Thesis Project Portfolio

Implementation of Universal Robots UR10 Robotic Arm for an Automated Sowing Robot with Customized End Effectors

(Technical Report)

Sluggish Electric Vehicle Adoption and The Related Impact of Inadequate EV Support Systems

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

In the forthcoming thesis portfolio, I tried to provide a research-based comprehensive contribution to the technical and sociological analysis of two independent emerging technologies. Although these topics are not directly related and were researched independently of each other, there is a prevailing theme: emerging technology adoption. In American contemporary society, we have become accustomed to new devices and gadgets made available with the intent of easing our daily routines. The cyclical rate of new phone generations being tied to regular yearly releases, our favorite car models going through a new generation every few years, and even the way we have evolved to consume media at home being so removed from the way that entertainment once dominated television networks is now a thing of the past – all these, are examples of how modern America quickly adapts to new technologies, sometimes going through giant leaps in technology within a couple of decades as we've seen from the first mass market cellphones, to what today can only be described as artificial intelligence (AI) augmented smart devices that serve as personal assistants. Through this lens, we will take a technologically focused look at automated farming robotics intended to reduce the manual labor input needed for large scale farming seedling growing, and its application potentials in reforestation. Secondly, we will take a more philosophical focused approach to electric vehicle (EV) technology and evaluate the societal factors that affect adoption of this historied, yet newly re-emerging technology.

In the STS part of this thesis portfolio, *Sluggish Electric Vehicle Adoption and The Related Impact of Inadequate EV Support Systems*, research conducted provided insight into cultural, technical, and organizational factors that have affected the adoption rate of EVs. Thorough analysis of the interplay between some of these factors was also considered and

explained by use of Arnold Pacey's model of technology practice. Further analysis also revealed connections to Geoffrey Moore's modified technology adoption cycle, which served to provide insights into the chasm that must be crossed before a technology can be fully adopted even when the public perception is of acceptance of the technology by most of the society. Examples of how this technology has been largely accepted by the popular opinion as a solution to societal concerns of great import such as environmental causes and transportation accessibility are provided throughout this document, and as such are meticulously contrasted with the overall slow adoption of the emerging technology.

In the technical research paper, *Implementation of Universal Robots UR10 Robotic Arm for an Automated Sowing Robot with Customized End Effectors*, a robotic arm with proprietary software was used to plant seeds in a preformed seed tray. This technical research paper evaluated the capabilities of similar multijointed programmable robotic arms with student developed end effectors in a manufactured computer aided designed and 3D-printed environment. Through the research conducted, it was found that this technology can be reliably used in the designed environment to repeatedly plant seeds, and care for seed trays until the moment of a seedling growth up to the recommended time of transplantation into the seedling's final location. The implications of these abilities, imply that as farming manual labor trendlines decrease year over year, and as deforestation and natural disasters impact tree density, it may be possible to supplement current human efforts with robotic automation to effectively combat both sociotechnical concerns.

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