

Thesis Portfolio

Modification of a Golf Cart to Autonomous Campus Vehicle
(Technical Report)

Social Side Effects of the Development of Autonomous Transportation
(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

William Baldwin Smith V
Spring 2021

Department of Mechanical and Aerospace Engineering

Table of Contents

Sociotechnical Synthesis

Modification of Golf Cart to Autonomous Campus Vehicle

Social Side Effects of the Development of Autonomous Transportation

Thesis Prospectus

Sociotechnical Synthesis

Autonomous vehicle development has been pursued aggressively by both academia and industry in recent years. There have been many hours of research performed with the goal of developing a self driving vehicle, however much of this research focuses solely on the technical aspects. This paper aims to address the technical challenges present in developing autonomous vehicles as well as the technical considerations needed due to possible social consequences.

The technical project and Science, Technology, and Society (STS) research paper are meant to provide a wider scope on the issues surrounding the development of autonomous vehicles. The technical project focuses on the technical development, which demonstrates how certain considerations are given priority in order to achieve a successful development. The STS research paper is meant to cover the aspects missed during the technical project, by explicating examining the possible social effects. The goal of the technical project is to develop an autonomous golf cart to transport people between different buildings in a (Global Positioning System) GPS denied environment. A golf cart is used as the base vehicle for this project since it has lower speeds than a standard vehicle and the all electric components were easier to control than a gasoline powered vehicle. Many vehicles in production use GPS data to help position the vehicle globally however certain locations have limited GPS access so those methods would not work properly. By setting the constraint of being in a GPS denied environment, other methods of localization are pursued. Throughout the technical project a majority of the design considerations are technical in nature, with very few looking at the future consequences of a successful development. This problem is the main inspiration for the STS research portion of the project. The goal of the STS research paper is to determine the social side effects of integrating autonomous vehicles into everyday life. Since a successful development of an autonomous

vehicle would create a new dynamic between people and vehicles, the societal reaction should be investigated. The history of the automobile and its effects on society are analyzed to determine the current dynamics between people and vehicles. The current trends are then used in combination with the current dynamics to extrapolate how society might react to wide acceptance of autonomous vehicles.

It is key for engineers to understand both the technical details and social impacts of their projects to ensure the most successful project is developed. If only half of the relevant details are considered during development then the outcome will not be optimal. By combining the social considerations with the technical requirements, a successful autonomous vehicle should be able to be integrated into society with minimal consequences.