CarOLO's Caroline took seventh place at the 2007 DARPA Urban Challenge.

State-of-the-art robotics

David Crawford asks where next for the European auto-robots.

European guidance technology helped to power all the three US teams that came top in the final of the 2007 DARPA (Defense Advanced Research Projects Agency) Urban Challenge for autonomous vehicles, held in California in November. Winners Tartan Racing Team (Carnegie Mellon University / General Motors) and third-placed Victor Tango (Virginia Tech and its Torc Technologies spin-off) both used laser sensors manufactured by Germany-based Ibeo and its parent company Sick; while second-placed Stanford Racing (Stanford School of Engineering/VW of America) deployed equipment from Austrian company Riegl as well as from Ibeo.

The Challenge (see *ITS Solutions*, September 2007) was a driverless vehicle race run by the US Department of Defense that required complete autonomy from the competing entries. Four European teams (all of German origin, though American-led to comply with DARPA rules) qualified as semifinalists.

None of these, however, succeeded in crossing the line in the final in California. The most successful European entrant, coming in seventh place, was Team CarOLO from the University of Braunschweig Technology, Germany.

Another finalist, University of Karlsruhe, German-based Team AnnieWAY, was disqualified when, close to the start of the race, its vehicle came to a standstill at a turnaround junction, although its engine and autonomous run mode were still functioning. Pushing a reboot button would have enabled it to continue, but this was not allowed under the rules.

There is some uncertainty as to whether there will be another DARPA Challenge. This is partly on the grounds that the US Department of Defense has gained much of the knowledge that it needs on the military capabilities of robotic vehicles from the 2007 event and its two predecessors.

But European interest in the area continues Team AnnieWAY, for example, has already taken part in a follow-up University of Munich meeting of participants in the German Research Foundation (DFG)'s Collaborative Research Centre on Cognitive Automobiles, of which it is a spin-off. The University of Karlsruhe, for one, intends to continue with research in the field.

There is also growing interest in what claims to be Europe's answer to DARPA – the European Land ROBot (ELROB) Trial Programme for unmanned ground vehicles (UGVs). This started in 2006 (after the original DARPA Challenge event) and runs military (M-ELROB) and civilian (C-ELROB) versions in alternate years.

The German Army and Directorate General of Armament is organising the next M-ELROB which will be held between 30 June and 3 July 2008 at its Infantry School in Hammelburg, Bavaria. M-ELROB aims to help the deployment of currently-available technology in real-world military and police scenarios where there is potential for human lives to be saved, and presents itself as a showcase for state-of-the-art fully-autonomous or remote-control robotics.

European Robotics, the scientific and organisational 'brain' behind ELROB, wants to encourage fully autonomous vehicles. But, says organiser Frank E Schneider: 'We know that, at present, this is not possible; so we are interested in vehicles that can offer support or protection even if they are teleoperated.'

The event will be open to civilian as well as military entrants from anywhere in Europe (not just EU Member States). There will be a late-January 2008 kick-off for registered entrants.

ELROB lacks the lure of DARPA's huge cash prizes – from US$2 million down to US$500,000 – which may be one reason why the 2008 event does not seem to be appealing to DARPA's 2007 European entrants. The organisers will not publish specific winners, though there will be an internal ranking system and details of each robot's performance will be made available. Another possible constraint on 2008 entries is the military nature of the event. This is being cited as a reason by Ibeo's own DARPA entrant Team-LUX, while some universities – which appear strongly in the lists of robotic automotive teams – prefer not to be involved in military R&D.

The situation may well, of course, be different when it comes to C-ELROB 2009, which will not encourage military entries (the two ELROBs seem, for these reasons, unlikely ever to coalesce into a single annual event). Again, the fact that ELROB allows teleoperation offers some protection against the risk of technical hitches such as the one that grounded AnnieWAY at DARPA.

One academic – Professor Joe Wünsche, a member of Team AnnieWAY, who also took part in the 2007 C-ELROB – is of the opinion that the ELROB challenges are harder than DARPA's. One way or another, it seems unlikely that Europe's failure to do better in DARPA 2007 means the end of the story.

www.darpa.mil
www.european-robotics.eu
www.m-elrob.eu
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http://annieway.mrt.uni-karlsruhe.de
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