RESÚMENES EN INGLÉS
ENGLISH ABSTRACTS

EVENT BASED SAMPLING, CONTROL AND COMMUNICATION

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Abstract: Most research in control engineering considers periodic or time-driven control systems. Event based control is particularly a very promising alternative when systems with reduced computation and communication capacities are considered. For event-driven controllers it is the occurrence of an event, instead of the autonomous progression of time what decides when the sampling should be made. This paper presents an overview of the current situation of event based sampling systems. The main based event sampling schemes are described and the different strategies of control design using this sampling type are analyzed. Finally the implications that will have its application in the new field of network control systems are considered. *Copyright © 2008 CEA-IFAC.*

Keywords: Event based sampling, event based control, network control system.

DISSIPATIVE DESIGN OF OBSERVERS FOR NONLINEAR DISCONTINUOUS OR MULTIVALUED SYSTEMS.

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Abstract: This paper describes the application to discontinuous or multivalued systems of a new observers design methodology based on dissipativity that uses the differential inclusions theory and a circle theorem generalization. We deal with systems that can be put in Luré form. This treatment includes discontinuous or multivalued, generally non-Lipschitz nonlinearities. This method rules out some strong restrictions imposed by other methods about monotony and equal number of input and outputs. *Copyright © 2008 CEA-IFAC.*

Keywords: Nonlinear Systems, Nonlinear Observers, Dissipativity, Discontinuous Mappings, Multivalued Mappings

OPTOCOUPLED CONTROL LOOP FOR SWITCH MODE POWER SUPPLY

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Abstract: An optocoupled closed loop for switching power converters is introduced, describing loop compensation procedures. As example, one application is presented where the high loop gain allows the optocoupler non linearity compensation. The loop compensation is designed assuming the system linear enough to apply conventional methods as the switching frequency exceeds the dynamic response required in more than a magnitude order. Copyright © 2008 CEA-IFAC.

Keywords: Closed loop compensation, optocouplers, switch mode power supplies, static power converters, power electronics.

DEVELOPMENT OF A LIBRARY OF COMPONENTS IN ECOSIMPRO FOR THE OPERATION OF THERMAL PROCESSING PLANTS

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Abstract: In this work a library of operation units for the simulation, optimisation and control of thermal processes in the food industry is presented. Food processing plants are good examples of hybrid systems where continuous dynamics are coupled with discrete events. The library was developed in EcosimPro since it is able to efficiently handle hybrid systems. In addition, it includes a user friendly graphical interface (Ecodiagram) which makes mathematical models accessible to non expert users. The paradigm of object oriented programming (OOP), which includes features such as the inheritance, abstraction or encapsulation, was employed to construct such models in EcosimPro. The library can be employed, for instance, to analyse the effect of alternative production technologies or to design new operation policies in the event of fluctuating supply conditions. Although this work is focused on processes of the canned food industry, new units can be added in order to simulate other processes such as pasteurization or drying without the need of modifying the existing components. The models have been validated using a pilot plant installed at the IIM-CSIC although they can be applied to other plants with different specifications. Finally, some advantages of the library are illustrated through a number of case studies. *Copyright © 2008 CEA-IFAC.*

Keywords: Hybrid Systems, Dynamic Simulation, Food Thermal Processing, User Friendly Simulation Environment

QUALITY MEASURES FOR OBJECT GRASPING

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Abstract: The correct grasp of objects is a key aspect for the right fulfilment of several tasks. In robotics, the development of grippers more and more complex and versatile, such as mechanical hands, increases the necessity of algorithms to automatically determine the grasps, and, simultaneously, arises the need to evaluate the quality of the grasps in order to optimize them. This work presents a review of the quality measures proposed in the literature to quantify the grasp quality. The quality measures are classified into two main groups according to the main considered aspect: the location of the contact points on the object surface or the hand configuration. Approaches that combine different quality measures from the two previous groups to obtain global quality measures are also discussed. *Copyright © 2008 CEA-IFAC.*

TRAJECTORY GENERATION AND DECISION MAKING FOR UAVS

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Abstract: The trajectory generation and its replanning in hostile environments for UAVs (Unmanned Aerial Vehicles) is a discipline in expansion. The hostile environments contains threats, modelled here as radars. Initially a route is planned. Then, if during the fly arise pop-up threats, a replanning is carried out. In both cases the routes are obtained via the A* algorithm. When replanning, the UAV makes a decision about whether to continue the initial plan or to follow the replanned route. The multiattribute decision making theory is a suitable strategy. *Copyright © 2008 CEA-IFAC.*

