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EINSTEIN'S 'ALBERT': ZOOM WITH A VIEW

Hampshire College's Lemelson Center sending team
to annual showcase of nation's top student inventors

AMHERST, MASS. — Hampshire College's Lemelson Center is sending two representatives of an innovative Five College team to the tenth annual "March Madness for the Mind," a showcase for the nation's top student inventors, which will be held in Portland, Oregon, on March 25.

Hampshire student Ben Einstein and Mt. Holyoke student Laura Trutoiu will present a small prototype of a full-size automated vehicle that is being designed by a team of professors and students from across the Five Colleges as a potential way to enable long-distance transportation for the visually and physically disabled.

The idea originated with Einstein, a work-study student in the Lemelson Center, who after reading about the 2005 DARPA Grand Challenge began to think about possible applications to assistive technology. The Grand Challenge was a race by self-driven vehicles across 132 miles of difficult terrain in the Southwest desert. The annual race is actually a field test run by the U.S. Department of Defense to accelerate development of robotics and autonomous ground vehicles that could help save lives on the battlefield. Competing vehicles must operate autonomously, with no control commands allowed during the race.

"People all over the country are working on ideas for vehicles that can operate autonomously," said Einstein. "What makes our project special is the assistive technology component. The needs of visually or physically disabled persons would not normally be considered in a pure research setting."

The team developed a small prototype to refine all aspects of the technology before trying to load the system into a full-size car. When developed, the full-size vehicle will officially be called ERNEST (Electronic Rationale and Navigation Embedded Systems Technology), but other students at Hampshire have, for obvious reasons, nicknamed the small prototype that will be shown in Portland "Albert." Albert is around two feet long, weighs about forty pounds, and operates robotically by software on built-in computer controls that regulate speed, steering, and braking. Two cameras mounted horizontally in front provide "stereovision," comparable to the way a person's eyes work together to look at the same point simultaneously.

"The cameras enable it to 'see' what it's doing," Einstein said. "Although we don't generally think much about it, driving requires an incredibly complex set of skills. The ERNEST Project has a very optimistic goal — that an individual could sit in a vehicle and operate it through speech or touch, sending it a message by doing something as simple as saying 'take me to Mom's house.'"

Those with visual impairments would be the most obvious beneficiaries, but the technology could serve countless others, including the elderly, an increasingly large group as baby-boomers age. The technology could also potentially reduce the number of vehicle accidents for the general population, Einstein said. As computer processing power increases, it may be possible that the computers can predict and avoid accidents more rapidly than a human being can respond.

Einstein initially discussed his idea with Colin Twitchell, director of the Lemelson Assistive Technology Development Center at Hampshire, who shared his enthusiasm and agreed to serve on a project committee. Twitchell assisted the student in tapping into the rich resources across the Five College consortium to build the team of professors and students now working with him on the technological challenges of developing a self-driving automobile directed by speech.

Computer science professors at Hampshire (Jaime Davila, specializing in neural networks) and Mount Holyoke (Claude Fennema, one of the nation's leading computer vision researchers) joined Twitchell on the committee overseeing Einstein's academic work related to the project.

Mt. Holyoke students Farahnaz Ahmed and Susannah Larrabee are also working with Einstein and Trutoiu on ERNEST, and a number of other Five College professors and students have been consulted or assisted with smaller aspects of the project. Professors have contributed expertise and guidance in natural language processing, artificial intelligence, neurophysiology and neurobiology, and navigation and mapping systems.

Einstein spent the recent January term perfecting his related design for an adaptive steering wheel, a system that allows all mechanisms of the vehicle to be operated with one finger, which could enable double or triple amputees and hemiplegics to travel without requiring public transportation or a personal assistant. A patent is pending on the "Drive-by-Finger Control System," which will also be shown at the Portland exhibition. Einstein, who qualified for a pilot's license while in high school, based the design on the yoke of an airplane.

March Madness for the Mind is an annual event of the National Collegiate Inventors and Innovators Alliance (NCIIA), an independent organization that was founded at Hampshire College and now includes more than 200 colleges and universities in all regions of the country. The NCIIA is an initiative of the Lemelson Foundation, a private philanthropy established by one of the country's most prolific inventors, Jerome Lemelson (1923-1997) and his family, to support faculty and students who believe that invention and innovation are critical to American higher education.

Einstein, who will graduate from Hampshire in 2007, is from Lawrenceville, New Jersey, and is the son of Susan and Steven Einstein. He graduated from The Lawrenceville School. Trutoiu, a computer science major at Mt. Holyoke, is from Romania and graduated from the International Computer High School of Constanta. Her parents, Liviu and Moira, live in Dragasani, Romania.

Hampshire College, a liberal arts institution with approximately 1,300 students, is part of Massachusetts' distinguished Five College consortium (Amherst, Hampshire, Mt. Holyoke, and Smith Colleges and the University of Massachusetts Amherst). Hampshire students work closely with faculty mentors to design individualized academic programs encompassing several disciplines or studying a single field in depth after satisfying distribution requirements. In order to graduate, all advanced students must complete original work of a high standard, working with assistance from faculty mentors on capstone projects that follow a graduate thesis model.

Online information regarding the ERNEST Project will be posted in the future to:
<http://ernest.hampshire.edu>