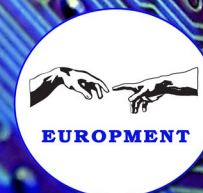




Editors: Valeri Mladenov, Olga Martin

## Recent Researches in Circuits, Systems, Mechanics and Transportation Systems

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- Proceedings of the 10<sup>th</sup> WSEAS International Conference on Circuits, Systems, Electronics, Control & Signal Processing (CSECS '11)
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## Plenary Lecture 1

### Statistical Techniques for Virtual Sensors Design using Neural Networks



#### **Professor Francklin Rivas-Echeverria**

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**Abstract:** This plenary speech covers the advantages of having statistical analysis to input data previous to training Artificial Neural Networks. It will be also presented some industrial applications including methodologies for designing virtual sensors for oil companies.

Shorter training periods, simpler topologies and more reliable networks can be found. The presented techniques for variables and patterns selection allow reducing the data dimension, obtaining quicker training, simpler topologies and lower prediction errors.

The pattern reduction techniques allow generating a data partition for training and validation based on statistical analysis. Additionally, these selection techniques can be used for reducing the patterns number in the data when it is very high.

The Outliers detection techniques can be used when great volumes of data are used for neural networks training and it is possible to use them for developing algorithms that detect possible observations significantly different from the rest of the data. These techniques can depurate and select those data that provide a better training.

It is very important the fusion of both disciplines: Artificial intelligence and Statistical Data Analysis. The work shows the advantages that it has for the practical Statistic the Artificial intelligence and vice versa.

#### **Brief Biography of the Speaker:**

Francklin Rivas-Echeverria Systems Engineer, MSc. in Control Engineering and Applied Science Doctor. Full professor in Control Systems Department, at Universidad de Los Andes, Venezuela. He has been invited professor in the Laboratoire d'Architecture et d'Analyse des Systemes (LAAS, Toulouse-France) and some Venezuelan and international Universities. He has also been technical advisor for "Venezuelan Oil Company" (PDVSA), "Aluminum Venezuelan Company" (VENALUM), "Steel Venezuelan Company" (SIDOR), Trolleybus System in Venezuela (TROLMERIDA). He has created and is the Director of the Intelligent Systems Laboratory and is the head of the University consulting unit (UAPIT-ULA). Over 180 publications in high level conferences and journals: the main topics of his papers are: Artificial Intelligence, Intelligent Control, Automation Systems and Industrial Applications. He has applied his results to many fields: Processes Control and Supervision, Oil production, Steel production processes, among others. Also, has developed several tools for automatic control teaching. He is coauthor of two books concerning Artificial Intelligence and Nonlinear Systems.

## Plenary Lecture 2

### Protective System Reliability Enhancement in Smart Power Grid



**Professor Hamid Bentarzi**

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**Abstract:** The functional security of the power Grid depends upon the successful operation of thousands of relays that may be used in protective scheme for preventing the power system from cascading failures. The failure of one relay of the protective scheme to operate as intended may jeopardize the stability of the entire power grid and hence it may lead the whole system to blackout. In fact, major power system failures after a transient disturbance appearance are more likely to be caused by unnecessary protective relay tripping rather than by the failure of a relay to take action. In other words, the performance of protective relay or system is determined by several criteria including reliability, selectivity, speed of operation, etc. However, reliability which has two aspects: dependability and security is very important especially in smart power grid. Dependability is a degree of certainty that the protective relay will operate correctly when there is a fault in the power system. However, security relates to the degree of certainty that the protective relay or scheme will operate unnecessary when there is transient distribution in the power grid.

Appropriate relay testing provides a first defense against relay mal-operations and hence improves power grid stability and prevents catastrophic bulk power system failures. Relay testing can help to validate the design of relay logic, compare the performance of different relays, verify relay settings, identify power system conditions that might cause unintended relay operation, and carry out post-event analysis to understand the causes of unintended or incorrect relay actions. Relay testing system improvements need to continue because of the use of relays in smart power grids where the conditions that are not the same as in the simple conventional one.

In this talk we discuss new technologies that allow designing an enhanced relay testing system that can be used for improving the performance of protective relay. At the beginning, we present the different steps which may be followed in order to develop an enhanced relay testing system taking into count all conditions of the power grid. After that, we discuss how to improve protective system reliability, both dependability and security; using this relay testing system in smart power grid. We have already designed and implemented Microprocessor based relay testing system through the use of the new technologies such as microcontroller or PC associated with acquisition as well as we have tested its performances for showing its experimental evaluation. Besides, we have developed some relays where these advanced testing system have been used for evaluating their performances. We will end up this talk by presenting our research projects related to this subject.

#### **Brief Biography of the Speaker:**

Hamid BENTARZI was born in Leguatta, Boumerdes, Algeria. He received both bachelor in Electrical Engineering and Magister Degrees in Applied Electronics with honors from "Institut National d'Electricite et d'Electronique" (INELEC), Boumerdes, Algeria, in 1989 and 1992 respectively and Ph.D in Microelectronic systems from "Ecole Nationale Polytechnique" (ENP), Algiers, Algeria, in 2004. Till 1993, he was a lecturer at INELEC, Boumerdes, Algeria. Since 1999, he has been a faculty member at the Institute of Electrical and Electronic Engineering, University of Boumerdes, Algeria. Besides, he is head of research team working in developing microelectronic systems applied to power systems in the Signal and System Laboratory, Boumerdes, since 2001. His current research interests are in the fields of microelectronics, electrical protection systems, electric energy systems and systems reliability. He has authored and co-authored over 70 technical papers. Besides, he has been a member of organizing and technical committee of several conferences including WSEAS group.