparse and nonsymmetric linear systems from Computational Mechanics problems. In practice, restarted versions, are used to reduce storage and orthogonalization costs. However, numerical experience shows that these methods may present stagnation or slow convergence. The Stationary method is older, simpler to understand and implement, but usually not completely effective. Contrarily, the Krylov method has a more recent development and is more effective than the former, but the analysis is usually harder to understand with difficulties in selecting its parameters. A cycle of a proposed hybrid method consists of n Stationary iterations of Richardson followed by m × k iterations of the restarted GMRES, where n, m and k are values much smaller than the dimension of the non-symmetric matrix. Such cycles can be repeated until convergence is achieved. The advantage of this approach is in the opportunity to allow better performance of its individual properties. This combination of methods is competitive from the point of view of helping to accelerate convergence with respect to the number of iterations for some linear problems. We are going to present computational experiments to show the advantages and the main problems raised from the perspective of the proposed hybrid method.

A mathematical programming model for the logistic design of an agricultural network and rural schools.

Recalde-Ramírez, Jorge L.; Vera Andreo, Jorge; Plá-Aragonés,Lluís M.; López, María Margarita

Link: https://claio2022.dc.uba.ar/docs/abstract-book.pdf

CLAIO 2022 Abstract book

Abstract

According to UNESCO (2017), some 264 million children and young people do not go to school worldwide. The causes can be complex: there are attributions to corruption, poverty, hunger, and lack of public policies, among others. Nations have discussed the issue, drawing sustainable objectives regarding the right to education, the number of hungry people, and goals they wish to achieve by 2030. In this sense, have been created the Programs of School Feeding (PAE) as support tools in public policies. The PAE tendency at the Latin American and rural levels has been to seek social protection to meet children's food requirements and, on the other hand, to promote family farming. This project aims to support decision-making regarding the logistics network design that links the rural schools attached to the PAE with the farms of small local farmers who serve as food providers. To this end, it is proposed to use the situation of rural schools and small agricultural producers in the department of Caazapá, Paraguay, as a case study. In this region of the country, 82% of the population lives in rural areas. The conditions lend themselves to the research project development due to the data availability. Since it is expected to have a relatively high number of variables and constraints, a mathematical programming model was formulated to address the problem. For a representative mathematical model, restrictions of sustainable agricultural planning must be addressed, such as crop rotation and crop selection, as well as meeting the demand for school lunches by schools, among other social issues. The inclusion of only one objective is pertinent for the moment: the minimization of costs in distributing and generating food rations for schools. As a second objective, independently, a social objective is proposed: the maximization of benefits for small farmers. As the work is in progress, it is hoped in future work to merge the two objectives and treat the problem as a bi-objective.

A Mixed Integer Programming model for peasant farmers in developing countries: A study case from Paraguay

López, María Margarita; Plá Aragonés, Lluís Miguel; Vera Andreo, Jorge; Recalde-Ramírez, Jorge L.

DOI: http://dx.doi.org/10.48786/alioeuro.2022.07
Link: http://openproceedings.org/2022/conf/alioeuro/ALIOEURO_2021_paper_20.pdf

Open Proceedings-Short Paper

Abstract

In developing countries, governmental programs push agricultural supply chain networks to optimize farmer food security and rural growth. Decision-making in this system includes available cropping options and criteria regarding nutrition, income, work capacity that must be satisfied. We propose a mathematical optimization model to help the decision-making, tested in a case study: Caazapá-Paraguay, where the rural population is 80%, and 42% is poor. The optimization model addresses the problem complexity, suggests the crops, improves the production and rotation mix, decreases the total cost, and satisfies almost the same nutritional requirements.

Agricultural operations planning addressing sustainability: a case study for family farmers in Paraguay

López, Maria Margarita; Vera, Jorge; Plá Aragonés, Lluis Miguel; Recalde-Ramírez, Jorge L.

Link:https://claio2022.dc.uba.ar/docs/abstract-book.pdf

CLAIO 2022 Abstract book

Abstract

Family farmers in developing countries experience the self-consumption of few crops available on their farms, the uprooting of their communities, and inadequate diets. The above issues occur, although they are predominant in achieving the population's food security. In the short term, through the Sustainable Development Goals (United Nations), the provision of food and assistance to vulnerable regions is expected. However, the increase in sustainable productivity depends on the feeding systems in the long term. In this work, we design a network and an operations planning scheme for multiple producers and crops, involving cooperatives of family farmers to obtain profitability and food security for their members. We formulated a mathematical model for the network, considering relevant decisions and operations: supply of agricultural inputs, production, harvest and crop rotation, storage, distribution of products to other producers, external consumers, and self-consumption. We developed a base case and three scenarios for Caazapá (Paraguay), with 80% rural population and 40% poor. They are five cooperatives (107 farmers), 60 months, 12 crops, and 6 rotation crops. Comparing the model results with the actual production was possible to increase and vary the crop mix to 12 proposed items against the 3 traditional products produced per farm (corn, cassava, and beans). The model results address sustainability through lower-cost plans, crop rotation and expansion of the product mix, and satisfaction of a percentage of families' nutritional requirements. We expect to expand the work after identifying the primary sources of uncertainty for production and consumption (yield and demand).

Análisis de Confiabilidad del Sistema Eléctrico Paraguayo como herramienta de priorización de Obras de Transmisión

Valdéz Barboza, Diana; Torres Larroza, Oscar; Vallejos, José

DOI: https://doi.org/10.1109/ARGENCON55245.2022.9939950
Link: https://ieeexplore.ieee.org/document/9939950

IEEE Xplore

Abstract

As unconventional renewable generation is increasingly introduced and the grid becomes more extensive, the task of planning the future transmission facilities required becomes an assignment of growing complexity. In developing economies with limited resources for investment, such as the case of Latin American countries, expanding the network often involves reconfigurations of the grid using existing infrastructure, a situation that is difficult to capture with conventional planning considering only new transmission corridors. Faced with these challenges, selecting and prioritizing candidate facilities is a task that must be analyzed from various angles, such as investment cost, social benefit of the work, system reliability, environmental impact, among others. This paper proposes a methodology for the analysis and prioritization of infrastructure projects in the National Electricity Administration's Transmission Master Plan based on system reliability indices measured by the expected energy not supplied for N-1 contingencies. To consider the expected value, the probabilities of occurrence of each fault and the average repair time are taken and the energy not supplied, among other reliability index, are calculated. This methodology is applied to an equivalent system of the National Interconnected System considering the inclusion of works and load levels in the year 2030. Finally, with the results obtained from the simulations, it is possible to prioritize the works analyzed according to their impact on the reliability of the Paraguayan electricity system.

Application of the Perceptor Hierarchical Model to the negotiations on the cost of electricity service of a binational hydropower plant: the case of ITAIPU

Ortigoza, Eduardo; Oxilia, Victorio; Ferreira, Fernando; Cabral, Juan; Coronel, Tamatia

DOI: https://doi.org/10.1109/ICA-ACCA56767.2022.10006116

2022 IEEE International Conference on Automation/XXV Congress of the Chilean Association of Automatic Control (ICA-ACCA)

Abstract

In 2023, the partners of the ITAIPU Binational Entity, Paraguay and Brazil, will have to review Annex C of the ITAIPU Treaty, which relates to the conditions of the tariff structure and commercialization of the energy produced by the power plant. The governments must define strategies for the negotiation based on the diversity of interests of the different segments of society, particularly in Paraguay, where the debate on these negotiations extends to society in general. Given the location and importance of ITAIPU for the region, the negotiation to be held should devote considerable effort to the revision of Annex C of ITAIPU. This article evaluates the implications of the components of the Cost of Electricity Service (CSE) in terms of what Paraguayan society considers important, using a multiple criteria type methodology called Perceptor Hierarchical Decision (PHD). For this purpose, surveys were carried out to know what the respondents want according to their needs. We evaluated the influence of the CSE components on the fulfillment of the PND 2030, taking into account the preferences of society. The results show that the component that relates to Energy Assignment is the one that could help to achieve greater objectives of the National Development Plan (PND) 2030. These results suggest that this component should be taken into account when preparing the negotiation strategy, taking into account the considerations.

Applications, Admissions and Graduations of Women in Computer Science Careers for the Universidad Nacional de Asunción

Méndez Xavier, Ellen, L.; von Lücken, Christian; Cantero, Rita

Link: https://ceur-ws.org/Vol-3321/paper2.pdf

XIV Congress of Latin American Women in Computing 2022

Abstract

The presence of women in higher education and, mainly, STEM careers is a topic of growing interest in recent years. Several works highlight the low representation of women in technology careers. Through a series of initiatives to promote reducing the underrepresentation of women in STEM careers, much remains to be done. To characterize and analyze the presence of women in computer science-related careers at the Facultad Politécnica of the Universidad Nacional de Asunción, we present in this paper a longitudinal analysis of cohorts associated with student applications, admissions, and graduations since 2010.

Assistive prototype using speech recognition and eye tracking

Recalde, Luciano; Villegas, Carolina; Núñez, José; Yegros, César

Link: https://sabi2022.unsj.edu.ar/libro-de-resumenes/

Libro de resúmenes del XXIII Congreso Argentino de Bioingeniería y XII Jornadas De Ingeniería Clínica

Abstract

According to the PAHO, it is estimated that 15% of the population, around 1 billion people worldwide, live with a disability. In the Americas region alone, around 140 million people live with some type of disability. One of the biggest barriers encountered by people with disabilities is the fact that such a condition limits their ability to fully interact with their environment. Therefore, it is necessary to offer tools that can help to solve this problem. The project seeks to provide help to people who, due to their condition, find it difficult to use information and communication access technologies, such as computers, mobile devices, etc.A prototype that uses Voice command and eye tracking was developed to be used as an interface between the person and his computer, laboratory tests were carried out to verify its operation. As a result, a tool was obtained that allows achieving higher levels of independence through the use of speech recognition and eye tracking techniques.

Automated optimized irrigation systems for small farmers in a subtropical region

Jara, Iris Marcela; Del Puerto, Blanca; Ruiz Olazar, Margarita; Schaerer, Christian E.

