Self-Driving Cars

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CS485 Group 5

Technology Involved

Sensors

- Reading road markings, proximity to obstacles, etc.

Connectivity

- Traffic data, weather conditions, maps/navigation

Software/control algorithms

- Making decisions based on sensor and connectivity data

Stakeholders

- Drivers
- AV Manufacturers
- Insurance companies
- Pedestrians
- City infrastructure
- Shipping industry

Major Impacts

- Complete shift in the way our roads function, and the function of the actual human “driver”
- Algorithmic morality
  - We need to design algorithms to act in an ethical way
- Industry impacts
  - Insurance
  - Trucking
  - Car manufacturing
- Rideshare / Driving as a service
  - Job loss
  - Forcing more people out of unskilled labor

Advantages

- Driver safety
- Insurance savings
  - human life value approximately $9.1M
- Time efficiency
  - Parking
  - Increasing speed limits
  - Traffic control
  - Greener, more fuel efficient
- AVs are never distracted, tired, or under the influence of drugs or alcohol
- Pollution

Disadvantages

- Learning curve to properly operate self driving cars
- Cost
- Computers can fail
  - Driver complacency due to trust in the technology
- Most of the pros rely on a society that is mostly/completely self-driving
- Lack of standards for liability
- Cybersecurity risk

Issues/Challenges

Any new AI technology always brings up the issue of proper decision-making and who is responsible for the computer's actions.

- Should the computer or the driver be insured?
- If the computer fails, should the car be at fault for an accident or should the driver be at fault for not taking over?

With all these grey areas, it will be challenging for self-driving cars to be fully regulated and safe for the market.

Public Opinion

Jean-Francois Bonnefon at the Toulouse School of Economics in France

- ***Experimental Ethics:*** *Are We Ready for Utilitarian Cars?*
- Overall, participants strongly agreed that it would be more moral for AVs to sacrifice their own passengers, when this sacrifice would save a greater number of lives overall.
- Consensus: *"People are in favor of cars that sacrifice the occupant to save other lives—as long they don't have to drive one themselves."*

Should regulators enforce the behavior that yields the best global outcome?

- Compare to gun control debate...

Ethical Concerns

Trolley Problem

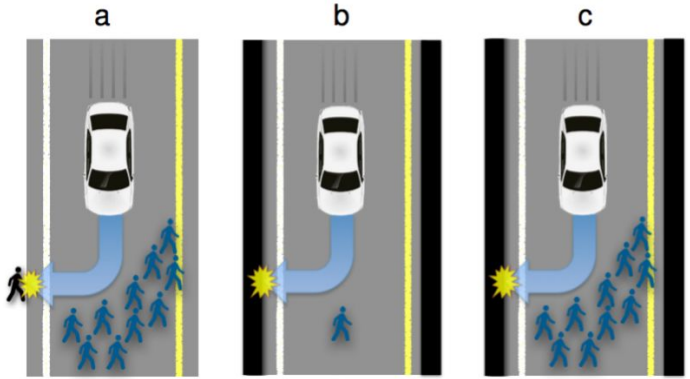
- Wrong focus

Time to Market

- Choice between allowing deaths due to driver error to proliferate or allowing ill-tested AVs to hit the streets

Pleasure

- People like driving
- Can regulators take away their “weapons?”



Code of Ethics

1.03. Approve software only if they have a well-founded belief that it is ***safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy or harm the environment***. The ultimate effect of the work should be to the public good.

1.04. ***Disclose*** to appropriate persons or authorities ***any actual or potential danger to the user, the public***, or the environment, that they reasonably believe to be associated with software or related documents.

1.06. Be fair and ***avoid deception in all statements***, particularly public ones, concerning software or related documents, methods and tools.

2.01. ***Provide service in their areas of competence***, being honest and forthright about any limitations of their experience and education.

3.10. ***Ensure adequate testing, debugging, and review of software*** and related documents on which they work.

6.07. ***Be accurate in stating the characteristics of software*** on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading, or doubtful.

6.10. ***Avoid associations with businesses and organizations which are in conflict with this code***.

From the Software Engineering Code of Ethics

Solutions

Regulation

- Safety standards, inspection
- High-traffic or dangerous roads

Education

- Avoid complacency
- No “blind trust”
- Get people to trust the technology

Software Engineering

- Manual overrides
- Involve experimental ethics

Widespread Adoption

- Insurance incentives
- Promotion from automotive companies
- Mandatory?

Sources

https://www.technologyreview.com/s/539731/how-to-help-self-driving-cars-make-ethical-decisions/

https://www.fi.edu/science-of-selfdriving-cars

https://www.technologyreview.com/s/542626/why-self-driving-cars-must-be-programmed-to-kill/

https://www.weforum.org/agenda/2018/01/why-we-have-the-ethics-of-self-driving-cars-all-wrong/

https://arxiv.org/pdf/1510.03346.pdf