This paper investigates the impacts of a wind farm connected at Harterbeespoort substation in South Africa on voltage stability of the power network. The site wind speed was determined and analyzed for viability. A comparison is made between the use of Doubly-Fed Induction Generators and Self-excited Induction Generators driven by the wind turbines. The resulting P-V and Q-V curves from load flow studies are presented and analyzed. The models for this study were implemented in DigSILENT PowerFactory.

Dynamic Characteristics of Tiny Ultrasonic Linear Actuators

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Tiny ultrasonic linear actuators (TULAs) are used in many industrial applications and a full characterization of their dynamic behavior is needed. This paper presents a detailed theoretical-experimental study of TULAs. The general structure and operation principle of TULAs are introduced. The actuator dynamics is then described using a simple piezoelectric model. In practice, TULAs are most often used as actuators for positioning mechanisms. The proposed model includes electromechanical relations which offer designers a broad range of possibilities for precise positioning and reliable model-based control. TULAs are experimentally investigated to determine the conditions that allow an optimal performance.

Internet-Enabled Calibration: A Future of Calibration?

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Calibration of measuring instruments provides the confidence in measurements. It is the obligation of every laboratory to have its measuring equipment calibrated in regular intervals. This obligation means that the laboratory must send its equipment to the calibration laboratory every year or two depending on the calibration intervals. During this time the equipment is not available and this presents a financial burden to the laboratory of the customer. Since many of the modern instruments include some communication interfaces, it was made
possible to create an Internet-enabled calibration system. This term encompasses a wide range of possible applications and services. The Internet-enabled calibrations must address several problems not present in standard calibrations, including security issues, since the equipment is not always under direct control of the calibration laboratory personnel who will sign the calibration certificate. As the traceability and integrity of the calibration process directly depends on the measured data, the reliable and secure remote control and monitoring of instruments must be a crucial aspect of Internet-enabled calibration technologies.

A Data Acquisition System to Detect Bubble Collapse Time and Pressure Losses in Water Cavitation

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This paper presents a data acquisition system oriented to detect bubble collapse time and pressure losses in water cavitation in an internal orifice. An experimental campaign on a cavitating flow of water through an orifice has been performed to analyze the flow behavior at different pressures and temperatures. The experiments were based on visual observations and pressure fluctuations frequency analysis. Comparing the visual observations and the spectral analysis of the pressure signals, it is evident that the behavior of the different cavitating flows can be correlated to the frequency spectrum of the upstream, downstream and differential pressure fluctuations. The further reduction of the cavitation number and the consequent increase in the width of the cavitating area are related to a corresponding significant increase of the amplitude of typical frequency components. The spectrogram analysis of the pressure signals leads to the evaluation of the bubble collapse time, also compared with the numerical results calculated by the Rayleigh–Plesset equation.

New Approaches of Nanocomposite Materials for Electromagnetic Sensors and Robotics

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In this paper, the authors define new classes of devices based on nanocomposite materials (NMs). The work introduces approaches about the design and the experimental characterization of these materials. A wide range of applications is presented by discussing novel devices implemented by nanocomposite techniques including sensing and robotic in micro/nano scale. The approaches are oriented on the electromagnetic (EM) characterization of tailored devices such as sensors, and micro/nano antennas. New EM numerical approaches for the design are presented.
A Real Time Attachment Free, Psycho Physiological Stress and Heart Rate Measurement System

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The challenges in the development of a system performing real time detection of physiological parameters are fundamentally aversive because of the incommodities caused by the wires and sensing attachments onto the user, making the measurement sessions uncomfortable. Another factor is that the sensing accessories influence the plausibility of the measurements. In this paper, the authors introduce a system based on a device that can acquire physiological signals from a computer user with no prerequisites, postural, kinetic, or other constraints in the environment of normal usage of the home computer for the detection of their psychosomatic state and optimally their affect and emotional responses. The authors also discuss issues that could otherwise compromise the credibility of the results. Redundancy and special adaptive and corrective algorithms have been developed to improve reliability and achieve acceptable standards of quality. Measurements include skin conductance (SC) and reart rate (HR) detected by sensors positioned on the vertical sides of a computer mouse. The system is intended for interactive educational environments, during assessment, e-learning, psychosomatic user profiling, mobile and web based interfaces, and for Human Computer Interaction (HCI) platforms.

Software Tool for Assessment of Complexity and Variability in Physiological Signals of Respiration

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In this paper, the authors examine software implementation and the initial preprocessing of data and tools during the assessment of the complexity and variability of long physiological time-series. The algorithms presented advance a bigger Matlab library devoted to complex system and data analysis. Commercial software is unavailable for many of these functions and is generally unsuitable for use with multi-gigabyte datasets. Reliable inter-event time extraction from input signal is an important step for the presented considerations. Knowing the distribution of the inter-event time distances, it is possible to calculate exponents due to power-law scaling. From a methodology point of view, simulations and considerations with experimental data supported each stage of the work presented. In this paper, initial calibration of the procedures with accessible data confirmed assessments made during earlier studies, which raise objectivity of measurements planned in the future.

