

Thesis Portfolio

Vertical Farming Control System
(Technical Report)

Analysis of Effects of Sensor-Based Automated Irrigation Systems in Agriculture
(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

People have been inventing new technology since the beginning of humankind as a means to simplify tasks and improve the lives of humans. As time has progressed into the 21st century, automation and computers have seemingly infiltrated every industry in the United States. An important challenge currently facing the technological world is the research and development of sustainable technologies that combat climate change and pollution. The agriculture industry in the U.S. is at the center of this challenge and has a large impact on the environment. Learning how to provide food, clothes, and other agricultural products in a way that is not harmful to the environment is an area of fast-growing research.

In my technical project, my teammates and I designed and developed a vertical farming control system. This project was chosen as all members of the team were interested in the use of automated irrigation as a way to reduce water consumption and ensure maximum plant growth. Reduction of water consumption and increased plant resilience positively affects the environment, and the technologies employed in this project can be applied on a larger scale to the agriculture industry. In this project, we explored the challenges and benefits of automated irrigation and the use of soil moisture sensors on a small scale. The findings of this project can be used to create large-scale systems and advanced modifications. We believe this technology can be used to improve the sustainability of the agriculture industry, and this inspired us to pursue the chosen project.

The topic of the science, technology, and society paper written along with the technical project report was chosen as a direct result of the technical project. The development of automated irrigation techniques has the potential to affect many areas of the U.S. society if adopted. The STS research paper explores these possible affects through the lens of the social

construction of technology framework. This is tightly coupled with the technical project since the STS research paper is an analysis of the direct result of widespread adoption of technology used in the technical project. Together, the STS research paper and technical project present the design and development of an automated irrigation system along with an analysis on how the implementation of the technology could affect society.

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