DESIGN OF A CO-NAVIGATIONAL AQUACULTURE VEHICLE SYSTEM

FOODS AND THEIR REPERCUSSIONS:

A STUDY ON FOOD INSECURITY AND SOLUTIONS

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Mechanical Engineering

By

Peter Stauffer

May 1, 2023

SOCIOTECHNICAL SYNTHESIS

As populations rise and climate changes threaten traditional food production, food insecurity has become an increasingly pressing issue. However, a new and innovative solution called aquaculture farming has the potential to not only feed millions but to also do it in a sustainable and environmentally friendly way. The technical research report will cover the creation and design of a co-navigational aquaculture vehicle system to help clean and maintain fish pens. Undertaking this research is not only important for addressing complex problems and finding multifaceted solutions, but also to help shift the focus to more sustainable food production service industries. The STS research paper will cover the importance of food equality and the factors that income and race play in food insecurity. This topic drew interest as it highlighted the seemly unfair circumstances ordinary people must endure. To foster a positive social change and work towards a better future, addressing these problems is the first step. These tightly coupled topics intertwine with each other on a multitude of levels. Both have potential to create positive environmental effects, both aim to push a positive social change, both have global ramifications, and furthermore, the technical project is a potential solution to the STS research.

The technical research report will introduce and provide a background for what the technical project is about and why. Cleaning aquaculture fish pens is essential for maintaining a healthy fish population, but it can be hazardous and time-consuming for humans. The use of autonomous robots in offshore facilities can improve efficiency, reduce the risk to human workers, and save money on labor costs. The development of autonomous robots for fish pen cleaning is an economically viable solution that benefits both the fish population and the aquaculture industry. The objective is to develop surface and underwater vehicles to support the maintenance of offshore aquaculture facilities. The system will initially be programmed for remote operation, which will permit ease of transition into a fully automated system and ensure that testing of the design can be done more easily before advancing to a more complex programming environment. To narrow down the exact focus of the consumer needs, much time was spent

in target specification and concept generation to find the measurable variables from each need then determine whether it should be prioritized.

The final design was developed and put into production. The Autonomous Surface Vehicle (ASV) has a catamaran style hull, a cooling system, and is propelled by two submerged thrusters. The control system is a combination of a base station computer, on-board computer, and Raspberry Pi. The Autonomous Underwater Vehicle (AUV) is built on the BlueROV2 and will support the addition of a water jet and rotating disk cleaning system, with control via the on-board Raspberry Pi. The performance of the system will be evaluated through several different analyses, including a heat transfer analysis of the cooling system, a stress analysis of the vehicle structure, and a fluid analysis of computer models. All results met the target specifications.

The STS research paper will explore and question the rising trends of segregation of health based on income. More specifically, the lack of healthy foods that seem to disproportionately affect underprivileged communities. Through an analysis of current research and case studies, this STS research paper will argue that health segregation based on income is detrimental to society, and that policy changes must continue to be implemented to address this issue and improve health equity for all individuals, regardless of their economic status. These disparages will be investigated through the Social Construction of Technology (SCOT) framework. In the SCOT system, all related and impacting parties will be investigated to show how the engineer can make the best possible solution.

According to the United States Department of Agriculture, 23.5 million Americans live in food deserts, which are defined as areas with limited access to affordable and nutritious foods. Low-income and minority communities are disproportionately affected by this issue, with 11.5 million households living more than a mile from a supermarket and without access to a vehicle. This means that these individuals are often forced to rely on corner stores and fast-food restaurants for their meals, which are typically higher in calories, saturated fats, and sodium, and lower in essential nutrients like fiber, vitamins, and minerals. Aquaculture fish farming has the potential to fix some of these issues by making

fresh fish available to consumers regardless of economics. Policies such as the Healthy Food Financing Initiative, which was launched by the federal government in 2010 to provide financial support to grocery stores in low-income communities exist to improve such issues but haven't made huge impacts. New and aggressive policies and laws need to be enacted if there is to be a major change.

Through a combination of technical and STS research, it is evident that the implementation of new policies and ideas like aquaculture has the potential to provide a sustainable solution to food insecurity, while also improving environmental outcomes. However, it is essential to consider the social implications and it's crucial for policymakers to address these issues to ensure that the benefits of technology are distributed equitably and sustainably. By taking a more proactive approach, all parties can play a key role in bridging the disparages between economic groups and their access to healthy and nutritious food, ultimately leading to better health outcomes for all individuals.

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