

NJIT team designs driverless vehicle to enter the grand challenge

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A team of students from New Jersey Institute of Technology (NJIT) is designing a driverless vehicle that will compete in a national race in which it must navigate 175-miles of daunting desert terrain.

If the unmanned vehicle is the first to cross the finish line in a 10-hour deadline, the NJIT team will get \$2 million from The Defense Advanced Research Projects Agency (DARPA), the race's sponsor. DARPA is the central research and development unit for the U.S. Department of Defense.

Known as the Grand Challenge, the race is scheduled for Oct. 8, 2005. DARPA does not reveal the location of the course until race day. But the race is expected to take place in the Mojave Desert somewhere between Los Angeles and Las Vegas.

The NJIT team is an alliance of 15 students, faculty advisers and corporate sponsors including IBM, BAE Systems, L-3 Com and General Motors (GM). The companies have given the students funding, components, technology as well technical advice.

GM donated a 2000 Chevy Blazer, which the students are now busily transforming into an unmanned robot, which they have named Optimus. Thanks to sponsors, the students are outfitting Optimus with a stereoscopic machine-vision camera, a GPS-guided system and laser-radar. The students will also retrofit Optimus with computers and software to point sensors along intended routes, sensor-fusion algorithms, and automated swerving technology that will let Optimus

maneuver at high speeds.

"The Grand Challenge race is a great chance for NJIT students to combine their engineering skills to design a vehicle equipped with the most sophisticated technologies," said Atam Dhawan, PhD, chairman of the electrical and computer engineering department at NJIT.

"Our student team," Dhawan added, "has been working relentlessly on Optimus, and with help from the nation's most prominent companies - IBM, BAE Systems, L-3 Com and GM – it has a good chance to win the race and return home \$2 million richer." Optimus must be fully autonomous; the students cannot use remote control. They essentially will press a button and Optimus will be on its own, relying on sensors and computers to negotiate the sundry obstacles - pitfalls and ditches, rocks and boulders - the desert will strew in its path.

The NJIT team, though, will face a host of competitors. A total of 195 teams from 37 states and three foreign countries have entered the race. Thirty-five of the teams are university-based and three are high-school teams. Qualifying races will narrow the teams down to 20 teams, which will compete in the final.

In last year's inaugural race, none of the vehicles finished the course – the lead vehicle traveled only 7.4 miles, far shy of the 175-mile course - so none won the prize. DARPA, which helped create the Internet, started the Grand Challenge to spur the development of autonomous-vehicles that it hopes will replace manned vehicles in dangerous missions.

Shamoon Siddiqui, the NJIT team leader, said he is confident of his team's chances. Siddiqui, a master's student in electrical and computer engineering (ECE), said team members possess a rich brew of academic majors including electrical and computer engineering, mechanical engineering, computer science, math, physics, and information

technology. The team has both undergraduate and graduate students. NJIT has supplied the team with its own on-campus laboratory, and the team has a second off-campus lab in Edison, where they keep and work on Optimus.

Siddiqui, 22, of Monroe, said he first read about the Grand Challenge last summer and was intrigued. When he returned to NJIT in the fall, he formed the team and approached Dhawan for help. Dhawan recruited three electrical and computer engineering professors to advise and help the students: Tim Chang, PhD, associate professor, Yun Shi, PhD, professor, and Jack Richman, PhD, adjunct professor.

"NJIT has been so supportive of our team," said Siddiqui, "and we are learning so much since we entered the race. "We've gotten to meet and visit with our sponsors, and have talked some of the nation's top engineers."

The NJIT team recently gave DARPA detailed information about Optimus, said Siddiqui, including a five-minute video demonstration of the Blazer-cum-robot. All 195 teams must submit videos, which judges will review and use to decide which teams will earn site visits in early May from DARPA judges.

The results of the site visits will decide which 40 teams advance to the Sept. 2005 qualifying race held at the California Speedway in Fontana. At the Speedway, the semi-finalists' vehicles will go through a series of competitive tests, after which DARPA judges will pick 20 finalists to compete in the Grand Challenge.

"We look forward to making the qualifying rounds," said Siddiqui, "and in competing in the final race, the Grand Challenge. I think we can win, but even if we don't, we are having so much fun and learning so much about technologies that, in a way, we have already won."

Source: New Jersey Institute of Technology

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