Link: https://proceedings.sbmac.emnuvens.com.br/sbmac/article/view/3896

Proceeding Series of the Brazilian Society of Computational and applied Mathematics

Abstract

Several Latin American countries have an economy strongly based on agricultural/livestock sector, where dependence on water plays a predominant role. This dependency is being observed in a cyclical way due to el Niño, la Niña, and climatic changes. Among the producers, those of small and medium-size, based mainly on family farming, are the ones that suffer the most from the consequences of water scarcity.

Automation of a LPG (Liquefied Petroleum Gas) Plant

Duarte, Pedro; Fernández, Federico

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2022 IEEE International Conference on Automation/XXV Congress of the Chilean Association of Automatic Control (ICA-ACCA)

Abstract

Liquefied Petroleum Gas (LPG) is one of the most widely used energy sources in the world, both domestically and industrially, and its use are constantly increasing. Its handling represents a complex and delicate process, which on many occasions the stages of provision of the product lead to errors. For this reason, it is necessary to minimize the operations and controls under human supervision, taking into account that the variables that influence their handling and that depend on the control devices must be continuously verified, such as product levels, pressure and temperature in the spheres that are used for storage. These variables must be within the established security parameters. The non-use of automation techniques maintaining the LPG dispensing service manually is very inefficient both from an operational and economic point of view, so automating an LPG dispensing system is necessary from both points of view in order to ensure its correct handling and efficiency in delivery as well as a result of these improvements increase the financial benefit of its operation. In this work, the results of automating a LPG liquefied petroleum gas plant are presented, being the same from the operational and financial point of view, being the same highly positive, achieving the maximization of safety in the handling of LPG, promoting the reduction of cost and time savings in operations.

Baited traps for early detection of triatomines in dwellings of indigenous communities of the Paraguayan Chaco region

Rojas de Arias, Antonieta; Vega, María; Rolón, Miriam; Monteiro, Magna; Gaona, Federico; Schaerer, Christian; Ruiz Olazar, Margarita; Sosa Galeano, Horacio; Barán, Benjamín

Link:
https://congresos.unlp.edu.ar/lasove/wp-content/uploads/sites/45/2023/03/ABSTRACT-BOOK-LA-SOVE-2022_final-version.pdf

Abstract book LA SOVE 2022

Abstract

In order to evaluate the capacity of attraction of different aliphatic aldehydes to intradomiciliary triatomines, a field trial was conducted in four indigenous communities of the Paraguayan Chaco, all of them endemic for Chagas disease: 12 de Junio, El Martillo, Karandillas and Tiberia. After one month of complete spraying and being declared negative for triatomines at the beginning of the study, two traps were nailed on opposite walls of each inhabited house, 1.5 m above ground level; one was baited with an attractant and the other was an unbaited as control. Traps were not placed in peridomestic structures. A total of 139 baited traps and their controls were observed and checked after 1, 3 and 6 months of exposure. Four different triatomine attractants were tested: hexanal, nonanal, benzaldehyde, and heptanal at 98% purity or mixtures of them in different proportions. Attractants were placed in a hydroxyapatite tablet at a dose of 250 mL per trap. Statistical analysis was performed using Fisher Exact Test odds ratios (ORs) and p-value < 0.05, for all independent observations and McNemar's test p-value with continuity correction for each attractant. During the study, a total of 1,696 observations in baited traps and their controls were undertaken and 39 triatomines were captured inside the traps, corresponding to the species Triatoma infestans, Triatoma platensis, Triatoma sordida, and Triatoma guasayana. Overall, our results suggest a better performance of baited than control traps. (Fisher OR 2.90 CI 1.22 ± 6.89; p< 0.02) The capacity of attraction with the nonanal + hexanal mixture showed a highly probability of finding triatomines in traps with the mixture than without it (McNemar p< 0.04), enhancing the capture of triatomines in the traps in the first month of exposure. The probability of triatomine capture in traps with attractants in dwellings that were infested before spraying is 3.45%. T. infestans is no longer the predominant species in these communities with a history of high infestation of this species. Indeed, currently, adult T. sordida captures were

predominating throughout the study in the traps as well as in the peridomicile by 1 man*hour manual search. The early detection of reinfestation or repopulation of intradomiciliary triatomines in the post-spraying period highlights the importance of this instrument as a useful tool for the early detection of triatomines in endemic areas and a support for communities under entomological surveillance.

BIRDS-4 Satellites Constellation: APRS Mission Preliminary Results for Remote Detection of Triatomines in the Paraguayan Chaco

Jara, Adolfo; Sejera,Marloun; Ferrer T., Eladio J.; Gaona, Federico; Cho, Mengu

Link:
https://iafastro.directory/iac/paper/id/67436/abstract-pdf/IAC-22,B4,1,9,x67436.brief.pdf?2022-08-18.09:14:18

73rd International Astronautical Congress 2022

Abstract

Until March 2021, Paraguay was the only South American country that did not have a satellite in space. The transition from its non-space faring nation status began in 2018 after joining the Joint Global Multi-National Birds or BIRDS program, a multinational small satellite project led by Kyushu Institute of Technology (Kyutech) in Japan. The BIRDS program gives non-space faring nations the opportunity to design, integrate, build, test, launch, and operate their country's first satellite. The fourth edition of the BIRDS program (BIRDS-4) is developed by Kyutech jointly with the Paraguay Space Agency (AEP) and the University of the Philippines Diliman (UPD). It consists of three CubeSats, GuaraniSat-1 (Paraguay's first satellite), Maya-2 (Philippines), and Tsuru (Japan). All three satellites have the same design and among nine missions, one of them aims to collect data from ground sensor terminals (GST) and transmit it to a database storage server via satellite link. The GST comprises traps to detect the presence of arthropod insects in a remote indigenous village of the Paraguayan Chaco, where the insects that spread Chagas disease are persistent to infest the area. This paper describes the satellite mission design considering the space segment and ground segment, operation concept, initial operational results, lessons learned and the background of Paraguay's participation in the BIRDS-4 project. This paper also investigates technical challenges through experiments on appropriate data format and multiple access schemes while complying with limited operational time and power constraints using the APRS protocol, such that if proven successful, will be used for future satellite missions to gather data in remote areas.

Computer simulation of pressure and velocity fields in drug-eluting stents using the gridap library

Lucena, Rachel; Shin, Hyun Ho; Oliveira, Gustavo P.; Anjos, Gustavo R.; Pontes, José; McGinty, Sean; Mangiavacchi, Norberto.

Link: http://enmc.ccam.uesc.br/
http://enmc.ccam.uesc.br/templates/PROGRAMACAO_GERAL_DO_XXV_ENMC_XIII_ECTM_9_MCSul_IX_SEMENGOc.pdf

XXV ENMC, XIII ECTM, 9º MCSul e IX SEMENGO

Abstract

Several numerical simulations of drug release from coronary drug-eluting stents were formerly performed by the authors through Matlab© and Octave to understand transport and binding mechanisms over the device/artery interface. As a continued effort, this paper is intended to reproduce results previously obtained of pressure distribution and velocity field, now employing Gridap, a Julia language-based library, able to explore different approaches of approximation Finite Element spaces, and high performance solution strategies. We compared results obtained employing diverse numerical and computational choices, such as variable mesh refinement levels, finite element interpolation order, pre-conditioner classes, and solver configurations (architecture, memory, multi-threading, etc.). The proposed benchmark problem, even addressing a relatively simple geometry and a linear differential equation, has singular regions that cause numerical difficulties, thus limiting the rate of convergence of the numerical approximations. The main contribution of the paper is to show the benefits of employing Julia as a programming language for scientific applications, and Gridap as a Finite Element library, which provided easy access to high performance resources as multi threading, parallel processing, GPU acceleration, thus great versatility in solving complex problems.

Contrast enhancement of orthopantomograms to improve tooth segmentation using U-Nets

Gonzalez Aseretto, Sebastián; Vázquez Noguera, José Luis

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Link: https://ieeexplore.ieee.org/document/9959912

Abstract

Panoramic radiographs of teeth, also called orthopantomograms, play an important role in different tasks, from the diagnosis of diseases to the identification of persons in forensic dentistry. The segmentation of teeth from these radiographs can be used as a preliminary step for tasks such as counting, measure the similarity between two orthopantomograms and recognition of a person's teeth. These types of radiographs suffer from low contrast which can make it difficult to segment the teeth. In this paper we propose a methodology in which a contrast enhancement technique is used on orthopantomograms, and then used in the segmentation task using U-Nets. In the experiments, different image contrast enhancement methods were evaluated, obtaining better values in the F1-score metric compared to using no pre-processing before segmentation using U-nets. Finally, a correlation analysis of different metrics of image quality enhancement evaluation was performed, showing that contrast is positively correlated with the precision and accuracy of the segmentation obtained by U-nets.

Data Modeling with Ontological Formalism for Semantic Interoperability between Health Information Systems, applied to Primary Health Care in Paraguay

Osorio, Viviana; Laviosa, Sonia; Giménez-Lugo, Gustavo; Villalba, Cynthia

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Link: https://ieeexplore.ieee.org/abstract/document/9959960

IEEE Xplore

Abstract

In terms of public health policies, having all the information from the different Health Information Systems enriches the decision-making criteria, but the fact that each system has its own structure and protocols makes integrating all this information a challenge. Therefore, it is essential to have interoperability standards that enable such communication, but although several standards are available for this purpose, in order to make better use of such information, such as making inferences or integrated queries that depend on the semantics of a specific context, such as the public policies of a country, it is necessary to use modeling techniques according to the context. In this sense, this paper presents a solution for semantic interoperability between Health Information Systems, through the use of ontologies. For this purpose, we start from the definition of a Minimum Data Set for Primary Health Care in Paraguay, this Minimum Data Set is used as the basis for the development of an ontology, which for the scope of this work, and as a demonstration, the vaccination area was taken as a scenario. For the ontology validation process, the necessary syntactic interoperability was also implemented to integrate some testing systems and enable the execution of ontological queries.

