Resúmenes en Inglés
English Abstracts

Robotics, a Valuable Tool in Surgery

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Abstract: Continuous advances on diagnostic techniques based on medical images, as well as the incorporation of new techniques in surgical instruments are progressively changing the new surgical procedures. Also, new minimally invasive techniques, which are currently highly consolidated, have produced significant advances, both from the technological and from the surgical treatment perspectives. The limitations that the manual realization of surgical interventions implies, in what refers to precision and accessibility, can be tackled with the help of robotics. In the same way, sensor based robot control techniques are opening new possibilities for the introduction of more improvements in these procedures, either relying on teleoperation, in which the surgeon and the robot establish their best synergy to get the optimal results, or by means of the automation of some specific actions or tasks. In this article the effect of robotics in the evolution of surgical techniques is described. Starting with a review of the robotics application fields, the article continues analyzing the methods and technologies involved in the process of robotizing surgical procedures, as well as the surgeon-robot interaction systems. Copyright © 2009 CEA.

Keywords: Robotics, Medical Applications, Teleoperation, Biomedical Systems, Computer Aided Surgery, Human-Machine Interaction.

Closed Loop Identification and Regulator Tuning by Means of Genetic Algorithms.

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Abstract: Closed loop continuous systems identification is a non linear optimization problem difficult to solve by means of conventional optimization methods. In this paper it is proposed the use of genetic algorithms (GA) to solve this task and it is shown, using simulation techniques, that the identified models can faithfully reproduce the plant dynamic behavior, even in case of unstable systems or those which present some types of non-linearities. The models can be used for the PID regulators parameters tuning using a close GA method as it is shown in two examples: an open loop unstable second order system and a high order plus delay system. The proposed method is also applied to the IEEE AC5A model for electrical generation units, which includes a saturation type non linearity. Copyright © 2009 CEA.

Keywords: continuous systems closed loop identification, genetic algorithms, PID parameters closed loop tuning, AC5A models.

Networked Neurofuzzy Control. An Application to a Drilling Process.

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Abstract: The neurofuzzy system known as Adaptive Network-based Fuzzy Inference System (ANFIS), is a pioneering work, as well as the simplest computationally and the most viable for real-time applications. This work is focused on designing and implementing a neurofuzzy control system of a high-performance drilling process through a Profibus network. The internal model control (IMC) paradigm accomplishes this goal by using direct and inverse process models for designing the control system. From the technical point of view, the aim is to maximize both the material removal rate and useful tool life. The results obtained are significant both in simulation as well as the real time application which are also verified by several performance indices. Copyright © 2009 CEA.

Keywords: neurofuzzy systems, internal model control, networked control, high-performance drilling process.

Application of Artificial Neural Networks for Detecting Instability Trends in Wire Electrical Discharge Machining.

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Abstract: This article presents the results of a comparative study performed to select the most appropriate neural network configuration for Wire Electrical Discharge Machining (WEDM). The main objective is to detect instability trends that allow alerting to the increasing risk of wire breakage of the cutting tool: the wire. The wire breakage reduces the process productivity and the required accuracy. Considering the results of previous works of the authors, in which different types of degraded behaviors were identified, a comparative study that considers different aspects has been performed. Among them, the evaluation of classic neural architectures stands out, in particular, the static architecture MultiLayer Perceptron (MLP), and the recurrent architecture Elman. The main conclusion of this work is that the Elman architecture is the most approppriate for detecting the degradation of the cutting process. Copyright © 2009 CEA.

Keywords: WEDM, electro-discharge machining, ANN, Artificial Neural Network, Perceptron Multilayer, Elman.

Local Model Sets with Internal Description. Application to a Cooling Solar Plant.

