The Future of Personal Transport

How the driverless car will reshape our cities

BY KATE SHIRLEY

In early 2013, Texas A&M released the findings of its annual mobility study, where it estimated that the average American spends 38 hours – almost a full work week - stuck in traffic each year. According to the U.S. Department of Transportation's National Highway Traffic Safety Administration, 30 percent of driving in business districts is spent searching for parking. This adds up to roughly one million miles of driving wasted per year and contributes to urban gridlock, pollution and lost productivity.

With the advent of the driverless car, these time-wasting frustrations of modern life could soon be a thing of the past.

Research and Development

The reality is, driverless cars may become available sooner than we think. Although only in the prototype phase, Google already maintains a fleet of about 20 self-driving vehicles that have completed over 400,000 miles of accident and incident-free autonomous driving. The technology used includes a combination of sensors, computers, cameras and GPS to guide cars through traffic safely, and major car manufacturers like Audi, Volvo and Toyota are predicting this technology will be available to the public within the decade.

The Federal agencies charged with creating safe, efficient and convenient infrastructure to support vehicular travel have had their eyes on this technology ever since Congress passed the Intermodal Surface Transportation Act in 1991, which set aside $650 million for the research and development of the technology needed to support autonomous vehicles. Today, the Federal Highway Administration and the U.S. Department of Transportation continue to research the practical concerns in preparation for its eventual acceptance into mainstream travel.

This model of a 10-lane intersection is completely free from traffic lights and stop signs, allowing autonomous vehicles to move through quickly by eliminating unnecessary slowing and stops.

Impact on Roadway Capacity

As one would imagine, the transition to an infrastructure system that can accommodate a mix of autonomous and human-driving vehicles will be long and gradual. The FHWA and U.S. DOT anticipate that eventually there will be a need for smarter highways and roads that will play a larger role in communicating with and guiding these vehicles. As more self-driving cars are released onto our roads, dedicated highway lanes may have to be built to accommodate their specialized features, like faster speeds and reduced safety gaps. This may be problematic for overburdened state and local governments, who already lack the funding needed to repair and maintain the nation's existing roadway infrastructure.

While car manufacturers and researchers at Google have focused on this concept from the vehicle perspective, a higher-level automated traffic management service is required to fully realize the benefits of autonomous transportation. Researchers at the Artificial Intelligence (AI) Laboratory at the University of Texas at Austin have been working on traffic control solutions to maximize the efficiency, control and precision of driverless cars. They have developed a computer-controlled framework for traffic management called Autonomous Intersection Management. Instead of our existing mix of traffic lights, stop signs and roundabouts, the AI Lab projects that in the future, intersections will be controlled by servers, or intersection managers, that communicate directly with vehicles as they pass through. The servers will be able to perfectly time and coordinate the cars as they move through the intersection, reducing deceleration and acceleration, thereby improving efficiency while minimizing traffic and air pollution from idling cars.

The driverless car promises to change transportation as we know it, but there are also potential risks. With reduced travel times and the freedom of not having to navigate or drive, longer commutes might give way to urban sprawl and disconnected city centers. There are also a host of regulatory and licensing concerns that could develop with broad adoption of this technology. While most state laws don't specifically address the issue of driverless vehicles, they also don't prohibit them. In June 2011, Nevada became the first state to authorize their use, and Florida and California soon followed suit with laws of their own. Insurance policies and licensing requirements will need to be completely overhauled. No system is foolproof, and if an accident occurs in a driverless car, what will be the consequences?

With Google's headquarters in Northern California, John Updike, the Director of Real Estate for the City and County of San Francisco says the Bay Area is starting to focus on some of these challenges. "Staff is just beginning to explore how traffic law enforcement may change, not to mention licensing. Who is really driving a 'driverless car,' and thus who might be at fault in an accident or some moving violation? What are the restrictions upon, and expectations of, the occupants in the vehicle?" he said.

Future Considerations

With the proliferation and standardization of autonomous personal transportation technology, predicting the impact is hard to imagine. While the upsides are practically limitless, the ensuing challenges of adjusting the physical infrastructure to accommodate the changing transportation landscape is significant.

For example, roadway capacity will increase with reduced congestion and better traffic flow management, thanks to a reduced need for safety gaps and speed limits, not to mention the absence of driving incidents related to human error. Autonomous cars will always travel optimal routes according to real-time traffic information, and will even be able to communicate with each other, maximizing safety and efficiency. Cities will expand, and businesses will have access to a wider pool of workers, as travel to city centers will be faster and more convenient.

And what about the fact that cars currently spend up to 98 percent of their lives parked? Unused driverless cars might be able be able to increase efficiency and utilization by scooting off to perform other tasks while waiting for its human owner, like delivering goods, or taking part in a taxi or rideshare program. Valuable space once dedicated to street parking, expansive parking lots and centralized structures will be freed up, transforming the look and feel of urban spaces, creating more walking space and room for parks, as well as increased centralized residential and commercial development. Cities will become more inviting, and housing could become more affordable as this extra space is put to better use.

There is no question that there are important questions that need to be resolved before this system can achieve widespread use. Getting out of the driver's seat and surrendering our roads to computers will certainly be a complicated process that will involve all kinds of unfamiliar moral considerations and trade-offs, leaving little doubt that our physical environment and the transportation infrastructure we rely on will need to adapt as well. ✪