COMPLETE METHOD FOR CAMERA CALIBRATION USING A TWO-DIMENSIONAL TEMPLATE

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Abstract: Camera calibration is necessary to obtain 3D information from 2D images of a scene. Different techniques exist, which are based on photogrammetry or self-calibration. As a result of the calibration, the intrinsic and extrinsic camera parameters are computed. Much work has been done in camera calibration and also in data pre- and post-processing techniques. From a practical viewpoint, bibliography shows that the calibration method using a two-dimensional template is easier to resolve and finest results are computed. However, in any case, techniques of data pre and post processing are taken into account to improve this calibration method.

In this paper a review of different techniques of data pre and post processing is done in order to improve the calibration process using a two-dimensional template of Zhang (Zhang, 1998, 2000). These techniques optimize the computing process, reduce the noise in the points coordinates and they accomplished a non linear searching suitable to the camera parameters. In this article a complete camera calibration process with a two-dimensional template is defined, in order to compute optimal parameters. *Copyright © 2008 CEA-IFAC.*

Keywords: camera calibration, two-dimensional template, distortion correction, data normalization, non linear calibration.

PARAMETRIC REDESIGN OF THE PENDUBOT FOR VERTICAL POSITIONING IN MINIMUM TIME

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Abstract: A parametric redesign methodology of nonlinear systems for minimum-time control without constraints on the state trajectory and bounded control is proposed. This methodology states the optimum redesign problem as a dynamic optimization one. This methodology simultaneously finds both the structural parameters of the system and the switching intervals of the control signal which minimize the required time to take the system from an initial state to a final one. Experimental results applying the minimum-time control methodology and the parametric redesign methodology to the Pendubot are shown. *Copyright © 2008 CEA-IFAC.*

Keywords: Integrated Design, Parametric Redesign, Dynamic Optimization, Pendubot, Minimum Time.

OPTIMAL TRAINING ALGORITHM TO DESIGN AN ASSOCIATIVE MEMORY FOR FAULT DIAGNOSIS

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Abstract: In this paper, the authors propose a new synthesis approach to train associative memories implemented by recurrent neural networks. The weights of the recurrent neural network are determined as the optimal solution of a linear combination of support patterns. The proposed training algorithm maximizes the margin between the training patterns and the decision boundary. The design problem considers: 1) obtaining of weights via an optimal hyperplane algorithm for support vector machines and 2) obtaining conditions to reduce the total number of spurious memories. This new algorithm is used to design an associative memory for fault diagnosis in fossil electric power plants. *Copyright © 2008 CEA-IFAC.*

Keywords: Associative memory, recurrent neural network, support vector machines, optimal hyperplane, fault detection and isolation, fossil electric power plants.

PARAMETRIC IDENTIFICATION OF BUILDINGS SUBJECT TO BIDIMENSIONAL SEISMIC EXCITATION

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Abstract: A method for least squares parameter identification of shear building models that consider three degrees of freedom for each story is presented. Excitation is obtained from two orthogonal components of horizontal ground motion induced by an earthquake. Knowledge of these parameters is very useful for applying semiactive control techniques that mitigate buildings vibration and help to avoid permanent damage in the structure. The method introduces a variation of the conventional least squares formulation that allows a very important reduction on the number of involved calculations that makes it possible to achieve real-time implementation. To test the methodology, a set of data recorded in two instrumented buildings during an earthquake is used. Obtained results show the efficacy of the algorithm in reconstructing stories accelerations and recovering fundamental natural vibration frequencies. *Copyright © 2008 CEA-IFAC.*

Keywords: real-time parameter identification, semiactive control of buildings, least squares algorithm, buildings health.

ADAPTIVE STATE ESTIMATION IN A SHEAR BUILDING EQUIPPED WITH A MAGNETO-RHEOLOGICAL DAMPER

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Abstract: An adaptive observer for a shear building with a magneto-rheological damper is presented. This observer is able to reconstruct the structural parameters and absolute storey displacements and velocities using measurements of acceleration. These signals are reconstructed in an explicit form because the proposed scheme does not require canonical forms nor state transformations. The observer's performance is illustrated with experimental results obtained with a small-scale structure. *Copyright © 2008 CEA-IFAC.*

Keywords: Adaptive observer, magneto-rheological damper, parameter identification, structural control.