Thorax: Physiological Monitoring and Modeling for Diagnosis of Pulmonary Edema

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In this paper, the authors prove that variations in thoracic volumes are greatly responsive to the act of breathing (i.e., inspiration and expiration). These variations may be adopted for diagnosing various respiration related diseases and pulmonary edema. In this study, the authors present a method to estimate the thoracic volume non-invasively using anthropometric dimensions. The change in the geometry of thorax with the act of breathe is recorded by measuring the anthropometric parameters for nine healthy human subjects. The model based approach shows the extent of its sensitivity in terms of volumetric variations with the state of inspiration and expiration. Many deaths occur due to unavailability of health care and monitoring systems in rural areas and developing countries. The technique presented in this paper takes care of these situations and the volumetric estimation of thorax is independent of any instrumentation, expensive equipment, and clinical environment.

An Efficient Agent based Rumor Propagation for Wireless Sensor Networks
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In the context of Wireless Sensor Networks (WSNs), in this paper, the authors present a new agent based routing protocol named Fast Rumor Agents protocol (FRA). The FRA protocol optimizes the agent (respectively the query) propagation through the network preventing backward paths. With FRA, a rumor must have a straight trajectory, reducing the total overhead of the network. Performances comparisons of ZRR and FRA protocols show that the main contributions of FRA protocol are the reduction of time of path establishment, the overhead caused in the network, and consequently, the energy consumption.

Measurements and Characterization of Photovoltaic Modules for Tolerance Verification

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One of the most important aspects of photovoltaic modules is reliability for future uses, that is, a certain module will last certain number of years in use (generally 30 or 35 years). Reliability yields from excellent qualification tests on photovoltaic (PV) modules. Testing for reliability identifies unknown failure mechanisms and whether modules are susceptible to known failure mechanisms. This paper illustrates techniques of outdoor measurements and qualification characterization to know PV module conditions for commercial uses. Matrix methods are used for energy prediction. Failure material tests, using digital imaging and thermography, have also been conducted.

Design, Measurements and Characterization of Smart Electronic Board for PV Streetlight based on LED and High Intensity Discharge Lamps

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This work presents an electronic board for driving and control of High Intensity Discharge (HID) lamps and Light Emitting Diode (LED) lamps. The proposed electronic board is able to drive HID or LED lamps by means of a reconfigurable output. This feature allows using the ballast in lighting systems that currently use traditional discharge lamps, as well as keeping the same ballast when discharge lamps are replaced by LED modules in the near future, when LED street lighting systems will be more affordable. Additionally, since the lighting system is designed to be used in rural areas where there is no public electricity, each lighting point incorporates a system to convert solar energy into continuous voltage by means of photovoltaic panels. In this work, energy saving issues are taken into account.


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The authors prove that the standard least action principle implies a more general form of the same principle by which they can state generalized motion equation including the classical Euler equation as a particular case. This form is based on an observation regarding the last action principle about the limit case in the classical approach using symmetry violations. Furthermore the well known first integrals of the classical Euler equations become only approximate first integrals. The authors also prove a generalization of the fundamental lemma of the calculus of variation and we consider the application in electromagnetism.

**Impedance-based Wireless Sensor Network for Metal-Protective Coating Evaluation**

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Researchers have been focused on the influences of flowing fluid on the corrosion of bare metals, but there is little emphasis on the degradation of metal-protective coating. Evaluating the metal-protective coating usually uses the Electrochemical Impedance Spectroscopy (EIS) method. EIS is a technique used for evaluating coating permeability or barrier performance based on the electrical impedance of coating. This paper presents a new impedance-based wireless sensor network for metal-protective coating evaluation. This wireless sensor network consists of two parts: impedance-based wireless sensor nodes and a wireless data base that are equipped with a network analyzer (AD5933) and a RF transceiver (CC1111/CC1110). In the experiment, there are three coating panels immersed in flowing deionized water (DI water) and one coating panel immersed in stationary DI water. Experimental results demonstrate that the proposed wireless sensor network is capable to evaluate the coating degrading.
In this paper, the authors examine a common issue concerning the influence of measurement uncertainty on decisions. In fact, in some practical applications, it can be necessary to put in comparison measurement data with thresholds and limits. It occurs when the conformity with fixed specifications has to be verified or if warning and alert levels have to be not exceeded. In such a circumstance, to take reliable decisions in presence of uncertainty is a concrete problem. Measurement uncertainty may reasonably be the cause of unreliable decisions. In order to manage properly the uncertainty effect, the authors have developed a decision making procedure based on a methodical approach to measurement uncertainty. In detail, a fuzzy logic algorithm estimates the probability to take a wrong decision because of the uncertainty. Such information is so used in order to optimize the decisional criteria, improving the consistency of the final computing results. Risks and costs associated to the possibility to take a mistaken decision are minimized. Consequently the algorithm singles out the most reliable decision.

