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SMART MATERIALS FOR ROBOTICS
 ROBOTIC PERCEPTION
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IJRCS '09

2nd International Joint Robotics Competition and Symposium

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PREFACE

For the past two years the International Joint Robotics Competition and Symposium has played a critical role in bringing together leading roboticists from academia and industry with backgrounds in various sub-fields of robotics to foster an intensive exchange of information and know-how. IJRC 2008 (www.ijrc2008.org) was the inaugural event to start up a robotics competition in North Cyprus for the first time. It was hosted by the Robotics Club of Eastern Mediterranean University (EMU, North Cyprus) which was joined by the following institutions in organizing: Student Affairs of Shiraz University, Iran; Boğaziçi University, Turkey; Süleyman Demirel University, Turkey; and Middle East Technical University, Turkey.

IJRCS 2009 (www.ijrcs.org) included a symposium simultaneously with the competition. It was hosted by Süleyman Demirel University in Isparta, Turkey. The following institutions joined in to organize it: Eastern Mediterranean University, North Cyprus; Sakarya University, Turkey; Ecole Polytechnique Fédérale de Lausanne, Switzerland; K. N. Toosi University of Technology, Iran; Mehmet Akif Ersoy University, Turkey; Moscow State University, Russia; and Atılım University, Turkey. Symposium listened to oral presentations and a panel. Four of the presentations were invited talks by Dr. Haldun Komsuoglu (University of Pennsylvania, USA), Dr. Ferat Şahin (Rochester Institute of Technology, USA), Dr. Abdülkadir Erden (Atılım University, Turkey) and Dr. Hakan Temeltaş (Istanbul Technical University, Turkey). The most of the academic presentations were later submitted as written papers which were reviewed, edited, and finalized to appear in this proceedings special issue. The featured papers present an in depth description of exciting research projects based on: Mechanisms, Manipulation, Mobile systems, Field robotics, Robotic perception, Human-robot interaction, Smart materials for robotics, Estimation, learning, and programming, Robot Learning, Evolutionary robotics, Anthropomorphic robotics, Robotics and automation, Semantic robotics, and, Standards and common platforms for robotics.

Komsuoğlu in his paper titled “Dynamic Legged Mobility - An Overview” took up new terrestrial robotic systems “developed inspired by, but without mimicking, the examples from the Nature.” He contends that experimental work with such platforms has improved appreciation of legged locomotion. This paper presents an overview of differential advantage offered by dynamic legged locomotion over the classical wheeled and tracked approaches.

The second paper ("Drivable Floor Detection with Monocular Visual Perception") by Şencan, Sarıyanidi, and Temeltaş presents a study of vision-based scene analysis techniques towards improved navigation ability for autonomous mobile robots with a single camera. Experimental results obtained from a differential drive robot demonstrate the success of this approach.

Identifying friends in situations of team competition such as mini-sumo battlefield is crucial in order to implement a winning strategy. To be able to inter-communicate is not sufficient as the enemy may be pretending as a friend. Security of messages sent over the air among friends is the subject of the paper titled "A Novel and Simple-to-Implement Friend or Foe Identification System in Multi-Robot Battlefield" by Elçi, Rahnama, Bakhshi, and Sadeghi. The authors propose and demonstrate a framework for simultaneous localization and mapping (SLAM) scheme in order to identify position and heading of friends through beaming of encrypted messages. Outcome of the experiments carried out and comparison of results indicate to the virtues of the framework in settings of cooperative problem solving in uncharted environments.

A condensed review of underwater robot swarms is given in the paper by Yıldız, Gököl, and Yılmaz summarizing challenges, practical issues, and applications. Ongoing research deals with construction of coordinated missions to be performed by groups of autonomous underwater vehicles illustrating advantages of swarm formation.

Development and control of a high precision, six-degrees-of-freedom, parallel manipulator (i.e., Stewart platform) is the subject of the paper by Kızır, Bingül, Oysu, and Küçük. Kinematic analysis of the platform was designed and simulated in

Solidworks. The dynamic model of the two-body platform was created in Matlab-Simulink environments.

The design and development of a prototype project for tracking objects is the subject of the paper "Color or Motion Tracking Using Webcam" by Azhari and Ergün. Issues relating to color and motion detection, image processing, BLOB detection, object tracking, servo controller and PIC programming using a C-like programming language are treated stressing practical concerns.

Bodur takes up the design and development of line tracking control of a mobile competition robot in the context of an embedded systems design course pivot project in the next paper. The project is based on controlling forward/backward movement and steering motors of a toy-car installed with a microcontroller which simply reads track position sensors and decides on which way to run the motors through software. Virtues of the project are reviewed in terms of ABET-09 and EUR-ACE-08 accreditation criteria and favorable lessons are drawn.

The paper "Improved Lased-Based Navigation for Mobile Robots" by Awais models the behavior of a laser scanner with respect to glass surface using a probabilistic approach. This sensor model is then employed to improve mapping and localization of a mobile robot in an office environment. Test case applications have been run using a real robot obtaining excellent results.

The extended abstract by Dinç and Sönmez reconsiders how to generate dynamic motion by employing hierarchically-connected joints.

The final paper by Aksoy, Canbek, and Adar titled "DDS-Based Heterogeneous Robots Communication Middleware" adapts the Object Management Group's (OMG) open international communication middleware standard for real-time and embedded systems, namely, the Data Distribution Service for Real-time Systems (DDS) in order to develop a communication middleware model for multi-robot environments. The proposed

communication middleware is useful in modeling heterogeneous multi-robot systems through DDS QoS mechanism and Publish/Subscribe paradigm.

We thank Dr. İ. Serkan Üncü, Dr. Abdülkadir Erden, Dr. Atilla Elçi, Dr. Haldun Komsuoğlu, Dr. M. Reşit Usal, Dr. Behnam Rahnama, and Dr. Mehmet Albayrak for their participation in the “Panel on Future Trends in Mechatronics Education” and for sharing their valuable insight with the audience.

We would like to thank first of all the authors who submitted top quality papers addressing many exciting and important research topics. We are grateful to the program committee members and external reviewers for the outstanding job with paper review.

We are highly indebted to our respective institutions for their support in organizing IJRCS 2009. Our special thanks go to our sponsors The Scientific and Technological Research Council of Turkey (TÜBİTAK), IEEE Turkey Section IES/RAS Joint Chapter, INETA Turkey Section, Microsoft Turkey, Figes Engineering Co., Plus Electronic Co., Hiscar Automotive Industries Co., Infotron Co., Turkish Red Crescent, Cornelia Hotels; without their support perhaps this event would not have taken place.

Sincere appreciation, therefore thanks, goes to the members of the Local and Student Organizing Committees. This special issue perhaps would not have been possible without the meticulous effort of Esmâ GÜNGÖR and Ebru Yılmaz, both of Süleyman Demirel University, in converting, formatting, and pagination of all the papers.

We are greatly indebted to the following officials for they have not spared their solid support of this event, therefore we sincerely thank, the Rector Dr. Metin Lütfi Baydar, Rector’s Advisor Dr. Hüseyin Gül, Dean of Faculty of Education Dr. Songül Sallan Gül, Head of Tourism Department Dr. Murat Çuhadar (all of Süleyman Demirel University) and Mehmet Akif Ersoy University’s Head of Informatics Department Dr. Güvenç Görgülü.

We hope you will enjoy reading this issue,

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¹ NB: Dr. Elçi was with Eastern Mediterranean University, TRNC, North Cyprus, during both events.

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