Robotic Assistive Technology

Engineering Students Explore Adaptive Technologies:

A Win-Win Scenario

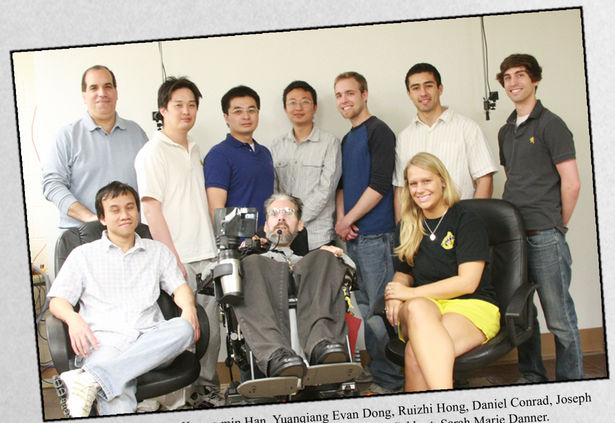
Public Service Projects Promote Student Recruitment and Program Funding

University of Missouri College of Engineering students addressed challenges faced by the Adaptive Computing Technology Center. Students used person-centered technology to create practical solutions to alleviate real-life disabilities and improve their program.

The Robotic Assistive Technology (RAT) team is aimed at helping persons with disabilities compete academically and professionally with their non-disabled peers. The readily visible impact of their public service research **engages students** and provides a **basis for recruitment**.

RAT work has also given faculty a **fresh insight** into person-centered technology research and development, as well as new opportunities for **niche funding**. The collaborative efforts of the team have culminated in five grant proposals.

Permobot Smart Wheelchair of the Future.



Back Row: Gui DeSouza, Kyung min Han, Yuanqiang Evan Dong, Ruizhi Hong, Daniel Conrad, Joseph Anthony Ayala, Joe Scaduto. *Front Row:* Dao Minh Lam, Darren Gabbert, Sarah Marie Danner.

Student Sentiments

Most projects I have worked on have not really had much of a purpose other than educational. This project allows me to use my knowledge and skills to design and build a device that will actually help someone. – ***Tony Hoff***

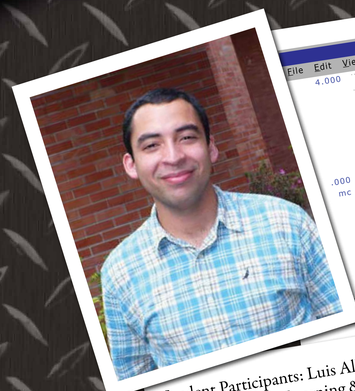
Developing technology is just like any other career choice, it must support a greater good, and nothing is better than benefiting the members of our society. – ***Mahmood Sobahy***

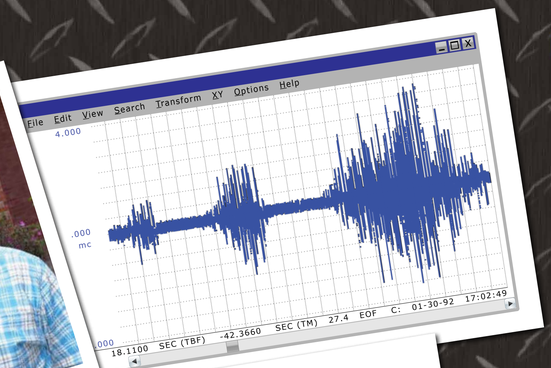
Knowing that the project will directly benefit someone and make their life easier is, to me, the biggest factor in making this project more meaningful. – ***Jeff Piersol***

The goal of a lot of engineering projects is to help people or satisfy a need of some sort, but our project aims to address an even more important need. We want to help improve the quality of life for persons with disabilities and that's the reason this project is meaningful. – ***Sarah Danner***

Adaptive Computing Technology Center and the MU College of Engineering

Meet the 2010 RAT Pack





Student Participants: Luis Alberto Rivera
Course: Machine Learning & Pattern Recognition
Project: **Pattern Recognition Applied to Muscle Activity**

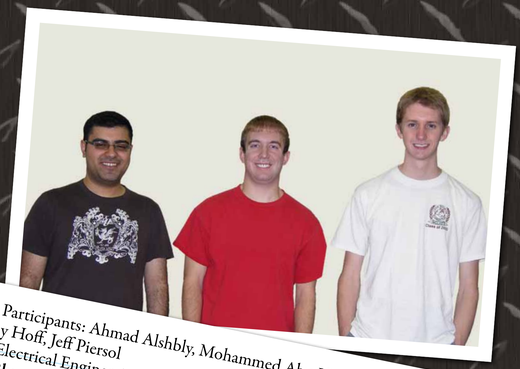
This project consists on investigating classification techniques used on muscle activity. Specifically, those used on Electromyography (EMG) signals. These signals have to go through several steps of processing before being ready to be classified. The project is a requirement for the Machine Learning and Pattern Recognition course. Therefore, the main interest is not the processing of the signals, but the classification techniques.

