Tilted Towers: KBMSTER (Keyboard Master)

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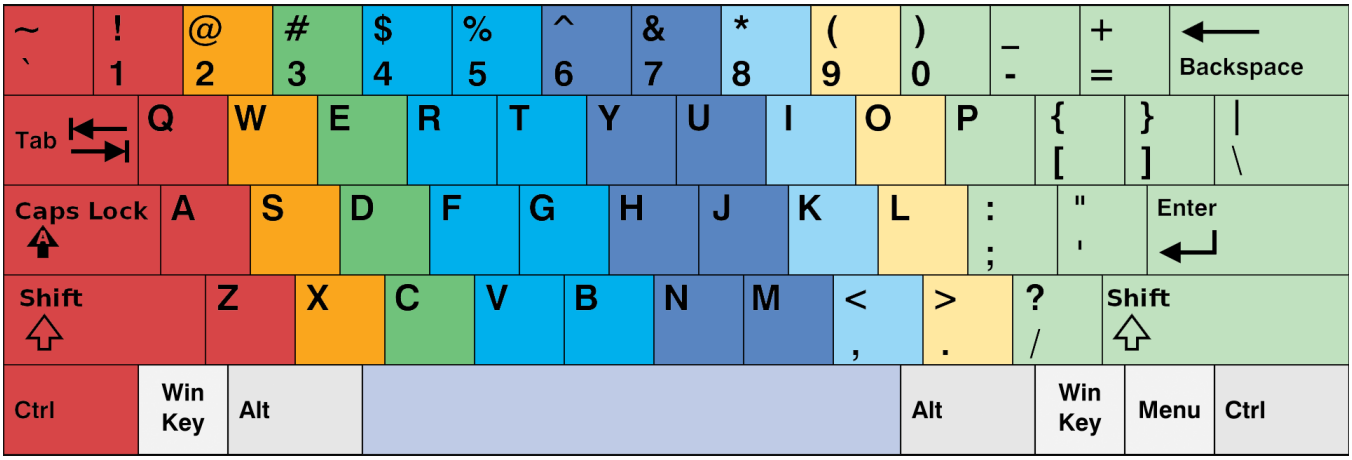

Figure 1: Standard QWERTY keyboard layout with color coding representing areas of finger responsibility.

ABSTRACT

The most common interaction between humans and computers comes from the keyboard. The most popular keyboard is the standard QWERTY keyboard, however, this keyboard was designed on July 1, 1874, meaning this design is almost 150 years old. By analyzing the Dvorak keyboard's efficiency versus the QWERTY keyboard layout, we can see that the most popular layout is not nearly as efficient. By incorporating a genetic algorithm, more efficient keyboard layouts can be found with a predicted 150-200% increase in typing speeds.

KEYWORDS

dataset, genetic algorithm, machine learning, keyboard layouts, typing efficiency

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1 THE ISSUE WITH KEYBOARDS

1.1 Introduction

The keyboard is a fundamental part of the modern computer. It is this feature of the computer, alongside the mouse and other peripherals that allow humans to utilize the power of the well-researched and optimized machines on our laps or in our pockets.

It can be argued that the keyboard is the most important peripheral that comes with the computer; one can fully utilize a computer with just the keyboard. In fact, the most effective users only utilize the keyboard to interact with their computers.

When a person is using their computer, they are undoubtedly going to need to use the keyboard. This goes for smartphones as well - users will need to utilize an on-screen keyboard for messaging others, searching for a funny cat video, or quickly looking up their symptoms and diagnosing themselves with various illnesses. The keyboard offers a wide range of commands for the user to instruct the computer and acts as an interface; the keyboard allows users to interact with a computer.

1.2 The Problem

The fact of the matter is that the keyboard is the most important tool for human-computer interaction, but the most frequently used design is over 150 years old and can be demonstrated as virtually

ineffective when compared to other, less common designs or non-standard typing techniques. In terms of improvement, there are two areas in which needless inefficiency lies. First, there is a lack of proficiency in using the keyboard to type. Many are unpracticed in utilizing the keyboard to its potential, therefore consuming more time than necessary to achieve their computer-use goals. But what if there is already expertise in typing, or a person finds a nonstandard method of typing to be more accessible? This raises another problem, the core problem of keyboards; there is a physical limit to how a particular keyboard layout, that is, the ordering of the keys either accelerates or inhibits the maximum *useful* inputs a person can produce for a computer.

For example, if a person utilized a computer to write an English novel or an essay for class, they are likely typing using Latin characters. But the way in which they type is individualized - maybe they use all ten fingers to produce the input, or maybe they just use their index fingers, or maybe they do something in-between - all of which are equally as valid. However, despite the method of typing, they are all likely using the standard QWERTY layout - a layout that is not optimal for any of these techniques.

Now imagine someone is utilizing a keyboard for a different use, like writing Java code. Java syntax has an emphasis on the semicolon - each line written ends with a semicolon. This means that this key is used more often, and thus the person would benefit from it being in a different position.

