

# **Investigation of the anticorrosive effect of organic coatings on concrete reinforcement in the presence or absence of corrosion inhibitor by the Strain Gauge technique**

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## **Abstract**

Reinforced concrete is a versatile, cost-effective and profitable construction material. Its alkalinity leads to a passive layer of saturated hydrated iron oxide forming on the steel surface. This layer is a dense impenetrable film, which prevents further corrosion of reinforcing steel. However, corrosion remains the most frequent cause of concrete deterioration, as finally expansive corrosion products exert significant tensile forces within the concrete, contributing to the cracking and spalling of concrete cover.

To reduce the risk of reinforcement corrosion several methods are promoted. Some methods are based on the properties of the concrete, such as increasing the concrete cover, lowering the concrete permeability, adding inhibitors or sealing the surface and others deal with the problem by protecting the reinforcement.

Surface coatings on concrete have become well established mainly to prevent the deterioration due to chemical and physical effects and to improve or maintain the appearance. They offer an effective and reliable solution for the protection both of the concrete and the embedded steel. The different types of surface coatings that can be used for the protection of reinforced concrete include epoxy resin, polyurethane, siloxane and acrylic dispersions coatings.

Corrosion inhibitors have been successfully used as admixtures to concrete. The flexibility of corrosion inhibitors with regard to dosage and their compatibility with all aspects of construction and operation of structures makes them useful for protection against corrosion. Inhibitors should have good solubility characteristics, rapidly saturate the corroding surface and not adversely affect the physical and durability properties of concrete. Alkanolamine-based corrosion inhibitors move through the pore structure of the concrete to reach the surface of reinforcing steel, where they form a protective film. They also reduce chloride ion penetration into concrete.

The purpose of this study was initially to compare the effectiveness of five different types of organic coatings applied on concrete surface to the corrosion protection of steel reinforcement. Then a corrosion inhibitor added in the cement paste was used simultaneously with the coatings, to enhance their protective effect.



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The determination of the rebars corrosion protection by the Strain Gauge technique was correlated to the results from the gravimetric determination of metal loss of rebars. The results of the methodology applied were encouraging for the fast monitoring and classification of the protective effect of organic coatings, either used concurrently with a corrosion inhibitor or not, against corrosion.

**Keywords:** concrete, reinforcement corrosion, organic coatings, corrosion inhibitor, Strain Gauges.

## **A Hybrid Approach on ECG Diagnosis Based on Recursive Time Series Detection and Wavelet Features Classification Methods.**

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### **Abstract**

In this paper a novel electrocardiogram (ECG) diagnosis scheme is presented which consists of two, distinct, detection and classification steps. In the first step, the diagnosis scheme detects the ECG signal parts that are associated with cardiac abnormalities while in the second step these abnormal signal instances are further classified into specific cardiac arrhythmia classes. The detection stage is built upon recursive stochastic time-series representations which are used for detecting any potentially abnormal heartbeat incidents in the ECG signal. The detected incidents are subsequently sent to the second stage which derives heartbeat wavelet features and classifies them into one of three heartbeat arrhythmia classes, i.e., Supraventricular, Ventricular and Normal. The classification task is thus focused on abnormal ECG segments, as the segments related to healthy heart status are discarded by the detection step. The scheme's performance is evaluated on several ECG recordings from the MIT-BIH Arrhythmia database with promising results.

## **Determination of the emission zone in OLED structures using a transmission line model**

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### **Abstract**

The determination of the emission-zone profile inside the emissive layer of an OLED device is significant for its optimum operation design. In this paper we present a method for the estimation of the emission-zone, based on measurement data for the geometrical and optical characteristics of the OLED's layer materials, together with the outcoupling spectrum for the normal direction emission. The measured data concerning the outcoupling device's efficiency, are approached by a transmission line model. Thus, by using a fitting technique, the emission profile is estimated accurately.

## External Quantum Efficiency Optimization of Hybrid Organic Photovoltaics using a Transmission Line method

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### Abstract

In this paper, we will examine the influence of inorganic metal oxide thin layers, on the external quantum efficiency (EQE) of a typical bulk heterojunction HyOPV, with different materials, thicknesses and placement throughout the device’s structure. Moreover, their special characteristics, such as the roughness that has been developed at the deposition phase, will be taken into account, since they will affect the interference phenomena.

The final results are useful for optimum design in both terms of EQE and IQE. In this context, the Transmission Line Method (TLM) is used as the simulation method for the EQE, due to its simplicity and efficiency in comparison with the more popular Transfer Matrix Method (TMM).

## Medical Emergency Wearable System based on Wireless Tracing Gear

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### Abstract

This project demonstrates the feasibility of using cost-effective, flexible, and user-friendly equipment to inform people when user needs an emergency response. For years, emergency medical service providers conducted patient care by manually measuring vital signs. Herein, we describe a scalable emergency medical response system that couples the efficient data collection of a pulse sensor with the flexibility and interoperability of GSM / GPS service architecture. It is proven that in most of the cases disabled people can significantly improve their safety feeling by using such devices.

## **Improved Microcontroller based Data Acquisition System for human body physiological and environmental parameters measurements**

A. Karagounis, A. Tzerachoglou, D. Tseles

Based on the initial design, a new improved data acquisition system has been designed and implemented, that enables human body physiological parameters measurements and environmental parameters as well. The system is based on Microchip PIC<sup>®</sup> 18F8720 microcontroller and includes a set of sensors such as temperature sensor which is implemented through LM 335 component, humidity sensor which is implemented through Milticomp HCZ-H8 component, pressure sensor which is implemented through Freescale MPX 2202 and MPX 5100 components, alcohol sensor which is implemented through Figaro TGS-2620 component, etc.