Design of a referential geolocation system and evaluation of its integration to the distance diagnostic coverage in patients with specific pathologies

Yegros, César ; Recalde, Luciano; Núñez, José

DOI: https://doi.org/10.54808/IMCIC2022.01.187
Link: https://www.iiis.org/CDs2022/CD2022Spring//papers/ZA870ZE.pdf

Proceedings of the 13th International Multi-Conference on Complexity, Informatics and Cybernetics (IMCIC 2022)

Abstract

The efficiency of a digital generation system for clinical records and the implementation of an integrated referential geolocation system are evaluated to provide remote diagnostic coverage to patients with Dengue, Sar-Cov2 and Leishmania, in the school hospital of the National University of Asunción, to assess its usefulness in patient management and generate maps with information on the area of influence of the Hospital with the physical location of patients with the aforementioned pathologies. the results will be presented with the system implemented within the hospital, in order to have better control and monitoring of patients, as well as to evaluate the efficiency and economic impact of the records management system with geolocation. This development seeks to be an assessment tool for the possible allocation of economic resources and health strategies for decision makers and the local health authority in the population of influence of the Hospital.

Development of KITSUNE: A 6U CubeSat for 5-m Class Imaging, C-band Radio Service, Ionospheric Research and IoT

Orger, Necmi Cihan; Cordova-Alarcon, Jose Rodrigo; Cordova-Alarcon, Jose Rodrigo; Schulz, Victor Hugo; Dayarathna, Tharindu; Cho, Mengu; Yamauchi, Takashi; Masui, Hirokazu; Ampadu, Ofosu Joseph; Kim, Sangkyun; Lepcha, Pooja; Nakayama, Daisuke; Sejera, Marloun Pelayo; Azami, Muhammed Hasif Bin; Kishimoto, Makiko; Chow, Chee Lap; Holden, King Ho Li; Harada, Hirotoshi; Fukuda, Yoshiya;Nakayama, Kazuhiro; Kagohashi, Akihiko; Kojima, Kaname

Link: http://hdl.handle.net/10228/00009123
Link: https://kyutech.repo.nii.ac.jp/records/7920

Kyushu Institute of Technology Academic Repository

Abstract

KITSUNE (Fox in Japanese language) is a 6-unit (6U) CubeSat with multiple missions such as Earth observation with 5-m class resolution color images, demonstration of C-band communication service, development of 2-unit main bus system (2UMB), measurements of total electron content in the ionosphere, LORA on-orbit demonstration for Internet of things (IoT), and store-and-forward mission from the ground sensor terminals of the developing countries. KITSUNE satellite has been developed as a dual-satellite system that is composed of the section controlled by the amateur frequencies, which includes the 2UMB and 3U-sized camera payload, and the section controlled by the non-amateur frequencies that is called SPATIUM-II. While SPATIUM-II only receives battery power from the 2UMB section, it is controlled by an independent ground station to perform store-and-forward mission and ionospheric research. On the other hand, the 2UMB system executes the Earth observation mission and C-band amateur radio service. Even though the camera payload has been developed to capture 5-m class color images for entertainment purposes, it will be used to demonstrate wild-fire detection by a CubeSat platform as well. Finally, the flight model of the satellite has been successfully completed, and KITSUNE is expected to launch in early 2022.

Diagnosis of Melanocytic Lesions using the K-Nearest Neighbors classification technique

Vázquez Noguera, José Luis; Pinto-Roa, Diego P.; Franco, Alba; Martinez, Leticia; Nuñez, Carlos

DOI: https://doi.org/10.23919/CISTI54924.2022.9820530
Link: https://ieeexplore.ieee.org/document/9820530

IEE Xplore

Abstract

Melanoma is a type of skin cancer that originates when melanocytes (the cells that give skin its tan or brown color) begin to grow out of control. Cells from almost any part of the body can develop into cancer and can then spread to other areas of the body. Currently there is no tool to assist the medical professional in the rapid diagnosis of melanoma. In this work, we propose a methodology that provides support to the dermatologist in the diagnosis of melanoma. This methodology is composed of 4 modules: Preprocessing, Segmentation, Feature Extraction and Classification. Image preprocessing consists of hair removal. Segmentation consists of isolating the object of interest (the lesion). The extracted features for classification are: asymmetry, border, color and dermoscopic structures. Finally, the K-nearest neighbor (K-NN) classification method is used to classify benign and malignant moles. The final results of the methodology show 91.67% accuracy, 92.50% sensitivity and 100% specificity. Since the results look promising, this technique could be the basis for more sophisticated tools useful to clinicians in the diagnosis of melanoma.

Effectiveness Assessment of Time Series Models for Anomalies Detection in Real Network Traffic

Hulskamp, Delia; Cappo, Cristian

DOI: https://doi.org/10.1109/SCCC57464.2022.10000354

2022 41st International Conference of the Chilean Computer Science Society (SCCC)

Abstract

In the field of Information Technology, threats have evolved and diversified. For this reason, detecting and identifying these threats is essential to prevent abnormal behavior within networks. Using Network Intrusion Detection Systems (NIDS) to analyze network traffic behavior helps identify and prevent malicious activities. This work assesses the effectiveness of three Time Series models for anomaly detection: ARIMA, Holt- Winters, and Moving Averages, implemented in Snort, a popular NIDS, using a public dataset with real network traffic collected in a Spanish ISP with long-term data traffic. The evaluated models have detected between 99% and 100% of DoS, PortScanning, and UDPScan attacks included in the dataset with low false alarms.

Energy Efficiency Labels in the World and Latin America: A Survey

De Oliveira, Jairo; Riveros, Natalia; González, Arturo; Oxilia, Victorio

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Link: https://ieeexplore.ieee.org/document/9939751

Abstract:

Energy efficiency labels are tools used to provide information to consumers and guide them to select the most efficient products from an energy perspective and they represent a very interesting tool to face the growing energy demand since it could generate both economic and ecological benefits. The current literature exposes indications to guarantee the effectiveness of the labeling programs, among them, its obligatory nature, that it be understandable by the users, among others. This work presents a systematic review of the literature in the period 2000-2022, where several research questions and a bibliometric analysis were defined, for which different types of scientific articles and some technical reports were addressed within the framework of a well-defined methodology. A global panorama is presented for which different works were analyzed worldwide and in the Latin American region in terms of energy efficiency labels mainly related to the use of household appliances. As principal a result, the different scientific works identified and consulted focus on studies related to aspects such as the presentation of information on labels, its interaction with consumer purchasing preferences, its relationship with socioeconomic and sociodemographic factors, and the responses of marketing programs about labels which were adopted in various parts of the world.

Epymodel: A user-friendly web application for visualising COVID-19 projections for Paraguay including under-reporting and vaccination

Vázquez-Noguera, J. L.; Shin, H. H.; Sauer,C.; Grillo, S.; Pérez-Estigarribia, P. E.

Link: https://link.springer.com/chapter/10.1007/978-3-031-36357-3_5

Conference proceedings. Advances in Computing. 16 th Colombian Congress, CCC 2022, Armenia Colombia, October 17-21, 2022, Revised Selected Papers

Most health software fails due to the lack of efficient use. Moreover, the appearance of COVID-19 has generated the need for a user-friendly system that allows us to visualise possible scenarios of contagion, hospitalised patients and deaths. Previous work addressed the mathematical modelling of the spread dynamics and its impact in the public health system with time-dependent transmissibility and proportions using a moving time-window strategy. In this work, we extend the mathematical model to include an estimate of under-reported COVID-19 cases and the immunisation impact from vaccination campaigns. The model parameters are estimated using a Bayesian approach with data from Paraguay and are compared to those obtained in a previous work. The comparisons show that the proposed model can better explain the different circumstances observed from Paraguay since June 2021, when the under-reporting and vaccinations effects become essential. Some scenarios are drawn based on the historical transmissibility and are assessed using the observed data. A web application called Epymodel was developed to show both the historical values of the parameters and variables of the proposed model, as well as the projections of the different scenarios. Finally, a usability test of the web application is performed. Users showed a high level of satisfaction in the use of Epymodel.

Establishing a network of ground sensor terminals (GSTs) for satellite based global store and forward data collection mission in developing countries

Lepcha, Pooja; Dayarathna, Tharindu; Orger, Necmi Cihan; Aiman Rahmat, Nik Amirul; Gaona, Federico; Quiñonez, Ever; Liu, Yu-Shen; Koirala, Sagar; Sayanju, Sirash; Bayansan, Barsbold; Tumenjargal, Turtogtokh; Ulambayar, Tuguldur; Cho, Mengu

Link:
https://iafastro.directory/iac/paper/id/67852/abstract-pdf/IAC-22,B4,1,11,x67852.brief.pdf?2022-04-01.13:38:42

73rd International Astronautical Congress 2022

Abstract

Kyushu Institute of Technology (Kyutech), Japan initiated and formed a network of ground sensor terminals (GSTs) with participants from 11 different agencies/institutions predominantly in developing countries for a CubeSat based store and forward (SF) data collection mission. Most of the participating countries have limited access to space technologies with emerging space programs. Involvement of these countries in this collaborative network has enabled the participating countries with access to space development and utilization without having to launch satellites using their own resources. The basic design for the GST was envisioned at Kyutech, each of these countries have customized the design based on material substitutes available locally, optimizing the design for that country. The participants from each country built their customized GSTs with applications that are most relevant in solving issues that arise 1 Paper ID: 67852 student locally. A SF receiver payload was developed for a 6-unit CubeSat called KITSUNE at Kyutech. This paper states the challenges faced in these countries and the basis on which the sensors have been selected for the GST to solve these issues. Additionally, the paper describes the efforts undertaken by participants to build GST using local component substitutes while learning about the complexities and limitations of ground to satellite communications. The research aims to promote large scale space utilization and human capacity development in developing countries despite having constrained space programs. KITSUNE was launched on February 24th, 2022 and it is expected to be deployed in the spring of 2022. The country specific dataset collected by the satellite will be archived and analyzed for generating prediction profiles and monitoring variables as a basis to address local data collection problems faced in the respective countries.

Estimation of Blood Pressure by Applying Principal Component Analysis Through the Decomposition of Pearson and Spearman Correlation Matrices

Villegas Colmán, Carolina Elizabeth; Villalba, Cynthia; Vázquez Noguera, José; Luis; Gómez Guerrero, Santiago

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IEEE Xplore

Abstract

For the training of blood pressure predictive models, it is necessary to determine the optimal number of predictors when the data set is of high dimensionality. Applying the appropriate dimensionality reduction technique according to the dataset will reduce the number of components and improve the performance of the predictive models. This work proposes the dimensionality reduction of the data set through the explorations of linear and nonlinear relationships of photoplethysmography signals by applying principal component analysis through the decomposition of Pearson and Spearman correlation matrices. The differences between the explained and cumulative variances of the principal components are minimal by applying Pearson and Spearman correlations. The predictive models trained with the first 5 principal components obtained better results for the estimation of blood pressure, with minimal loss of information with respect to the original data set.

