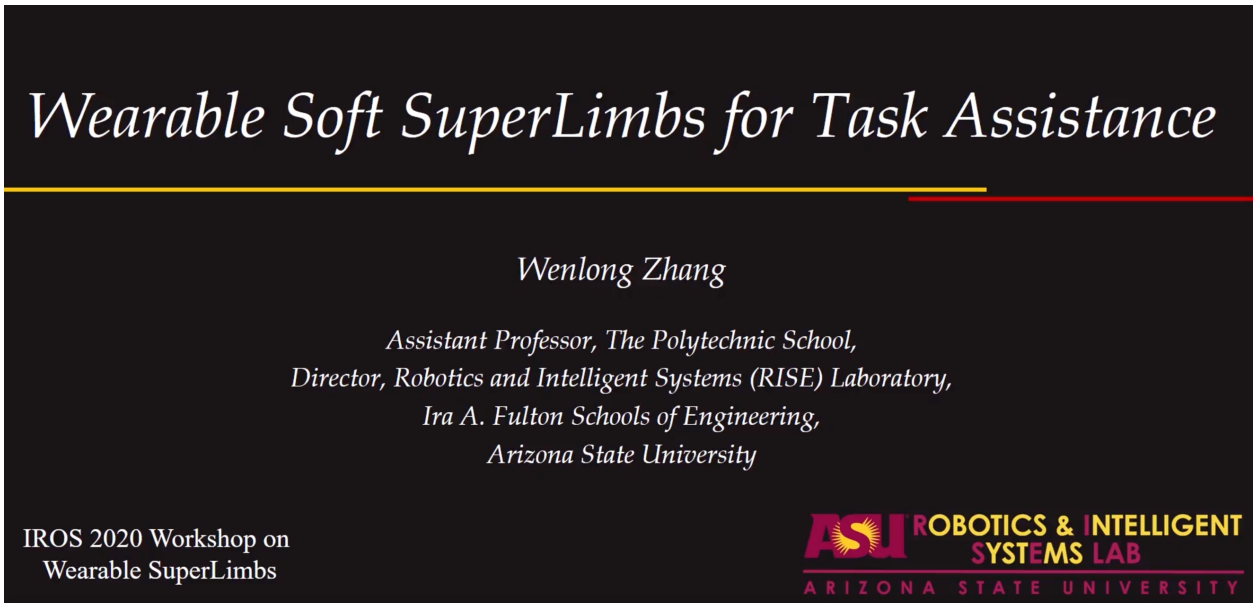

Abstract

Soft robotics has been extensively explored to enable safe interactions with the users and environments, by utilizing materials that are inherently compliant, low-cost, and lightweight. Wearable soft robots can assist the users in different ways, either as exosuits to provide joint support or as supernumerary limbs to augment the users. In this talk, we will present several designs of soft robotic supernumerary arms (we then called Soft Poly Limbs, SPLs), inspired by elephant trunks. The SPLs are enabled by fluidic-driven soft actuators made of elastomeric materials and multi-layered fabrics. The soft actuators are mechanically programmed to achieve bending, elongation, twisting, and a combination of these motion patterns upon inflation. We will introduce the actuator design, fabrication, characterization, computational modeling, and system integration of the SPLs. We will also discuss our work on the extended rigid-arm dynamic models, system identification, and learning controller design for individual soft actuators and the entire SPL to generate versatile motion patterns, and precisely manipulate objects using end effectors and its soft body. Our experimental results highlight the SPLs' abilities to safely interact with the user while demonstrating promising performance in assisting with a wide variety of tasks in the workplace and daily life. This talk will be concluded by proposing some new opportunities and challenges for building synergies between the human users and SuperLimbs outside the lab environment.