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Autonomous vehicles

How they work and implications for real estate

by Norm Miller

Autonomous vehicles navigate using motion sensors, multiple radar, sonar, lasers and artificial intelligence (AI) cameras. (AI actually refers to machine learning because there is no such thing as artificial intelligence quite yet; optical character sign readers and image recognition take repetition and practice, but can be learned and programmed for responses.) And not all carmakers are using the same combination of sensors or software. The cameras on a car manufactured by Tesla Inc. can read traffic signs and identify objects, for example, along with predictive analytics and high-speed computer chips allowing reactions in a few milliseconds. Tesla vehicles have had some autonomous driving features — cars that can stay in their lane and between cars in front and rear — since 2014, but the company has not pulled the trigger on full-blown autonomous driving except in test mode. The reason is, Tesla feels autonomously driven cars must be far safer than humans, not merely slightly safer.

If the current level of aggregate investment exceeding $25 billion from Intel Corp., Qualcomm Inc., Tesla, Google parent Alphabet Inc. and others is any indication, there is a high level of confidence that autonomous-driving vehicles are inevitable. In theory, with the speed of adjustment possible when machines drive, cars should be far safer than when humans drive. This is not only because computers are not distracted by cell phones. The speed of adjustments and reactions to events that humans cannot even observe is far superior.

How does the navigation work?

For some time, engineers presumed, to facilitate a large number of cars driving safely, a centralized control was required, and they also might simultaneously point out centralized controls are subject to cybersecurity problems.

It turns out this premise of centralized control as a prerequisite for a safe system is not true. By studying the navigating mechanisms of flocks of birds that swarm together yet never fly into each other, scientists learned birds navigate as a flock by keying off of only half a dozen or so nearby birds. Cars with radar and the current-technology autonomous-driving chips already can monitor three cars ahead and three behind, as well as a few cars on each side. This turns out to be more than sufficient for an entire peloton of cars to move in what will seem like a centrally coordinated flock.

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Radar, lasers or cameras are used to measure relative distance and motion. Motion sensors are an added safety feature, and cameras — with good software — are the ultimate safety mechanism. As mentioned above, cameras can easily read signs and identify objects or anticipate cars coming into the planned pathway. The real dilemma comes from choosing between the lesser of two disasters. Say the car behind is being driven by a mother with small children, and she doesn't appear to be braking in time to avoid your car. Your car can accelerate and ram into the car in front that contains only one elderly occupant. The ethical questions are enormous.

Should the software be made to choose to hit another single-occupant car to avoid one with more passengers? If all cars were autonomous, the good news is accidents would decline by 90 percent or more. If some cars were autonomous but not others, the reduction in accidents is far less.
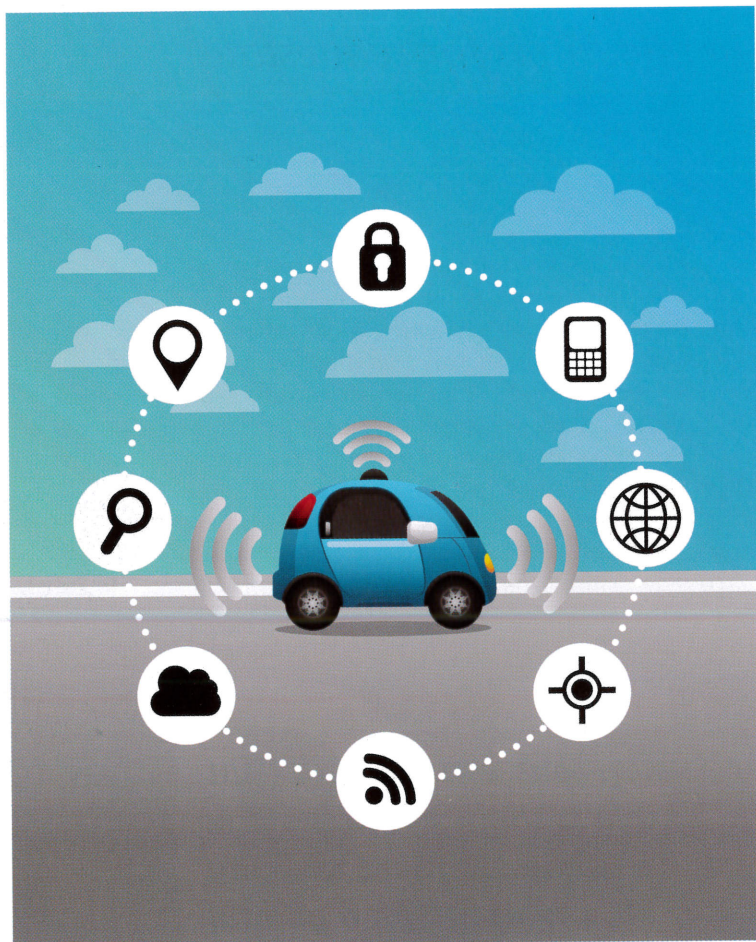
What is clear is regulations will need to be changed to allow autonomous driving. This is most likely going to happen in stages, first with long-distance truckers who will need to stay in their vehicles, and next with cars that drive those unable to drive themselves, such as the elderly or kids. If safety is considered good enough, then a series of rapid green lights will follow for the auto industry.

