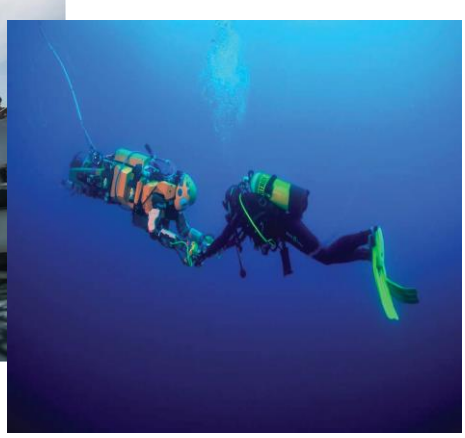

SEMINAR
OCEAN ONE: A ROBOTIC AVATAR FOR OCEANIC DISCOVERY

WEDNESDAY, MARCH 22, 2017.
TIME AND PLACE: 14:00-15:30 @ SEVIM TAN AUDITORIUM (D231, DEPT. OF ELECTRICAL AND ELECTRONICS ENGINEERING)

Abstract

The promise of oceanic discovery has intrigued scientists and explorers for centuries, whether to study underwater ecology and climate change, or to uncover natural resources and historic secrets buried deep at archaeological sites. This quest to explore the oceans requires skilled human access, yet much is inaccessible to human divers as nearly nine-tenths of the ocean floor is at a kilometer or deeper. Accessing these depths is imperative since factors such as pollution and deep-sea trawling increasingly threaten ecology and archaeological sites. These needs demand a system deploying human-level expertise at the depths, and yet remotely operated vehicles (ROVs) are inadequate for the task. A robotic avatar could go where humans cannot, while embodying human intelligence and intentions through immersive interfaces. To meet the challenge of dexterous operation at oceanic depths, Stanford University, working with KAUST's Red Sea Research Center and MEKA Robotics, developed Ocean One, a bimanual force-controlled humanoid robot that brings immediate and intuitive haptic interaction to oceanic environments. Teaming with the French Ministry of Culture's Underwater Archaeology Research Department, Stanford deployed Ocean One in an expedition in the Mediterranean to Louis XIV's flagship Lune, lying off the coast of Toulon at ninety-one meters. Following extensive testing at Stanford University, Ocean One was flown to France in the spring of 2016 for its maiden deployment, where it became the first robot avatar to embody a human's presence at the seabed. This expedition demonstrated synergistic collaboration between a robot and a human operating over challenging manipulation tasks in an inhospitable environment. Tasks such as coral-reef monitoring, underwater pipeline maintenance, and offshore and marine operations will greatly benefit from such robot capabilities. Ocean One's journey in the Mediterranean marks a new level of marine exploration: Much as past technological innovations have impacted society, Ocean One's ability to distance humans physically from dangerous and unreachable work spaces while connecting their skills, intuition, and experience to the task promises to fundamentally alter remote work. We foresee that robotic avatars will search for and acquire materials in hazardous and inhospitable settings, support equipment at remote sites, build infrastructure for monitoring the environment, and perform disaster prevention and recovery operations—be it deep in oceans and mines, at mountain tops, or in space.

Biography

Oussama Khatib received his PhD 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 IEEE RAS Distinguished Service Award, and the Japan Robot Association (JARA) Award in Research and Development.