To summarize using these examples, assume that the person had the muscle memory within their digits that allows them to type efficiently with their preferred method. Then, the limiting factor is the distance between the keys, or how long it takes for one finger to transition from one key to the next to produce the desired input.

Considering the above, the issue with keyboards is the arrangement of the keys, with regard to logical and functional placement. It is this arrangement that limits the ceiling of how quickly a person can type, thus how quickly a person can achieve the results they desire for the computer to produce.

As computing technology has and is continuing to evolve rapidly, it has now come to a point where the human side of human-computer interaction is the limiting factor to utilizing a computer's full productivity potential. By creating a new, personalized way for an individual to interact with computers and by giving the users the tools to increase productivity, we can rethink how people utilize a keyboard to produce inputs to command computers, therefore increasing accessibility and efficiency.

1.3 Our Motive

The Tilted Towers group is motivated to solve this problem because it is a core element of human-computer interaction. With multiple trillions of keyboard presses a day (Source: it's a hyperbole, but probably true), the sheer amount of cumulative time saved would change the world! If work is able to be done at a quicker rate, more work can be done or more time can be spent away from the computer. More time spent away from the computer means less energy consumption and more time can spend time with friends and/or family. The more one spends time with friends and/or family, the deeper the relationships and bonds form. The deeper the relationship or bond, the more fulfilled one will feel, and thus one will be happier. The happier the people, the fewer problems in the world and the more time spent helping others.

In short, Tilted towers is motivated to solve this issue because of how it will change the world, for the better.

2 LITERATURE REVIEW

2.1 Current Keyboards

Our project was inspired by the provided youtube video above in source2. The creator of the youtube video generated a keyboard that is the most efficient, however, it's more universal rather than specific to each person to accomplish a task.We will be adding other forms of keyboards through research to help figure out which keyboard works best for the user. Our objective is to find the best keyboard with the shortest travel distance between each letter on the keyboard. The lower the travel distance is, the faster a user will be able to type and the more effective the keyboard will be.

For languages using the Latin alphabet, there are three main key layouts: QWERTY, QWERTZ, and AZERTY. With QWERTY being the most popular, it is worth looking at a little history. The QWERTY layout was created by an American inventor named Christopher Latham Sholes and made its debut on July 1, 1874, making it almost 150 years old. QWERTZ and AZERTY keyboard layouts follow from the QWERTY layout.

Figure 2: The QWERTY keyboard

Source: QWERTZ WPM rate compared to other layouts

This article shows how the QWERTY keyboard layout has the fastest rate of wpm compared to other keyboard layouts. We are going to implement a genetic algorithm that finds the fastest and most efficient keyboard layout for each specific user of our program. From an ergonomic point of view, the layout of the keys designed

Figure 3: The QWERTZ keyboard

by American researchers August Dvorak and William Dealey in the 1930s aims to maximize user comfort. The keyboard is named after the inventor, Dvorak. This layout is unique as it was designed using more extensive research on typing efficiency and comfort.

Figure 4: The AZERTY keyboard

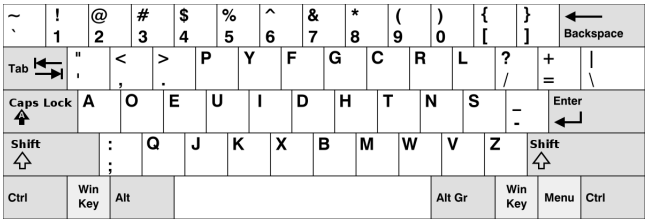

Figure 5: The DVORAK keyboard

All of these layouts fall short as they attempt to be all-in-one solutions for everyone, when different computer users may need different keyboards for different purposes. Our app will be superior in the sense that it will find the best keyboard layout based on the individual.

3 PERSONAS

3.1 Persona 1

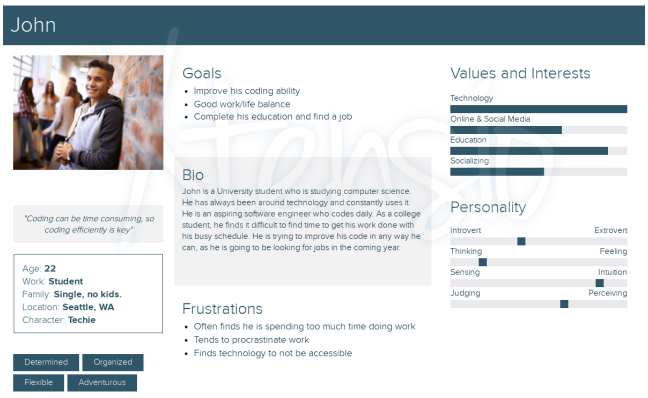

Figure 6: Persona 1 - John

Our first persona is John. John is a 22 year old going to University for Computer Science. He is single with no children, living in Seattle, Washington. Since John is on his own out at University, he can be very flexible and organized. Yet, he is still a busy student with many classes and projects. John's values and interests lie mostly within technology, but also include socializing and education. He is determined to become a software engineer but often finds it difficult to fit in enough time to code and that the technology he codes on is not as accessible as it could be. He aims to improve his coding skills to eventually graduate and find a software developer role, as well as improve his work/life balance. Getting in the way of these goals are his time management skills. John, like many other students, procrastinates. When he does get to his work, the time spent on it is way longer than he intends. John is just one of the types of users we are targeting for our web application. Users like John will be able to improve their coding ability and efficiency by training themselves on a new and improved keyboard layout designed specifically for them.

