Revista Iberoamericana de Automática e Informática Industrial
CEA comité español de automática
RIAI
ISSN: 1697-7912. Vol. 6, Núm. 4, Octubre 2009, pp. 115-119
http://www.revista-riai.org

Resúmenes en Inglés
English Abstracts

Modelling and Control of DC-DC Switching Converters: A Tutorial Perspective

L. Martinez Salamero, A. Cid-Pastor, A. El Aroudi, Roberto Giral and Javier Calvente

Departamento de Ingenieria Electrónica, Eléctrica y Automática, Escuela Técnica Superior de Ingenieria
Universidad Rovira i Virgili, Campus Sescelades
Països Catalans 26, 43007 Tarragona, España (e-mail: luis.martinez@urv.cat)

Abstract: Basic concepts of modelling and control of DC-to-DC switching converters are presented in a tutorial approach. After defining Power Electronics and its application domain , DC-DC switching conversion is presented as the basic core of the domain, and power converters are classified as variable structure systems.
The notion of switching regulator is subsequently introduced and the operation of a pulse width modulator is described to eventually derive a continuous-time model from the averaged converter dynamics.
Using the converter continuous-time model, a dynamic model of the switching regulator is obtained and both one-loop and cascaded linear controllers are described.
Non-linear control of switching converters is studied through the induction of sliding regimes in power converters. Equivalences between sliding systems and those employing a pulse width modulator are established and some applications are described.
Finally, a compilation of techniques for the non-linear dynamics analysis in switching converters is introduced by means of a generalized description based on a discrete-time model that predicts the resulting bifurcations and allows controlling the chaos.

Keywords: Switching networks, Variable-structure systems, Nonlinear systems, Pulse-width modulation, Nonlinear control, Sliding-mode control, Linear control systems, H-infinity control, Chaotic behavior.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 5-20.

Readjustment of the Parameters of the Impedance for the Improvement of the Energy Dissipation During Impact

Ranko Zotovic Stanisic, Ángel Valera Fernández

Departamento de Ingeniería de Sistemas y Automática, Universidad Politécnica de Valencia, Camino de Vera s/n, 46022, Valencia, España, (e-mails: rzotovic@isa.upv.es, giuprog@isa.upv.es)

Abstract: The impact is the most dangerous part of a contact task. Its duration is very brief; hence an extremely fast control is necessary. During the impact, the kinetic energy of the robot acquired during free motion is transformed into elastic potential energy and vice versa. This article proposes the commutation of the parameters of the mechanical impedance in order to increase the dissipation of the energy of the system, and thus to smooth the impact.

Keywords: Impact, Impedance, Robot Arms, Robot Control, Energy.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 21-31.

On Modelling of Co-current Rotary Dryers

F. Castaño, F. R. Rubio and M. G. Ortega

Departamento de Ingeniería de Sistemas y Automática, Univ. de Sevilla, Camino de los Descubrimientos s/n, 41092 Sevilla, España (e-mail: fercas@us.es, rubio@us.es, mortega@esi.us.es)

Abstract: This paper presents a methodology for the modelling of co-current rotary dryers.
The model is based in parametric differential equations and in the use of some correlations that allow simplifying the processing. In the work, which aspects of modelling are common to most installations are distinguished, and which ones are particular of each one depending on its configuration or drying material.
It is also shown the tests to which the material has to be subjected to for the determination of some analytical expressions that are essential in the model. Likewise, the application of the modelling to an experimental rotary dryer of sand is presented.

Keywords: Rotary dryer, Modelling, Differencial equations, Distributed parameters, Correlation coefficients.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 32-43.

Control Systems Analysis and Design Toolbox for Excel Spreadsheets

Nourdine Aliane

Departamento de Arquitectura de Computadores y Automática, Universidad Europea de Madrid, Villaviciosa de Odón- Madrid, España, 28670
(e-mail: nourdine.aliane@uem.es)

Abstract: This paper presents a toolbox for control systems analysis and design using Excel spreadsheets. The toolbox is a set of routines and function written in VBA macro programming language. At present, the toolbox is limited to linear systems represented by transfer functions. The user can specify a model, plot its time or frequency responses, perform a feedback, and tune interactively the controller parameters. The tool is intended to offer good level of productivity maintaining multiple simulations in a unique worksheet, and allows users to switch easily from one simulation to another. It is also intended to be highly interactive, where the user can perform "what-if" experiments in a straightforward manner by changing the parameters values and immediately see how these changes influence the system behavior. To illustrate the scope and the principal features of this tool, several examples are provided.

Keywords: Control, Linear Systems, Simulation, Excel Spreadheets.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 44-55.

