Thesis Project Portfolio

Hybrid Humanoid Robot

(Technical Report)

NHTSA's Role and Stakeholder Influence in Shaping Autonomous Vehicle Policies

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

This thesis project details two projects, one technical and one STS research paper. The technical project that I worked on in my capstone class focuses on autonomous Hybrid Humanoid Robot (HHR). The robot is supposed to be constructed for a Navy ship where it would be able to do work autonomously without running into obstacles. The STS research paper focuses on the policy-making of autonomous vehicles on the road and how different stakeholder has their share of saying on those processes. Both my STS research paper and my technical project focus on autonomous vehicles, with the research paper focusing on the laws of the vehicles and the technical project focusing on the making process of the autonomous robot. The two projects are slightly unrelated because my technical project focuses on an autonomous robot that is placed on a ship but my STS research paper focuses more on the autonomous vehicles on the road and the policies regarding that.

My group was tasked to work on a Hybrid Humanoid Robot (HHR) for the U.S. Navy ship. The reason why it is called ‘hybrid” is because it should be able to switch between walking and rolling on wheels, making it adaptable to different environments on naval ships. We were able to bring in the idea of spring so there is a compliant mechanism on the robot's foot/wheel. The robot would go bipedal when climbing on the ladder. During this process, the wheel should be able to act as a foot by compressing on the spring that is on the wheel. The foot/wheel mechanism can act as a wheel when on an even surface making the movement of the robot easy to operate by rolling. The design process involves meeting specific customer needs like teleoperation, ladder climbing, and navigating obstacles. We were able to make the robot teleoperated by software and a game controller. The robot in the future should be able to navigate

the ship autonomously without a need for a controller. Overall we needed to create a robot that helps in naval operations while continuously improving its functions.

The STS paper explores how NHTSA's (National Highway Traffic Safety Administration) role and stakeholder influence in shaping of autonomous vehicle policies. It talks about despite the authority that NHTSA holds, it has been limited due to funding issues and how they rely on other stakeholders. The research uses the SCOT framework to understand how different groups shape autonomous vehicles development and its policies. The paper gets into how the growing interest of autonomous vehicles had lead to a increase on its testing to learn more about the technology. Testing is done by numerous groups with the lisense to go forward with the testing. The lisesnce is gain through series of progress which proves the ligitimacy of the company. The analysis portion highlights the importance of collaboration among the stakeholders and transparent data sharing. These would help the technology to improve at a faster rate. It also focuses on how we need to have stritcter regulations to balance innovation with safety because we don't want improperly tested vehicles on the road causing danger to others. The paper provides insights into the complex world of AV technology and the need for effective regulation to ensure safety and progress. It also looks at how other stakeholders plays roles during these processes.

Working on the hybrid humanoid robot and also doing research on autonomous vehicles taught me different sides of building a vehicle. Building the robot taught me how to make it work in the real world and the complication of thinking about all the things that might go wrong. On the other hand, researching about the policies for autonomous vehicles showed me the bigger picture. I learned about the rules and regulation that need to be put in place for a vehicles to be out for the public use. It also help me understand the different stakeholder that might play a role

in creating thoses rules. I saw how the technical side of building the robot connected with the social and legal side of making sure it follows the rules. It made me think more deeply about how technology and society interact. Working on both project at once helped me gain a well-rounded understanding that I wouldn't have gotten by just doing one or the other.