I'm from Guatemala. In my country, most of the people with disabilities have very limited access to assistive technology (or no access at all). Doing research in this area is definitively helpful for people everywhere. And I think I could bring back my experience to my country, and hopefully help there.
– Luis Alberto Rivera

Student Participants: Joe Scaduto
Course: Real Time Embedded Computing
Project: **NEWhandcom**

This project involves development of a human-interface for a Pocket PC. This software application will allow the user to control the Windows Mobile 5.0 Operating System via an electromyographic switch. The switch, connected to the COM port or via Bluetooth, triggers horizontal and vertical bars to pan the display creating cross hairs for target selection. The user can customize the speed and acceleration at which the bars pan. The goal of this project is to enable complete device access through the cross hairs which simulate a stylus tap at any point on the screen.

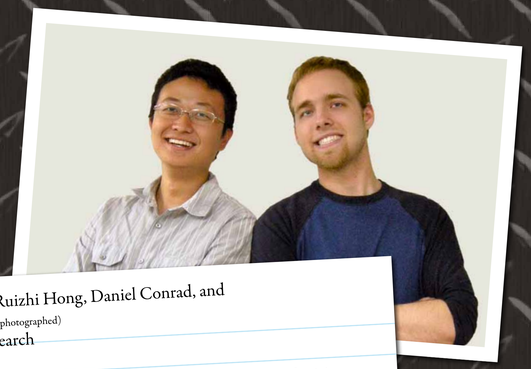
This project challenges me to learn skills I wanted to obtain by giving me the motivation of knowing product of my work will impact someone's life, which is a reward in itself. – Joe Scaduto



Student Participants: Ahmad Alshbly, Mohammed Abu Haleegah (not photographed), Tony Hoff, Jeff Piersol
Course: Electrical Engineering Projects
Project: **Bluetooth Interface for EMG Sensor**

Currently, an electromyographic switch is being used to control a smart phone, where a serial connection is used to connect the switch with the smart phone. This project replaces the wired serial interface with a wireless Bluetooth interface for use with the electromyographic controller. The project consists of two main parts: hardware filters and amplifiers that condition the electromyographic signal for processing and software that reads the conditioned signal and outputs the signal to the Bluetooth controller.

Considering the user disability was really meaningful. Back in my home, Saudi Arabia, a lot of disabled people are looking forward to "Moving freely and with the lowest [amount of] help from others around them."
– Mohammed Abu Haleegah



Student Participants: Ruizhi Hong, Daniel Conrad, and Randy Melloy (not photographed)
Course: Graduate Research
Project: **Permobot**

The Permobot project intends to develop a "smart" wheelchair with vision guided intelligence that incorporates path planning and obstacle detection. Hardware and software component development was needed to allow the wheelchair to be controlled by an onboard embedded device. This embedded device acts similar to a server, in that it processes requests from other programs. Obstacle detection is performed with an algorithm that uses planar detection between images collected by cameras. By finding the planar regions, such as walls and floors, in the scene we can designate parts of the images found outside these planes as obstacles.

I especially was drawn to the wheel chair because my aunt is mentally and physically disabled, so being able to see simple advances in technology could maybe one day improve her life as well. – Randy Melloy

Robotic Assistive Technology Advisory Committee

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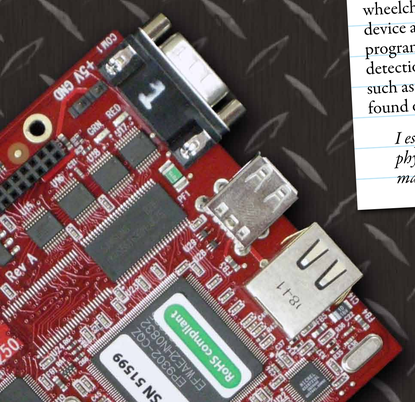
Student Participants: Mahmood Sobahy, Truc Bui, Sarah Danner, Joe Ayala
Course: Capstone II
Project: **Wheelchair Control Device**

The goal of this project is to aid persons with limited to no mobility through a device that allows control of a powered wheelchair by simply making humming noises. A small microphone that is inserted into the ear detects the unique frequencies that each humming noise produces. The programmed micro controller in our hardware analyzes these frequencies, comparing them with four humming noises designated to enact wheelchair movement – forward, backward, right and left. This product offers a unique way for people with severe mobility limitations to have movement thus enabling them to have a higher quality of life.

The project provides us the opportunity to showcase our research and design to many staff and students, further promoting research and development in the areas of rehabilitation and assistive technologies.
– Joe Ayala



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