Resúmenes en Inglés
English Abstracts

The Scientific Engineer or the House with Two Doors is Difficult to Guard

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Abstract: This paper is focused on the meaning of the locution 'scientific engineer', discussing the specificity of engineering and his method. It starts by emphasizing the essential role played by technology at the mankind genesis, just as that of engineering in the rise of the civilization. Next, the engineer's method is analyzed, discussing Simon, Vaughn Koen and Vincenti's contributions to the characterization of this method, including engineering knowledge peculiar characteristics. Once exposed engineer particular features different from those of scientist, next step is dealing with what a scientific engineer means. Finally, comments related to specific cases on control engineering are included. Copyright © 2011 CEA.

Keywords: Technique, engineering, science, engineer's method, control engineering.

Robust linear control of nonlinear systems

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Abstract: In this article, a linear observer-linear controller approach is proposed for the robust trajectory-tracking task in a large class of nonlinear differentially flat systems, including multi-variable nonlinear flat systems. A non-phenomenological model of the input-to-flat-output dynamics is proposed which only retains the orders of the Kronecker integration subsystems and, the control input gain matrix, as key controller design elements. The additive influence of the rest of the nonlinear state dependent dynamics, including exogenous unknown perturbation inputs, is considered as unknown but uniformly absolutely bounded disturbance that is shown to be algebraically observable and it can, hence, be approximately determined, to any desired degree of accuracy, by means of a set of linear observers with suitable, self-updating, time-polynomial internal models of the unknown disturbances. The controller design task is reduced to that of cancelling the additive disturbances while imposing a desired linear dynamics, via estimated state feedback, obtained from the proposed observer itself. A convincing simulation example dealing with rather complex nonlinear physical system is provided. Two experimental implementations on laboratory prototype systems are also reported. Copyright © 2011 CEA.

Keywords: Disturbance rejection, Linear output feedback, Linearizable systems, Observers, Nonlinear systems.

Omnidirectional Vision Based Formation Control for Non-Holonomic Mobile Robots

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Abstract: This paper presents a novel control algorithm for the autonomous navigation of a non-holonomic robot team while preserving a specified formation. The control errors are defined in terms of the actual position of each robot and its desired position in the formation, relative to the leader robot of the team. The stability and robustness analysis for the proposed control system are presented. Experimental results that show the good performance of the proposed control system are also presented. Copyright © 2011 CEA.

Keywords: Formation Control, Mobile Robotics, Non Linear Systems, Stability and Robustness Analysis.

A Pre-process Model for Surface Finish Prediction in High Speed Milling Based on Softcomputing

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Abstract: The surface quality is one of the most careful elements in the manufacture of parts in various industrial fields such as aeronautics and automotive. Often the surface quality is estimated according to the surface roughness (Ra) and depends largely on the combination of factors in machining. Works that incorporate techniques to the study of Ra Soft computing in-process or post-processing are relatively common in the literature, however, are almost non existent in this study devoted to pre-process, although this can help reduce costs associated the estimate of surface quality, etc.. This paper presents a technique to generate a model Soft computing pre-Ra predictive process based on experimentation with different characteristics of the milling process at high speed. The prediction model is a Bayesian classifier, validated the method with k-fold cross-validation. Copyright © 2011 CEA.

Keywords: High Speed Machining, High Speed milling process, softcomputing, Bayesians networks, predictive models.

Laser Scanner to Detect Road Environments

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Abstract: Road security applications are getting more complex thanks to the latest advances. These applications require sensors able to provide information to perform complex and demanding tasks. Laser Scanners sensors have proved to be a trustable sensor family. This reliability has lead to increase the research activities related to laser scanners usability in road applications. Every day is more frequent to find Advance Driver Assistant Systems (ADAS) that takes advantage of the characteristics of these devices. These systems performs different task, some of them related to detection and prediction of movements of obstacles in the surroundings of a vehicle. Present work studies the possibility of using two different sensors in road applications. The second part of the work focuses on the presentation of a new algorithm able to detect moving obstacles in the surrounding of a vehicle using scanner laser. Copyright © 2011 CEA.

Keywords: sensors, signal processing, real systems, vehicles, detection algorithms.

