National Science Foundation:
Stroke Victim Rehabilitation and Socially Assistive Robotics

This research project will develop principles for human-robot interaction to benefit victims of strokes, both as part of rehabilitation and to assist stroke victims in coping with their disabilities.

Lead Agency:

National Science Foundation
Directorate for Computer and Information Science and Engineering
Division of Information and Intelligent Systems

Agency Mission:

NSF's mission is to promote the progress of science: to advance the national health, prosperity and welfare; to secure the national defense (NSF Act of 1950).

Principal Investigator:

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Partner Agencies:

N/A

General Description:

This research project focuses on the development and understanding of human-robot interaction (HRI) systems to benefit victims of strokes – disturbances in the blood supply to the brain resulting in some degree of loss of brain function. Robotics has the potential of positively impacting quality of life, especially for people with special needs, like those coping with the effects of strokes. If we are to meet the demand for personalized one-on-one care for the growing populations of elderly individuals and those with special cognitive and social needs throughout life, great strides must be made in human-robot interaction in order to bring robotics into everyday application domains.

This interdisciplinary project identifies a specific set of human-robot interaction research questions in the study of robotic systems capable of providing help through social rather than physical interaction. The research foci of the study are: embodiment, personality, empathy, and adaptivity toward the development of an assistive human-robot interaction model for customized time-extended assistive interaction. The research will be grounded in the stroke rehabilitation domain, where personalized and dedicated care is needed to provide supervision, motivation, and training during the critical post-stroke period and beyond, and where assistive human-robot interaction can play a key role. A novel

assistive human-robot interaction model will be developed based on personality matching between the user and the robot, in order to optimize the user's task performance on rehabilitation exercises.

Excellence: What makes this project exceptional?

The work is the first to study the role of personality and empathy in assistive human-robot interaction with human subjects, as well as to engage in longitudinal assistive human-robot interaction research to assess time-extended human-machine interaction in the assistive context.

Most novel is the use of a socially assistive robotic agent as a rehabilitation coach. The researcher has built a bio-mimetic humanoid robot capable of expressing emotion and making human-like gestures plus software for the robot that allows it to behave in an empathetic manner. This empathetic behavior will allow the robot to endear itself to the user during rehabilitation.

Significance: How is this research relevant to older persons, populations and/or an aging society?

Strokes are far more common among elderly people, and they may face greater challenges coping with life after their strokes than do younger people.

Effectiveness: What is the impact and/or application of this research to older persons?

Project outcomes will provide pilot data necessary for translating the methodologies developed toward clinical applications.

Innovativeness: Why is this research exciting and newsworthy?

Currently there are about 750,000 new strokes per year in the United States, and some expect the number to double in the next twenty years with the growing elderly population.