Special Issue about Advances in Physical Agents

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***Abstract*—Nowadays, there are a lot of Spanish groups which are doing research in areas related with physical agents: they use agent-based technologies concepts, especially industrial applications, robotics and domotics (physical agents) and applications related to the information society, (software agents) highlighting the similarities and synergies among physical and software agents. In this special issue we will show several works from those groups, focusing on the recent advances in Physical Agents.**

***Index Terms*—Physical Agents.**

I. Advances in Physical Agents

THIS issue of the Journal of Physical Agents (JoPhA) contains a selection of papers related with Physical Agents from different Spanish groups. With this issue we start a series, which will provide a "big picture" of the current state of the art of this research at Spain. As a summary of this special issue, below you can find a brief description of the papers.

The first one *Control of Autonomous Mobile Robots with Automated Planning* presents an approach for the control of autonomous robots, based on Automated Planning (AP) techniques, where a control architecture was developed (ROPEM: RObot Plan Execution with Monitoring). The proposed architecture is composed of a set of modules that integrates deliberation with a standard planner, execution, monitoring and replanning.

The second one *Efficient Plane Detection in Multilevel Surface Maps* describes an automatic system aimed at producing a compact tridimensional description of indoor environments using a mobile3D laser scanner. The resulting description is made up of a Multi-Level Map (ML map) and a series of plane patches extracted from the MLSM. Authors propose a novel plane detection algorithm, based on the efficient RANSAC algorithm, that operates directly over the data structures of aML map and does not need to rely on the low level laser data cloud.

The third paper of this issue *Motion Planning for Omnidirectional Dynamic Gait in Humanoid Soccer Robots* deals with the problem of planning the Center of Mass (CoM) trajectory of a humanoid robot while its feet follow an omnidirectional walking pattern. This trajectory should satisfy the dynamic stability criterion to ensure analytically that the Zero Moment Point (ZMP) lies within the support polygon. The proposed approach provides flexibility and agility to humanoid robots, which is of special interest in highly dynamic environments, such as soccer robotics.

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The fourth selected paper *Robust Behavior and Perception using Hierarchical State Machines: A Pallet Manipulation Experiment* presents the computational architecture and results obtained from a pallet manipulation experiment with a real robot. To achieve a good success rate in locating and picking the pallets a set of behaviors is assembled in a hierarchical state machine. The only sensory sources of information available to the robot are a binocular vision system and its internal odometry.

The fifth one *Combining invariant features and localization techniques for visual place classification: successful experiences in the robotVision@ImageCLEF competition* focus on the optional task of the RobotVision@ ImageCLEF competition, which consists of a visual place classification problem where images are not isolated pictures but a sequence of frames captured by a camera mounted on a mobile robot. This fact leads us to deal with this problem not as stand-alone classification problem, but as a problem of self localization in which the robots main sensor only captures visual information. Thus, authors base their proposal on a clever combination of Monte-Carlo-based self-localization methods with optimized versions of scale-invariant feature transformation algorithms for image representation and matching.

The last paper of this issue *Embedded Distributed Vision System for Humanoid Soccer Robot* presents a distributed architecture for humanoid visual control using specific nodes for vision processing cooperating with the main CPU to coordinate the movements of the exploring behaviours. This architecture provides additional computing resources in a reduced area, without disturbing tasks related with low level control (mainly kinematics) with the ones involving vision processing algorithms.

To conclude this introduction, we would like to thank the Spanish Network of Physical Agents (http://www.redaf.es) which provides support for all the events related with physical agents in Spain.