2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
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Wearable SuperLimbs:

Design, Communication, and Control

An IROS 2020 Workshop

Thursday, October 29, 2020 – Full Day

Abstract

Supernumerary Robotic Limbs (or SuperLimbs for short) are wearable robots that assist and augment the human physical abilities as well as compensate for lost abilities with extra arms and legs attached to the human. SuperLimbs differ from other types of wearable robotics, such as powered exoskeletons and prosthetics. Exoskeletons are attached along the human limbs to augment the joint strength. Therefore, they neither change the number of limbs nor change the anatomical structure of the limbs. Prosthetic devices, too, do not add any new limb, but replace the lost limb by a mechanical limb and compensate for the lost function. SuperLimbs are supernumerary; they increase the number of limbs to create new functionality and strength.

This difference has created a new frontier of robotics research. How can a human communicate with and control extra limbs together with his/her own natural limbs? How can a human exploit the extra limbs to perform otherwise difficult and/or laborious tasks? Does the human brain support extra limbs attached to the body? SuperLimbs have attracted researchers from diverse disciplinary fields, ranging from brain and cognitive science, neuroscience, and human factors to robot design, human-computer interface, rehabilitation and biomechanics. Recently novel technologies, including soft robotics, lightweight structures using additive manufacturing, and flexible wearable sensors, have been applied to SuperLimbs, opening up a new direction of robotics. Numerous groups worldwide are now developing various types of wearable SuperLimbs for a variety of applications. These range from workers assistance in aerospace, construction, and infrastructure industries to rehabilitation, elderly support, entertainment, and housekeeping assistance. At this IROS workshop we will display and demonstrate the state-of-the-art of SuperLimbs, and exchange ideas among researchers and practitioners from diverse disciplinary fields.

The Workshop will start with a keynote talk by the organizer, introducing the key design concept, new functionalities, and potential applications and impact of SuperLimbs. Two talks will focus on communications with SuperLimbs from the human-computer interface perspective. Two talks will be on soft robotics and new actuator applications to SuperLimbs. Two talks will be on biomechanics of human-SuperLimb systems, and their rehabilitation applications. Two talks will be on a broad spectrum of industrial applications. SuperLimbs are presenting a rich variety of challenging issues in both science and engineering, and are opening up new opportunities and alternative solutions to critical areas of robotics applications. We will discuss these challenges and opportunities further in a panel discussion and general discussion, both of which include industrial participants and practitioners.

We plan to display and demonstrate real SuperLimbs at the workshop in addition to oral presentations by leading researchers of SuperLimbs. Furthermore, we plan to have a panel discussion by inviting

scientists, researchers, practitioners, and entrepreneurs from diverse fields as panelists. Participants will have plenty of opportunities to interact with each other.

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