

Robot Companions: Rethinking Healthcare Robot Design and Fabrication

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Abstract

The world faces a number of challenges that require new, science-grounded technology to promote economic growth, sustain the cost of welfare and enable an aging population to remain active and live independent lives. The development of high performance, complex artificial systems, like robots, as companions for assisted living may require design methods and enabling technologies not presently available nor reachable by merely applying current engineering paradigms. Major scientific and engineering breakthroughs are needed to develop new types of artifacts that are safe, social, dependable, sustainable and skilled, literally going beyond the current design and fabrication paradigms.

Nature can be an extraordinarily rich and matchless reference for inspiring, conceiving and designing novel robotic systems. This approach is increasingly recognized by scientists and engineers as a valuable, winning strategy in order to push engineering frontiers beyond the threshold of traditional design and technology, as well as to develop new and more effective tools to elucidate scientific problems. If wisely pursued and exploited, biomimetics and bioinspiration have the potential to lead to disruptive innovations in science and engineering. Developing a new generation of healthcare robots intended to serve doctors and patients by being acceptable, affordable and dependable, requires the mobilization of multidisciplinary scientific excellence, new multi-functional materials and morphologies endowed with structural intelligence, novel engineering design methods and solutions, and novel methodologies addressing soft human-robot interaction and co-existence.

This lecture introduces the theoretical framework of biorobotics and discusses its many implications and a number of applications, from components to robotic systems, aimed at providing better healthcare in surgery, rehabilitation and functional substitution, and at assisting human life at all ages, from infants to elderly