

Design of a Reconfigurable Control System for Smart Wheelchair using Capacitive Interface Joystick

Engineering Technology



FUNDER:

Ontario Centres of Excellence

INDUSTRY PARTNER:

Andy's Radios and Electronics

TIMELINE:

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RESEARCH TEAM:

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KEY STATS:

The use of hand gesture technology and deployed sensors made this a unique project, according to available literature.

Context: Nearly 8 million individuals in the US and Canada have limited arm and hand mobility, making it difficult or impossible for them to use products with embedded computers, such as wheelchairs, to access healthcare, education, and social activities.

Industry Challenge: The Industry Partner wished to develop assistive technology for powered mobility and establish devices that make use of touchless free hand gesture and multisensory monitoring in order to develop smart control of a powered wheelchair.

Solution: The project created a prototype of a novel adaptive control system for a wheelchair based on the new partial reconfiguration property of the Field Programmable Gate Array (FPGA) technology. This technology will provide the user an easier finger based control, benefiting those persons with limited dexterity by eliminating the difficult and sometimes painful control of a joystick.

Impact of the project: There is great potential to develop this prototype further. Local hospitals and rehabilitation clinics in Hamilton and Toronto have expressed interest in the wheelchairs, as many patients have mobility issues; clinical trials and testing could further refine and improve the prototype. In addition, the prototype can detect any significant changes in the patient's status due to the embedded sensor technology and monitoring.

Mohawk's role: Using Mohawk College's electronic and instrumentation lab resources, the expertise of a full-time faculty member experienced with the development of bioedical devices used for physiological and healthcare monitoring along with Computer Engineering and Instrumentation students created the prototype wheelchair.