Thesis Project Portfolio

Designing the UVA Solar Car Team Pushrod Suspension System

(Technical Report)

Driving Resistance: Investigating How Political Ideology and Vehicle Symbolism Shape Electric Vehicle Adoption in the United States

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The technical and STS components of this project are related through their shared focus on sustainable transportation. The technical project involves designing a high-performance pushrod suspension system for UVA's Solar Car team. The pushrod suspension system will help the team better perform in racing competitions by allowing modular customizability to the car's suspension configuration. Similarly, the STS research, which explores how political identities associated with electric vehicles (EVs) affect EV adoption rate, emphasizes how advancements in EV technologies have made widespread EV adoption feasible for the consumer market. Technological innovation, much like how UVA's Solar Car team is exploring how to maximize EV efficiency and understanding societal readiness to accept these new technologies are important for ushering in the era of EV dominance on the roadway.

The motivation behind our team's project is to bring a high-performance suspension package to a high-performance race vehicle. UVA's Solar Car team competes in races including the American Solar Challenge, a cross-country endurance race, and the Formula Sun Grand Prix, a circuit style race, both of which being tests of endurance, reliability, and speed. As with conventional race cars such as Formula 1 and stock cars, performance is achieved by optimizing every component for weight. One of the most critical vehicle systems to optimize is the suspension system, which is designed to maintain optimal vehicle stability and provide shock absorption for the chassis. Our team is designing and manufacturing a pushrod suspension system, which allows the strut assembly to be reduced in size, ultimately reducing weight, while simultaneously allowing for better handling by moving the weight suspension system towards the center of the car. The project places an emphasis on creating a modular system and maintaining low material and production cost, which allows the system to easily be incorporated

into future models of the solar car. Ultimately, this improved suspension package will bring greater performance to the solar car by reducing overall vehicle weight and improving controllability.

The STS research paper examines how political factors influence EV adoption rates in the United States. In recent years EV technical capabilities such as vehicle range have become more favorable for consumers. Despite these technical improvements, there remains a noticeable regional disparity between in EV adoption rates across the U.S. The persistence of adoption disparity across different regions of the U.S. suggests a need to investigate further what motivates, or impedes EV sales in the U.S. My research, which involves a comparative case study comparing EV adoption rates in California and Texas, indicates that much of the disparity in EV adoption occurs across along political lines, with political identity playing a significant role in shaping consumer attitudes towards EVs. To better understand the mechanisms that allow this, I referenced the Social Life of Things (SLOT) framework to explore how members in a society can assign meaning to material objects, which helps explain how cars have become extensions of their owner's personality in American society. My research suggests that this symbolic relationship between car owner and political identity is a considerable factor in EV adoption rates in the U.S.

Working on a technical EV project while researching EV adoption in the U.S. influenced my design approach as an engineer by bringing greater awareness as to how I can design a component to meet the needs and expectations of the consumer market. Although I am working on a niche project, specifically a race car which is not a common car type for consumers, I place emphasis on the need to design a low-cost modular suspension system, which can be easily modified to fit more conventional consumer market cars. By focusing on designing low-cost,

customizable suspension systems, I hope that one day these systems can be implemented in the consumer market, making EVs more affordable, and helping reduce a barrier to EV adoption in the U.S.