THESIS PROJECT PORTFOLIO

LANGPAD: A Computer Peripheral That Allows for Easy Typing of Special Characters Used in Latin-based Languages.

(Technical Report)

English and Programming: Factors Influencing the Widespread Use of English in the Software Development Field

(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

Christopher Hamilton

Spring, 2022

Department of Electrical & Computer Engineering

TABLE OF CONTENTS

The rapid expansion of computer capabilities coupled with increased availability of digital devices has resulted in an unprecedented lifestyle change for all humanity. While digital technology has universally improved quality of life and accessibility, there are countless instances where the benefits of technology are not distributed fairly among different groups of people. Despite the fact that most people in the world do not speak English as their first language, English is the most dominant language in the technological sphere. One's language determines the amount of information that is available to them and affects his or her user experience with technology. While the impact of language on one's experience with technology can be seen in a number of different areas, I will be focused on two areas in my portfolio. The first area of focus is the ability to type in languages other than English. The second area of focus is the impact of English dominance on the field of software engineering.

My technical work was my capstone project in the Electrical and Computer Engineering Department, which was completed with a group of fellow students. While computer technology has progressed at an extraordinary pace, the primary keyboard layout has remained the same since the early days of typewriters. The standard English keyboard layout is limited in its support of special symbols and characters used by other languages. To address the difficulties of typing special characters used in foreign languages, my capstone group designed a standalone touchpad device capable of typing these characters. By making a standalone device with an intuitive interface, it provides a user-friendly experience for people who need to type characters in foreign languages. Our device connects to a computer using a USB cable and acts as an input device. Once plugged in, tapping the touch screen display allows for typing specific special characters. Our device currently has support for symbols from Spanish, French, and Greek, allowing the

user to quickly toggle between typing in these languages. We were able to successfully construct a prototype of our design, and its functionality was demonstrated at the 2021 ECE Capstone Fair.

For the social technical research portion of the project, I researched the role of the English language in the programming field. I felt that this was an important issue because it serves as an entrance barrier for many people, and it limits the perspectives in software design. I decided to approach this project by analyzing the history of the software field and its effects on the modern field of programming. To analyze the history of the programming field, I focused on developments in programming languages. I used the STS framework of technological momentum to analyze the historical data that I found. Using this, I showed how the English language amassed a large amount of momentum throughout the history of the programming field. I also looked at the modern programming field to see the impacts of the prolonged English domination in the field. I found that the historical English dominance has made the field such that it is very difficult for the software field to pivot away from using English. This dominance is manifested in the overwhelming popularity of English programming languages and the dominance of English in the educational sphere. While these issues are very difficult to change, they should be recognized by those who influence the development of the software field.

Looking back on my work, I would say that it was successful overall. For the technical portion, my group was able to successfully complete our design. Beyond that, we were able to create a functional prototype of the design. It was well-received in our demonstration, and we were very happy with the final product. Given the time and budget constraints of the project, we exceeded our expectations that we had set for ourselves. Going forward, we would hope that others would look to expand on the idea to support new features and languages. The logical next step would be to try to bring this product into the consumer electronic market to make the

functionality available to those that could benefit from it. For the sociotechnical topic, I generally think that my work was successful. Given the constraints for the paper, I thought that I offered satisfactory analysis of English's role over the history of the programming field. I think that this general area of study could definitely benefit from more research. This would allow for more quality information to be gathered and could bring light to the social issues that English dominance in the programming field poses. Building upon my work, I think that it would be good to study the effects of English dominance in the future programming field and to look at the validity of potential solutions to the issue.