Feature selection for Time Series Clustering: A case study on Dengue in Peru

Martinez, Maria Giohanna; Stalder, Diego H.; Bogado, Juan Vicente; Schaerer, Christian E.; Ramírez-Soto M., Max; Champin, Denisse

Link: https://proceedings.sbmac.org.br/sbmac/article/view/3841

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics

Abstract

In recent decades, the world has experienced a health crisis due to the increase of infectious diseases cases, such as COVID-19, Dengue, Zika, among others. Dengue is one of the world's most important neglected tropical disease transmitted by vectors, mainly Aedes Aegypti.

Finite Element Modeling and Characterization of a GTEM Cell

Reckziegel, Alejandro; Shin, Hyun Ho; Cabral, Juan Carlos; Stalder, Diego

Link https://proceedings.sbmac.org.br/sbmac/article/view/3818/3868

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics

Abstract

Giga-hertz Transverse Electromagnetic (GTEM) Cells are instruments used in the field of elec- tronics for the purpose of performing electromagnetic compatibility tests, which are necessary in order to verify that electronic equipment is immune to external disturbances and does not produce signals that disturb other equipment.

Gradual and Synergistic Correlation between Tumor Thickness and Histological Grade in Penile Invasive Carcinomas. An Outcome Study of 147 Mexican Patients

Alvarado-Cabrero, Isabel; Sanchez, Diego F.; Valencia-Cedillo, Raquel; Fernandez-Nestosa, María José; Canete-Portillo, Sofia; Cubilla, Antonio

Link: https://www.nature.com/articles/s41379-022-01038-2.pdf
(Resumen 528, página 567)

Modern Pathology Abstractcs 2022 USCAP 111TH Annual Meeting

Background: Histological grade is among the best outcome pathological predictor in penile cancer. The TNM system is based on the combination of grade and depth of infiltration of penile anatomical levels. It is assumed in general that higher grade and deep tumors carries the worst prognosis and the contrary occur with superficially invading and low-grade neoplasms. However, there is no systematic evaluation of the phenomenon.

Design: 147 patients diagnosed, treated, and followed at the Hospital de Oncologia - Instituto Mexicano del Seguro Social, from January 2000 to August 2013 were selected. All patients were treated either by total or partial penectomies. Lymph node involvement was evaluated by bilateral inguinal node dissection (126 cases) or ultrasonography (21 cases). Thickness was measured in mm from tumor surface to deepest invasion point and were classified as superficial (≤5 mm) or deep (>10 mm) tumors. Histological grade evaluation was made according to WHO 2016 and AFIP 2020 criteria [low-grade: grades 1 (G1) and 2 (G2); high-grade: grade 3(G3)]. Correlation between grade and thickness was explored using Spearman's rank correlation test. Comparative outcome was evaluated using Fisher's exact test.

Results: Average age was 62 (26 to 98) years old. Thickness average was 15 mm (2 to 30 mm). G1, G2 and G3 tumors corresponded to 19 (13%), 48 (33%), and 80 (54%) cases, respectively. Distribution according to thickness, histological grade, positive lymph nodes, and outcome is shown in Table. Follow-up ranged from 10 to 82 months (median: 57 months). Fifty-three (36%) patients died of disease. There was a positive correlation between grade and thickness (Spearman's rho: 0.72, p-value < 2.2e-16) (Figure).

Conclusions: There was an overall correlation between thickness and grade in most of the cases. Low-grade tumors were encountered in 92% (12/13) of

superficial tumors. Deep tumors showed high-grade in 75% of cases (73/97 cases, p-value = 1.879e-12). Superficial tumors with low histological grade had negative inguinal nodes and no mortality whereas deep tumors showing high histological grade were associated with a higher metastatic risk to lymph nodes (69/73 cases, 94%, p-value = 9.063e14) and mortality (53/73 cases, 73%, p-value = 1.443e-12). Of 24 deep tumors with low histological grade, 7 had nodal spread (29%) but only 1 died of disease. Thickness and grade are important synergistic and predictive pathological factors in relation to prognosis.

Identificación de niveles confiables de penetración de generación fotovoltaica

Torres Larroza, Oscar; Valdéz Barboza, Diana; Zambroni, Antonio Carlos

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Link: https://ieeexplore.ieee.org/document/9940104

IEEE Xplore

Abstract

This paper presents the development of a methodology to identify reliable penetration levels of non-conventional renewable generation, such as photovoltaic generation in the Paraguayan Transmission System. Therefore, this methodology is developed for the quantification of current stability margins, the recognition of critical areas of the system, and the identification of candidate busbars for possible system reinforcements such as the insertion of solar photovoltaic generation, thus obtaining an evaluation of the technical performance of the system. For this, some classical voltage stability tools are applied, such as the Load Margin, obtained by means of the PV curves and the Tangent Vector. Likewise, this analysis allows to obtain the positive impacts of a higher photovoltaic penetration such as a significant increase in the load margin, as well as eventual negative effects considering the decrease of the rotational inertia of the system. Finally, it is concluded that this method is valid for the proposed analysis and that, in the Paraguayan system, up to 15% of non-conventional renewable generation can be safely inserted, based on dynamic studies.

Infrared Photoelectric Sensor Network Applied to Remote Arthropod Insects' Surveillance

Gaona, Federico A.; Quiñonez, Ever; Jara. Adolfo; Manabe, Ariel; Silva, Norma; Monteiro, Magna; Schaerer, Christian E.; Vega, Celeste; Rojas de Arias, Antonieta

DOI: http://dx.doi.org/10.5220/0010793400003118
Link: https://www.scitepress.org/Link.aspx?doi=10.5220/0010793400003118
https://www.researchgate.net/publication/358597647_Infrared_Photoelectric_Sensor_Network_Applied_to_Remote_Arthropod_Insects'_Surveillance

SciTePress

Abstract

This work presents a monitoring system trap to detect the presence of arthropod insects in a remote surveillance zone. Detections are made using sensor traps that are installed in twenty houses of an indigenous village of the Paraguayan Chaco in South America, where the insects that transmit Chagas disease are pressing to infest the area. Pheromone baits are used to ensure the attraction of Triatoma infestans. For detecting variations of the light due to insect intrusion, trap entrances have photoelectric infrared sensors. Once the insect is detected, the information is collected and transmitted to an Internet database storage server. More than 750 intrusions were detected during nine months, the highest number of detections occurred when the temperature ranged between 20 °C and 34 °C, relative humidity average less than 30% and the precipitation was less than 1.5 mm. This new result provides evidence of the T. infestans activity at different times of the day and month, and its relationship with certain environmental variables. These findings contribute to reorientate surveillance procedures, validate the monitoring system proposal and give important information on the vector's life activity.

Improving cooperation using incomplete fractional punishment

Botta, Rocio; Blanco, Gerardo; Schaerer, Christian E.

Link:
https://www.sing17.org/_files/ugd/1e630e_46278b2fb73b4ddc8c551643f35faba6.pdf

17th European Meeting on Game Theory. Plenary Speakers

Abstract

In a public goods game, when a sanctioning system is defined, typically every defector in the population is punished [3]. However, in real-world situations, punishing every free-rider is not the norm. On one hand, sanctioning is expensive and resourceconsuming [4, 2], on the other hand, it may be impossible to catch all the defectors in the population. Therefore, the group must decide between accepting the sanctioning cost or assuming the financial loss. Often, an intermediate solution is applied. To sanction a reduced group expecting that, as a consequence, defectors are persuaded to change their strategy. In this work, we consider a compulsory public goods game where only a percentage of the free-riders are sanctioned. We call this mechanism fractional punishment [1]. The punished fraction of defectors has their payoff reduced by a fine. We analyze the interplay between both parameters: the fraction of sanctioned defectors and the amount of the fine applied to improve cooperation in the group. Using replicator dynamics we study the evolution of the system. The results show that it is not necessary to sanction every defector in order to improve cooperation in the population. Furthermore, due to the relation between the parameters, depending on the circumstances, it can be more advisable to sanction more defectors and apply a small fine or, on the contrary, to apply a large fine to fewer defectors. Thus, cooperation can be achieved with a moderate effort in chasing the free-riders and reasonable fines.

Lymphovascular Invasion (LVI) and Perineural Invasion (PNI) According to Tumor Thickness in Invasive Penile Carcinomas

Alvarado-Cabrero,Isabel; Sanchez, Diego F.; Fernandez-Nestosa, María José; Valencia-Cedillo, Raquel; Rodríguez, Ingrid; Servín, Sofia; Canete-Portillo, Antonio Cubilla.

Link: https://www.nature.com/articles/s41379-022-01038-2.pdf
(Resumen 529, página 569)

Modern Pathology Abstractcs 2022 USCAP 111TH Annual Meeting

Background: Lymphovascular invasion (LVI) and perineural invasion (PNI) were considered adverse prognostic factors in superficially invasive carcinomas in the 8th edition of the TNM staging manual, hence responsible for the pT1b category. pT1 refers to tumors invading into lamina propria (LP). We would like to challenge this view, since in our experience LVI and PNI tend to occur in deeply invasive and not in superficial tumors.

Design: 147 patients with invasive carcinoma treated by partial or total penectomies were studied. Lymph node involvement was evaluated by bilateral inguinal node dissection (126 cases) or ultrasonography (21 cases). Tumor thickness was measured in mm from tumor surface to deepest invasion point and were classified as superficial (≤5 mm) or deep (>10 mm) tumors. Follow-up ranged from 10 to 82 months (median: 57 months). Statistical analysis was done using Fisher's exact test Results: Average tumor thickness was 15 mm (2 to 30 mm). LVI was identified in 87 (59%) and PNI in 58 (39%) cases, respectively. No LVI was detected in superficial tumors (1-5mm) and only 2 of these had PNI. There was a gradual and synergistic increase in the rate of LVI and PNI in deeper tumors (LVI p-value < 2.2e-16, PNI p-value = 5.701e-12). Unfavorable outcome was present only in tumors with thickness greater than 10mm (LVI p-value = 1.17e-14, PNI p-value = 2.435e-09) (Table)

Conclusions: Only 2 patients with superficial tumors (1-5mm) had PNI, with no regional spread or mortality. LVI was not detected in this category. Nodal metastasis was noted in 4 carcinomas invading 5 to 10 mm and none died from disease. There was a gradual increase of metastasis and mortality rate for tumors with LVI or PNI invading more than 10 mm with highest rate for those invading more than 15 mm. Tumors invading superficial CS behaved as those invading only LP and tumors invading into deep CS behaved as those invading CC. Tumor thickness may be a better prognostic indicator than anatomical

levels. We found no evidence for supporting the category pT1b in the current TNM staging model.

