

Thesis Project Portfolio

Gesture Controlled Robotic Vehicle

(Technical Report)

**A Study of the Political Divide Caused by the Implementation of 5G Wireless
Communication in Virginia**

(STS Research Paper)

An Undergraduate Thesis

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

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Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

The technical aspect of the thesis is the creation of a gesture controlled robotic vehicle. The purpose of this project is to demonstrate a new method of vehicle control for applications and situations that prevents common methods for robot operation. For instance, this robot enables access to robots for those with limited arm movement. The project also has relevant search and rescue applications when conventional controllers are too bulky to carry in unsafe conditions.

The project successfully demonstrated the desired capabilities set at the beginning of the project. The features demonstrated by the gesture controlled robotic vehicle include touchless toggling between strafe and rotation modes, visual feedback from the robot using analog video transmission, and haptic feedback to sense obstacles.

The successful implementation of the gesture controlled robotic vehicle signifies the increasing need for definitive wireless communication standards and protocols because a key aspect of having a robot controlled wirelessly is a backbone of well defined standards and regulations. To scale up devices that rely on wireless communication, governing bodies and institutions must agree upon how wireless communication protocols are designed in the future. The technical aspect of this project was possible because of the availability of Bluetooth transmitters. However, as more wireless devices are proposed, devices rely heavily on higher throughput protocols such as 5G to send more information.

The most important issue facing wireless communication policy is the task of implementing 5G. However, with the rise of conspiracy theories intruding into the debate about 5G, how do institutions address 5G? Does the fear of upsetting customers or constituents affect their policy decisions? The resulting problem relies on the mixture between science and policy and is the focus of the societal aspect of the thesis.

The STS paper addresses the questions presented above using a case study method. The paper summarizes the fears about 5G and presents examples of major institutions embracing or hiding away from the 5G issue. The paper utilizes the STS framework of the Social Construction of Technology presented by Bijker et al (Douglas, 2012). Specifically, the paper examines each case study through the lens of the load factor metric. The load factor is a method presented in SCoT for characterizing how useful a technology system is. If the system has a higher output rate than the rate required to maintain the system, the technology system is considered reliable and necessary to society. If however, a system is deemed to not have a high enough output, the technology system is considered obsolete and it is necessary to change the system.

The scope of the paper focuses on the effects on 5G specifically in Virginia. The region for 5G policy is limited because there are numerous instances of the 5G debate across the world each with unique problems that can not be addressed succinctly. Focusing on Virginia fixes the number of potential cases to be a reasonable amount. Additionally, the diverse population distribution of Virginia, with significant regions of rural, urban, and suburban life, makes the region suitable for examining how the 5G debate affects many different lifestyles.

The paper demonstrates how different institutions determine the load factor for 5G and make policy decisions based on their opinion of the load factor. The case studies range in their opinion on 5G, their priorities, and size of the institution. For instance, the paper examines the rapid implementation of 5G by a small community in Virginia and how the new access to 5G plays a significant role in the lives of constituents. On a larger scale, the paper also examines the role of the Department of Defense and their safety concerns on the impact of 5G implementation in northern Virginia.