Thesis Project Portfolio

Gesture-Controlled LED Matrix Display

(Technical Report)

A Buddhist Approach to Engineering

(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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Spring, 2024

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Executive Summary

Engineering, as a discipline, has widespread implications that permeate all modes of society, regardless of the project in question. In my technical engineering project, I explored the application of certain interactive LED technologies in the classroom. Specifically, using said technology to introduce Electrical and Computer Engineering concepts to younger students. From here, I want to ask a larger question: how can we be sure that we are engineering for good? In a world full of conflicting interests, it can be hard to separate that which is good for you, and that which is good for all; here, I apply the principles of Buddhism to further explore what is missing from modern engineering ethics approaches, and how we can approach this discipline with more emphasis on intersectionality. While the more ethical portion of my research seemingly has no direct correlation to its technical aspects, I think it is important to, for any project, take a step back and question the overall nature of the field I am operating in. Engineering effects almost every facet of our modern society, and I believe that for a field with an increasing effect on society, its approach should be constantly analyzed, and critiqued.

Electrical and Computer Engineering is a field that is often hard to approach, especially when coming from a less privileged early education. Oftentimes, students in more wealthy areas, with more supported and diverse education programs, are provided with resources to explore this field of engineering, leaving students in less supported areas without the exposure to this revolutionizing field of study. Here, we propose a design, and a proof of concept, that could be used to both educate, and spark interest in, students who are lacking this immediate exposure. Furthermore, a design that is cost-effective, and easy to set up and use. In order to apply our solution to the aforementioned problem, a series of qualifications were devised to ensure that our product correctly meets the standards of approachability, cost-effectiveness, etc.

After the design of our final product was completed, we were able to meet quite a few of our initial goals. In terms of usability, teachability, and modularity, we met our initial goal; however, for cost, we missed the mark. That being said, most of our costs were part of R&D, and after doing some calculations, we estimated that if we were to mass produce and market our project, it would be no more than $200 per unit. So, in the end, we felt that our design achieved all of our aforementioned goals.

For my STS research, I ask: what can be learned from Buddhist practices and principles within the field of engineering and engineering ethics? In a world dominated by unnecessary engineering designs, and often, harmful ones, I investigate why it is that engineers work on these projects. Specifically, I look east to propose a route which engineers can take in order to ensure they produce good designs with their skill sets. In order to make this argument and propose this framework, I utilize a series of research papers, books, and articles; furthermore, I tap into my experience as an undergraduate in the University of Virginia's School of Engineering and Applied Sciences and share what I have observed and learned from my peers.

After collecting my findings, I show how engineers nowadays become too distracted with by monetary aspects of their career that they forget to ask themselves: "engineering for what?" Students have a great desire to do good in the world, but are often scalped by contractors of the Department of Defense, who offers them high salaries and stellar benefits. To combat this, I suggest that Buddhist principles could help give engineers both more of a sense of urgency to do good in the world, and to recognize the potential harm their designs can do. By emphasizing concepts such as interconnectedness, and mindfulness, engineers are set up for success in the world of engineering and engineering ethics — and, more importantly, in society as a whole.