Mathematical programming application for the assignment of patients, with Covid-19, to ICU beds

Román, Sannie; Echagüe, Betania; Recalde-Ramírez, Jorge L.; López, Maria Margarita

Link: https://claio2022.dc.uba.ar/docs/abstract-book.pdf

Abstract Book XXI Latin Ibero-American Conference on Operations

Abstract

A problem with high notoriety worldwide and nationally during the Covid-19 pandemic is the lack of resources (beds, medicines, nurses, doctors) in the called reference hospitals to attend to patients infected. Also, the hospital managers affront the congestion and the priority order to attend to patients. Even more, some users are left on the waiting list to occupy a bed or to be transferred to other hospitals with available capacity. We can represent this problem through mathematical programming considering restrictions such as the number of beds available per hospital, the distance between hospitals, and the priority level of patient care. The objectives could be minimizing the distance traveled, maximizing the use of hospital beds, minimizing the work time of health personnel in congested hospitals, minimizing the cost of treating patients in hospitals, among others. We analyze the case of the effective reassignment of patients with Covid-19, on the waiting list to be treated in the reference hospitals in Asunción and the Central Department (Paraguay) with data provided by the Ministry of Health and Social Welfare. In previous results, we describe and graph a "Protocol for the referral of patients who require an ICU bed in the public health system." Also, analyzing the data collected, the relevant parameters were determined, as the capacity of ICU beds (Intensive care unit) available in the reference hospitals, the level of occupancy of the beds, the care priority criteria, patient stabilization and transfer time, and the number of requests for ICU beds. It is expected to obtain a schedule for the effective assignment of patients, in this case with COVID-19, considering the levels of congestion of other hospitals, the priority of patient care, and other restrictions related to the problem. For the computational programming of the model, we will employ Gurobi 8.1.1 optimization software with the Python programming language.

Multicast routing and virtual network function placement in NFV-SDN networks: a genetic algorithms approach

García, Germán; Pinto-Roa, Diego P.

DOI: https://doi.org/10.1145/3545250.3560846
Link: https://dl.acm.org/doi/10.1145/3545250.3560846

LANC´22: Proceedings of the 2022 Latin American Networking Conference

Abstract

Communication trends demand services that require flexible multicast transmission with requirements for data processing functions at the network nodes. This challenge is achieved with software-defined networking (SDN) and network functions virtualization (NFV) technologies. In the multicast routing problem in NFV-SDN networks, the goal is to compute a multicast tree and the location of virtual network functions (VNFs) at nodes, satisfying the traffic demand and processing functions with the least possible resource. The traffic flow must pass through a VNF node before reaching a destination node. Since the problem has high computational complexity and current proposals consider only one type of virtual function in all demands, the development of scalable solutions for multiple sessions with different virtual functions is necessary. This paper addresses the multicast session routing and VNF placement (MSVNFP) problem in NFV-SDN networks as a joint optimization problem. In this context, we propose an approach based on Genetic Algorithms (GA) called MSVNFP-GA. Given a set of multicast demands, the proposed algorithm calculates for each demand a tree and the location of VNFs seeking to minimize the total cost of links and node activation. Numerical simulations on different network topologies and traffic loads show that MSVNFP-GA is promising compared to the state-of-the-art competitive algorithms.

Multicriteria analysis of the performance in the use of electrical energy in the UNA: An approach based on AHP

Aquino, Fabio; Fernández, Félix; Ortigoza, Eduardo

DOI: https://doi.org/10.1109/ICA-ACCA56767.2022.10006203
Link: https://ieeexplore.ieee.org/document/10006203

2022 IEEE International Conference on Automation/XXV Congress of the Chilean Association of Automatic Control (ICA-ACCA)

Abstract

Currently, energy efficiency, alternative sources and rational use of energy are widely used concepts to achieve process profitability, electricity bill reduction, security of supply and mitigation of environmental costs, being useful for all final consumption sectors of a country. The main objective of this work is to perform an analysis of the electric energy management of the Faculties of the National University of Asuncion (UNA). It is proposed to use the Analytic Hierarchy Process (AHP) method to analyze and rank those faculties that have a better performance in the management of resources related to energy consumption. The criteria chosen for the AHP evaluation were the characteristics of consumption, the level of losses, the efficiency of the Significant Energy Uses, the economic, the quality of management and the environmental. For the analysis, 8 alternatives were initially considered, which are represented by the faculties located at the headquarters. The results show that the best alternative under the criteria analyzed, being considered with the same level of importance, is represented by the Faculty of Chemical Sciences. A sensitivity analysis of the AHP results to changes in the importance of the criteria was also performed, obtaining a distribution of yields similar to the first scenario considered, which confirms the current performance trends of the facilities analyzed. Finally, with the results obtained, an Energy Benchmarking was also proposed, in order to know the levels of effort that each academic unit needs to make to move towards a performance standard in electric energy management.

Multi-criteria decision making for prioritization of Distribution System alternatives in 23 kV

Fernández, Félix; Barreto, Francisco; Sanabria, Jazmín; Ortigoza, Eduardo; Ríos, Daniel; Baum, Gabriel; González, Arturo

DOI: https://doi.org/10.1109/ICA-ACCA56767.2022.10006104

2022 IEEE International Conference on Automation/ XXV Congress of the Chilean Association of Automatic Control (ICA-ACCA)

Abstract

The Paraguayan electricity system in recent years has experienced a marked acceleration in the growth of demand, attributing it to industries, commerce and, above all, to population growth. In this sense, the Paraguayan electricity company ANDE has a program of works for the Generation, Transmission and Distribution of electricity, described in the ANDE Master Investment Plan, required by the National Interconnected System (NIS), which are necessary to meet the current requirements. Particularly, for the Distribution system, new works are contemplated that seek to attend to the expansion of the system and improve the conditions of the electrical service. Said plan includes a program for the feeders that includes the group of works of: expansion, adaptation and reinforcements in the Medium Voltage (MV) networks, for each system: Metropolitan, East, Central, South, North and West. The works of new 23 kV feeders are proposed with the aim of improving the quality of the electricity supply. To achieve this, large economic investments are required, which are generally limited for each system, hence the need to have an adequate prioritization plan for works. In this sense, the present work seeks to identify which are the priority 23 kV feeder works, based on multiple evaluation criteria, which determine the suitability of each work for a system, in this particular case it is the Central System, for the works of year 2021. Therefore, a multi-criteria analysis methodology is proposed, based on the decision-making tool called the Analytic Hierarchy Process (AHP), which allows evaluating the proposed alternatives based on criteria and/or selected subcriteria. The study proposes a hierarchical tree within the framework of the problem statement, together with the alternatives selected for the year 2021. With this, it is intended to provide a decision-making tool that allows the works analyzed to be prioritized and collaborate in the field of planning of the Paraguayan electricity company.

Multidimensional Composite Energy Poverty Index based on a Regional Average Benchmark. Study Case: Argentina, Brazil, Uruguay, and Paraguay

González, Arturo; Pereira, Gabriel; Ríos, Richard; Llamosas, Cecilia; Oxilia, Victorio; Blanco, Gerardo

DOI: https://doi.org/10.1109/CHILECON54041.2021.9702981
Link: https://ieeexplore.ieee.org/document/9702981

IEEE Xplore

Abstract

The evolution of technologies and the lifestyle of human beings have made energy become an essential element for the prosperity and well-being of countries and even regions. A large part of the world population still lives without being able to access energy sources that make it impossible to satisfy basic and fundamental needs, which implies suffering from energy poverty. This work proposes a methodology with a multidimensional approach (Availability, Accessibility and Affordability of Energy) for the calculation of a Composite Energy Poverty Index based on a regional reference called "Regional Average Parameter" for the measurement of energy poverty to regional level. In this way, it seeks to provide a more accurate vision of the problem of energy poverty in the region, taking Argentina, Brazil, Uruguay and Paraguay as a case study.

Noise removal and contrast enhancement in fundus images via morphological operations

Fleitas Maidana, María Belén; Vázquez Noguera, José Luis; Pinto-Roa, Diego P.; Mello-Román, Julio César

DOI: https://doi.org/10.23919/CISTI54924.2022.9820324
Link: https://ieeexplore.ieee.org/document/9820324

IEEE Xplore

Abstract

Retinal images or fundus images are used to support the diagnosis of eye diseases and cardiovascular diseases. However, if these images present poor quality such as noise, low contrast or poor details, they may not be useful for diagnosis, especially in automated image analysis systems. In this paper, a scheme for noise reduction and contrast enhancement of fundus images is presented. This approach is based on mathematical morphology operations and consists of two steps. In the first step, the Open-Close Close-Open (OCCO) morphological filter is used to smooth the image. In the second step, a contrast enhancement algorithm based on the top-hat transform is used. The proposed approach obtains better results in terms of noise reduction and contrast enhancement compared to state-of-the-art methods.

Optimal Control of Fractional Punishment in Optional Public Goods Game

Grau, Josías; Botta, Rocío; Schaerer, Christian E.

Link: https://proceedings.sbmac.org.br/sbmac/article/view/3780/3830

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics

Abstract

Improving cooperation is a key issue in many systems and organizations. Punishment is a mechanism to improve cooperation, but it can be expensive [1], and consequently it itself becomes a Public Good [2]. Several mechanism to implement punishment are encountered in the literature including sanctioning only a fraction of the free riders [3]. This approach reduces the number of free riders, and consequently the cost of the sanctioning system.

Optimization in Positioning of Police Resources A case study of Asunción - Paraguay

Álvarez Penayo, Luis Alberto; Álvarez Penayo, Marco Antonio; Colbes, José Pinto-Roa, Diego P.