The main improvements of the design include low consumption circuitry which enables the system to be autonomous battery operated, small physical dimensions allowing the system to be attached on a garment , increased accuracy of the measurements and due to the existence of multiplexer, more sensor inputs.

The embedded program is more efficient and enables improved accuracy of the measurements. The system's interface is simpler and easily readable. It consists of a set of five membrane buttons to access the menu and a large backlit screen.

## **Distant Patient Monitoring through a Platform for Virtual Building Display**

D. Piromalis, D. Tseles

The ageing of population in developed societies necessitates the use of monitoring systems for people confined at home. Progress of micro-electro-mechanical (MEMS) technology has helped towards the development of innovative systems for body and home area. Such systems mainly collect physiological data from sensors located near or onto the human body, process data in real-time, gather all measurements and send them to a hospital center or a doctor through internet or telephone infrastructures. In this paper a software platform for virtual building display is presented. This software platform allows for remote monitoring of patients or elderly. It is based on the Sketchup 2D and 3D design CAD tool and other development tools for programming and communication through internet. This paper described the main design details, points out the advantages and disadvantages, and highlights the potential applications.



## **An innovative platform based on MiWi protocol for wireless indoor communication**

D. Piromalis, P. Potiriadis, D. Tseles

The wireless sensor networks technology's momentum allowed the design and implementation of many home and building applications for measuring and control. In this paper an innovative platform using the 868 MHz of frequency band and based on MiWi protocol of Microchip is presented. All the steps from analysis, selection, design, implementation and deployment are covered in detail. In particular a wireless sensor network has been implemented comprised of several wireless sensor nodes. With the proposed design, there are many advantages for indoor operation, such as better cover range and lower cost.

## **ARM-processor based TFT controller for automotive applications**

D. Piromalis, A. Sari, C. Alafodimos, D. Tseles

The advancement in microelectronic technology boosted the embedded systems technology and applications. In addition, the vast demand for more processing capacity and performance in mobile phones forced integrated chips manufacturers to launch new, sophisticated and powerful microprocessors with many integrated functions and peripherals. This paper presents the design and implementation cycle of an integrated display unit for automotive applications. The presented system is based on the ARM LPC1788 microprocessor and has all the necessary circuitry for driving a TFT technology display color screen. The resulting system is a robust, versatile and low cost embedded system for display in the automotive environment.

## Power quality measurements in the Hellenic Urban Rail Transport SA: Methodology & Results

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### Abstract

In this paper an experimental work regarding power quality in existing dc traction systems is presented and its results are evaluated. The main supply systems consist of a medium voltage substation feeding a rectifier that provides the dc power supply system for the traction motors. The measurements were performed according to the European standard EN 50160, using 3 wire connection systems. The collected data were analyzed using the software application supporting the instrument. Following this analysis, it is obvious that the power quality is very poor while the trains' number, running on lines during a measuring period, affects the power quality as it has direct relation with the current absorption from the system. The existence of harmonics in the networks affects the installed equipment and cabling. The fundamental reason and cause which bring forth these problems are the distortion of voltage and current which is supplied and drawn respectively, by those equipments and installations. The harmonic distortion if it measured in the maximum values presents significant higher values compared to the average values. This difference could be attributed to the measurement method and instrument on one hand and in the line traffic due to the required high load demand on the other.

**Keywords:** power quality, traction systems, three phase 12pulse rectifiers

## Open source platform for real-time sensing and control of remote unmanned vehicles based on web technology

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### Abstract

This article presents an open source platform for the real-time interaction with a remote autonomous robotic vehicle (or a number of vehicles) using a message-centric approach. The system presented provides bi-directional communication with MQTT and HTTP clients for the remote control of the robotic vehicle and the capability of modifying the navigation scenarios regarding the mission of the robotic vehicle together with the transmittance of vital data from the vehicles' embedded sensors using modern telemetry technology.

### Keywords:

Autonomous robots, unmanned vehicles, telemetry, Message Oriented Middleware, Message Queuing Telemetry Transport protocol (MQTT), Ubiquitous computing, Distributed systems

## **Experimental Validation of a Theoretical Model for the Simulation of Wind-PV-Storage Stand-Alone Installations**

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Remote consumers usually cover their electricity needs based on the operation of small diesel-generator sets. On the other hand, in many remote areas, medium-high RES potential is encountered, encouraging examination of stand-alone solutions based on wind and solar power, without the need to introduce extreme energy storage capacity. To this end, the present study examines the theoretical and experimental operation of a hybrid, stand-alone wind-PV system located in the Technological Educational Institute of Piraeus, Athens-Greece. In this regard, by using detailed monitoring data from the experimental installation as well as a preliminary simulation process, comparison is obtained between theoretical results and experimental data, while the long-term energy performance of the installation main components is evaluated. The results obtained provide useful information on the actual performance of such systems, while at the same time designate operation directions in order for such systems to become both more reliable and energy efficient.

## **Science thinking creativity through the Techno-Recycle science contest: experimental device construction using recycling materials**

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## Transmission line modeling of a Microwave Pulse Compression System using a Double Stub Technique

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## **“Experimental devices made of recycling materials: “Techno-Recycle” science teaching and science demystifying interactive scenarios”**

A. Baldoukas, A. Skountzos, J. Zisos, S. Theodoridou, I. Bourika





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## **“Wireless acoustic sensor network design stages for an environmental monitoring application”**

S. Despotopoulos, E. Kyriakis-Bitzaros, I. Liaperdos, D. Nicolaidis, S. M. Potirakis, M. Rangoussi, N.-A. Tatlas



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## **Micro inverters for PV plants compared to the ordinary string or central inverters - Benefits and Drawbacks**

G. Vokas

## **Performance evaluation of a building integrated photovoltaic thermal (BIPVT) air collector using different photovoltaic technologies**

G. Vokas