Editorial to Special Issue

On behalf of the Chilean Association of Automatic Control - ACCA (Chilean NMO of IFAC), it is an honor for us to introduce you to this special issue, which includes a selection of the best papers presented at the XIX Congress of ACCA and the XIV Latin American Congress of Automatic Control (both held in Santiago of Chile, August 2010), as well as other articles that cover topics of particular interest to researchers on the field of automatic control in Latin America.

Since 1974, ACCA has organized congresses (every 2 years), tutorial courses for continuing education, seminars, workshops, and expositions of equipment and control systems. All of these activities have significant influence in many domains associated to the discipline of automatic control, helping to (i) strengthen existent links between industry, academia, science and technology, (ii) disseminate theoretical and engineering knowledge for industry and consultancies, (iii) increase national and international networks on the basis of collaboration and exchange of experiences, and (iv) promote innovation and entrepreneurship in the new globalized scenarios. Hence, this special issue represents a valuable sample that takes into consideration many of the challenges and objectives that drive the interest of researchers in this region of the planet.

Selected papers come from various countries, among which we mention Brazil, Chile, Costa Rica, Mexico and Peru. The articles cover diverse areas, such as artificial intelligence, robotics, vision, state estimation, control and systems.

In “Decentralized Formation Control of Multi-agent Robots Systems based on Formation Graphs”, Hernandez-Martinez and Aranda-Bricaire present a formal result about global convergence to the desired pattern for any formation graph for control and motion coordination of Multi-agent Robots Systems, where the goal is to coordinate a group of agents to achieve a desired formation pattern. Finally, the control approach is extended to the case of unicycle-type robots.

In “On-line Master/Slave Robot System Synchronization with Obstacle Avoidance”, Portillo-Vélez *et al* propose a controller for the synchronization of master/slave robotic systems. The aim of the controller is to provide autonomy to the slave robot, via obstacle avoidance capability. The controller includes a PID controller and the on-line solution of an optimal control problem (OCP), which considers the dynamic model of the slave robot.

In “Concurrent Real-time Schedulers, a Classification Based on Functions”, Guevara-López *et al* define the working environment of Real-time Operating Systems (RTOS) in the analysis of schedulability, reconstruction, fail-safe and predictability where all activities are performed by a set of Concurrent Real-time Tasks (CRTT) which ask to be given attention by a processor through a Concurrent Real-time Tasks Scheduler (CRTTS).

In “Integration of Algorithms to Detect Movement and Color of a Dynamic Object, Applied to a Mobile Robot”, Osorio *et al* describe the integration of several image processing algorithms necessary to recognize a particular color and the movement of an object. Mean and RGB filters are applied to process the input image and locate the position of objects to develop the robot motion. These algorithms are applied to a mobile robot, in a tested scenario, tracking an object.

In “Syntax Extensions for a Constrained-Object Language via Dynamic Parser Cooperation”, Ricardo Soto *et al* introduce a simple description language for extending the syntax of the modeling language, with the purpose of making the typical three-layer architecture (modeling language, solver language, and mapping) adaptable to further upgrades of the solver layer. This allows one to model a problem in a single language and to execute it in a set of solver engines, facilitating experimentation as well as model sharing.

In “An Hybrid Particle Swarm Optimization – Simulated Annealing Algorithm for the Probabilistic Traveling Salesman Problem”, Cabrera *et al* present a hybrid algorithm combining Particle Swarm Optimization (PSO) and Simulated Annealing (SA) to solve the Probabilistic Traveling Salesman Problem (PTSP). The SA algorithm is used to improve the particle diversity and to avoid the algorithm being trapped into local optimum. Two well-known benchmarks of the literature are used and the proposed.

In “Study of Financial Systems Volatility Using Suboptimal Estimation Algorithms”, Tobar and Orchard implement a novel stochastic volatility (SV) model, based on the structure of the GARCH model, to describe the relationship between an observed financial return series and its standard deviation, namely volatility. The proposed approach is compared to the standard GARCH as the underlying modeling structure within a particle-filtering-based scheme for state estimation. The proposed structure is implemented to estimate the volatility of the NASDAQ Composite index during the period July 21, 2008 - July 17, 2009.

In “Feedback Linearization and Model Reference Adaptive Control of a Magnetic Levitation System”, Torres *et al* combine two techniques to control a nonlinear Magnetic Levitation System (MLS). Firstly, a feedback linearization technique and a linearization made via direct cancellation of nonlinear functions, which represent the phenomenological model of the system. Finally, to deal with the presence of uncertainty in the system model, an adaptive controller is used. The controller is based on model reference adaptive control to estimate the functions that contain the nonlinearities of the system.

In “Performance/Robustness Trade-off Design Framework for 2DoF PI Controllers”, Alfaro and Vilanova present a design framework for two-degree-of-freedom (2DoF) proportional integral (PI) controllers that allows to deal with the control system performance/robustness trade-off, based on the use of a model reference optimization procedure with target servo-control and regulatory control closed-loop transfer functions for first- and second-order-plus-dead-time. A comparative example shows the effectiveness of the proposed design methodology.

Control of a modular multilevel matrix converter for high power applications, Diego Soto *et al* present a control scheme for a multilevel AC-AC converter. This work explains the basics of the multilevel matrix converter and develops its associated control schemes to operate it as AC-AC converter. Control objectives include: regulation of multiple capacitor voltages; control of the multiple valve currents; and control of the output voltages. The proposed scheme is verified experimentally and through simulations.

We would like to thank the authors and reviewers of all the manuscripts that were submitted. Last but not least, ACCA would like to thank Professor Filip Florin, Editor-in-Chief, for his stimulating encouragements and Dr. Niculescu Andrei, Executive Managing Editor, in particular, for his efforts in language editing, prompt assistance and excellent organization skills in helping us meet the deadline and provide our association with this invaluable opportunity to show and disseminate the research activities performed in Chile and throughout Latin America. We hope that the readers of Studies in Informatics and Control journal will find this special issue interesting and useful.

Carolina Lagos
Elected President of ACCA

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Former President of ACCA

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