DOI: https://doi.org/10.1109/CLEI56649.2022.9959939
Link: https://ieeexplore.ieee.org/document/9959939/authors

IEEE Xplore

Abstract

Efficient attendance of 911 emergency calls is a significant challenge, mainly in cities with high rates of violence. This problem has been addressed by considering it as a coverage problem with violence rates but without guaranteeing maximum response time or minimizing response time without guaranteeing coverage. Consequently, in this work, we address this problem by considering a coverage maximization according to the violence index guaranteeing maximum response and coverage. For this purpose, we developed a tool that builds a weighted graph with the violence index, given a city map and the history of recorded incidents. Next, inspired by the previous works, we propose a new mathematical formulation that maximizes coverage according to the rate of violence subject to total coverage and guarantees maximum response time. Furthermore, we apply a Tabu Search to calculate the best solution. Considering actual data from the city of Asunción (Paraguay), a numerical simulation was performed using the strategy in the system 911, a state-of-the art algorithm based on coverage, and our contribution. The simulation results show that the proposed algorithm can find security coverage solutions with a better allocation for the areas with a high rate of violence than the other alternatives evaluated.

Optimization of an agricultural supply chain to increase farmer food security and promote rural development

Vera,Jorge; López, María Margarita; Plà-Aragonès,Lluís Miquel; Recalde, Jorge.

Link: https://www.euro-online.org/conf/admin/tmp/program-euro32.pdf

Abstract Book EURO 2022

Abstract

Many rural areas in the world are occupied by peasants with low incomes, deficient access to technology, and other limitations, which translates into poverty and, overall, lack of food security. This situation is a severe problem in developing countries where small farmers allocate most of their crops for self-consumption, embarking in a condition where poverty increases, and nutrition requirements are not fulfilled. However, several government programs in some countries are trying to push incentives for better decisions on crop rotation and exchange of crops between farmers, as well as better access to markets. Still, these actions require coordination and planning as decisionmaking in a system like this is complex. In this paper, we propose the use of a mathematical optimization model to help decision-making in this environment. Our model considers decisions on crops, product allocation to markets or self-consumption, and contemplates economic objectives, as well as nutritional ones. We test our model in a case developed for the Department of Caazapá, in Paraguay, where 80% of the population is rural, and 42% is poor. We considered instances with different requirements and organizations, showing results for various scenarios. The results allow to analyze the effects of cooperative structures and crops on revenue and food security. We expect the model to be helpful in the design of public policies to support rural farmers and increase food security.

Planificación del ciclo productivo de lotes avícolas en granjas parrilleras. Caso de estudio

Rios Ceupen, Blanca Irene; Colbes, José; Pinto-Roa, Diego P.

Link: https://claio2022.dc.uba.ar/docs/abstract-book.pdf

Abstract Book XXI Latin Ibero-American Conference on Operations Research CLAIO 2022

Abstract

El trabajo propone un cambio de paradigma de la cadena de producción de una de las empresas avícolas más importantes del Paraguay. Actualmente la misma realiza una planificación basada en la estrategia push, donde se produce a una determinada capacidad constante en las granjas avícolas e independiente de las fluctuaciones del mercado. Las granjas avícolas son cargadas de pollos BB para su engorde por un determinado tiempo para luego ser retirados y faenados en las plantas de producción para posterior venta directa o inventariados. Históricamente esta estrategia ha sido aplicada por la empresa dado que las fluctuaciones del mercado presentaban baja varianza. No obstante se ha detectado la necesidad de un cambio en la estrategia de producción debido a las modificaciones del patrón de consumo. El enfoque actual deja vulnerable a la empresa en dos situaciones principales: (a) incapacidad de satisfacer el mercado cuando existen picos de demanda generando un agudo quiebre de stock, e (b) incurre en altos niveles de inventario que son críticos debido al alto volumen de almacenamiento y consumo energético del sistema de refrigeración. Estas dos situaciones generan costos importantes restando competitividad en un mercado donde el margen de errores tiende a ser cada vez más estrecho. En consecuencia, este trabajo desarrolla una planificación basada en programación lineal entera basada en una estrategia pull. En esta estrategia la cadena de producción se planea en función a la demanda histórica del último lustro. El modelo ha sido codificado en lenguaje OPL y ejecutado en la herramienta computacional Cplex sobre un computador de alto desempeño. El modelo ha sido probado en instancias reales de la empresa mostrando su efectividad dotando de una mayor flexibilidad de la cadena de producción. Esta estrategia ha logrado minimizar los costos operativos y pérdidas de ventas por quiebres de stock en comparación al enfoque operativo actual.

Preliminary analysis and design of a greedy algorithm for the manufacturing process of integrated circuits

Fleytas, Sonia; Pinto-Roa, Diego P.; Colbes, José

DOI: https://doi.org/10.1109/CLEI56649.2022.9959965
Link: https://ieeexplore.ieee.org/document/9959965

Abstract

The stage of transporting semiconductor chips from the wafer to the support strip is crucial in the integrated circuit manufacturing process. This process can be modeled as a combinatorial optimization problem where the objective is to reduce the total distance the robotic arm must travel to pick up each chip and place it in its corresponding position within the support structure. This problem is of the pick-and-place type and is NP-hard. The (approximate) solution proposals of state-of-the-art methods include rule-based approaches, genetic algorithms, and reinforcement learning. In the present work one of these methods is analyzed, which models the problem as one of binary integer programming and proposes a genetic algorithm. Based on this analysis, we proposed and evaluated other methods, including a greedy algorithm that improves the state-of-the-art results for test cases usually used in the literature.

Reinforcement Learning applied to the Routing and Spectrum Assignment in Elastic Optical Networks

Arce, Santiago; Ayala Albertini, Luis; Ríos, Iván; Pinto-Roa, Diego P.; Colbes, José; Villagra, Marcos

DOI: https://doi.org/10.1109/LA-CCI54402.2022.9981609
Link: https://ieeexplore.ieee.org/document/9981609

Abstract

Elastic Optical Networks (EON) has emerged as technology in optical networks whose architecture can respond to the growing need for elasticity in allocating optical network resources. EON imposes physical layer constraints on traffics. In this context, developing efficient Routing and Spectrum Assignment (RSA) algorithms for dynamic traffic is critical to EON's success. Strategies based on Reinforcement Learning (RL) emerge as a valid alternative to dynamic RSA, due to its ability to adapt to changes in the state of the network by learning process. In this work, we propose RL algorithms based on Q-learning to solve the dynamic RSA problem. First, we study the performance of routing algorithms that evaluate the learning Q values for a set of pre-calculated disjoint routes by selecting a route that corresponds to a minimum blocking rate. Similarly, we studied Q-learning algorithms for spectrum assignment, which selects a block of the spectrum from a pre-routed path to minimize the blocking rate. Numerical simulations on different dynamic traffic loads show that the performance of the Q-learning-based proposals is promising in obtaining a better blocking rate than the state-of-the-art heuristic approaches.

Routing, baud rate, code, modulation level, and spectrum assignment in elastic optical networks: a genetic algorithms approach

Benítez, Divina; Zorrilla, Richard; Bogado-Martínez, César F.; Pinto-Roa, Diego P.; Barán, Benjamín

DOI: https://doi.org/10.1145/3545250.3560849
Link: https://dl.acm.org/doi/10.1145/3545250.3560849

LANC´22: Proceedings of the 2022 Latin American Networking Conference

Abstract

The Routing, Code, Baud rate, Modulation Level, and Spectrum Assignment (RBCMLSA) problem is critical in Elastic Optical Networks (EON). Literature reports solutions based on Integer Linear Programming (ILP) and heuristic techniques. However, when the complexity of the problem increases, the first technique becomes a non-scalable solution, while the second is inefficient. As an alternative, this work proposes two techniques based on Genetic Algorithms (GA): (1) a routing-based GA and (2) a permutation-based GA. The GAs seek a solution that minimizes the used spectrum subject to optical layer constraints. Numerical simulations perform the proposed GAs and the state-of-the-art (ILP and heuristic) under static traffic in several traffic loads and network scenarios. The simulation results in the considered instances show that the proposed GAs are competitive obtaining quality results close to the ILP approach with a reasonable computational time. Even more, the route-based GA incurs in a longer computational time than the permutation-based GA.

Selection of schools in districts using a bi-objective MILP model: A case study from Paraguay

Saldivar-Patiño, Tadeo R.; López, María Margarita Recalde-Ramírez; Jorge L.; Pinto-Roa, Diego P.

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Link: http://openproceedings.org/2022/conf/alioeuro/ALIOEURO_2021_paper_61.pdf

Open Proceedings-Short Paper

Abstract

The district of Abaí in the department of Caazapá, Paraguay, has building infrastructure conditions that can be improved in order to improve the quality of education. The reduction of schools could contribute to better management. Unfortunately, any change in the operation of the system generates strong resistance to change when it comes to closing schools. We present a bi-objective model that simultaneously seeks to reduce the total cost of the education system and minimize the number of students displaced from schools that must be closed.

Significant Geographic Variation in the Prevalence of HPV16 in Penile intraepithelial Neoplasia (PeIN). A Study of 172 International. Cases from 4 Regions

Sanchez,Diego F.Alemany, Laia;Clavero, Omar;Fernandez-Nestosa,María José;Cañete-Portillo,Sofía; de Sanjosé,Silvia; Munzo,Nubia;Bosch, Francesc Xavier;Quint, Wim;Guimerà,Nuria ;Prieto Granada,Carlos; Rodriguez Pena, Maria Del Carmen;Gordetsky, Jennifer y otros

Link: https://www.nature.com/articles/s41379-022-01038-2.pdf
(Resumen 614, página 661)

Modern Pathology Abstractcs 2022 USCAP 111TH Annual Meeting

Background: There is geographic variation in the prevalence of invasive penile carcinomas. The data on geographic distribution of penile precancerous lesions is limited. The majority of penile intraepithelial neoplasias (PeIN) are HPV-related, with a heterogeneous array of genotypes. Our aim was to compare the geographic distribution of PeIN HPV genotypes.

