Robotic Assistance During Ambulation By Older Adults

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Abstract
Some older adults require assistance with ambulation due to physical mobility limitations. Others lack the cognitive ability, either alone or in combination with physical impairment, to get where they need to go. Investigation of older adults’ gait speed, social interaction, and responsiveness to a robot during ambulation is part of the Nursebot Project, a unique collaboration of health care professionals and technologists focused on developing a personal robotic assistant for frail elderly adults at home.

"Pearl," the Nursebot prototype

Description of the Project
Self-reported walking ability may be the best indicator of functional mobility and performance of activities of daily living among older adults in the community.¹ The importance of walking as a form of exercise and a means by which to connect with others warrants efforts to design a robotic device that, among other functions, encourages social interaction and safe ambulation in a vulnerable and largely sedentary population. The Nursebot Project involves clinicians and researchers from the University of Pittsburgh, Carnegie Mellon University, and the University of Michigan who are developing a personal robotic assistant to augment the in-home help and supervision provided by family members, friends, and health care providers. The ultimate goal is to produce a robot with multiple functionalities (e.g., issuing reminders to eat, drink fluids, and take medication; monitoring health status and medication adherence; enhancing communication with persons outside the home; providing physical assistance with ambulation and other activities of daily living; and promoting personal safety), which could be tailored to an individual’s evolving needs.

Our current prototype, “Pearl,” has E.T.-like eyes, ears that spin when information is being processed (indicating that she cannot converse at the same time), and a mouth that can frown or smile. “Pearl” is equipped with mapping technology that enables her to learn the layout of her environment, then navigate autonomously within it. Using laser sensors, she is able to detect changes in her surroundings, as when furniture is relocated or a person moves within her field of vision, thus enabling her to avoid collision. “Pearl” is capable of limited natural language dialogue, with everything she says also displayed on her touchscreen chest. Her height is adjustable, and she has a tray on which items can be transported.²

Early field tests have demonstrated that older adults will interact with “Pearl.” Yet, she is not able to keep pace with the varying speeds at which older adults walk, and her speech is not easily understood, particularly while walking. Thus, we have undertaken a field investigation of older adults’ gait speed and social interaction while ambulating alone, with another person, and with “Pearl.” The investigations include older adults from a retirement community who live either independently or in an assisted living environment and ambulate with or without an assistive device, such as a walker or cane.

References