Home, James - public transport gets personal

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(PhysOrg.com) -- A European research project has developed technologies that pave the way for highly efficient unmanned public transport systems in our cities.

In our congested cities it is hard to imagine that private cars and taxis could ever be replaced by a public transport system that provides a personal, door-to-door service. But this is exactly the long-term vision of Michel Parent who directs the R&D programme into automated transportation at the French National Institute for Research in Computer Science and Control (INRIA).

“At the moment most public transport needs drivers to control the vehicles,” he says, “and that makes it suitable only for mass transportation. But the more you can automate vehicles and make them work on the existing infrastructure - in other words roads - then personal, rapid transit becomes feasible.

“Automation offers a massive boost in the efficiency of public transportation and is an ideal solution for our polluted and congested city centres. They can complement mass transportation systems by extending the reach of public transport, taking people from the bus, tram and train stations deeper into the heart of cities or to distant suburbs.”

Taking turns

Parent is the coordinator of CyberCars2, a European research project that is developing a wide range of technologies that, together, will make

road-based automated transport systems a reality.

CyberCars2 builds on the work of two earlier successful projects. The first, CyberCars, developed a number of sense, control and guidance technologies to enable vehicles to navigate roads and avoid obstacles. These technologies were successfully demonstrated by the CyberMove project with a final demonstration in Antibes.

The technology to control single automated vehicles is therefore tried and tested - and is found in automated transport systems, including the ULTRa system under construction at Heathrow Airport and the Cybercab in Masdar, Abu Dhabi.

“The main challenge we wanted to address in the CyberCars2 follow-on project was how to operate and coordinate several different vehicles at high throughput,” explains Parent.

“Efficient transport systems require vehicles to cooperate with each other. [They need] to be able to communicate and negotiate with each other and with the infrastructure itself. We wanted to make this happen automatically, too.”

One of the most important aspects of the project, then, was to work out the best way to route data between vehicles.

“We have developed the routing layer so that vehicles can communicate even when they can't ‘see’ each other. We came up with the routing protocols to make it possible to do ‘multi-hop’ data exchanges between two vehicles on the move, by using a go-between, which could be another vehicle or part of the roadside infrastructure,” he explains.

The project also developed the data exchange mechanisms (based on web-services) and the standards for exchanging data about position and

speed.

The project team is in discussions with the International Standards Organisation and the European Car-to-Car Consortium (a collaboration of stakeholders involved in vehicular communication) about the adoption of its communications layer as a standard for automated vehicle communication.

Speed up take up

Having endowed vehicles with an ability to ‘talk’, CyberCars2 addressed the control software that would allow them to cooperate. The aim was for several different cybercars, using a variety of sense and control technologies, to have the ability to move close to each other, yet remain safe from collisions.

Using computer simulations of intersections and merges, the project partners developed rules for how vehicles must negotiate with each other in close proximity. They also added so-called ‘platooning’ capabilities to the control software so that vehicles could follow closely behind each other.

The results of the project made quite a spectacle. A fleet of six cybercars (electric Fiat Pandas and a Citroen Berlingo van) and three unmanned buggies built by INRIA, were let loose on a figure-of-eight circuit in a special test zone in La Rochelle.

The cars successfully navigated the circuit using a wide range of different navigation systems - but that was just the 'old' technology at work. More importantly, the cars would communicate with other vehicles at the four-way crossover and slow down or stop to avoid collisions, then safely navigate the junction.

Various project partners are incorporating the results of the project into their own products. Demonstrations also take place in several other European cities as part of the CityMobil project.

“Automated transportation makes a lot of sense to reduce congestion and fumy cars, as a complement to mass transport,” says Parent. “We've proven that the technology now exists to deploy a fleet and run an efficient and safe system. We expect many cities will start to explore these options.”

More information: www-c.inria.fr/cybercars2

This is the first of a two-part special feature on CyberCars2.

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