Soft robotics: a review and progress towards faster and higher torque actuators (Presentation Video)

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ABSTRACT

Last year, nearly 160,000 industrial robots were shipped worldwide—into a total market valued at ~$26 Bn (including hardware, software, and peripherals).[1] Service robots for professional (e.g., defense, medical, agriculture) and personal (e.g., household, handicap assistance, toys, and education) use accounted for ~16,000 units, $3.4 Bn and ~3,000,000 units, $1.2 Bn respectively.[1] The vast majority of these robotic systems use fully actuated, rigid components that take little advantage of passive dynamics. Soft robotics is a field that is taking advantage of compliant actuators and passive dynamics to achieve several goals: reduced design, manufacturing and control complexity, improved energy efficiency, more sophisticated motions, and safe human-machine interactions to name a few. The potential for societal impact is immense. In some instances, soft actuators have achieved commercial success; however, large scale adoption will require improved methods of controlling non-linear systems, greater reliability in their function, and increased utility from faster and more forceful actuation. In my talk, I will describe efforts from my work in the Whitesides group at Harvard to prove sophisticated motions in these machines using simple controls, as well capabilities unique to soft machines. I will also describe the potential for combinations of different classes of soft actuators (e.g., electrically and pneumatically actuated systems) to improve the utility of soft robots. 1. World Robotics - Industrial Robots 2013, 2013, International Federation of Robotics.

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