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EDITORIAL

Advances in Robotics in Latin America

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Research activities in the field of robotics in Latin America have increased dramatically in the past years. For over 10 years, the Latin American Robotics Council (http://ewh.ieee.org/reg/9/robotica/) has been actively involved in the organization of student competitions, symposia, and summer schools, in order to promote robotics and bring together students and researchers across the region.

The aim of this special issue is to further extend these efforts by presenting recent research developments in robotics in Latin America. Our goal has been to publish a limited but selective number of contributions from top scientists and research groups in the region giving special emphasis to those papers reflecting real applications of intelligent robotic systems described using international benchmarks and/or in-field experimental testing.

We received twenty-four high-quality submissions and after extensive reviews nine papers were selected. All papers were reviewed by at least three international reviewers with expertise in the specific field. The selected nine papers are included in this special issue as follows: 4 from Brazil, 3 from Mexico, and 2 from Chile. It is worth noting that all 24 submissions were exclusively from these three countries.

The main topics addressed by these papers are: robot design and modeling, path planning, robot vision, self-localization, SLAM, and learning.

Da Silva *et al.* propose the TORP (The Open Robot Project) robotics framework, which aims to put forward standardization in all dimensions (electrical, mechanical and computational) of a robot shared development model. The framework is based on the disassociation between the robot and its parts, and between the robot parts and their technologies. In addition, the first specification for a TORP family, and the first humanoid robot constructed following the TORP specification set are presented.

Okamoto *et al.* present the development of an autonomous robot for the inspection of gas spheres. The robot is capable of autonomously following a welding line, and transporting corrosion measurement sensors. The robot uses magnetic wheels, and its main sensors are a video camera and a laser. Tests are conducted at the laboratory and in a real sphere.

Julca *et al.* describe the development of a semi-autonomous unmanned underwater vehicle, and propose a method for the modeling and

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identification of the yaw motion dynamics. The method is based on the utilization of an uncoupled 1 DOF dynamic system equation of the underwater vehicle, and the application of the integral method. The method also includes an experimental setup that uses a low-cost magnetic compass sensor. Experimental trials with the vehicle are performed in a hydrodynamic test tank and a diving pool.

Hayet studies the local nature of the shortest length paths for a differential drive robot, in the presence of two or more landmarks that the robot has to keep in its field of view, and the shape of the configuration space resulting from these constraints. In addition, he describes a randomized planner that is based on these local primitives, and for which planning simulations are presented.

Llarena *et al.* propose a robot localization approach based on the use of Self-Organizing Maps (SOMs) and the Viterbi algorithm. Through the use of SOMs a so-called Tolerant Observation Model is built, while odometer-dependent transition probabilities are used for building an odometer-dependent motion model. The Viterbi Algorithm is used to evaluate the state-transition updates. Validation experiments are conducted in real and simulated environments.

Garrido and Soria propose an image-based visual servoing scheme applied to a class of over actuated planar parallel robots with revolute joints. The methodology relies only on position measurements of the end-effector through a vision system, and on position measurements of the robot joints. Experimental results on a laboratory prototype validate the robustness of the servoing scheme.

Loncomilla and Ruiz-del-Solar propose a visual SLAM system based on the use of what are called rigid-body 3D landmarks. A rigid-body 3D landmark represents the 6D pose of a rigid body in space. By using rigid-body 3D landmarks, the computational time of an EKF-SLAM system can be reduced up to 5.5%, as the number of landmarks increases. The proposed visual SLAM system is validated in simulated and real video sequences (outdoor).

Caro *et al.* describe recent developments in indoor autonomous social robots. Among others, they describe algorithms for autonomous navigation using wheeled robots (localization using range sensors and active perception, topological map building using visual perception), scene recognition using vision and 3D range sensors, and social behaviors using Markov Decision Processes.

Ramos da Silva and Romero present a robotic architecture that provides the capacity of learning mutual gaze, gaze following and declarative pointing using a robotic head interacting with a caregiver. Three learning methods are incorporated to this architecture, and a comparison of their performance is carried out in real experiments.

Finally, we would like to thank all researchers having submitted papers to this special issue and we hope to see many of these contributions published in future issues.