

A marriage made in self-driving heaven

Meet Marilyn and Martti — automated cars developed by the VTT Technical Research Centre of Finland. They're the first self-driving cars to be granted road traffic testing permits in the country, thanks to a suite of sophisticated optical sensors. VTT has dubbed the duo "spouses," as they will soon begin not only sharing the road but exchanging information with each other in their driving environments.

The automated cars can hear, see and sense; they're able to follow preprogrammed routes and avoid collisions without input from a driver. The cars currently require the lane markings or sides of the roads to be visible, but that will soon change as the cars will be driving in more

demanding conditions such as gravel and snow.

"Marilyn is dedicated for developing urban automation scenarios, whereas Martti goes to inter-urban roads and harsh arctic weather conditions," said Matti Kutila, VTT project manager. "In inter-urban areas, maps and lane markings are unreliable and driving dynamics are different. In urban areas, the traffic is hectic and includes more bicycles and pedestrians."

To overcome these obstacles, Marilyn and Martti are equipped with special features, including two thermal cameras for pedestrian and animal detection; two laser scanners for object detection 50 to 150 m ahead of the vehicle; a stereo

camera for object detection with depth information up to 50 m; radar for high-resolution scanning; and GPS/Glonass receivers for positioning. The vehicles also have inertia units for determining direction and acceleration. The sensors and actuators are connected by intelligence that creates a situational awareness and controls the actuators so that the car moves as planned at an accuracy of milliseconds and centimeters.

"The major difference between our cars and other automated cars is the software that has been self-developed and is dedicated to optimizing performance of the environment perception system," said Kutila. "The software is also intended to be more general and useful in working machine areas too."

Kutila told Photonics Media that adverse weather conditions will be handled with optimizing sensor configurations according to the actual weather. The vehicles will recognize these conditions and switch between the available instruments. For example, snowy conditions call for radar and/or lidar, as they typically work better than cameras. In fog, radar works better than lidar. VTT is still working on perfecting this intelligence for use with the cars.

Today, Marilyn and Martti are not communicating with each other. However, that feature will soon be added using a 5G cellular network.

"The communications channel of the automated cars is open, but the messages are not yet fully compliant with the standards," said Kutila.

The "couple" will take the next step in their relationship in the fall, when they begin exchanging information in a standard format and begin communication with VTT's public digital infrastructure.

Autum C. Pylant

autum.pylant@photonics.com



Automated car Marilyn.



Stereo camera for object detection.



Automated car Martti with his environment perception system.