

The New Robotics Age: Meeting the Physical Interactivity Challenge

Oussama Khatib

Abstract The generations of robots now being developed will increasingly touch people and their lives. They will explore, work, and interact with humans in their homes, workplaces, in new production systems, and in challenging field domains. The emerging robots will provide increased operational support in mining, underwater, and in hostile and dangerous environments. While full autonomy for the performance of advanced tasks in complex environments remains challenging, strategic intervention of a human will tremendously facilitate reliable real-time robot operations. Human-robot synergy benefits from combining the experience and cognitive abilities of the human with the strength, dependability, competence, reach, and endurance of robots. Moving beyond conventional teleoperation, the new paradigm—placing the human at the highest level of task abstraction—relies on robots with the requisite physical skills for advanced task behavior capabilities. Such connecting of humans to increasingly competent robots will fuel a wide range of new robotic applications in places where they have never gone before. This discussion focuses on robot design concepts, robot control architectures, and advanced task primitives and control strategies that bring human modeling and skill understanding to the development of safe, easy-to-use, and competent robotic systems. The presentation will highlight these developments in the context of a novel underwater robot, Ocean One, called O2, developed at Stanford in collaboration with Meka Robotics, and KAUST.

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Author Biography



Biography of Oussama Khatib Oussama Khatib received his Ph.D. from Sup'Aero, Toulouse, France, in 1980. He is Professor of Computer Science at Stanford University. His research focuses on methodologies and technologies in human-centered robotics including humanoid control architectures, human motion synthesis, interactive dynamic simulation, haptics, and human-friendly robot design. He is a Fellow of IEEE. He is Co-Editor of the Springer Tracts in Advanced Robotics (STAR) series and the Springer Handbook of Robotics, which received the PROSE Award for Excellence in Physical Sciences & Mathematics. Professor Khatib is the President of the International Foundation of Robotics Research (IFRR). He has been the recipient of numerous awards, including the IEEE RAS Pioneer Award in Robotics and Automation, the IEEE RAS George Saridis Leadership Award in Robotics and Automation, the

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