Design: Geographical regions evaluated were Asia-Oceania, Europe, USA, and Latin America with 10, 52, 31 and 79 lesions, respectively. Only HPV-positive basaloid, warty-basaloid (WB) or warty PeINs were included. HPV-negative cases including differentiated PeIN or others were excluded (WHO 2016). HPV genotypes were determined by either whole tissue section PCR (99 lesions) or laser capture microdissection PCR (73 lesions), performed in 4 different laboratories. Statistical significance was evaluated using the Fisher's Exact Test with simulated p-value Results: Overall, 16 HPV genotypes were detected (Table). HPV16 was the most frequent genotype, prevailing in Asia-Oceania, USA and Europe and was less frequent in Latin America. HPV16 was found in solitary or coexisting with other genotypes in 87, 85, 80 and 48% of cases from USA, Europe, Asia-Oceania, and Latin America respectively, p-value = 5e-07 (Fig. 1, Multiple_HPV16 indicates positivity of HPV16 genotype along other HPV genotypes in the same lesion. Multiple_non_HPV16 is used to denote positivity for more than one HPV genotype and no HPV16 detection). Considering the nonavalent HPV vaccine genotypes, coverage would occur in 100, 90, 83 and 63% of lesions of Asia Oceania, Europe, USA, and Latin America, respectively (p-value = 0.0019) (Fig. 2)

Conclusions: There were significant geographic differences in the distribution of HPV16. This genotype was more prevalent in all regions but Latin America. Variegated, non-HPV16 genotypes, were more prevalent in the latter. These

differences may affect coverage of current vaccination programs. Non coverage would occur in 0, 10, 17, and 36% of cases in Asia-Oceania, USA, Europe, and Latin America, respectively. Further research with a more uniform methodology for HPV detection is needed for analyzing these trends.

Solving the equation of the physical pendulum by some numerical methods of differential equations

Vega, Salustiano; Vega, Osvaldo; Ortigoza, Eduardo

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IEEE International Conference on Automatica (ICA-ACCA)

Abstract

The pendulum problem is one of the most studied topics in the field of Physics. In fact, in most cases, the simplest case is analyzed, so that in the less complex techniques given to describe the harmonic motion, small oscillation amplitudes are considered. However, the analysis of large oscillations presents a greater complexity and numerical methods are required to solve approximately the nonlinear differential equations that describe this type of problem. In this work, the nonlinear differential equations describing the damped oscillations of a rigid pendulum rotating on a pivot subject to a uniform gravitational force in the vertical direction will be solved numerically. Some initial conditions will be proposed and some classical numerical algorithms will be implemented, such as Euler and Euler Back methods both of first order, second order, Runge Kutta, Adams Bashforth and Trapezium methods, third order methods such as Adams Bashforth, Adams Moulton and fourth order methods such as Runge Kutta and Adams Moulton. Approximate solutions will be recommended for some values of the parameters of the differential equation studied and, finally, a comparison of the numerical algorithms with the solution of ordinary differential equations ODE45 of Matlab software will be made.

Space Vector Modulation applied to a Multi-Modular Matrix Converter for Current Control in Six-phase Generation Systems

Quiñonez, E. A.; Gómez-Redondo, M.; Toledo, S.; Caballero, D.; Nuñez, S.; Romero, R.; Maqueda, E.; Comparatore, L.; Gregor, R.; Rivera, M.

DOI: https://doi.org/10.1109/ICA-ACCA56767.2022.10006140

Abstract

Multiphase generators allow redundant conversion topologies to be applied by organizing sources into three-phase groups, this document presents a way to take advantage of this feature in conjunction with 3x3 matrix converters and SVM modulation, which allows not only control of the output signal, it also allows control of the input current phase. For this, a current PI control is applied. System performance is verified by reference tracking and THD with satisfactory transients for amplitude and frequency step in current applied to load.

Stochastic dynamics of the generation expansion in renewable power systems: the Paraguayan case

Ríos-Festner,Daniel; Blanco, Gerardo; López, Sonia; Olsina, Fernando

DOI: https://doi.org/10.1109/ARGENCON55245.2022.9939722
Link: https://ieeexplore.ieee.org/abstract/document/9939722

Abstract

This article presents a model that reproduces the long-term dynamics of the Paraguayan generation system, seeking to obtain a capacity expansion schedule under uncertainty. A centralized power dispatch model calculates the capacity addition rate of four technologies in two stages. First, the model dispatches existing technologies and quantifies the unsupplied demand. The dispatch model then assesses candidate technologies to cover the demand mismatch based on their available firm capacity. For each technology, the model calculates the total cost of covering the deficit and computes an optimal investment rate by applying an economic merit order. By considering Paraguay's Gross Domestic Product, and therefore electricity demand, as uncertain variables, this analysis offers empirical probability distribution functions (PDF) for firm capacity reserve margins and average system costs. By doing so, this model constitutes a tool to assess the uncertain long-term dynamics of generation systems from both a macroeconomic and a power system reliability point of view, according to the integration of firm capacity.

Structural and shape optimization in aerodynamic airfoil performance: literature review

De Egea J., Juan Manuel; Pinto Roa, Diego P.; Schaerer, Christian E.

Link: https://proceedings.sbmac.org.br/sbmac/article/view/3891

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics

Abstract

Aerodynamic airfoil performance has been subject to research from the beginning of aviation itself. Oversimplifying, airfoil shape generates the lift and drag forces, and the goal of airfoil design consists in to minimize the drag force (under certain conditions) while achieving an appropriate lift without massive flow separation (boundary layer shedding) fulfilling possible limitations on the lifting force, pitching moment, and structural requirements.

Sustainability and Goal Fitness Index for the Analysis of Sustainable Development Goals: A Methodological Proposal

González, Sanny; Pereira, Gabriel; González, Arturo

DOI: 10.5220/0011122400003197
Link: https://www.scitepress.org/Link.aspx?doi=10.5220/0011122400003197

Proceedings of the 7th International Conference on Complexity, Future Information Systems and Risk – COMPLEXIS

Abstract

The Sustainable Development Goals (SDGs) were adopted in September 2015 by the 193 member states of the United Nations (UN), which include 17 goals, 169 targets and 244 indicators, as an attempt to radically change the approach of the Sustainable Development Goals. Millennium Development (MDG). Since the adoption of the 2030 Agenda, the scientific community has increased its interest in the evaluation, analysis, and evaluation of the interrelationships between the SDGs, proposing different approaches and using a diversity of methodological tools for the interactions of the SDGs. This research proposes a methodology that takes advantage of the concepts of Economic Fitness for the creation of a Sustainability Fitness Index (SFI) for the countries and a Goal Fitness Index (GFI) for each SDG. These indices are intended to provide a tool to analyze the interrelationships between the Sustainable Development Goals in such a way that they offer a new approach to address the capacities of the countries and the fulfillment of the SDGs. The results of the SFI are a first attempt to identify development priorities aligned with the SDGs in each country, based on their available productive capacities, which could help make more efficient use of their limited resources and increase the achievement of the SDGs.

Temperature-based Dengue Outbreaks Modelling with Exogenous Variables

Bogado, Juan V.; Stalder, Diego H.; Schaerer, Christian E.; Ramírez Soto, Max; Champin, Denisse

DOI: https://doi.org/10.5540/03.2022.009.01.0311
Link: https://proceedings.sbmac.emnuvens.com.br/sbmac/article/view/3861

XLI CNMAC, Unicamp - Campinas - SP, 2022

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics

Abstract

Dengue fever is an endemic disease, present in tropical and subtropical regions, transmitted by the Aedes Aegypti mosquito vector. It has recently appeared in non-tropical regions with dry weather. This represents a setback for advanced temperature-based reference models, since mosquitos reproductive cycle does not necessarily match with the outbreaks. This situation indicates that other variables are also involved in epidemic outbreaks. In this work we propose to include a component that capture this process, whether entomological, environmental or related to population mobility, and include it to the reference model by adding a Gaussian function to the formulation of humans (βh) and vectors (βv) transmission rate. The parameters to be adjusted for this function were evaluated by a probabilistic model selection experiment. The parameters for this function are u, σ and k. The results indicate that, our model outperforms the reference model, and that additional information about outbreaks can be obtained from the new parameters.

TNM Model in Penile Cancer: Stage-by-Stage Critical Revision and Proposal for Changes

Sanchez, Diego F.; Canete-Portillo, Sofía; Fernandez-Nestosa, María José; Rodríguez Servín, Ingrid; Cubilla, Antonio

Link: https://www.nature.com/articles/s41379-022-01038-2.pdf
(Resumen 615, página 663)

Modern Pathology Abstractcs 2022 USCAP 111TH Annual Meeting

Background: We recently analyzed and explained changes proposed in the 8th Edition of TNM staging for penile cancer. There was considerable improvement comparing with previous models. However, we identified problematic issues which need to be addressed in future manuals

Design: We identified stage-by-stage problems and proposed diverse approaches looking for solutions

Results: Problems identified and recommendation in different stages are shown in the table. Other factors identified are: A) the designation of invasion of preputial LP and dartos as the same stage is not based on evidence and it is contrary to our experience where LP invasion is not associated with tumor spread. B) There is emerging evidence that size may be an important prognostic factor, especially after exclusion of low-grade verruciform tumors from the analysis and it is not considered in the present staging model. C) Depth or tumor thickness may be more important than anatomical levels and it is not considered in the current model. D) There are insufficient studies to stage tumors exclusive of foreskin, coronal sulcus and shaft, comprising about a third of penile cancers, which is an important omission. E) The model does not consider tumor type as an automatic prognostic predictor (verrucous and pseudohypoerplastic carcinomas do not metastasize independently of depth of invasion). F) Detection of HPV, known to be associated with a better prognosis, is not considered in the current model

Conclusions: We identified issues in every stage. Retrospectively generated data produce weak evidence. We suggest to prospectively design a staging model based on: complete sectioning of the surgical specimen; localizing the anatomical site of origin; gross and photographic evidence for tumor size and precise level of invasion; tumor thickness and depth of invasion for comparing with anatomical level of invasion identifying best predictor by anatomic site; evaluating the role of vascular and PNI according to anatomical levels; studying the histology of the anatomical levels at these sites using histochemistry or

immunohistochemistry to delineate boundaries; evaluating significance of TA invasion and urethral invasion by site of tumor invasion; correct pathological classification of tumor types and tumor grading; use of p16 in known HPV-related tumors as well as in poorly differentiated carcinomas; at least 3-year follow up. We propose a critical evaluation and change of current staging model, according to the explained issues.