3.2 Persona 2

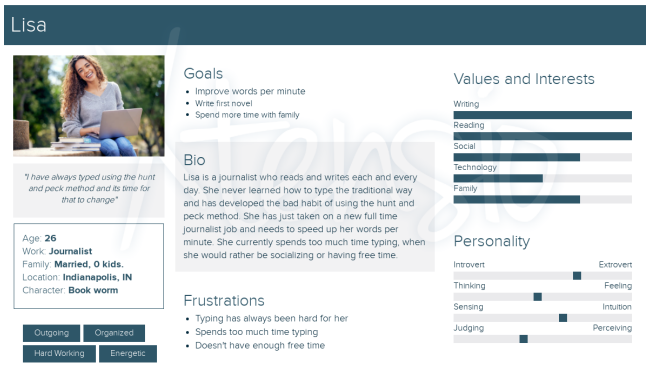

Figure 7: Persona 2 - Lisa

Our second persona is Lisa. Lisa is a 26 year old who is married with no children. She lives in Indianapolis, Indiana. She is a journalist who loves reading and writing whenever she can. Her values and interests include writing and reading, as well as technology and family. She is quite the extrovert and book worm. Lisa hopes to improve her words per minute so she can write a novel more efficiently and spend more time with her family and friends. One issue that Lisa faces is that she was not taught the traditional way of typing on a keyboard. Instead, she uses the infamous hunt and peck method. That method makes typing much harder for her and often spends too much time typing. She wants to have more free time and typing faster would free up more time for her values and interests. Writing a novel using the hunt and peck method will take a significant amount of time compared to other typing methods. Learning a different method for typing would greatly reduce the time to type out her novel. Users like Lisa would benefit from using our web application. Users who haven't learned the traditional way of typing can learn how to do that on their own using our web application. They will be able to see their efficiency and develop efficient typing skills using our training feature.

4 TASKS

4.1 Task 1

John is assigned a project in his computer science class in which he needs to use the language Python in order to create a program that serves as a game. He is very familiar with the technology and he's

been coding for awhile now. He realizes from the past that when using a 'QWERTY' style keyboard, he spends an extensive amount of time on assignments which leads to his procrastination as well as less time to complete other things in his daily life. Also, when writing code he rarely uses some of the keys on the keyboard and other times he uses some keys more often than others. There are also many instances when symbols and numbers are used more frequently than just letters, having a habit of using symbols is very useful when it comes to coding. John must finish the project by the due date in order to receive credit and he's already behind due to starting late and the 'QWERTY' style keyboard.

4.2 Task 2

Lisa is a journalist who is tasked with writing her first novel. She's given a strict deadline and serious consequences follow if the deadline is not met. However, she has other responsibilities and cannot spend all of her time writing the book. Lisa is not very efficient when it comes to typing, she uses the "hunt and peck" method which makes her words per minute time terrible. She has always struggled with typing and all of these factors combined make it difficult for her to finish this task. Lisa needs to build her muscle memory, which would lead to finishing projects much faster giving her time to deal with other things.

4.3 Task 3

Lisa, a newly hired journalist, is assigned with the project of writing a biography. She is given a list of available celebrities and she must pick the person of her choice. In order to write the biography she must interview the celebrity and take notes. Rather than recording, Lisa wants to take notes instead and writing down notes on paper during the interview is not very efficient as it would take an extensive amount of time. Typing notes would be much better Lisa realizes. However, Lisa struggles with a number of things when it comes to typing, she does not have great muscle memory to specific keyboards when typing.

5 PARTICIPATION

5.1 Noah Krueger

I set up the template for the rest of the group and wrote the abstract and problem statement (Section 1- The Issue With Keyboards) for the report (this document) aspect of Milestone 1. I participated in the creation of the presentation aspect of Milestone 1.

5.2 Kenny Drewry

I designed the personas layout and then created two personas using the template. I then wrote a couple paragraphs to dive deeper into the personas and our users. In the presentation, I presented the personas and edited/uploaded the video.

5.3 Victor Chen

I contributed to the literature review with information and diagram regarding the DVORAK keyboard layout. I also presented the section on existing keyboard layouts in the presentation video.

5.4 Piyush Makkapati

I contributed to the literature review with information about the QWERTY keyboard layout and also explained how our implementation will solve the problem we stated.

5.5 McAddai Owusu

I created each of the three tasks.

6 REFERENCES

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https://www.youtube.com/watch?v=EOaPb9wrgDY