USE OF COMPUTER VISION AND MICROPROCESSORS FOR RESISTOR SORTING

WORKING ALONGSIDE TECHNOLOGY: THE FUTURE OF THE WORKFORCE

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 Computer Engineering

By

Robyn Guarriello

April 28, 2020

SOCIOTECHNICAL SYNTHESIS

If technology is successfully integrated into the workforce, increases in productivity and even new jobs will be abundant. To illustrate one such example of an increase in productivity, a resistor sorting system built using computer vision and an MSP430 microprocessor served as the technical research. This system was created such that an engineer does not have to take the time to read the small colored bands on a resistor themselves, instead leaving that job to a computer, allowing the engineer to focus their time and energy on the more demanding parts of circuitry. However, automation is a polarizing topic in the world today as it leads to some jobs becoming obsolete when the workers are replaced by technology that can do their job more accurately and precisely. The STS research paper analyzed how to overcome the fear of automation in order for humans to work effectively alongside technology; capitalizing on humans' innate ability to be creative is the key to a prosperous future in the workforce. Both the technical and STS research look into the world of automation in search of a way to increase the productivity of workers without sacrificing the autonomy of humans.

The technical research project was taken on when Robyn Guarriello, Joseph Laux, and Kiri Nicholson noticed that resistors were often misplaced when engineers did not have the time to sort them by hand. Wanting to create a system that had a practical use, the team concluded that a resistor sorting system would both provide a solution to a real problem and help increase their productivity in the future. The team created a custom CAD model of the system that was 3D printed, designed a custom printed circuit board, programmed an MSP430 microprocessor to control two stepper motors, and built a computer vision Android application to read the colored bands on a resistor. Once all connected, the Android application read the value of a resistor, the

value was sent over Bluetooth to the microprocessor, and the motors were turned based on the current position of the system and the value of the resistor.

At the conclusion of the semester, the system was successfully working but contained a few bugs. The computer vision application was able to read the colored bands on a resistor with some reliability but the changing lighting in a room throughout the day made calibration nearly impossible. Additionally, the Bluetooth connection between the application and the microprocessor was unreliable, so a separate Bluetooth Terminal application was used to send the resistance value over the Bluetooth connection to the microprocessor. Though most of the goals of the project were met, there is certainly room for future work on the system that would greatly improve its practicality.

The STS research paper asked the question “how can humans most effectively work alongside automation”. The history of how automation has impacted the workforce proved that productivity has increased since the adoption of technology but also showed the negative impacts it has had, such as the destruction of jobs and increasing distrust of technology. In order to see humans and technology work in harmony, the strengths of each must be understood and capitalized on. Scholarly articles analyzing the history and impact of automation, research papers on human creativity, and mass media pieces outlining the fear surrounding automation were among the most important sources used to show the specializations of both humans and technology.

There is no doubt that the media has created a culture of fear surrounding automation, leaving the public slow to trust technology as a whole. However, the personal computer created a net gain of 16,500 jobs and AI and robotics is expected to create a net gain of 58 million jobs.

While technology's ability to follow patterns and rules is unparalleled, it is unable to match the creativity and critical thinking skills that humans innately have. If educational systems focus on fostering creative thought alongside technical knowledge, workers will be able to transition into creative and technical fields that are virtually untouchable by technology, allowing society to reap the rewards of automation while diminishing the negatives.

Just as a resistor sorting system allows the human engineer to focus on the creative task of designing and building circuits rather than sorting resistors, automation as a whole can allow the entire workforce to focus its energy on more creative work. Capitalizing on the unique human capacity to be creative will inevitably increase the productivity of the entire workforce and allow humans to work effectively alongside technology. Automation undoubtedly presents the opportunity to better the future of the workforce for generations to come.

TABLE OF CONTENTS