Ethical Challenges of Autonomous Vehicles

A Sociotechnical Synthesis (Level 1)
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By
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction:

My STS research and my technical project are not directly related, but both address issues pertaining to transportation as a whole. My technical project involved researching a space-based solution to improve monitoring of roadway infrastructure. For my STS research, I decided to examine another topic relating to roadway safety. After some thought, I chose to research the ethical problems caused by the coming introduction of autonomous vehicles (AVs). AVs are a very interesting topic to me, and I thought my research paper would be a good opportunity to gain some in-depth knowledge on the subject.

Project Summaries:

My technical project's objective was to develop a concept of a spacecraft that could collect real time weather data on roadway conditions in Virginia. The satellite would be able to detect conditions such as water, ice, or snow on roads, and this data would be available to drivers in real time. The project was completed as a class, and the class was split into teams which each focused on one aspect of spacecraft design. My team worked on selecting an ADACS unit (attitude determination and control system) and selecting a GPS unit. Put simply, an ADACS unit on a satellite is used to correctly orient the satellite with respect to the earth and measure the orientation of the satellite. The GPS unit is used to determine the location of the satellite in its orbit. With the information from the ADACS and GPS units together, it is possible to know the location on earth where the satellite's instruments are pointing. This is necessary because the location of each image from the satellite's sensors needs to have a known location in order to be useful. My team selected commercial ADACS and GPS units to be used for the satellite. Additionally, my team worked on selecting orbits for the satellite. This was done using orbital analysis software called STK (Systems Tool Kit). At the end of the second semester of the

project, the deliverable was a conceptual design of the satellite. The final concept was a constellation (a group of satellites working together) of satellites that would be able to provide hourly weather data for a region near D.C. in order to provide proof of concept. Future years of the class would then possibly continue the project where our class left off.

My STS research paper looked at the ethics of autonomous vehicles. Since AVs are in development and will likely be on roads in the near future, I thought it was important to examine some of the major ethical concerns of AVs that are still unresolved. In my research, I focused on three areas which are central to debates in the literature on the topic. The first is how AVs should react in situations where a crash cannot be avoided and the AV's algorithm must decide on the lesser of two evils. These are called dilemma situations and are often looked at from the point of view of the trolley problem. This is one of the most commonly considered issues in the field of AV ethics, but my research found that there is a lot of disagreement on how this should be approached and whether it is deserves the attention it currently has. The second issue was the responsibility for crashes involving AVs. Although I found some differing arguments in the literature, it seems that for the most part the consensus is that the manufacturer is a fault if an AV causes a crash. The third issue I examined is privacy of AV data. AVs collect a massive amount of data, and nearby AVs can potentially share this data, which has been shown to improve safety. However, data such as location of the user is very personal, and my research found that it is not decided yet whether the user actually owns this data. Although some work has been done on this issue, it seems to be a very serious problem that will need to be addressed.

Conclusion:

I feel that I learned a lot from both my technical project and my STS research. My technical project gave me valuable knowledge on the process of spacecraft design (which I hope

to pursue as a career) as well as experience working in teams toward a common goal. My STS research gave me the opportunity to learn a lot about a topic that otherwise I would not have known much about. Prior to my research, I had only heard of dilemma situations, as that topic has received the most attention in the media. I would not have thought about how responsibility and privacy are also major issues without doing this research. I also found multiple papers arguing that dilemma situations should not be researched as much as they are currently and that issues such as privacy are in fact much more important at the time being. My STS research shed a light on the types of ethical concerns that engineers must consider, and gave me a new understanding of how important and difficult to answer these questions can be.

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