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Human Behavior Understanding

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Preface

Research domains for which an understanding of human behavior is a crucial need (e.g., robotics, human-computer interaction, affective computing, and social signal processing) rely on advanced pattern recognition techniques to automatically interpret complex behavioral patterns generated when humans interact with machines or with each other. This is a challenging problem, where many issues are still open, including the joint modeling of behavioral cues taking place on different time scales, the inherent uncertainty of machine-detectable evidences of human behavior, the mutual influence of people involved in interactions, the presence of long-term dependencies in observations extracted from human behavior, and the important role of dynamics in human behavior understanding. Implementing these methods on robotic platforms introduces further constraints on processing resources, tracking over time, model building, and generalization.

The Third Workshop on Human Behavior Understanding (HBU), organized as a satellite to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2012), gathered researchers dealing with the problem of modeling human behavior under its multiple facets (expression of emotions, display of relational attitudes, performance of individual or joint actions, imitation, etc.), with particular attention to implications in robotics, including additional resource and robustness constraints of robotic platforms, social aspects of human-robot interaction, and developmental approaches to robotics.

The workshop featured three invited talks by François Brémond (INRIA, France), Erol Şahin (METU, Turkey), and Oussama Khatib (Stanford University, USA).

François Brémond, in his talk entitled "Scene Understanding and Assisted Living," described scene understanding, which requires five levels of generic computer vision functionality of detection, localization, tracking, recognition, and understanding. Scene understanding systems go beyond the detection of visual features such as corners, edges, and moving regions to extract information related to the physical world that is meaningful for human operators. The aim is to achieve more robust, resilient, and adaptable computer vision functionalities by endowing them with a cognitive faculty: the ability to learn, adapt, weigh alternative solutions, and develop new strategies for analysis and interpretation. Brémond also discussed how scene understanding can be applied to home care monitoring.

In his talk on "Affordances and Concepts", Erol Şahin reviewed Gibson's popular notion of *affordance* through its different, sometimes contradictory, interpretations in fields ranging from human-computer interaction to autonomous robotics, to develop a formalization of affordances for its use at different levels of autonomous robot control. Using this formalization as a framework, he exposed methods on how robots could automatically learn to perceive affordances

in their environments, use learned affordance relations to ground symbolic planning mechanisms in the continuous sensory-motor experiences of the robot, and link them with concepts represented by verbs and nouns to communicate with humans. He concluded by pointing out future directions in this line of research, briefly discussing social affordances observed in human-robot interactions.

In the field of robotics, the motivation to emulate human movement has been driven by the desire to endow robots, humanoids in particular, with human-like movement properties. In his talk entitled "Robots and the Human", Oussama Khatib discussed the connection between humans and robots in terms of development of accurate models of the kinematics, dynamics, and actuation of human musculoskeletal systems, building full-body human motion simulations, performing motion reconstruction from captured data, as well as analysis and characterization of human movement. These developments, which are proving extremely valuable in human biomechanics, are providing new avenues for exploring human motion – with exciting prospects for novel clinical therapies, athletic training, character animation, and human performance improvement.

This proceedings volume contains the papers presented at the workshop and a summarizing paper. We received 31 submissions in total, and each paper was peer-reviewed by at least two members of the technical program committee.

We would like to take the opportunity to thank our program committee members and reviewers for their rigorous feedback, our authors and our keynote speakers for their contributions. We thank the PAL project of INRIA, BAP 6531 project of Boğaziçi University, and the EUCogIII network for their financial support.

October 2012

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