Ford's Smooth-Driving Autonomous Research Car

By Lucas Laursen
Posted 25 Feb 2014 | 19:27 GMT

Ford's first autonomous research vehicles, with protruding sensors and instruments, “kind of look[ed] like a science project” says Chris Attard, a Ford research engineer who works on their replacement. The new one, a Ford Fusion Hybrid test vehicle—announced in December and displayed here at at this week's Mobile World Congress in Barcelona, Spain—looks like someone installed a few gas canisters on the car's roof rack, except that the canisters spin.

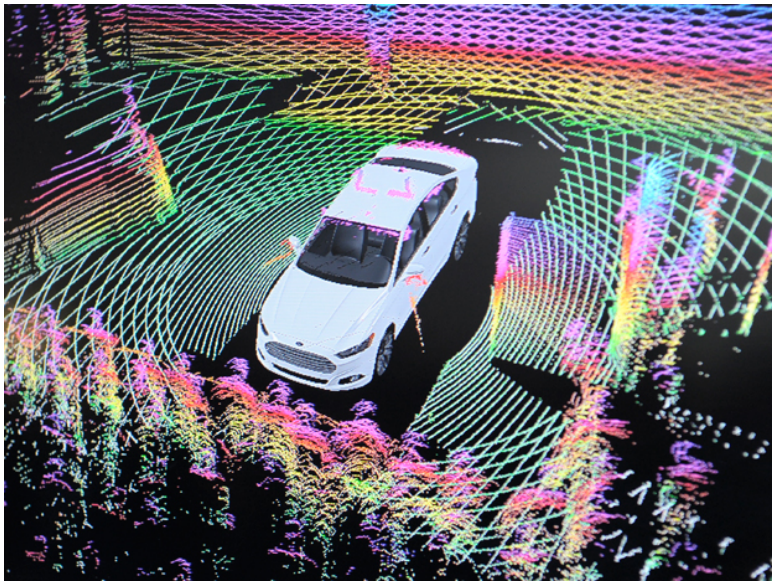

Photo: Ford

Smile: you're on LIDAR!

These cylinders house a new generation of light detection and ranging (LIDAR) (http://spectrum.ieee.org/green-tech/advanced-cars/keeping-cars-from-crashing) sensors. There are two on each side of the car, midway along the roof. One on each side tilts, giving the car the ability to detect objects closer to its sides than the older central roof-mounted LIDAR on Google's self-driving prototypes. It is the only non-production sensor added to the Fusion, though the research vehicle does contain some extra processing and communications hardware in the trunk. The engineers also added a wide-angle optical camera to record the vehicle's driving for post-trip analyses.

LIDAR is one of a handful of sensing technologies carmakers are using in prototypes to identify a car's surroundings and help localize the vehicle. The systems are not yet in production, because they cost about as much as a luxury car—Google's may cost about $70 000 (http://content.usatoday.com/communities/driveon/post/2012/06/google-discloses-costs-of-its-driverless-car-tests/1).

The second-generation LIDARs would make the car conspicuous even without the optical camera, and the crowd milling around the Ford display was in no more danger of confusing the experimental Fusion with its production version than the car was of confusing them with an open road.

A pair of display screens showed in real time the rainbow-colored silhuoettes of visitors, as detected by the experimental vehicle's LIDAR units. Two of those rainbow figures were those of Attard and his colleague Wayne Williams, who discussed the car with curious visitors.

Williams explains that the LIDAR is part of the effort to localize cars with far more precision than is possible with, say, the Global Positioning Satellite (GPS) system (http://spectrum.ieee.org/tag/GPS). Precise knowledge of a car's location will help algorithms to deliver an accurate and smooth driving experience, he says. Smooth driving also requires sophisticated computation, to account for the complex mix of the car's power output and its always-changing rolling and sliding friction. Delivering a smooth ride, at high speed is how autonomous car makers are likely to differentiate themselves in the future: Each will be developing its own driving algorithms and make different choices about, say, the stiffness of the steering. So the ride in each will differ.

“Look for when they go around a corner, and watch the steering wheel,” he says, referring to a video (http://www.carsguide.com.au/news-and-reviews/car-news/look_mum_no_hands_bmw_builds_the_self_drifting_car_81194_20140108) released last month of a BMW self-driving vehicle recovering from a skid. He breaks into a smile and says he was impressed by how fast and how smooth the steering was, given how hard it is to do the necessary computing in real-time. Then he points to a video playing on the wall of the Ford car on a test track just as the camera switches to the steering wheel. It makes a steady, smooth, hands-free turn.

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