Softsensor Trained Using the Concept of Instrumental Variables and Applied in the Measurement of Temperature in a Teniente Converter

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Abstract: This article presents the proposition, software design and implementation of a virtual sensor, based on artificial neural networks trained with instrumental variables, to emulate and replace sensors in real copper mining company. These sensors real suffer from various shortcomings and failures that, given the amounts of the masses and volumes of material treated, incurred heavy losses to such companies. The virtual sensor proposed remedy, at low cost and in an optimal way, these shortcomings of the actual devices, ensuring product quality, reactors and other elements and at the same time improving the working conditions of staff. In addition, virtual sensors allow maintain a sustained line of information, independent of the availability of plant and operators.

In the Codelco Company of Chile the largest fusion reactor, in the field of production of copper, is the 'Teniente Converter', design and patent Chilean, and the thesis is considered a implementation of the proposed virtual sensor to temperature measure in a Teniente Converter of the Salvador Division of the Company.

The article provides an introduction to these processes of production of copper, a Vision on State of Art in measurements of the relevant variables and a description and Metallurgical Process 'Teniente Converter'. It is followed by a description of the implementation and Signals of interest to virtual sensing. It continues with Proposition Virtual Sensor, Algorithms and their training methods and the implementation of sensor. Evidence was presented with two models, the results and their analysis.

It is concluded that the proposed and design virtual sensor allows remedy the shortcomings of the actual sensors and optimally improve the instrumentation, control and monitoring processes described, providing also sustained lines of information about them and other processes in the company.

The primary contribution of the article lies in the design of the sensor virtual neural network trained with algorithms gradient with artificial variables and with two models. Copyright © 2011 CEA.

Keywords: Virtual sensors, Neural networks, Instrumental variables, Copper production processes, Instrumentation and virtual measurements.

A Proposal for Allocation Resources in Embedded Control Systems: The Control Kernel

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Abstract: This paper defines the architecture of a control kernel to run embedded control applications. Control kernel services are defined to execute one or more controllers in a resource constraints environment (memory, processor, communications and energy). In addition, we discuss a set of strategies to ensure safety, reliability and economy in their operations. Two examples that illustrate how kernel control works with two of the proposed strategies are given. Copyright © 2011 CEA.

Keywords: Embedded systems, real time systems, computed controlled system, control application, software engineering, resource allocation, constraints.

A Decision Support System Applied to Emergency Situations in Real Time

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Abstract: This paper proposes a Computational Decision Support System, the Fire Emergency Manager (GCF), designed for assisting a person to make decisions in real time during emergency situations, specifically during a fire in a building. The dynamics of the GCF is based on the estimation of the final state related to each alternative via a net of concepts and some evolution functions that define how the initial state will evolve given a certain alternative. The GCF scores the alternatives computing their expected utility and so, it requires a probability value associated to each possible final state. The estimated values of the criteria that characterize a state are bounded using fuzzy sets, which provide an easy method for assigning probability values. The GCF considers that it could be necessary to carry out simultaneously more than one alternative to mitigate a fire emergency. Copyright © 2011 CEA.

Keywords: decision support systems, decision making, fuzzy sets, utility functions, knowledge representation.

CtrWeb: A Programming Tool for Remote Control of Educational Systems

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Abstract: This paper describes a distributed software architecture that provides an open source Java RMI-based API for programming remote prototypes for educational purposes. The access to the physical prototype is time-shared among different developers. The proposed system integrates with Moodle, a widely-used free-distribution Learning Management System. Copyright © 2011 CEA.

Keywords: Remote control, remote labs, distance learning, Ethernet, industrial automation, PLC.

Object Oriented Models Library for the Simulation of Sugar Houses: continuous crystallizer.

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Abstract: The Sugar House is the final department of beet sugar factories. The section receives from the previous department concentrated sucrose syrup and delivers the commercial sugar grains. In this article the main features of an Object Oriented Library to model the typical Sugar House with the declared purpose of building simulation tools for the training of control room operators is presented. The model of the continuous crystallizer is described in detail. Copyright © 2011 CEA.

Keywords: Simulation languages, Simulators, process models, object oriented modeling techniques, computer simulation, process equipment.

A methodology to evaluate PID auto-tuning algorithms

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Abstract: This paper presents a methodology to evaluate PID auto-tuning algorithms. For that, several indexes are defined to measure the performance of the algorithms

in both, the experiment and the control phases. The proposed methodology allows to compare the behavior of different auto-tuning algorithms. Copyright © 2011 CEA.

Keywords: auto-tuning, PID.