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Abstract: In this paper a method for creating linear local submodels is presented and analyzed. The main contribution is the use of a weighting function based on input-output signals alone. This choice has the advantage of simplifying some aspects related to the model building task. The representational capacity remains the same, being compared in the paper with other techniques. The simplification mentioned above is an important one since it allows the method to the industrial practice of process identification. The resulting identification technique is illustrated using a simulated process (proposed by Narendra) and a real process consisting of a cooling solar plant. These examples prove the applicability of the method as a simple tool usable in industry. Copyright © 2009 CEA.

Keywords: local models, identification, model based predictive control.

Cascade Predictive Control of an Autonomous Vehicle.

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Abstract: This paper presents the design of a predictive controller based on lateral and longitudinal dynamics model of an autonomous vehicle. The proposed controller implements by means of a cascade structure with the vehicle kinematics control to obtain the benefits wished at high speeds for the path following problem. A decentralized predictive controller based on the linearized dynamic model of the vehicle is used. Experimental results obtained by using the kinematic controller and simulation results using the proposed cascade controller are shown to corroborate the theoretical analysis. Copyright © 2009 CEA.

Keywords: Autonomous vehicle, predictive control, path following, side-slip control.

Simulation of Algorithms for Regulating the Vehicular Flow and the Communication between Autonomous Vehicles Using Ad Hoc Networks.

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Abstract: This work presents the analysis, development, simulation, and results of two algorithms that have the objective of regulating the vehicular flow and the communication between autonomous vehicles. The vehicular flow is simulated with a microscopic algorithm and the communication between autonomous mobile vehicles is simulated with an algorithm based in geographic localization, both implemented in the same simulation scenario. The hypothesis that this research work pretends demonstrate is that for reaching an efficient communication between autonomous mobile vehicles is necessary two components: a constant vehicular flow and a communication protocol that incorporate a prediction algorithm. Copyright © 2009 CEA.

Keywords: vehicular ad hoc networks, microscopic model, autonomous vehicle, wireless technology, network simulation.

Usability Evaluation for the Task of Human Supervision in Industrial Control Room.

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Abstract: In tasks requiring human supervision in industrial control room there are applied generic disciplines like safety, automatic control and engineering systems. From the point of view of the human-computer interaction applied to these disciplines it is necessary to add the usability engineering and the cognitive ergonomics since they contribute with rules for the human-centred design. The main goal of this work is the application of a cognitive ergonomic guideline for supervisory control and the usability engineering approach in order to improve a sugar mill interface design and the efficiency of the human operator task in control room. The paper shows the application of this approach in the full scale simulator and the training program of the Spanish Technological Center, Centro de Tecnologia Azucarera, in order to improve the performance of this human-computer system in industrial processes control. Copyright © 2009 CEA.

Keywords: supervisory control, human-machine systems, design methdos, industrial processes control, cognition and control.

Input-variable Selection for Call Center Load Forecasting

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Abstract: The paper highlights the importance of input-variable selection for neural models used to forecast the call load in a telephonic attention center.
The models have at their disposal a large number of variables to be used as inputs. However, the number of observations that can be used for training is small due to social and economic changes. This prompts to carefully selecting the input variables and using the smallest possible set, otherwise generalization would be degraded.
To solve the problem a mixed approach is used. In a first stage a large number of candidate variables are sorted and some are selected. The second stage does a finer selection among the surviving candidate variables. The results obtained with data from a real attention center show that a correct input-variable selection is vital for this kind of applications. Copyright © 2009 CEA.

Keywords: models, forecasting, artificial neural networks.

ISO 10303 AP-238 Extension to Automate CNC Process Data Access

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Abstract: The new ISO standard (STEP-NC) opens new opportunities for communication between CAD/CAM systems and CNC manufacturing systems. This paper proposes an extension of the STEP-NC information model with new data structures and nc-functions to address real time machining process data access capabilities, with the aim of supporting other advanced activities such as traceability or closed loop manufacturing process. Copyright © 2009 CEA.

Keywords: Automation, CAD/CAM, CNC, Standards, ISO, monitoring, data acquisition.