Collision Free Path Planning for Multiple UAVs using the Velocity Profile

Juan José Rebollo* Iván Maza* Aníbal Ollero*,**

** Grupo de Robótica, Visión y Control*
Universidad de Sevilla
Edif. Escuela Superior de Ingenieros
Camino de los Descubrimientos, s/n, 41092 Sevilla, España
e-mail: juanjorebollo@hotmail.com; imaza,aollero@cartuja.us.es
*** Centro Avanzado de Tecnologías Aeroespaciales, FADA-CATEC*
Aerópolis, Parque Tecnológico Aeroespacial de Andalucía
N-IV, Km. 529, C/ Wilbur y Orville Wright, 17
41309, La Rinconada - Sevilla, España
e-mail: aollero@catec.aero

Abstract: This paper presents a method for collision resolution among multiple UAVs sharing the airspace with non-cooperative aircrafts. The proposed method finds collision free trajectories by changing the velocity profile of the different vehicles involved in the conflict taking into account other mobile objects or non-cooperative vehicles. The objective is to find the closest solution to the initially planned trajectories for the UAvs. The collision resolution process has two main steps: initialization using tree search and final solution applying Tabu search. The paper presents different simulations showing the efficiency of the proposed method for collision resolution in real-time.

Keywords: Multiple UAVs, Velocity planning, Tabu search, Tree search, Space discretization.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 56-65.

Speed Control based on Fuzzy Logic for Traffic Jams

V. Milanés, E. Onieva, J. Pérez, T. de Pedro and C. González

Instituto de Automática Industrial (CSIC)
Carretera de Campo Real km 0,200, Arganda del Rey, 28500, Madrid, España,
e-mail: {vmilanes, onieva, jperez, tere, gonzalez}@iai.csic.es

Abstract: The adaptive cruise control systems are capable of adapting the speed to the precedent car in highways as long as the car does not stop. However, in urban areas where the traffic flow can cause stop and go maneuvers continuously, this system is not very useful due to the necessity of re-start it once the car is stopped. In this paper, a speed control based on fuzzy logic for continuous stop and go manoeuvres is presented where the speed car is up to ten kilometers per hour. The system has been tested with two Citroën C3 vehicles, one of them full automated, in the Instituto de Automática Industrial facilities with great results. Copyright © 2009 CEA.

Keywords: Autonomous vehicles, Vehicle to vehicle communications, Speed control, Fuzzy control, Global positioning systems.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 66-73.

Study and Characterization of Feet Kinematics in Walker Assisted Gait

A. Frizera, A. Abellanas, R. Ceres, J. L. Pons, R. Raya

Grupo de Bioingeniería, Instituto de Automática Industrial - Consejo Superior de Investigaciones Científicas, Crta. de Campo Real Km 0.200, 28500 Arganda del Rey, Madrid, España
(e-mail: ffrizera, andres, ceres, jlpons, rrayag@iai.csic.es)

Abstract: In this work, general considerations are placed regarding the application of robotics in personal assistance aiming in particular the necessities of people with physical, sensory or cognitive impairments. The main focus of this work is the configuration of a series of ultrasonic transducers for the measurement of the relative position between the user's feet and a robotic walker during gait. From such measurements, descriptive parameters of the human gait are obtained. Such parameters were used to elaborate a novel analytical formulation describing the feet evolution in time. Such ultrasonic system is integrated in an advanced walker that consists of a multisensory platform to study the human-machine interaction and cooperation in assisted gait. Copyright © 2009 CEA.

Keywords: Rehabilitation robotics, Human gait, Ultrasound, Human-machine interfaces, Modeling.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 74-84.

Tracking Problem in Robot Manipulators: Revision and New Proposals

S. Torres, J. A. Méndez

Departamento de Ingeniería de Sistemas y Automática y Arquitectura y Tecnología de Computadores. Universidad de La Laguna. Av. Astrof. Sánchez, s/n, Ed. de Física y Matemáticas. 38271, Tenerife, España. E–mail: {storres , jamendez}@ull.es

Abstract: The tracking problem in robot manipulators has been afforded by applying a great variety of controllers, since easy designs based on PD controllers until complex control designs based on adaptive and robust algorithms. These last techniques show some drawbacks, i.e., some bounds in the robot dynamics have to be considered or the controller does not afford with the system constraints. This work makes a revision of the existing classical control techniques for manipulators and proposes a new set of robust and predictive controllers in order to avoid the mentioned problems. Particularly, a self-adaptive robust controller is described which avoids the error produced by an inexact cancellation of the nonlinear dynamics terms. This controller is improved by means of predictive algorithms that include the robot constraints in the control law. This work includes real and simulation results of a PUMA-560 arm of Unimation, which prove the satisfactory performance of the proposed controllers.

Keywords: Robot manipulators, Robust Control, Adaptive Control, Self-adaptive Control, Predictive Control, Implementation, Real-time tasks.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 85-97.

Multiobjective Design of PID controllers for the 2008-2009 Control Benchmark

Gilberto Reynoso-Meza, Xavier Blasco, Javier Sanchis

Instituto Universitario de Automática e Informática Industrial, Universidad Politécnica de Valencia Camino de Vera s/n, 46022 Valencia, España (e-mail: gilreyme@posgrado.upv.es, fxblasco,jsanchisg@isa.upv.es)

Abstract: In this work a multiobjective optimization approach is used to propose a set of digital controllers for the Benchmark presented by the IFAC-CEA Thematic Group of Control Engineering, fulfilling all its restrictions and requirements. The multiobjective strategy allows to determine the best set of solutions that represents which is known as the Pareto front, where all the solutions are non-nominated, optimal and each solution differs from others only by its degree of compromise with the given optimization objectives.

Keywords: Multiobjective optimization, PID controllers, Decision making.

RIAI, Vol. 6, Núm. 4, October 2009, pp. 98-108.