

Blind can take wheel with vehicle designed by university engineering design team

By Steven Mackay

BLACKSBURG, Va., July 15, 2009 -- A student team in the Virginia Tech College of Engineering is providing the blind with an opportunity many never thought possible: The opportunity to drive.

A retrofitted four-wheel dirt buggy developed by the Blind Driver Challenge team from Virginia Tech's Robotics and Mechanisms Laboratory uses laser range finders, an instant voice command interface and a host of other innovative, cutting-edge technology to guide blind drivers as they steer, brake, and accelerate. Although in the early testing stage, the National Federation of the Blind -- which spurred the project -- considers the vehicle a major breakthrough for independent living of the visually impaired.

"It was great!" said Wes Majerus, of Baltimore, the first blind person to drive the buggy on a closed course at the Virginia Tech campus earlier this summer. Majerus is an access technology specialist with the National Federation of the Blind's Jernigan Institute in Baltimore, a research and training institute dedicated to developing technologies and services to help

the blind achieve independence.

Majerus called his drive a liberating experience, adding that he drove before on Nebraska farm roads with his father as a guide in the passenger seat.

Sitting inside the vehicle, a blind driver can turn the steering wheel, stop

and accelerate by following data from a computing unit that uses sensory information from the laser range finder serving as the 'eyes' of the driver,

in addition to a combination of voice commands and a vibrating vest as guides. A member of the Virginia Tech student team sat next to Majerus in the passenger seat to monitor the system's software operations.

"It's a great first step," Majerus added. "As far as the differences between

human instructions and those given by the voice in the Blind Driver Challenge car, the car's instructions are very precise. You use the technology to act on the environment -- the driving course -- in a very orderly manner. In some cases, the human passenger will be vague, "turn left" -- does that mean just a small turn to the left, or are we going for large amounts of turn?"

Also driving the vehicle was Mark Riccobono, also of Baltimore, the executive director of the Jernigan Institute, who also is blind. He called his test drive historic. "This is sort of our going to the moon project," he

said

In 2004 Jernigan Institute challenged university research teams to develop a

vehicle that would one day allow the blind to drive. Virginia Tech was the only university in the nation to accept the nonprofit's call two years later, said Dennis Hong, director of the Robotics and Mechanisms Laboratory,

part of the Virginia Tech mechanical engineering department. The National Federation of the Blind provided a \$3,000 grant to launch the project.

"I thought it would be a very rewarding project, helping the blind," said Hong, the current faculty adviser on the project. "We are not only excited about the vehicle itself, but more than that, we are excited about the potential of the many spin-off technologies from this project that can be used for helping the blind in so many ways."

The team will bring the Blind Driver Challenge vehicle to the National Federation of the Blind's Youth Slam summer camp event held July 26 through Aug. 1 in College Park, Md. There, the team hopes to have teenagers who would be obtaining their driver's licenses, but cannot because of their blindness, drive the buggy.

Youth participants also are expected to remote control drive miniature cars.

Additionally, the car is expected to ride in a National Federation of the Blind-sponsored parade in Washington D.C.

"I most look forward to learning as much as I can from these bright young students," said Greg Jannaman, who led the Virginia Tech student team in his

senior year and graduated in May with a bachelor's degree in mechanical engineering. "Blind students from across the nation apply to be selected to attend this summer camp. While we are there to provide an educational experience for them, I can only imagine the invaluable feedback and fresh new ideas that they will provide in return."

Jannaman is excited about the vehicle's success. "There wasn't a moment's hesitation with any of our blind drivers, whereas blind-folded sighted drivers weren't as quick to let go of their preconceptions," said Jannaman of Hendersonville, Tenn. "The blind drivers actually performed better than their sighted counterparts. An overwhelming sense of accomplishment overcame

me as I simply rode along while Wes and Mark successfully navigated the driving course without my assistance."

Early models of the Blind Driver Challenge vehicle relied more on technologies for fully autonomous vehicles, previously developed by Virginia

Tech mechanical engineering students as part of the DARPA Urban Challenge. The student team redesigned the vehicle so that the blind motorist has complete control of the driving process, as any sighted driver would.

This change in approach led to new challenges, including how to effectively convey the high bandwidth of information from the laser sensors scanning the

vehicle's surrounding environment to the driver fast enough and accurate enough to allow safe driving. As a result, the team developed non-visual interface technologies, including a vibrating vest for feedback on speed, a click counter steering wheel with audio cues, spoken commands for

directional feedback, and a unique tactile map interface that utilizes compressed air to provide information about the road and obstacles surrounding the vehicle.

Riccobono knows of mock ups and non-working "blind driver car" set-ups from the past, but says this is the first working vehicle to put the blind and visually impaired in control of the steering wheel. "Blind people have brains, the capacity to make decisions," he said. "Blind people want to live independent lives, why would they not want to drive?"

Even once the technology is perfected, laws now barring the blind from driving and public perception must be changed, Riccobono said. "This is the piece that we know will be the most difficult," said Riccobono, adding that the car must be near-perfected before the National Federation of the Blind can truly push the car to law-makers and the general public. He said this effort will take millions of dollars in development.

The 2009-10 student team already is planning major changes to the technology, including replacing the dirt buggy vehicle with a fully electric car commonly used by traffic officers in downtown city centers. The all-electric vehicle would reduce the vibration which can cause problems to the laser sensor, and it will provide clean electric power for the computing units and that is better for the environment.

Hong is a National Science Foundation CAREER Award recipient. He received his bachelor's degree in mechanical engineering from the University of Wisconsin-Madison in 1994, and his master's and doctoral degrees in mechanical engineering from Purdue University in 1999 and 2002, respectively.

IMAGE INFORMATION: Mark Riccobono, executive director of the National Federation of the Blind's Jernigan Institute, drives the Virginia Tech Blind

Driver Challenge vehicle through an obstacle course of traffic cones on a campus parking lot. In the passenger seat is Greg Jannaman, who led the student team within the mechanical engineering department during the past year, and is monitoring the software of the vehicle..

Contact Steven Mackay at smackay@vt.edu or (540) 231-4787 .

Stewart Hughes
Family Resource Coordinator II
Family Access Services/PARC
Children's Hospital of Philadelphia
Children's Seashore House Rm# 126A
Little Rock Foundation Family Resource Room
267-426-7285
HUGHESS@email.chop.edu
In-House: Tuesday, Wednesday, Friday