Look Mum, no hands!

What a strange sight it will be: a vehicle without a driver. A bus that travels on public roads and across the campus with only passengers - how is that possible? Is it safe? And who can use this bus, or rather, who dares?

tekst: Roelof Kleis

The minibuses (there will be two of them) pulling off this feat answer to the name WEpod. WE stands for Wageningen and Ede, the two final destinations of one of the buses. The other bus will travel a circuit on the campus. The instigator, Gelderland Province, is boasting that this is a world first. Electric and self-guided road vehicles are the future, experts believe. There is currently a flood of experiments with automated guided cars. Driving with no hands is hot. But all these vehicles have a steering wheel. In fact, they are all about engineering designed to support the driver, who can take over the controls at any moment. The WEpod is different. Ⓡ

SUPERVISION

The WEpod travels on public roads without a driver. What's more, the vehicle has no steering wheel and no pedals. Actually, according to the rules of the RDW, the Netherlands' driver and vehicle licensing agency, this means it is not a vehicle at all. More of a cabin or gondola. Hence the name 'pod', which means a casing or capsule. Modern sensor technology guides the WEpod. But that does not mean its passengers are entirely at the mercy of the technology. 'Someone will be watching the bus the whole time that it is moving,' explains professor Eldert van Henten, chair of the Farm Technology Group. 'This is a familiar concept in robotics: supervised autonomy. Outside intervention will be possible at any time.' This supervision will be carried out from the Municipality of Ede's new control room.

VISIBILITY

But it takes more than just localization and movement sensors. GPS works well when vertical visibility is unimpaired. 'But with trees or buildings along the road, visibility soon diminishes,' says IJsselmuiden. And - also important - GPS does not see other road users and obstacles. 'That's why there are extra sensors on board. Cameras and radar provide a 360-degree image of the surroundings, in colour and with depth. Information that tells us about the position of the vehicle in relation to other objects. We are responsible for this landmark detection. Using cameras and radar, we are increasing the accuracy on tricky stretches of the route. The margin of error in the transverse direction of the road is ten centimetres, and in the longitudinal direction, 50 centimetres.'

PASSENGERS

The WEpod is no regular public transport service. It is a pilot that the province is using to build the role of FoodValley as a innovative knowledge centre. Which means that money is no object. The WEpod pilot is costing 3.4 million euros. A couple of hundred thousand is paying for the two electric buses, bought from the French company EasyMile. The rest is being spent on engineering and organization. The first tests will be held, says director Peter Booman of Facilities and Services, in November 'on a quiet part of the campus'. The first passengers are expected to be carried from Ede to the campus no earlier than May of next year. They will be VIPs and visitors to Wageningen UR. The WEpod will be a hospitality bus. For least for anyone who dares take it. The transport function of the second bus on campus is still under consideration.

SAFETY

The WEpod has a top speed of 25 km/hour, does not travel in the rush hour (because there are too many cyclists on the road) nor in the dark, nor in bad weather. The control room provides constant supervision. There is an intercom system and a stop button. But is all this enough to make passengers feel safe? The human factor is one of the research themes. Passenger behaviour, but especially that of other road users. How will we react to the WEpod? Will we become more careful or, conversely, reckless at the sight of a vehicle without a driver? Road signs alerting road users to the WEpod will be erected. Residents will be informed. There will even be a 'failure test afternoon'. Anyone who is interested can take the opportunity to test whether the vehicle really does stop if you jump in front of it.

SENSOR FUSION

What it all comes down to, says Van Henten, is sensor fusion. The combination and comparison of information. 'Comparing the things you can see with things that you know are there. As people that's something we also do. We are actually very good at it. And that is what robotics is all about: using prior knowledge. The whole project is about localization, guidance and safety, and the clever linking and integration of these systems. In robotics it's all about the software, the intelligence, not the hardware.' Given this, the WEpod project ties in well with the work of his chair group. 'Making a smart process and basing good decisions on that. That's the challenge. Mechanization and engineering used to play a major role in traditional agriculture. Today it is a question of supporting the farmer's own intelligence: it's about observing and intervening. In that process you are applying the same algorithm as in the WEpod.'

THE ROUTE

One of the two WEpods will travel between Ede-Wageningen station and the campus. Not that you will see it on the Mansholtlaan. Wherever possible, the WEpod will take a quiet route along backways. For reasons of safety and to minimize inconvenience to other traffic. This vehicle is no speed demon. As the bus has a maximum speed of 25 km/hour, you can easily keep up with it on your bike. After leaving the station in Ede, the bus will make its first stop at the vocational training campus ROC A12. Continuing along the Bovenbuurtweg, it will take a back road route to Bennekom. On the way, it will cross the motorway. In Bennekom the WEpod will skirt the edge of the village, going via the Achterstraat and the Bennekom Tourist Office to the Mansholtlaan. Here, it will cross the provincial road and take the Kielekampsteeg and Bornsesteeg to the campus.

NAVIGATION

How does it work? It is all about navigation. In the absence of a flesh and blood driver, sensors and computers do the work. 'Automated guided driving requires a positioning function that is as accurate as possible,' explains Joris IJsselmuiden. As a robotics specialist with the Farm Technology Group, he is closely involved in the project. 'The bus has to know where it is on the map.' Of course, this relies on GPS. But not the ordinary GPS found in a car or mobile phone, because that is not accurate enough. 'In cooperation with the Netherlands' Cadastre, Land Registry and Mapping Agency, we are using RTK GPS, which works with base stations,' says IJsselmuiden. 'These are GPS receivers located at sites whose exact location is known. They serve as reference points, so that measuring errors in the GPS location can be continually corrected for. In theory this is accurate to within two to three centimetres.' As well as GPS, there are sensors (compass, gyroscope and accelerometer) on board that feel acceleration and corners being taken. These provide information about the vehicle's movements. For the rest, the main part of the technology involved is the work of TU Delft and the company Robot Care Systems.