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Driver's Seat: Lidar could make autonomous future of driving shine bright in dark, snowy weather

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By Scott Sturgis

So winter finally came to southeastern Pennsylvania — all at once, in a couple days in March, when snow, ice, freezing rain and terrible temperatures landed with a whump.

It's safely past now, but it certainly left an impression: During one of the winter storms, I was test driving a car with today's latest safety features — adaptive cruise control, collision warning, automatic braking, and lane keeping. Not long after the weather hit, about half an inch of snow and slush started to build up on the Schuylkill, so we all slowed down to a safe 35 mph or so.

And my dashboard came on with an alert — all those safety features I listed above? Shut off.

So I got to wondering: As we move into autonomous cars, will these systems be up to a Pennsylvania winter? Or will our vehicles act like a driver my brother-in-law encountered in a rare North Carolina storm — parked in a panic in the center of the road, not knowing what to do.

Better systems: The short answer to that question, from the people who seem to know, is — as the Magic 8 Ball might say — "Ask again later."

While lane-keeping, automatic braking, and adaptive cruise control are features that incorporate some of the technologies of autonomous vehicles, fully autonomous vehicles being tested have far more advanced systems than these crude cameras and radars.

The first real advance is lidar, which stands for light detection and ranging. Appropriately enough, an explanation I discovered about lidar came from the National Oceanic and Atmospheric Administration website. The remote sensing method uses a pulsed laser to measure distances and is something like a laser radar system. NOAA uses it to map the Earth's topography, through oceans and whatnot, so presumably a bit of snow won't stop it.

Of course, a small lidar system runs about $70,000 right now, so a bit of a price cut is needed there.

Ford officials say they've had success in all kinds of weather, including snow, and that's mainly because of lidar.

"Using the snow example, our fully autonomous vehicle was able to drive even when its cameras could not see the lines on the road because it doesn't use the lines on the road to localize itself," Alan Hall, Ford's communications manager for autonomous vehicles, said in an email.

Better mapping: The systems in the typical cars on the road today are keeping alert to what drivers see. Their cameras and radar sensors tell the computer where the lines on the road are, whether an object is in range, and perhaps even cause the car to correct itself to avoid that object.

Autonomous cars, though, use a 3-D map that is fed into the vehicle's computer.

"So, the car is actually using the ground plane and physical landmarks (buildings, trees, signs, curbs, etc.) to localize itself, therefore it doesn't need to see the lines painted on the road," Mr. Hall said.

Google and Uber self-driving cars use the same technology.

A big problem for the technology — certainly in my case — is sensors that are gunked up with snow and ice.

Limitations: On the other hand, one researcher suggests that all is not so rosy in Autonomous Cartown.

John Dolan, principal systems scientist at Carnegie Mellon University's Robotics Institute in Pittsburgh, suggests that the different systems offer different levels of ability to see through storms.

A camera, obviously, is the least effective. But the radar?

"The snow shouldn't really bother the radar," Mr. Dolan said. "That is pretty weather impervious, and the snow is not going to confuse it." But its drawback is the blob of a picture it reports back to the computer.

Lidar, though, can be easily confused, he said. He pointed to dust devils — sandstorms in desert areas — that pretty much set current autonomous vehicles to parking by the side of the road.

"I think the snow is going to cause some problems that you can't simply write off by virtue of having lidar and GPS," Mr. Dolan said.

Weather or not: The real problem, he said, is the technology itself, or at least our point in its development.

Autonomous vehicles are still in testing stages, and crashes like a recent one of an Uber car in Arizona show that kinks need to be worked out. (The kink in that situation was driver error on the part of the other

vehicle's operator. Machines seem to outdrive humans every time behind the wheel.)

Though Mr. Dolan says Ford's 2021 goal for a car without a steering wheel or accelerator pedal is achievable, there's a whole lot yet to be done.

"In my experience, there hasn't been a whole lot of dedicated work to trying to make autonomous cars work in snow, partially because there have been so many problems with good weather driving," Mr. Dolan said.

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