Robotic Vehicles Contend for the Battlefield

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PRIMM, Nev., Oct. 8 - Fifteen robotic vehicles sprinted through the Nevada desert Saturday afternoon, closing in on a $2 million prize from the Pentagon meant to spur development of technologies for 21st century automated warfare.

The vehicles were the survivors from an original starting field of 23 teams fielded by alliances of computer, automotive and aerospace companies, university researchers and others.

The competition, called the Grand Challenge, was organized by the Defense Advanced Research Projects Agency, or Darpa, and was designed to tap into the talents of a wide range of researchers and innovators who might not otherwise be found by the nation's military technology firms. Darpa gave birth to the Internet's predecessor, the Arpanet, along with the Predator drone and the stealth fighter.

The second Grand Challenge was run on a new 131.6 mile course, laid out over dusty unpaved roads, mountain passes and flat lake beds north of the gambling town of Primm on the California border.

At the halfway mark on the course, the contest grew tense as five leaders stayed close together, averaging slightly more than 20 miles an hour. There were a number of stalls and a dramatic crash directly in front of an audience viewing area when Alice, created by the California Institute of Technology, plowed into a concrete barrier and then...
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Red Team's Sandstorm begins the race. (45 sec., 22 MB, avi)

Darpa Grand Challenge Web Site

At the 102-mile mark, Stanley, a Volkswagen from Stanford, took the lead, passing a Hummer outfitted by Carnegie Mellon.

Near the end of the course the robots were set to run through Beer Bottle Pass, which included a cliff with a 100-foot drop. The course also passed through several tunnels where the vehicles would be cut off from satellite navigation signals.

A number of the competitors were repeat entrants, but the start of this year's race was much different than that of the first Grand Challenge, held in March 2004. During that race, a number of the vehicles failed to leave the starting gate, including Ghostrider, a robotic motorcycle entered by a group of Berkeley students. Within four hours, the rest of the 15 entrants were stalled and broken, strewn along the desert course south of Barstow, Calif.

This year's race began under partly cloudy skies and breezy winds along U.S. 15, the freeway that connects Los Angeles and Las Vegas. At 6:40 a.m., the first three robots entered a starting gate in front of about 2,000 spectators: Highlander and Sandstorm, two Hummers from Carnegie Mellon's Red Team, and Stanley, Stanford's Volkswagen Touareg.

"It's time to see what has transpired over the last year and a half," said Dr. Anthony J. Tether, Darpa's director.

Just minutes after sunrise, as three helicopters hovered overhead, the robots set off at five minute intervals, traveling slowly past a long stretch of bleachers and then turning south and accelerating smartly, leaving distinct clouds of dust in their wake. The robots all made siren or horn sounds for safety reasons, and they were closely followed by a Darpa pickup.

Soon the vehicles were traveling at speeds above 30 miles an hour. The course was set up to provide an early loop, which within a half-hour brought Highlander, the first starter, past the crowd. Shortly after 8 a.m., Spider, the Cornell team's entry, hit a bridge at the 21-mile mark and was out of action. An hour later, four other vehicles were immobilized on the course.

This year's race brought a large Internet audience to a Web site, grandchallenge.org, that tracked the progress of the vehicles. It received 3.4 million hits during the first two hours of the race.

Darpa set up the Grand Challenge in response to a Congressional mandate that the Pentagon develop technology to make one-third of the military's land vehicles autonomous by 2015.

In addition to supporters for the various teams, this year's race attracted robotics hobbyists and several Silicon Valley tech celebrities. Larry Page, a founder of Google, was in the crowd, and Stephen Wozniak, Apple Computer's co-founder, raced around the pit area on a Segway scooter in a bicycle helmet.

While the military uses contemplated by Darpa were hypothetical for most of the entrants this year, several of the vehicles were developed by teams closely involved with military contractors.

The most imposing entrant in this year's race was TerraMax, which was a modified version of Oshkosh Truck's Medium Tactical Vehicle Replacement. The company has manufactured 7,000 of the machines for the Marines and Navy, and as many as 1,500 have been deployed to Iraq.

"We think that this control system has a real place in the military for the trucks we produce," said Gary W. Schmiedel, vice president for advanced products engineering at
Oshkosh Truck. The challenge, he said, is protecting American soldiers now driving the roads in Iraq: "If we can't eliminate the threat, we can certainly reduce it."

Other designers saw this year's event as a milestone in the world of robotics.

"My goal was to qualify," said Sebastian Thrun, the director of the Stanford Artificial Intelligence Laboratory and one of the leaders of Stanford's team, which was the only one to have four flawless runs during last week's qualifying session. "It's been so wonderful to be at this party of 1,000 people who have been working on the same project for the last year."

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