

Look, Ma, No Hands - News - Carnegie Mellon University

Carnegie Mellon University

July 17, 2015

Look, Ma, No Hands



Dean Pomerleau and Todd Jochem

It's [big news](#) when a car drives itself across the country. Earlier this year, [news accounts](#) heralded a car, outfitted by automotive supplier Delphi and using software from a Carnegie Mellon University spinoff, that did 99 percent of its own driving on a 3,400-mile trip from San Francisco to New York.

The same feat also [made headlines 20 years ago](#), when Carnegie Mellon's NavLab 5 minivan, with support from Delphi's corporate forerunner, Delco, steered itself for 2,800 of the 2,850 miles between Pittsburgh and San Diego.

"At the time, we were saying that fully autonomous driving would be 10–20 years out," recalled Dean Pomerleau, who hit the road with Todd Jochem on July 23, 1995. "We're still probably five or 10 years

from commercially available autonomous vehicles, but our prediction wasn't that far off."

Carnegie Mellon already had a decade of experience with self-driving vehicles when Pomerleau, then a Robotics Institute research scientist and Ph.D. alumnus, and Jochem, then a robotics Ph.D. student, modified a Pontiac Transport for the trip, which was promoted as "No Hands Across America."

"At a time when the notion of computers driving cars was merely a dream shared by a few visionary researchers, No Hands Across America was an amazing technical achievement and the precursor to today's reality of self-driving cars," said [Martial Hebert](#), director of the Robotics Institute and a veteran of CMU's autonomous driving programs.

Pomerleau and Jochem would see a six-legged steer in Kansas, give a lift to a [BusinessWeek reporter](#) and meet Tonight Show host Jay Leno on [their nine-day adventure](#). But the real purpose was two-fold: to demonstrate that autonomous driving on highways was practical and to gather data they would use to improve [RALPH](#), the Rapidly Adapting Lateral Position Handler, a newly devised computer program that would be doing the steering.

Virtually every automobile maker, along with tech firms such as Google and Uber, is working on autonomous vehicles today. "But back then there were basically two groups in the world — us and one German university," Jochem noted. The vision for the future of automated driving was still unclear; while CMU worked on making cars smarter, the federal government also was funding research to create smart highways with embedded magnets and sensors that could guide cars.

"We argued at the time that the path to autonomy would be a gradual one," Pomerleau said. CMU researchers considered it more practical to add autonomous capabilities to cars over time than to rebuild every road. Following the success of the robot car competitions sponsored by the Defense Advanced Research Projects Agency from 2003-07, including [the victory of CMU's Boss](#) in the 2007 [Urban Challenge](#), car companies embraced the CMU approach.

The technology in NavLab 5, however, differed from that of the typical self-driving car of 2015. The detailed computerized road maps that help guide today's vehicles didn't exist then. Civilians then could get only approximate locations from GPS satellites; Pomerleau and Jochem used their GPS to calculate speed, not to navigate.

RALPH, a video-based system that used lane markings, road edges, ruts, lane discolorations and even the position of the car ahead to identify the center of the lane, did the steering. Pomerleau and Jochem had developed RALPH only a few months earlier. It worked well in initial testing, including trips to Erie and back, but they knew that changes in road conditions might throw RALPH for a loop. On a cross-country trip, they could gather data on a wide variety of road types and conditions that they could use to make RALPH better.

"We were fairly confident it could work better than 90 percent of the time," Pomerleau said. Newly

paved roads without lane markings, low sun angles and shadows did force the researchers to take the wheel temporarily, but RALPH proved amazingly robust.

"By the time we got to Vegas, we had seen five or six variations of road types," Jochem said. "At that point, we were very confident about RALPH's capabilities."

During their sojourn in Vegas, they used NavLab 5 both to autonomously drive across the Hoover Dam and non-autonomously visit a drive-thru wedding chapel where Jochem and his wife renewed their vows.

Though the tour officially ended in San Diego on the morning of July 31, the pair — joined by [Takeo Kanade](#), then-director of the Robotics Institute — headed to Los Angeles in hopes of meeting car aficionado Jay Leno and maybe making it on "The Tonight Show." They gave Leno a quick tour of the vehicle in the parking lot. Leno was reportedly impressed, but contended he loved to drive too much to ever use it.

As for the show — well, they watched it from their seats in the audience.

Jochem, who earned his Ph.D. the following year, and Pomerleau spun off a company, AssistWare Technology, to market a version of RALPH for warning drivers of commercial vehicles when they were departing a lane. They later sold the company and their group eventually ended up part of automotive supplier Takata Corp., which markets a lane departure warning device. Pomerleau noted Takata's Gibsonia office remains a vibrant force in Pittsburgh's smart car scene and employs several Robotics Institute graduates.

Both Pomerleau and Jochem work as industry consultants and live in the Pittsburgh area.

Self-driving vehicle research in CMU's School of Computer Science and College of Engineering has grown in sophistication and prominence. Notably, [Raj Rajkumar](#), professor of electrical and computer engineering, directs the [General Motors Collaborative Research Lab](#) at CMU. This center has developed a [self-driving Cadillac SRX](#) that takes ramps, merges onto highways and cruises at 70 mph. Rajkumar's spinoff company, [Ottomatika](#), provided the software that Delphi used in its cross-country trip this year.

In some ways, just as CMU was ahead of most research centers in the development of self-driving vehicles, No Hands Across America may have been a story that was ahead of its time, Jochem said.

"Back then, it was a headline on the science page," he said. "Now it's a news story on the front page."

Related:

[Robotics Institute](#)

[Electrical and Computer Engineering](#)