Mobility Robotics
A Multi-Modal Assistive Robotics Approach to Address Mobility Challenges

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Xiangrong Shen is an Associate Professor in the Department of Mechanical Engineering at The University of Alabama, where he has been a faculty member since 2008. He received his Ph.D. in Mechanical Engineering from Vanderbilt University in 2006 and subsequently completed a two-year postdoctoral training in rehabilitation robotics, also at Vanderbilt. Professor Shen’s research is focused on assistive and rehabilitation robotics, and the specific topics include robotic lower-limb prostheses, portable power-assistive lower-limb orthoses, and legged/wheeled assistive robots. His research has been supported by multiple NSF and NIH grants, including an NSF CAREER award in 2014. He served as an Associate Editor for the journal of Control Engineering Practice from 2008 to 2014, and currently, he is an Advisory Board member of the Alabama Life Research Institute.

ABSTRACT

With the aging of the U.S. population, there is an increasing number of individuals suffering from mobility impairment, including the persons with lower-limb amputations and frail older adults with lower-limb weaknesses. At the HUman-centered Bio-Robotics Laboratory (HUB-Robotics Lab) in The University of Alabama, our overarching objective is to create a multi-modal system of assistive robots to restore and/or enhance the mobility of such mobility-challenged individuals. For the persons suffering from lower limb amputations, we are exploring a biologically-inspired robotic framework to create powered prostheses with comparable functionality and appearance as biological limbs. We are also developing an innovative method to automate the prosthesis tuning for individual users, with the purpose of accelerating the large-scale adoption of robotic lower-limb prostheses. For the frail older adults, our multi-modal approach aims at developing an integrated system of robotic devices (powered ankle-foot orthosis, self-powered smart walker, etc.), which may overcome the various mobility challenges older adult faces in his/her daily life. Overall, with the direct physical assistance provided by our robots, we hope to generate a significant impact on the health and wellbeing of the amputee and older adult populations, so they can become healthier, more physically active, and enjoy a better quality of life.

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