Integrating Robotic Research for Assistive Technology Applications

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Assistive technology is an appropriate grand challenge application for the integration of robotics research. Robotic systems built for assistive technology applications are semi-autonomous systems. This means that a solution to Artificial Intelligence does not need to be found before we can create useful applications. The challenge at this time is to build working systems that integrate many research problems. Assistive devices must function reliably for long periods of time and must fail gracefully.

Robotic research has many applications in the assistive technology domain. Robotic wheelchairs can be used by people who are unable to drive a standard powered wheelchair. A robotic guide dog can assist blind people who need to use a walking device and thus do not have a free hand to use a guide dog or a cane. A mobile robot can fetch medication, books, food or other items for the elderly or disabled. Robotic arms, either attached to a table or to a mobile robot, can be used to reach for items, to open doors and cabinets, to bring food or water to the user, and to manipulate objects in a work environment.

Assistive robots require the integration of many areas of research, which may include vision, indoor navigation, outdoor navigation, navigation with maps, reactive navigation, mode (or behavior) selection, sensor fusion, and user interfaces and access methods. A robotic travel aid must be competent in multiple environments. A personal home attendant robot may only need to be competent in a known home environment. Any robotic aid must have a practical user interface. In designing the user interace, the abilities of the target community must be addressed and appropriate access methods must be developed for the systems. Although robotic research tends to focus heavily on the navigation problems, it is also important to create complete systems that disabled people can control.

Integrated robotic research in assistive technology applications will be immediately useful. The necessity of working applications in this domain requires robustness; a disabled person can not be expected to use a system with known failure cases. This requirement should force the creation of fully competent systems. Research in specialized domains like office environments has led to many useful findings; now is the time to apply useful findings to an application that requires more generalized capabilities.