Design of an Air Guitar: S.H.R.E.D

(Technical Report)

Analyzing E-Waste Exports to the Chinese City of Guiyu with a Utilitarian Ethics Approach

(STS Research Paper)

An Undergraduate Thesis Portfolio

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Socio-technical Synthesis: Air Guitar and E-waste

My capstone project is closely related to my STS research project through the idea of electronic waste, and realizing the implications of creating electronic products that contain hazardous materials that will eventually be discarded. While researching and designing the hardware needed to create a functioning air guitar, working on an STS project involving e-waste gave me another perspective as to where my product would end up after it became broken, outdated, and discarded.

My technical work involved creating hardware that would connect to an android device, in order to create a virtual guitar that could play chords and be strummed with different intensities so that a musician could have a realistic air guitar experience. The project's main sensors and hardware are connected to a National Instruments MyRIO device that takes all inputs and uses an algorithm to generate and output the sound of a guitar. An android app was developed to represent the fretboard and take touch inputs. Our functioning air guitar was developed as a novelty, but is also useful due to its portability, compatibility with headphones, and low price point compared to a normal guitar.

My STS project was useful in framing my mindset as a computer and electrical engineer. My research focused on a case study involving the Chinese city of Guiyu, which was at one point the most notorious e-waste dumping site in the world. My paper argued that e-waste exports to

impoverished communities is unethical from a utilitarian perspective, and causes more harm to people and their environment than any economic gain is worth.

Understanding the global flow of e-waste and how it ends up harming impoverished communities is important for engineers, who may not otherwise realize the impact of their creations beyond the problem they are intending to solve. My claim that e-waste dumping can be unethical should help give engineers a new perspective and mindset towards making environmentally conscious design decisions. As an example, in the development of my capstone project rather than creating a fretboard ourselves using buttons or touch sensors, a phone application was developed to represent the strings as most people already have access to cellular devices. In summary, working my capstone and STS paper simultaneously helped me explore the design process from an environmentally conscientious perspective, something I hope to bring with me to the workplace in the future.