Thesis Project Portfolio

Pothole Detector

(Technical Report)

The Societal Impacts of Micro-Mobility Vehicles

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

Efficient and reliable methods of transportation are essential to perform daily functions and routines. It is especially important for those who commute, with options including personal vehicles, public transportation, and micro-mobility. Changes in the way people commute can be influenced by time, affordability, and other personal factors. As someone who grew up in a dense metropolitan area, I have been interested in the way people travel and the factors that influence it. Even though I have never taken public transportation and have never used a micro-mobility vehicle to get to a destination, I have seen the benefits that alternative forms of transportation can have on the quality of life for individuals.

My technical thesis overviews on the process of detecting and marking potholes on a digital map. Current methods of detecting potholes include expensive lidar equipment and other proprietary methods. My capstone project was designed to be installable in any vehicle on the road today. There are two parts to this project: the physical pothole detector and the mobile application. The pothole detector used an accelerometer to detect spikes in vertical acceleration when a car runs over a pothole. The data is sent to the application and a marker is placed on a digital map, specifically Apple Maps since we developed the application in iOS. After successful trials of our prototype, my capstone group discussed ways to scale our device to include devices outside of the iOS ecosystem.

My STS thesis focuses on the societal impacts of micro-mobility vehicles. I centered my discussion and research on China's micro-mobility market and why e-bikes were not widely adopted in certain regions. I used what I discovered in my case study of China and applied it to Charlottesville's micro-mobility market. My thesis outlines the differences between the two markets, and how policy, public perception, and public desire can play a critical role in a technology's adoption, or lack thereof.

Innovation in the transportation industry is increasing dramatically because of advancements in technology and the rapid growth of populations around the world. If such innovations are not successful, there are existing options such as personal vehicles and public transportation. These methods rely on public roads, which are often deteriorating and in need of repair. My capstone project successfully demonstrated crowdsourcing hazardous road conditions for users so they can avoid damage to their personal vehicles. Overall, my capstone project and research paper indicate that improvements in transportation are constantly being developed, but acceptance will vary greatly from city to city.

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