Transporte Público e Dados Abertos: Uma comparação entre Curitiba e Assunção

Gomes da Luz, Mariana; Benitez, Patricia; Legal Ayala, Horacio; Puchalski Kozievitch, Nadia

Link: https://www.even3.com.br/anais/seisicite2022/

Anais do XII Seminário de Extensão e Inovação & XXVII Seminário de Iniciação Científica e Tecnológica da UTFPR

RESUMO

O interesse de agências governamentais em dados abertos vem aumentando na medida em que se procura otimizar serviços atuais e também preparar soluções mais sustentáveis diante de vigentes obstáculos como migração urbana, mudanças climáticas e envelhecimento da população. Nesse artigo, analisamos o processo de Curitiba e Assunção na abertura de seus dados governamentais relativos a transporte público. Particularmente, analisamos o conteúdo disponível e sua facilidade de acesso. Constatou-se que já foram realizados grandes avanços na disponibilização dos dados, mas ainda existem muitos desafios para facilitar o acesso, uso e processamento dos dados pelo cidadão.

ABSTRACT

The interest of government agencies in open data is increasing as they seek to optimize current services and also prepare more sustainable solutions in the face of current obstacles such as urban migration, climate change and population aging. In this article, we analyze the process of Curitiba and Assunção in opening up their government data on public transport. In particular, we analyze the content available and its ease of access. It was found that great advances have already been made in the availability of data, but there are still many challenges to facilitate the access, use and processing of data by citizens.

Unsupervised Hilbert Huang Transform with Pruned Exact Linear Time Algorithm for Anomaly Detection in Web Data

Soto Riveros, Emilio Gerardo; Cappo, Cristian; Shaerer, Christian

Link: https://proceedings.sbmac.org.br/sbmac/article/view/3761

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics

Abstract

With the massive use of digital technologies, many activities in society have transitioned to the web, from shopping and social interactions to business, industry, and, unfortunately, a crime. Recent reports reveal that criminals targeted more companies in 2020 than in 2019.

Using Fractional Punishment for Cooperation Improvement

Botta, R.; Blanco, G.; Schaerer, C.E

Link: http://www.cnmac.org.br/novo/index.php/CNMAC/conteudo/2022/e_5/0/25

Minisimposios

MS06: Mathematical Modeling and Numerical Simulation in Life Sciences

Mathematical and computational models are proven to be essential tools for understanding life sciences and dealing with emergencies, such as the Dengue and COVID-19 epidemics. They are also beneficial for industrial processes. In addition, simulation and modeling can provide different points of view to solve problems, explore new strategies and optimize the existing solution. In this mini-symposium, our goal is to provide a forum to present new results on mathematical and computational models (in the broad sense) for life science problems, including ODE and PDE models. Techniques involving AI are welcome, such as machine learning and deep learning for parameter adjustment and predictive control applied (or that can be applied) to biological and medical phenomena.

Versatilidad representativa y transición hacia la persistencia *Per Se* de Datos Estructuralmente Complejos con Haskell

Gómez, Wildo; Sosa-Cabrera, Gustavo; García-Díaz, María Elena

Link: https://ciaca-conf.org/wp-content/uploads/2022/11/4_CIACA2022_ES_F_020.pdf

IADIS Conference Template

RESUMEN

En los últimos años, se ha desarrollado un creciente interés por las formas de abordar la representación y el almacenamiento de los tipos de datos considerados estructuralmente complejos. Sin embargo, la mayoría de los estudios en el campo del descubrimiento de conocimiento sólo se han centrado en lo que respecta a la gestión y almacenamiento de grandes volúmenes de información. En este trabajo se aborda una exploración de la versatilidad en la definición de tipos de datos en Haskell y su asequible empleo para la representación de datos conceptualmente polimorfos. Se describe los aspectos relacionados al almacenamiento de las definiciones de tipos de datos en Haskell y la implementación de una librería conforme a la identificación de los factores mínimos hacia una persistencia primitiva.

Abstract

In recent years, there has been a growing interest in ways to approach the representation and storage of data types considered to be structurally complex. However, most studies in the field of knowledge discovery have only focused on the management and storage of large volumes of information. This paper addresses an exploration of the versatility in the definition of data types in Haskell and its affordable use for the representation of conceptually polymorphic data. Aspects related to the storage of data type definitions in Haskell and the implementation of a library according to the identification of the minimum factors towards a primitive persistence are described.

Virtual network function chaining placement based on dynamic multi-objective optimization and multi-criteria decision making

Ocampos, Arnaldo; Tapia, Néstor; Pinto-Roa, Diego P.

DOI: https://doi.org/10.1145/3545250.3560844
Link: https://dl.acm.org/doi/10.1145/3545250.3560844

2022 XVLIII Latin American Computer Conference (CLEI)

Abstract:

The stage of transporting semiconductor chips from the wafer to the support strip is crucial in the integrated circuit manufacturing process. This process can be modeled as a combinatorial optimization problem where the objective is to reduce the total distance the robotic arm must travel to pick up each chip and place it in its corresponding position within the support structure. This problem is of the pick-and-place type and is NP-hard. The (approximate) solution proposals of state-of-the-art methods include rule-based approaches, genetic algorithms, and reinforcement learning. In the present work one of these methods is analyzed, which models the problem as one of binary integer programming and proposes a genetic algorithm. Based on this analysis, we proposed and evaluated other methods, including a greedy algorithm that improves the state-of-the-art results for test cases usually used in the literature.

Capítulos De Libros

Capturing Multidimensional Energy Poverty in South America: A Comparative Study of Argentina, Brazil, Uruguay, and Paraguay

Pereira, Gabriel; González, Arturo; Ríos, Richard

DOI: https://doi.org/10.3389/frsc.2021.632009
Link: https://www.frontiersin.org/research-topics/14352/urban-energy-poverty-and-positive-energy-districts#overview

Abstract

Roughly 789 million people have no access to energy, and around 2.8 billion people lack access to clean cooking solutions according to the World Bank, and so we also find many people that cannot afford energy (reliable and clean) at the current prices. In the literature, accessibility, availability, and affordability are underlined as the key drivers of energy poverty. In South America, these aspects have not been studied in depth. This research is relevant because it provides a standardized, cross-country, and comparable analysis of multidimensional energy poverty in the region. The study of energy poverty is critical for the development and well-being of countries, especially in regions such as South America, where this issue can be affected by geographical, cultural, infrastructure, and/or socio-economic differences. In this study, we measured the magnitude of energy poverty in Argentina, Brazil, Uruguay, and Paraguay. This methodology is based on the analysis of energy poverty through a multidimensional approach, considering three parameters as drivers of energy poverty in the countries: accessibility, availability, and affordability. Through a two-step process, first, we calculate the Weighted Average Energy Poverty Index (WAEPI), based on three proposed scenarios (W_1, W_2, and W_3), and finally, through the Composite Energy Poverty Index (CEPI), we measure the existing gaps, based on the selected indicators, between the countries under study and the benchmark country. Additionally, we decided to focus our analysis on the country that has shown the highest level and gaps on multidimensional energy poverty in the region, as a case study to validate the results obtained through the chosen methodology. The results show that during the period of analysis (2000–2016), Paraguay has been the most energy-poor country among the countries under study, while Argentina has been the least energy-poor country. At the local level, we observed that, Paraguay, despite being one of the largest producers and exporters of clean hydroelectric energy in the region, still presents high levels of consumption of biomass or coal for cooking, while electricity only represents 17% of the total final energy consumption in the country (biomass and fossil fuels account for 83%). These results could lead the design of energy policies, projects, and programs to reduce the multidimensional energy poverty, nationally, also at the common platform: MERCOSUR. Finally, this study includes an analysis of policy implications and alternative solutions to eradicate energy poverty in the region.

Median Filter Based on the Entropy of the Color Components of RGB Images

Vázquez Noguera, José Luis; Legal-Ayala, Horacio; Mello Román, Julio César; Argüello, Derlis; Balbuena, Thelma

Link: https://link.springer.com/chapter/10.1007/978-3-030-75945-2_5

Trends and Advancements of Image Processing and Its Applications

Abstract

The median filter is a type of order filter used for noise removal in images. This filter is commonly applied to grayscale images. The need to establish an order between colors makes the extension of order filters to color images a challenge. Noise is present in digital images due to different factors and is an undesirable element within the images that may hinder their processing. Thus, noise removal is considered a pre-processing step for different types of applications such as segmentation, feature extraction, and object classification. This paper presents an ordering strategy based on entropy information of each color component of RGB images and a median filter using this ordering strategy for the removal of different types of noise. The results show that the median filter based on the entropy of the color components obtains better performance on average than other ordering strategies found in the state of the art for Gaussian and speckle noises.

SECTION 5: PENIS AND SCROTUM Frequent Lesions of Uncertain Relationship to Penile Neoplasia Condyloma

Fernández De Nestosa, María José

Link: https://www.elsevier.com/books/diagnostic-pathology-genitourinary/978-0-323-76332-5

Diagnostic Pathology: Genitourinary
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Abstract (Del libro)

This expert volume in the Diagnostic Pathology series is an excellent point-of-care resource for practitioners at all levels of experience and training. Covering all areas of genitourinary pathology, it incorporates the most recent clinical, pathologic, staging, and molecular knowledge in the field to provide a comprehensive overview of all key issues relevant to today's practice. Richly illustrated and easy to use, the third edition of Diagnostic Pathology: Genitourinary is a one-stop reference for accurate, complete surgical pathology reporting, ideal as a day-to-day reference or as a reliable training resource.

SECTION 5: PENIS AND SCROTUM Primary Epithelial Tumors Overview of HPV- and Non-HPV-Related Tumors

Fernández De Nestosa, María José; Sánchez Martínez, Diego Fernando; Amin, Mahul B.; Cubilla, Antonio L.

Link: https://shop.elsevier.com/books/diagnostic-pathology-genitourinary/amin/978-0-323-76332-5

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PUBLICACIÓN FP-UNA
Dirección de Investigación
Campus de la UNA
San Lorenzo – Paraguay
investigacion@pol.una.py
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investigacion@pol.una.py
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