

Automated Transport Systems

Driverless vehicles are no longer confined to scenes from science fiction films; they are becoming a reality on our roads today.

More and more transport authorities are taking an interest in automated passenger transport in a bid to tackle today's car-dominated culture. Many of these authorities are members of the Reference Group of CityMobil, a project co-funded by the EU through the Sixth Framework Programme for Research and Technological Development.

CityMobil is the latest in a series of European and national projects that have developed, tested and implemented automated transport technologies and systems. While CityMobil builds on the outcome of these projects, it is quite unique in that it is concerned with deployment; more specifically, identifying and addressing the issues that prevent full scale implementation of automated systems and developing the tools that can assist deployment.

It is widely acknowledged that a combination of land-use policies and a shift from the private car to a multi-modal approach is required to address the mobility problems facing our cities today. The multi-modal approach recognises the need for both high-capacity, scheduled mass transport (bus, train and metro) and individual on-demand short distance transport. Often, the car is used for these short distance trips but it is the least efficient in terms of space, energy and safety, especially in the densest parts of the city. Advanced transport systems based on automated technology can offer a solution in these circumstances. They are clean, quiet and more importantly reproduce the feel of the private car as they are small vehicles offering an on-demand and door-to-door service.

Why the need for automation?

Firstly and most importantly, for a passenger transport system to effectively replace the private car, it needs to be available on demand and provide a door-to-door service. This means that there must be a sufficient number of vehicles on the network to meet user needs. Operating such a fleet of vehicles with drivers would be far too expensive.

Secondly, the automation of driving tasks is already happening. Simple driver assistance systems are becoming standard features of new private vehicles and more sophisticated applications (parking assistance, collision avoidance, etc) are nearing market deployment. In the passenger transport sector, driverless metros and shuttle services at airports (connecting terminals for instance) have been operating for many years already.

What do automated transport vehicles look like?

Broadly speaking, automated transport systems can be broken down into five main concepts, each offering either full automation or a combination of automatic and manual driving. Personal Rapid Transit (PRT) and Cybercars are fully automatic vehicles running on segregated guideways and delivering an on-demand, stop-to-stop



service. PRT runs on dedicated infrastructure only (i.e. not mixing with other road users) and tend to be small cab-like vehicles providing a personal (as opposed to collective) service for individuals or small groups, such as families. Cybercars can, in theory, operate alongside other vehicles on the road and provide a door-to-door service, but this is not currently possible due to rules requiring all vehicles on public roads to be under the control of a driver. Cybercars can range in size, from small vehicles to higher capacity collective transport vehicles carrying 20 people.

Advanced city vehicles (ACV) have advanced driver assistance systems, such as intelligent speed adaptation, parking assistance, collision avoidance etc. to improve safety for occupants and pedestrians. They are

Fast track to the future

Automated transport systems - essentially driverless vehicles - are often seen as the “public face” of ITS, rightly or wrongly. But what are they? What can they do? And who is using them? SUZANNE HOADLEY investigates the progress of CityMobil

electric vehicles, so they are also quiet and do not emit polluting emissions. ACV deployment is more suited to city centre areas (where private car access may be limited) on a car-sharing basis. Dual-mode vehicles are advanced ACVs fitted with cruise control and lane keeping, and are able to support both fully automatic and manual driving.

The first application of automatic driving is expected to be for the relocation of shared cars using platooning techniques. In this way many vehicles can be collected up in a platoon at the end of a day and be re-located for the next day by a single driver in a leading vehicle. Finally, high-tech buses are essentially guided buses with additional automated features for driver assistance. They can run automatically on guideways and

CityMobil Testimonial No 1 Daventry District Council, UK

The wheels are now in motion for Daventry to have its own pilot Personal Rapid Transit (PRT) system following the success of the Daventry Transport Conference and CityMobil showcase.

Thanks to CityMobil's assistance in organising the event, the eyes of the world were focused on Daventry, and it captured the imagination of the whole community, including local schools which were directly involved.

Procurement is now underway for our pilot project and we are looking forward to developing our links with CityMobil and remaining at the cutting edge of this developing technology to show how it can work in towns and cities across the world.

Simon Bowers
Corporate Manager for Development and Property,
Daventry District Council



Castellón's TVRCas automated transport system crosses the Rio Seco via this new bridge

offer precise docking but require a driver when on a road with other vehicles. Depending on its design, an automated system has the potential to accomplish virtually any transport task, from a small-scale to a city-wide system. However, the most promising applications initially are as shuttle services (P&R, business park, airport, event venue) and feeder services to high-speed, high-capacity public transport nodes, within a 2-4 km range at a time and location where transport demand is too low for regular modes, in smaller towns and outside rush hour for instance.

How far has deployment come?

In Europe today, there are a number of applications of Cybercar technology in the Netherlands (Capelle) and France (Bitche and Clermont) and the Advanced City Vehicle is in operation in Antibes (France). Current deployment may look rather limited but it is gaining momentum. New systems are currently under construction at Heathrow (PRT), the Rome exhibition centre (Cybercar shuttle service) and

“Possibly the biggest challenge is actually getting the systems out there and up and running”

in the Spanish town of Castellón (High-tech bus) – all three sites are major demonstrations of CityMobil. The Heathrow PRT system will link the car park to the new Terminal 5 in a first phase (due to open to the public in late 2009) but all being well, is planned to be rolled out to the other car parks and terminals thereafter. When

launched, the Heathrow PRT will be the first PRT system of its kind in the world and therefore the stakes are high for the future deployment of PRT.

While Heathrow and the Rome exhibition centre can hardly be considered as urban environments, much can be learned from the systems that will operate there and more importantly, their successful deployment could act as a trigger.

