Self-driving cars

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Self-driving cars—popularized in the press by Google's driverless car prototypes and operated via sensors, microprocessors, software, algorithms, and controllers—are where computer science meets the road. Most of the major automotive companies will probably have developed successful driverless technology by 2020. It is unlikely that driverless vehicles will be on the road in significant numbers by then, however, because the legal and legislative issues surrounding their use will be a lot thornier than the technological ones. Even the question of who is liable in an accident of a car parking itself (the manufacturer, the software developer, the owner, and so on) is far from clear at present. *See also:* **Algorithm (/content/algorithm/022150)**; **Automobile (/content/automobile/063700)**; **Microprocessor (/content/microprocessor/423500)**; **Programmable controllers (/content/programmable-controllers/547500)**; **Software (/content/software/757374)**

Sensors for driverless cars include differential GPS, infrared cameras, laser scanners (rangefinders), lidar (light detection and ranging), short- and long-range radar, ultrasonic sensors (which send a high-frequency sound wave and receive an echo), and video cameras, with most cars using three or more types of sensors to probe their environment. Lidar sensors, for example, can be used to generate 3D maps showing everything within about 100 meters of the vehicle. The more complex projects advancing the future of driverless cars are in developing extremely reliable computers and the software and algorithms capable of processing all the information from the sensors. *See also:* **Camera (/content/camera/105100)**; **Infrared radiation (/content/infrared-radiation/344500)**; **Lidar (/content/lidar/380750)**; **Radar (/content/radar/565700)**; **Rangefinder (/content/rangefinder/572800)**; **Satellite navigation systems (/content/satellite-navigation-systems/602800)**; **Ultrasonics (/content/ultrasonics/719500)**

A major advantage of autonomous driving technology is hoped to be improved safety: The World Health Organization reports that every year 1.24 million people are killed in road traffic accidents and as many as 50 million are injured. Indeed, whether or not truly driverless cars ever become viable, automakers are already rolling out autonomous technology for reducing accidents, such as automatic braking, collision-avoidance systems, blind-spot detection, and adaptive cruise control. Mercedes's recent version of adaptive cruise control is nearly autonomous, because it operates in stop-and-go traffic up to about 35 mi/h (55 km/h). A further step toward driverless cars occurred on February 3, 2014, when the U.S. National Highway Traffic Safety Administration proposed rules for vehicle-to-vehicle (connected-vehicle) communications. Vehicle-to-vehicle communication and ubiquitous wireless sensor networks will be important components for preventing collisions and alerting the piloting and navigational systems of driverless cars to roadway conditions. *See also:* **Connected vehicles (/content/connected-vehicles/YB130106)**; **Data communications (/content/data-communications/180900)**; **Highway engineering (/content/highway-engineering/318700)**; **Mobile communications (/content/mobile-communications/428800)**; **Traffic-control systems (/content/traffic-control-systems/704010)**; **Transportation engineering (/content/transportation-engineering/706700)**; **Ubiquitous transportation network sensors (/content/ubiquitous-transportation-network-sensors/YB090151)**; **Wireless fidelity (Wi-Fi) (/content/wireless-fidelity-wi-fi/802040)**

Additional Readings

Continental Automotive: Automated Driving (http://www.conti-online.com/www/automotive_de_en/themes/passenger_cars/ov_automated_driving_en/)

Daimler: Adaptive Cruise Control DISTRONIC PLUS (http://www.daimler.com/dccom/0-5-1210218-1-1210321-1-0-0-1210228-0-0-135-0-0-0-0-0-0-0-0.html)

IEEE Spectrum: Ford's Smooth-Driving Autonomous Research Car (http://spectrum.ieee.org/tech-talk/green-tech/advanced-cars/fords-smoothdriving-autonomous-research-car)

IHS Automotive: Autonomous Cars—Not if, but when [pdf] (http://orfe.princeton.edu/~alaink/SmartDrivingCars/PDFs/IHS%20_EmergingTechnologies_AutonomousCars.pdf)

MIT Technology Review: Driverless Cars Are Further Away Than You Think (http://www.technologyreview.com/featuredstory/520431/driverless-cars-are-further-away-than-you-think/)

World Health Organization: Road traffic injuries (http://www.who.int/mediacentre/factsheets/fs358/en/)