Autonomous Vehicles

Vehicles that assist driving or drive themselves

Near Term Goal

- Improved safety
  - 35,000 crash related deaths per year
  - 94% of crashes caused by human error
  - Smart vehicles can scan 10 times faster than a human
  - Smart vehicles can apply brakes 1.6 sec faster than a human

Long Term Vision

- Reduced congestion, greater economy

    4% of time vehicle in use

    76% of commuter vehicles have only one occupant

    Shared occupancy of vehicles (HOV lanes)

        /multiple use vehicles (Uber/Lyft/Zip)

Most Affected Industries

Automotive
Electronics
Freight/personal transport
Auto Repair
Medical
Insurance
Legal
Construction/Infrastructure
Land development
Police
Oil & Gas
Security
Handicapped

Commercial Activity

Private companies working in auto tech are attracting record levels of deals and funding.

Forty-four companies are developing roadgoing self-driving vehicles.

The US Department of Transportation designated 10 sites in nine states to serve as proving grounds for self-driving cars.

California has issued permits to 36 companies testing about 200 Autonomous Vehicles.

Robotic vehicles in California, Michigan, Massachusetts and Nevada are home to ever larger test fleets.

Google's self-driving car technology, has already begun a large-scale public test in Arizona that may eventually grow to hundreds of driverless vehicles ferrying people around Phoenix.

Definitions

Level 0 - No automation, driver in complete control

Level 1 – Function specific, one or more control functions operating independently (cruise control, dynamic braking), driver can cede some control.

Level 2 – Two or more control functions operate in unison (dynamic cruise control).

Level 3 – Limited self-driving. Driver can cede full control for some operations but must monitor traffic and environmental conditions.

Level 4 – Full self-driving automation. Driver is not expected to be at control. Vehicle may be unoccupied

Legislative Activity

National

Proposed rules will come before the full House for a vote in September with a requirement that they certify the safety of those vehicles with the National Highway Traffic Safety Administration (NHTSA).

NHTSA responsible for developing, setting, and enforcing Federal motor vehicle safety standards. Reserved for states are setting standards for vehicle registration, operator licensing, and traffic laws.

Legislative Activity

State Activity

Nevada was the first state to authorize the operation of autonomous vehicles in 2011. Since then, 18 other states—**Alabama, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Louisiana, Michigan, New York, North Dakota, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia and Vermont**—and **Washington D.C**. have passed legislation related to autonomous vehicles. Governors in **Arizona, Massachusetts, Washington** and **Wisconsin** issued executive orders related to autonomous vehicles.

Typical Legislation

- Declare legislative intent to encourage development
- Establish an oversight committee
- Establish a task force to determine effective and appropriate practices for governing AVs
- Permit AV to be operated or tested under certain conditions by certain parties
- Define driver/operator
- Limits third party modifications
- Require operation in accordance with current laws, unless specifically excepted
- Requires driver/operator be capable of taking control
- Prohibits local governments from banning the use of vehicles with autonomous technology
- Define AV

NHTSA Recommendations for State

- Ensure drivers understand how to operate the vehicle
- Ensure on-road testing minimizes risk to others
- Be aware of testing operations, report malfunctions
- Requires driver/operator be capable of taking control
- Do not authorize full self-driving automation for use by the general public

Mcity: A 32-Acre Outdoor Lab

UNIVERSITY OF M

Mcity is the world's first full-scale simulated urban environment designed expressly for testing the performance and safety of connected, automated, and autonomous vehicles under controlled and realistic road conditions. It is a 32-acre outdoor laboratory for advanced mobility systems that includes:

- Urban and suburban streets, including various lane configurations and sidewalks, pedestrian crossings, bike lanes, ADA ramps, street lights, parallel and diagonal parking, and a bus turnoff/stop.
- Instrumentation throughout, including a control network to collect data about traffic activity using wireless, fiber optics, Ethernet, and a highly accurate real-time kinematic positioning system.

Other features include:

Straight gravel roadway with a railroad crossing.

Traffic circle, a smaller version of a roundabout that is common in Europe and some older cities in the U.S.

Signalized intersections in different configurations, with mast arms, wood and metal poles, and pedestrian crossings.

Trunk line road, a rural roadway with a fully equipped railroad crossing, guard rail, and temporary and permanent pavement markings.

Brick paver road simulated with stamped concrete.

Underpass, simulated by a tunnel that blocks vehicles from wireless and satellite signals.

Roundabout, an increasingly common approach to intersection design intended to improve safety.

Open test a that can be c for a wide ra scenarios, in parking lots intersection geometries.

4-way stop intersectio straight as w tight and sw curved appro roadways.

Tree canopy simulated tr that reprodu attenuation that pass thro

Metal bridg a bridge surf that poses s challenges fo and image p sensors.

Moveable b facades up stories high researchers the effects o materials an geometries performance

Meandering roadway

Limited acc freeway wit ramps, highw signage, gua crash attenu and a concre jersey-style

Calibration to calibrate i measuremen on vehicles.

Open test a that can be c for a wide ra scenarios, in parking lots intersection geometries.

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