The expanding CityMobil Reference Group is further testimony to the increasing interest among public authorities in automated transport systems. The Group now has 35 members, representing city authorities, small and large, within Europe. These authorities are all interested in innovative transport systems based on

automated technology but are at different stages of deliberation: some have undergone scoping studies and have already secured political commitment to deploy such a system (but not necessarily the funding) whereas others are at the stage of wanting to investigate whether this approach is the right one to address their particular mobility problem.

CityMobil is supporting all of them by providing a forum for discussion, the expertise of its partners, and for some members, the opportunity to 'test' the concepts on the general public.

Five member cities of the Reference Group have been selected to hold a showcase of either Cybercars or Advanced City Vehicles. Additionally, one city will run a small-scale demonstration and a further two will be the subject of studies.

The Northamptonshire town of Daventry (United Kingdom) held two weeks of awareness-raising activities in the Autumn of 2007, which saw a number of Cybercars put to service on a 400 metre track for members of the public to experience how an automated transportation system works and what it might look like in their town.

Daventry district council intends to implement a Personal Rapid Transit (PRT) system with the aim of reducing the number of car-based trips in/through the town centre and increasing the public transport modal share, which is currently very low. The next showcases will take place in Autumn this year in La Rochelle and Genoa and will both have Advanced City Vehicles equipped with some automated functions (including automatic parking, driving assistance or platooning) for the public to try out.

La Rochelle is considering Advanced City Vehicles for the extension of its car sharing service and is specifically interested in assisted driving and parking functions to tackle the narrow streets of the city centre area. Genoa is also interested in providing Advanced City Vehicles on a car-sharing basis for driving in the very narrow and hilly streets of the historic city centre.

The future for driverless passenger systems

It is clear that large-scale introduction of automated systems will not happen overnight, but the roll out of smaller systems in Europe's cities can be expected in the coming years. There are many barriers, of both a technical and non-technical nature, that are holding up wider implementation, including type approval (certification), liability and the multitude of national legislation. CityMobil has identified these barriers and is developing tools to address them.

But possibly the biggest challenge is actually getting the systems out there and up and running. The lack of practical evidence of functioning systems is a major reason for the limited take up today. The success of early schemes such as the Heathrow PRT could therefore be vital to the future of automated systems. **TH**

For more information on the CityMobil project, visit: <http://www.citymobil-project.eu/> or contact the project coordinator: Jan van Dijke, Senior Project Manager, TNO Science and Industry, email: jan.vandijke@tno.nl

TESTIMONIAL No 2 Valencia, Spain

Castellón will have one of the most modern and environmentally friendly models of automated public transport in Europe

The "Reserved-lane transport system of Castellón" (TVRCas) is an innovative, agile, economic and reliable automated transportation system. This new model of automated urban transport, which comprises two types of vehicles that will travel around the city, is due to start within the next weeks. One of them is a mechanical and hybrid traction vehicle that will connect the neighbourhood of Jaume I University (UJI) to the harbour of Castellón (Pinar del Grao), and the other a smaller and completely electric and autonomous system that will cover the city centre.

The city mayor, Alberto Fabra, (on the left flanked by Mario Flores, Valencian regional minister for Infrastructures and Transport) stated that "Castellón is one of the leading actors in Europe having a transport model that aims at linking not only the city but also the metropolitan area as a whole. With



these purposes two lines of trail have been designed. The first one goes from west to east, linking the University of Castellón line with the maritime district of Grao and which will run until the nearby town of Benicassim; a second line will connect the south of the neighbouring municipalities of Almassora, Vila-REAL and Burriana."

The TVRCas arises from the CityMobil European initiative which provides solutions to the demands of urban mobility through environmentally friendly systems.

Mayor Fabra has also emphasized that "the city has made a good bet on sustainable growth, which means offering the best services to citizens but always with respect for the environment and effectiveness planning. The automated transport model is based on an optical system and uses only catenaries on the farthest track from the city centre, avoiding new barriers in the most inhabited areas of the city, as well as reducing environmental and noise pollution."

The construction of Line 1, currently under execution, has a budget of more than €90m partly co-financed by the EU Sixth Framework Programme and will be around 9km in length.

Testimonial No 3 Heathrow Airport, UK



Airports are naturally at the sharp end of technological progress. Aircraft themselves are technically enormously complex and their designers are continually developing new systems and new materials. Passengers rightly expect that the whole experience of flying should be a thoroughly modern and attractive experience, and our airports make every effort to turn the time passengers spend on the ground into an enjoyable experience in its own right. We have always been the first to adopt new technologies where they can aid the passenger and improve the experience. Travelators, transit systems and other dedicated railways, electronic booking and automated baggage handling, and a host of other advanced technologies most passengers never see.

That is why at Heathrow British Airports Authority (BAA) is introducing Personal Rapid Transport - to give our customers a better service between their arrival point in the airport and check-in. Passengers will no longer have to wait for shuttle buses but will travel in their own private vehicles quickly and without delays en route. Importantly to BAA, the PRT vehicles will emit no pollutants into the airport environment, they will use less energy and overall emit far less greenhouse gases than other forms of transport, and they will be much quieter, important to the local community. Heathrow is the leader in this field. Once the system is proven with customers, we will expand it to serve not just car parks, but hotels, car hire and other airport activities, and bring the system directly into our buildings for greater customer convenience.

Its ultra-modern and stylish appearance will act as an advertisement for the extensive renewal of many parts of the airport which will follow the opening of our new Terminal 5. BAA is delighted to be part of CityMobil in order to share its experience of implementing this advanced transport system.

Duncan Garrod
Commercial Director, BAA