Thesis Project Portfolio

Dataplane Software Engineer Intern Experimental Learnings

(Technical Report)

An Investigation on the Merits of the Keyboard and Mouse

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Introduction

The computer industry is rapidly transforming the world around us before our eyes. Throughout the course of my thesis portfolio, I examine the experiences of myself and others with various aspects of computer-related technology. In my technical project, I detail my time as an intern software engineer and what I learned from the work that I performed. On the other hand, my STS project investigates the technological and historical driving factors behind the prominence and longevity of the keyboard and mouse, as well as their current and future validity.

Technical Project

Internships allow students, such as myself, to gain experience working in a professional environment and learn valuable skills and insight from industry professionals. In the summer of 2023, I was fortunate enough to be offered the opportunity to intern as a dataplane software engineer at the company Ciena, with their team in Burlington, MA. The intern group that I was a part of helped develop a testing suite for their subscriber management software.

One of the most important aspects of software testing is to understand the software that is being tested. Our arrival to the office marked the beginning of an extended learning process in order to familiarize ourselves with the software under test, as well as the tools that we would be using to test it. Experienced members of the team held meetings with demonstrations for the other interns and I in order for us to begin the learning process. After each demonstration, we would practice working with and implementing the techniques that we had learned.

My personal focus for the testing suite was implementing and automating the use of Cisco's TRex traffic generator. This tool allows developers to simulate large amounts of real-world traffic and analyze the resulting data that is received. In order to use this tool, the

TRex system required a server to be deployed in order to assist with the packet generation and routing. By providing the TRex system with the addresses of relevant nodes in the network, I was able to route the traffic generated by the TRex system through the subscriber management software and receive it on the other side.

After finishing work on the TRex system, the next step was to evaluate the performance of the subscriber management software and automate the whole process. I wrote code to collect the relevant metrics that the TRex provided, and I also implemented algorithms to evaluate these metrics. Each test run was evaluated to determine if it met established performance thresholds and was deemed to have passed or failed. At the end of the process, the entire procedure was able to be executed with a single line of code. The project was praised by the senior developers and other team leads, and I continued to work on it part time over my fourth year of school in order to further improve the testing suite.

STS Project

Having witnessed the rapid advancement of computing hardware and software over the course of my lifetime, I was incredulous as to how the designs and prevalence of the keyboard and mouse hardly changed over the same period. I decided to investigate the driving factors behind this seeming lack of advancement in computer input technology for my research paper.

The first step of this process was to research the history behind the creation and development of both of these computer input devices. Unsurprisingly, the origins of the computer keyboard can be traced back to the typewriter, where the QWERTY layout that is still in use today was first implemented. The original design of the computer mouse was an adaptation from an earlier project by the inventor, which helped measure two dimensional charts or objects. These designs were modified alongside the development of the computer as video

display terminals and graphical user interfaces rose to prominence throughout the 1970s and early 1980s.

After examining the literature on the history of these devices, I researched the user experience and existing alternatives. I read studies and conducted my own user experience survey. The literature review showed a number of adverse effects for prolonged use of both the keyboard and mouse, primarily for those that use them for extended periods of time at work. My own surveying also supported discomfort from these designs, with respondents reporting pain more commonly from the keyboard than the mouse. My survey revealed that most respondents had never even tried any traditional alternatives for the mouse and keyboard. Some alternatives that were developed originally for those with disabilities are speech-to-text for the keyboard and eye tracking with gesture commands for the mouse. These have arguably gained the most traction as alternatives in recent years as they continue to be improved and adapted for fields like augmented and virtual reality.

Through my analysis, I found that the main factors behind the staying power of the mouse and keyboard were their widespread use, versatility, and lack of decidedly better alternatives. I then went on to reason that as the mouse and keyboard were previously adapted to fit the advancement of the graphical user interface, technologies such as eye tracking and speech and gesture based commands will continue to be improved and iterated on as computers become even smaller and more intertwined with our everyday lives.