

Off-road run-ins for driverless fleets

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Carlos Holguin from the University of Rome, project coordinator with the CITYMOBIL2 project, talks about how the project is demonstrating automated road passenger transport through large and small-scale off-normal traffic experiments in European cities.

We are very close to making [self-driving vehicles](#) a reality, but is the world ready to welcome such vehicles on its roads? This question is at the centre of the CITYMOBIL2 project, which is demonstrating automated [transport systems](#) in various locations across Europe to bring them closer to commercialisation.

It may be one of the most exciting technologies the world has contemplated in years, but making automated driving an everyday reality would also result in major changes for society. For starters, it is still uncertain how the general public would react to such a dramatic change in their daily lives—where they would have to trust computers with their own safety.

Automated driving also needs to fit in the broader European plans towards a more sustainable society. It would certainly have an impact on the European economy which is still difficult to grasp and, last but not least, it is a major brainteaser for decision-makers who will be tasked with overcoming the long list of legal barriers preventing its deployment.

Answering these questions will take more than guesswork, which is why the EU-funded project CITYMOBIL2 (Cities demonstrating cybernetic mobility) has been set up. The project picks up where the CITYMOBIL

project left off in December 2011, by demonstrating automated road passenger transport in large and small-scale off-normal traffic experiments in cities such as Lausanne, La Rochelle, Milan, Oristano and Vantaa.

The CITYMOBIL2 fleet comprises shuttles capable of detecting and adapting to obstacles as well as a 'Fleet supervision and management system' (FISM) that assigns missions to each individual vehicle. With evidence gathered from these tests, the team—led by Carlos Holguin from the University of Rome—is working on a socio-economic study to better understand the future role of automated transport, solutions to harmonise national legislations and create a certification framework in Europe, as well as campaigns to raise awareness among citizens.

Can you tell us more about your cybercars? How do they work exactly?

An important clarification, to begin with, is that the building blocks for road vehicle automation technology already exist at commercial level. How they are combined and what is done with the technology in terms of transportation is another point, which is the purpose of CITYMOBIL2.

We generally don't speak about cybercars as individual vehicles, but rather about 'Automated road transport systems' (ARTS). We have two fleets of ARTS, made up of six vehicles each. Each vehicle is equipped with localisation (D-GPS and laser-based mapping) and perception systems (ultrasounds, laser scanners), which allow them to know where they are and what is in their surroundings, including static and mobile objects. They are equipped with on-board computers that process the data, make the vehicle control decisions, and transfer these decisions to the steering and engine/brakes. The vehicles then communicate with a centralised fleet and infrastructure supervision and management system,

which makes decisions at fleet level, attributing missions to each of the vehicles depending on demand for transportation.

What were your criteria for selecting pilot sites?

A number of criteria—ranging from the suitability of the transport task for the ARTS fleet to the expected demand, the visibility of the demonstrator, and the willingness of the local stakeholders to cooperate—have been measured from a qualitative and quantitative point of view, and we proceeded with a ranking. In the end, three large-scale demonstrators, four smaller-scale ones and four showcases were selected, in six European countries.

What have you learned from the pilot tests so far?

ARTS have been enthusiastically accepted everywhere. In Oristano, the only concluded demonstrator so far, 90 % of the users stated their interest in seeing these systems used permanently to complement mass transits.

In technical terms, we learned more about how to improve navigation—which requires merging at least two positioning systems—and avoid obstacles by mapping fixed obstacles and dynamically adapting the safety area around vehicles.

The most promising learning experience is to see how the other road users interact with automated vehicles. The qualitative impression is that most people easily adapt to the high level of safety of the system and change their behaviour accordingly. A specific task of the project will be to monitor such behaviour in more detail through enhanced video processing, with a view to defining a way to communicate 'non verbally' with other road users.

In the future, do you see ARTS replacing driver-based solutions or would they work together?

There will certainly be mixed technologies and solutions in the future. In the short to middle term, ARTS-based transportation systems will operate in specific areas and slowly expand to reach most urban areas, always operating as a complement to the mass transit systems and providing a taxi-like service, while manually-driven vehicles will slowly have greater capabilities and expand from the motorways (which are also dedicated infrastructures) towards more open areas. The future will certainly be different, but we think it will be the economics of the future transportation systems that will define the final scenario. Saving EUR 5 000 per year by not owning a car can be a huge gain in buying power and a good motivation for most people.

Cost, legislation, and the shortcomings of current road rules are major obstacles to commercialisation of automated transport systems. How do you think these can be overcome?

Overcoming this barrier is one of CITYMOBIL2's main goals! We have been working with several Transportation Ministries, not only in the countries in which we will hold or have held demonstrations, but also with other European countries. Part of that work consists in the definition of a certification procedure proposal that can guarantee, to the public and also to road authorities, a safety level equivalent to that of railway systems, that is, more than 100 times safer than today's roads! And this is not just by preventing injuries to the vehicle's passengers, but also preventing accidents with cyclists and pedestrians. This procedure includes the certification of the Automated Road Transport System together with the infrastructure and would be applied in specific areas of the road infrastructure. 'Normal' cars could use this infrastructure, but they would be obliged to respect rules specific to it.

Costs are an issue given the number of these vehicles/technologies being produced today. As more systems are implemented, the costs will go down. Today, the costs make it necessary to implement large vehicles, but as the costs go down, it will become possible to make smaller vehicles.

What will CITYMOBIL2's contribution be in this regard?

CITYMOBIL2 will test this certification procedure during its demonstrations and eventually come up with a certification procedure that, we think, can be a good compromise for the road authorities and also other actors such as the car industry, to help everyone move ahead.

In terms of market, the cities that participate in CITYMOBIL2 are innovators in terms of the technology adoption curve. They are leading the way to the adoption of this technology and creating a new market.

What would the main benefits of ARTS be in terms of road safety?

Road safety is embedded in ARTS' design, as we consider the vehicles, and also the infrastructure, the communication systems and, especially, other road users present in the area, right from the design phase. The risks that arise are mitigated even before a single vehicle operates in the infrastructure. This is how we aim to reach safety levels that simply don't exist in today's road transportation system.

What are the next steps in the project and after its end?

We have already started the demonstration phase, so the project will continue working on this. The next demonstrations will be held in Vantaa (Finland), Trikala (Greece), Sophia Antipolis (France) and San Sebastian (Spain). We will also carry out showcases (one week demonstrations) in Milan and participate in the ITS World Congress in Bordeaux and in the TRA in Warsaw. Several tasks will be running in parallel. The data that is being collected will serve to assess the systems' performance in each city, and to make a cross-comparison at the end of the project. Some cities have started planning permanent systems after the end of the project, but this will not be feasible until there is a legal framework, so we count on them to keep pushing the national governments and the European Commission to make one.

More information: For further information, please visit CITYMOBIL2: www.citymobil2.eu/en/

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