AC Magnetic Measurements on Auperconductors: Design of a Device for Magneto-Thermal Measurements

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Philippe Vanderbemden, University of Liège, Belgium

This work describes the design and realisation of an apparatus to measure simultaneously the AC magnetic properties and the temperature distribution on the top surface of bulk superconducting samples (up to 32 mm in diameter) in cryogenic conditions (temperature range 78-120 K). First the authors describe the experimental set-up used for simultaneous thermal and magnetic characterization of the sample. Next, the authors describe the practical considerations required for generating the large AC magnetic fields, possibly in the presence of DC fields. The next section presents a custom-made high speed data acquisition system for replacing the laboratory devices (DC voltmeter and AC lock-in amplifiers) when both temperature and magnetic data need to be recorded at high a sampling rate. The performances and limitations of the system are discussed.

Seismocardiogram and Ballistocardiogram Sensing

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Pedro Girão, Instituto de Telecomunicações and Technical University of Lisbon, Portugal
Gabriela Postolache, Atlantica University, Portugal
The paper describes the latest development in seismocardiography and ballistocardiography, including sensors with or without mechanical contact with the body, for cardiac functions monitoring in common daily activity. The authors discuss the information related with the seismocardiogram (SCG) and ballistocardiogram (BCG) and the work on SCG and BCG modeling. The latest advances reported on the devices aiming at BCG and SCG cardiovascular system evaluation are covered, highlighting their key features and novel concepts. The authors also underscore the applications of ElectroMechanical film (EMFi) sensors, MEMS accelerometers and radar sensing technology for vital signs monitoring. Discussion on the current developments and future improvements are included in the paper.

Design, Development and Testing of a Semi Cylindrical Capacitive Array Type Liquid Interface Level Sensor

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In this study, a semi cylindrical capacitive array type liquid interface level measuring sensor is described. The sensor consists of a continuous large semi cylindrical thin metallic plate acting as a common plate of the capacitor and an array of small semi cylindrical thin metallic plates, separated by very small gap distance. All plates are mounted along the outer wall of a cylindrical non conducting vertical storage tank. The detection of liquid interface is based on the measurement of capacitance of the array of plates which varies with the dielectric constant of the liquid within the tank. The measured capacitance has been obtained in nano farad range. Since the sensor is non contact type, it can be used for both conducting and non conducting type of liquid contained within a non conducting tank. Experimental results confirm the satisfactory performance of the sensor for liquid interface level measurement.

An Architectural and Evaluative Review of Implicit and Explicit SIP Overload Handling

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Last year’s trend to migrate circuit-switched voice networks to packet switched Internet Protocol (IP) based networks has favored wide deployment of Session Initiation Protocol (SIP) based systems and networks. As a reaction to large-scale SIP deployment experiences in the field and the need to implement high availability and reliability within these new networks, the focus of SIP extension standardization has shifted from adding new SIP signaling functionality to operational and maintenance aspects, a particular importance being attributed to overload control. Overload denotes a situation in which the traffic injected into a system exceeds the system’s designed
capacity. The authors present a detailed categorization of overload architectures and outline main reasons why SIP-based networks are at high risk to collapse when operating at overload. Using measurements in a real SIP infrastructure we compare the performance of two overload protection schemes, namely implicit and explicit overload protection, against the performance of non-protected systems. The results can be found further in the article.

**Impact of Human Factors on Measurement Errors**

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Measurement is the act or the result, of a quantitative comparison between a given quantity and a quantity of the same kind chosen as a unit. It is for observing and testing scientific and technological investigations and generally agreed that all measurements contain errors. In a measuring system where both a measuring instrument and a human being taking the measurement using a preset process, the measurement error could be due to the instrument, the process or human error. This study is devoted to understanding the human errors in measurement. Work and human involvement related factors that could affect measurement errors have been identified. An experimental study has been conducted using different subjects where the factors were changed one at a time and the measurements made by them recorded. Errors in measurement were then calculated and the data so obtained was subject to statistical analysis to draw conclusions regarding the influence of different factors on human errors in measurement. The findings are presented in the paper.

**Determination of Uncertainty in Gross Calorific Value of coal using Bomb Calorimeter**

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A bomb calorimeter is an apparatus used for measuring the performance of coal in term of heat of combustion. Recent awareness has been created regarding uncertainty of measurement, due to mainly two reasons. Laboratory accreditation, which has steadily been on the rise, which requires a estimation of uncertainty of measurement particularly in the field of calibration. Second, increased maturity level of the quality system certification as the manufacturing companies looking at the reliability of measurement through correct calibration of inspection, measuring and test equipment. The quality of coal is decided by the various parameters such as ash content, air dried moisture, volatile matter, gross calorific value and sulphur content etc. The grade of coal is decided by the quality of coal which decides the performance of generation of electricity. The uncertainty of measurement in bomb...
calorimeter gets affected by various parameters. This paper describes the methodology, uncertainty calculations and effects of individual factors on it.