Disruptions will occur. Trucking companies and truck drivers of autonomous vehicles permitted to drive 24 hours straight — with permission to sleep when on the open highway and with discretion on stops for food and fuel — are an obvious first mover that could benefit greatly. They will achieve faster delivery times and also generate excess capacity in the trucking system. This will lead to lower rates charged per mile,

helping consumers save on delivery costs. Trucking companies and truckers will end up making more money than before autonomous vehicles, but less per mile. Eventually, some truckers will be forced out of business and start to look for new jobs. Now, imagine the disruptions in the limo, taxi and ride-sharing businesses. These will be even greater. But this is the way technology improves the standard of living for all, while forcing a painful transition of those displaced.

Real estate implications

Cars are only used 5 percent of the time on average; however, peak driving might involve 20 percent or even 25 percent of all cars, say on holidays and some rush hours. Traffic jams in cities such as Los Angeles still will occur, but the traffic will move faster and more safely. We will need to redesign both parking structures and drop-off lanes. With fewer people parking and more people using drop-off lanes, future buildings may want to add more layers of drop-off lanes stacked on top of each other for faster off-loading. One lane of cars may split into three stacked ramps for drop-off, for example, and we may need even more lanes near stadiums and convention centers.

Parking still will be needed. Some cars, such as those for hire, simply will be on holding patterns, similar to flights approaching a landing at a crowded airport. Some parking will be shifted to locations that are farther away or in garages with fewer exhaust fans, few lights and tighter spaces. Below-grade parking might be available only for electric or nonpolluting vehicles, so the enormous ventilation systems now operated in underground garages will not be required. The parking decks above ground likely will be built with floor-to-ceiling heights that match the building above and with flat floors, so they can be converted to other uses should parking space no longer be essential.

Sharing cars will allow us to own far fewer cars than today, and most middle- or lower-income households will opt out of car ownership altogether. The choices of cars will be more focused on interior configurations that accommodate the size of the traveling group and the work or pleasure needs. Overall, we will have less than half the number of cars per capita that we have now, but the variety of interiors will be functionally unrecognizable from today's cars. There could be a working-mode interior, a theater interior and a sleeping interior that the user will select when ordering a ride, for example. Others formats we have not yet thought of will certainly appear — maybe a "love bug" instead

of a hotel? But I expect car widths to become fairly standardized within a minimum and maximum range, so radar, cameras and sonar can work more effectively.

Because cars could drive closer together, we will be able to add a lane to a four- or five-lane highway, providing 15 percent to 20 percent more width capacity, while also adding more cars per length of road. Street parking or holding-lane capacities likely will increase, not decrease, to facilitate access demand, except in places such as Paris or New York City, where cars are already parked bumper to bumper.

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The multifamily sector will benefit the most from reduced construction costs. Excessive parking requirements already exist in most urban markets, and eliminating these can save 20 percent or so per unit (with parking). Office also will benefit by shifting some parking to outer fringes and on more shared locations. Those older homes with driveways and no cars will be able to provide parking space for multiple cars in exchange for rental fees. Garages in single-family homes, already frequently used for storage or other purposes in warmer climates, will become a rarity except for luxury homes and for car collectors. Retail properties not displaced by e-commerce will have lots of drop-off lanes and short-term lots that vary in rental costs by access time. Industrial property will be the least affected of the major property types but will need to accommodate automated trucks unloaded by automated forklifts.

Overall, the benefits of autonomous cars include less air pollution, fewer accidents, less time wasted in cars during stop-and-go traffic, and a more productive society. Although many folks we know like driving, someday it will be an option whether to even bother obtaining a driver's license. This is already true in some cities with great public transit, but the United States has a car-centric culture, and it will take longer in most of the country for the realization to occur that our driving skills have and will be replaced by machines. ❖

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