

# Move Over, the Robot's Driving

By the Year 2050, Forecasters Predict Robots Will Rule the Road

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Just before 8 a.m. on a recent Saturday, more than 100 vehicles collided in a massive pileup on a fog-shrouded stretch of Highway 99 in California's Central Valley. At almost the same moment 250 miles southeast in Victorville, Calif., 11 driverless cars left the starting gate of the Pentagon-sponsored Urban Grand Challenge, a race held to demonstrate that robotic cars could safely share the road with human drivers in an urban environment.

The authorities were still clearing wreckage from a closed Highway 99 when the first robot crossed the finish line to claim the \$2 million grand prize.

The contrast between these two events – a robotic triumph and a human tragedy – underscores a simple and welcome fact. Well before the middle of this century, humans will be shoved out of the driver's seat and robotic chauffeurs will take over.

Sure, some vehicles will still allow a human to sit behind the wheel, but a vigilant robot "adviser" will be watching their every move, quietly fixing their mistakes while scanning for hazards down the road. Only hobbyists on closed courses will be allowed the risky pleasure of directly controlling a car as we do today.

This sounds outlandish, but no less outlandish than the notion that humans could be trusted behind a wheel to begin with. A century after the automobile's invention, nearly three-quarters of a million people a year -- almost 45,000 in the United States alone -- die in traffic accidents on



Hector Mata/Reuters

this globe, proof that we are lousy drivers and getting worse all the time.

The problem is that everything that makes us human also conspires to make us horrible drivers. We are emotional, easily distracted and too often just downright stupid. We multi-process poorly and still insist on chatting on our cell phones while roaring down the interstate.

Our eyesight is suspect and our hearing is terrible, even when the radio isn't blasting out the latest Foo Fighters hit. And we lack even the most rudimentary appreciation of Newtonian physics, happily tailgating at 80 miles per hour in rush hour traffic.

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Judgment is evident on the highway only by its absence. The firefighters at the Highway 99 pileup reported a 2-foot visibility in the dense fog and yet they could hear speeding cars smashing into the back of the mile-long tangle even as they were trying to rescue the first victims.

In contrast, robots can be programmed with a cool Spock-like logic and given sensory powers that would make even Superman swoon. The robots in the Victorville race had the entire California vehicle code programmed into their memories and sensed distances to a fraction of an inch. They could see in the dark and through the sort of fog that blinded the drivers on Highway 99.

Most important, and quite unlike humans, robots can be upgraded. The Victorville robots are but the first members of a class of devices that will advance along a steep curve like that traced by computers and the Internet over the last two decades. Saturday's winners will seem as musty as a 1950s Univac in just a few years.

A world of robotic vehicles thus is about much more than safer cars. The Pentagon sponsored the Grand challenge in hopes of removing vulnerable human drivers from one-third of its logistics convoys by 2015, but the civilian spinoffs are even more dramatic.

Eliminate fallible human drivers and robotic cars could safely tailgate their brethren, thus reducing traffic congestion by upping the density of vehicles per mile by an order of magnitude.

Or instead of wasting time with traffic lights, robo-vehicles could zip through gaps in the opposing traffic instead of waiting for lights to change.

Robotic pioneers, like Stanford professor Sebastian Thrun, note that robotic vehicles could turn commutes into productive time. Imagine sitting back and catching up on work or relaxing while en route to a destination.

And robotic chauffeurs would be a godsend for anyone who can't drive, from geriatric grandparents to schoolchildren. Parents will trust robo-cars to take grade-schoolers to soccer practice and will sleep soundly knowing that their intoxicated teenagers are safe in the back seat while the family car drives them home.

As a forecaster, I am certain the foregoing examples will seem quaintly wrong in a few decades for the simple reason that a shift as profound as removing drivers from cars will change vastly more than the way we move around. The rise of robotic vehicles is as profound a change as the arrival of the horseless carriage 100 years ago and the impact on global society today is no less unpredictable.

Consider an urban fixture so ubiquitous that we never notice it unless it is missing -- the parking space. When people drive cars, parking lots must be close to the buildings they serve. But in a world of robot chauffeurs, Thrun notes that parking lots can be anywhere, because your car can drop you off and then drive off and go wait with its brethren a few miles away.

Imagine a shopping district free of curbside parking. How will planners redesign the space formerly taken up by parking lots? Perhaps we will dramatically reduce the need for lot space because robo-cars can pack themselves in more tightly, or more dramatically, in a world of robotic cars, fewer people will own cars at all, relying instead on fleets of shared vehicles.

With all the space we will save, I hope we'll reserve some of it as a refuge for a few old-fashioned 2007-era jalopies we can still drive all by ourselves, a welcome memory of a time when in our folly we thought we could be trusted with several thousand pounds of fuel-injected steel.

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