

# Autonomous Vehicle

## History of Autonomous Vehicle

- Isaac Asimov
  - Essay in "The New York Times"
  - Robot Brains
- 1956 GM Firebird II concept car
- 1958 Chrysler Imperial-Cruise Control
- 1977 Tsukuba Mechanical Engineering Lab First Autonomous, Intelligent, Vehicle.
- 1980 University Bundeswehr Munich-Self Driving
- 2000's DARPA Challenge

# What is an autonomous vehicle?

- A vehicle that has the capability to use human or computer control or any combination of both to operate a motor vehicle.
- Proposed North Carolina Statute 20-399 (3)
  - A motor vehicle equipped with an automated driving system that has the capability to perform all aspects of the dynamic driving task without a human driver within a limited or unlimited operational design domain and will not at any time request that a driver assume any portion of the dynamic driving task when the automated driving system is operating within its operational design domain.

<http://www.ncleg.net/Sessions/2017/Bills/House/PDF/H469v0.pdf>

- Google's driverless vehicles have logged over 1.7 Million Miles in 6 years with fewer than a dozen accidents. None were attributed to system failure.
- 2014 Motor Vehicle Accidents killed 32,675 Americans.
- 2015 Motor Vehicle Accident killed 35,092 Americans.
- 7.2% Increase in nearly 50 years.

<https://www.brookings.edu/blog/techtank/2015/07/07/autonomous-vehicles-will-have-tremendous-impacts-on-government-revenue/>

<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/8123>

- Autonomous Vehicles could reduce average vehicle ownership rates by 43% and result in 75% increase in the annual miles per vehicle.
- Electric Vehicles don't pay gas tax
- Lack of Vehicle Ownership
- Need for Drivers License?
- Service Stations?

# Future Continued

- Biking and Walking Safety will increase
- Productivity
- Car Industry
  - Insurance
  - Financing Industry
  - Legacy cost from auto industry

- Fuel Tax
- Auto Repair
  - 25% reduction in crashes \$7.5 billion in revenue
- Insurance
  - No Car, No Insurance
- Licensing
  - Transportation Companies
  - No need for Drivers License
- Privacy

<http://www.sciencedirect.com/science/article/pii/S0965856415000804>



- Property Tax
  - Registration Renewal
  - Vehicle Ownership
- Reduction in Law Enforcement
- New traffic issues?
- Each Autonomous Vehicles are estimated to provide \$2000-\$4750 per year in societal benefit
- Morgan Stanley estimates an potential value for the economy of \$1.3 trillion dollars annually.

<http://www.sciencedirect.com/science/article/pii/S0965856415000804>

# Shifting Tax Revenue

- DUI's fees
  - Ignition Interlock
  - Fee's
- Towing fees
- Traffic Tickets
  - 2008 National Motorist Association-\$7.5 to \$15 billion
  - 2013 Campo Colorado generates 93% of towns budget
  - 2014The Arizona Republic-Phoenix's 1.1% or \$10.8 million

<https://www.brookings.edu/blog/techtank/2015/07/07/autonomous-vehicles-will-have-tremendous-impacts-on-government-revenue/>

# Shifting Tax Revenue

- Property Taxes
  - Vehicles
- Highway Use Taxes
  - Assets when purchasing new vehicles
- Federal Gas 18.4 cents per gallon
  - Alaska 12.25 cents per gallon (Lowest)
  - Pennsylvania 58.20 cents per gallon (highest)

<https://www.brookings.edu/blog/techtank/2015/07/07/autonomous-vehicles-will-have-tremendous-impacts-on-government-revenue/>

# Levels of Automation

- SAE Level 0-Human control-No Automation
- SAE Level 1-Function-Specific Automation
- SAE Level 2-Combined Function Automation
- SAE Level 3-Partial Control without Driver Engagement
- SAE Level 4-Limited Self-Driving Automation
- SAE Level 5-Full Self Driving Automation

<https://one.nhtsa.gov/nhtsa/av/av-policy.html>

# Impact on Families

- 2015 Consumer Expenditure Report
  - 32.9 % spent on housing
  - 12.5% spent on food
  - 11.3 % percent on insurance
- Transportation
  - 17 % of average household income goes to transportation
  - 7.5% on vehicle purchases
  - 3.7 % percent on fuel
  - 4.9 % vehicle related expenses
  - 12.5% spent on food

<https://www.iso.org/standard/43464.html>

- **Methods Hacking Autonomous Vehicles**
  - Physical access to car
  - Wireless
  - Crack of QNX Software
  - Cellular
  - USB
  - OTA (Over the air patches)
  - Bluetooth Devices

<http://fortune.com/2016/01/26/security-experts-hack-cars/>

- CANard
  - 60 dollars
  - Python Based Software
  - Unified Diagnostic Services Standards
- OBD II Port is “Ethernet jack for your car”
  - Performance modifications
  - PCM flashes

<http://www.computerworld.com/article/2903714/60-diy-car-hacking-device-is-an-inexpensive-and-easy-way-to-hack-cars.html>

# Questions



# For More Information Contact: