42611 - Theory of science in engineering

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Assignment 9
Controversies and Social Construction of Technology

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Assignment 9a: Controversial technology

The technology that controversies will be explored is that of self-driving vehicles. Self-driving or sometimes also called autonomous vehicles are vehicles that can operate without human intervention.

With most autonomous technologies, the concern of safety arises. Is potential malfunction considered during operation, and if so, will a mitigation procedure be possible and successful in avoiding unintended effects? Another controversial concern is that the technology could eliminate jobs without producing an equal amount of different jobs, hence increasing unemployment. Controversial ethical concerns are also at play, as to define the correct actions in dangerous situations. With a change to digital control, malicious intent like hacking threats also becomes a likely concern.

Information on the subject is very easy to find and gauge, as it is widely discussed, likely due to it being such a potentially impactful technology. The following search strings have been used on DuckDuckGo and YouTube. (N.B. + indicates conjunctive search. ex. "Autonomous cars Ethics")

- Self-driving cars
- Autonomous cars
- Autonomous trucks
- + Controversy
- + Debate
- + Ethics
- + Accidents
- + Pros and Cons
- + Concerns
- + Dilemma

A public debate discussing the controversy on the ethical judgment concerns is ongoing, and as the issue is quite complex it has widely different "correct" answers depending on who is asked. The controversy is best described by the following scenario:

An autonomous car is driving along a 1 lane narrow highspeed cliffside road, Another car is driving in the opposite lane and suddenly a middle-aged adult pedestrian is jumping out onto the road such that a collision cannot be avoided by braking. There are 3 realistic options available for the autonomous car:

- Sway into the oncoming car. This would likely kill or at the very least severely harm occupants of both vehicles.
- Collide with the pedestrian. This would likely kill the pedestrian.
- Sway away from the road, resulting in falling down the cliff. This would likely kill the occupants of the autonomous car.

One could argue that it is the fault of the pedestrian, for putting themselves in a commonly known dangerous situation. But what if we replace the middle-aged adult with a child who might not

know better? Then it could be argued that swaying over the cliff would be preferred, as a means of self-sacrifice for the younger generation. If the autonomous car occupants are full of children, then it could be argued that one option saves more lives and is therefore preferred et cetera. This game of adding complexities can be continued for a very long time, which demonstrates how these judgments are so complicated to calculate and define, as there are so many edge cases to consider. Even if we could manage to consider all possible situations and edge cases, the "correct" answers we find are determined by things like culture, and societal and personal values. Ethics are not universal and vary with different cultures and societies in the world, there are so many "correct" judgments that have to be accommodated. As an example of differing judgments, a scenario survey using the [Moral Machine, https://www.moralmachine.net/] reveals that more prosperous countries are less likely to spare jaywalkers than those in poorer regions [Forbes article link].

Assignment 9b: Social Construction of Technology

Social groups

- **Pedestrians**
  People who participate in transit in the public areas by walking on sidewalks, crosses, etc.

- **Professional drivers**
  People who make a living by driving vehicles, like taxis or trucks.

- **Regular car drivers (against)**
  People who participate in transit in the public, intending to transport themselves by car, for example from and to work.

- **Autonomous car occupants (for)**
  People who participate in transit in the public, intend to transport themselves by an autonomous car, for example from and to work.

Meanings and Problems

- **Pedestrians**
  A pedestrian could be insecure about less opportunity for negotiation with an "operator" of an autonomous vehicle. A pedestrian might also be afraid to travel due to maybe unfavorable ethical rules programmed into the AI controlling the vehicle. A pedestrian could think calmly of autonomous vehicles, as they are very predictable.

- **Professional drivers**
  A professional driver would very likely see the technology as a huge threat to their job security.

- **Regular drivers (against)**
  A regular driver could be thinking that being driven is boring, and wants to drive themselves. A regular driver might also be afraid to drive/be driven due to maybe unfavorable ethical rules programmed into the AI controlling the vehicle. A regular driver could be insecure about less opportunity for negotiation with an "operator" of an autonomous vehicle. A regular driver could be nervous about not being in control. A regular driver might be insecure about the capabilities of the autonomous system.

- **Autonomous car occupants (for)**
  An autonomous car occupant might think of autonomous cars as relaxing and convenient, as constant mental attention is not required. An autonomous car occupant might think of autonomous cars as efficient and productive, as other things can be done during transit. An autonomous car occupant could think calmly of autonomous vehicles, as they are very predictable.

Controversial

The controversies that the technology spark is concerning: Safety issues about malfunctioning systems, like for example interference with sensors or a software bug. Ethical concerns about what actions the autonomous vehicle should take in less than ideal situations, like when confronted with a situation that requires a choice to be made involving injury and death. Automation of many kinds incites job threats to those people that do the tasks manually, and without clear indications that an equal amount of other new jobs become available, it should be considered whether increased unemployment is a good idea. With the replacement of analog control with digital control, hacking could become a threat and therefore it should be considered whether it is a good idea to digitalize control of vehicles.

The focus will be on the ethical concerns and it is primarily pedestrians and regular drivers that are involved with the controversy. The pedestrians are involved, as they could be afraid to travel because of fearing being chosen to die instead of occupants of an autonomous vehicle, maybe based on age or some other attribute. In the same manner, a regular driver could also inhibit this fear.

Closure suggestion

If dedicated transit systems are built to be used only by autonomous vehicles, for example, special highways underground. In addition, limiting all autonomous driving to these systems by law, then it would close or stabilize the controversy. Without the numerous complicated ethical dilemmas that arise from merging autonomous vehicles, pedestrians and non-autonomous vehicles in a shared transit system, the fears would be lessened.