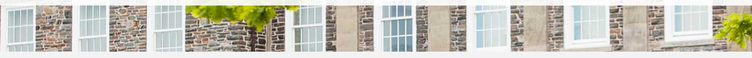

STUDENTS SUPPORT MORE STABLE WHEELCHAIRS

James Ross · December 3, 2018

Dr. Kirby (second from right) and the RoboRAD team. (Provided photo)

A group of Dalhousie Engineering students are working in collaboration with the Dalhousie Faculty of Medicine to develop a state of the art, app-controlled rear anti-tipping device (RAD) for manual wheelchairs.

Wheelchair users are familiar with the shortcomings of conventional RADs, which extend rigid arms from the back of the chair to prevent the chair from tipping backwards. While this greatly reduces the risk of a fall, it also inhibits the frequently performed function of raising the chair's front wheels to mount curbs and other low ledges. Worse still, these devices can get caught on curbs while dismounting, leaving the rear wheels "floating" and the chair immobile.

For the past several years, Dr. R. Lee Kirby, head of the Faculty of Medicine's Wheelchair Research Team, based at the Nova Scotia Rehabilitation and Arthritis Centre Site of the Nova Scotia Health Authority, has worked in collaboration with the Dalhousie Engineering Capstone Program to develop an improved RAD that would avoid the pitfalls of the conventional models. Each year, Dr. Kirby supervises a different Capstone group to iterate on a steadily improving design, providing continuity to a series of discrete Capstone projects.

"Conventional RADs force health-care personnel working with wheelchair users to choose between safety and performance," says Dr. Kirby. "Our new RAD design makes it possible for wheelchair users to have the best of both worlds: safety and performance. This innovation has the potential to help a great many people around the world."

RAD ideas

Previously, Dr. Kirby has worked with mechanical engineering students to develop an adjustable RAD, which allows the outer end to move through an arc when needed. However, this Arc-RAD must be manually adjusted for different environmental challenges, which poses an inconvenience to wheelchair users at best, and a prohibitive obstacle at worst.

Now, Dr. Kirby is teaming up with a team of electrical engineering students to add battery power and app-based remote control functionality to the existing prototype. The envisioned design has been dubbed the "Robo-RAD," only partly in fun.

"This project is a really exciting challenge, because it involves three different disciplines of engineering," says Kaartikeya Pandey, who along with Sung-Kwan Ahn, Brett Leard, and Michael Evelyn forms the electrical team. "We need electrical work to power the device, software engineering to create the app that will control it, and we had to brush up on our mechanical skills in order to make sure the adjustments actually work."

The challenge of adapting to work in a discipline other than their major demands careful planning. Though the team's primary focus is on converting the existing device to an electromechanical model and developing a Bluetooth-based app to control it, doing so requires an understanding of how the adjustments manifest in the physical world. The team's first step was to figure out just how much they needed to understand to get to work on the tasks that are in their wheelhouse.

"We decided to start by focusing on the lower half of the device's adjustable range, so that we could get started on the electrical and programming work sooner," says Leard. "Once we master remote control for the lower-half, the top half will be easy."

Moving along

While the team's work is still in the early stages—completed projects will be presented at the annual Dalhousie Engineering Capstone Conference on April 5, 2019—the long term vision for the Robo-RAD is clear. The current Arc-RAD prototype is designed for a specific model of wheelchair; the final version of the Robo-RAD will be retrofittable for any make of rigid-frame manual wheelchair.

The final version will be portable and travel-safe: easily removed and reinstalled, and convenient to store. The final student-project design will be a major step toward technological readiness for commercialization, although there will also be a number of business-related hurdles to overcome.

Ultimately, the team is aware that their contributions to this ongoing project are unlikely to be the final ones. This adds an additional challenge to their task, demanding a skill not always associated with engineers: effective communication.

"We're very much a stepping stone towards an end goal," says Evelyn, "and so it's crucial that we not only make our designs easy to understand and adapt, but that we document all of our work effectively so that the next team can pick up the ball and run with it."

Most Commented

Toward a barrier-free Dalhousie: Accessibility goals take shape as province sets standards

Sitting in with the Symphony: Digital audition earns Music student coveted honour

How we mourn the victims of tragedies depends on their citizenship status

News Archive

- September 2020
- August 2020
- July 2020
- June 2020
- May 2020
- April 2020
- March 2020

» More Archives