Tilted Towers: KBMSTER (Keyboard Master)

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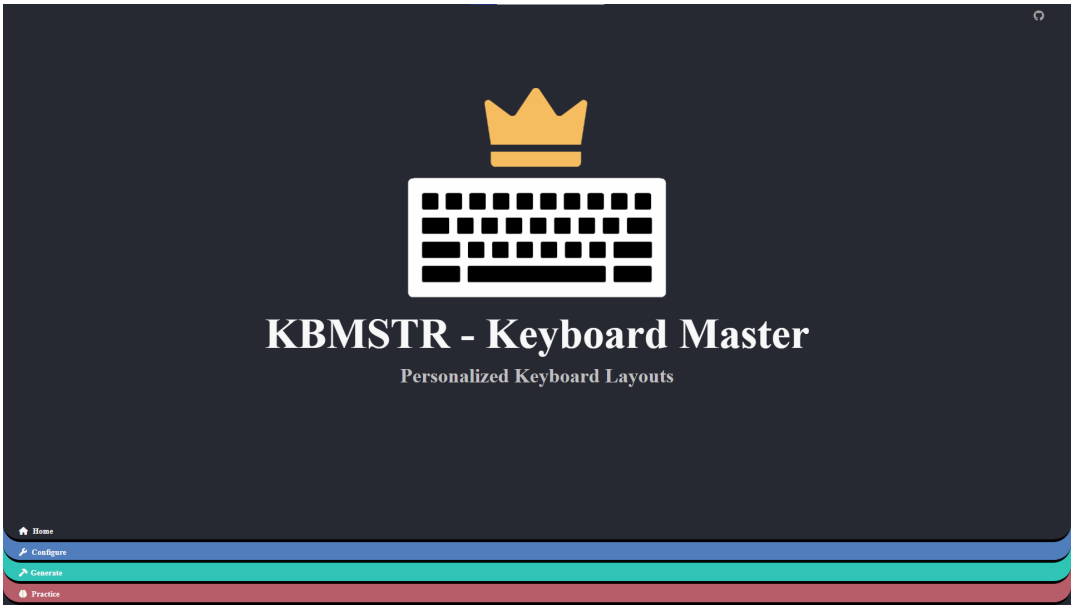

Figure 1: KBMSTR Webapp

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. KBMSTR is a webapp that has three features that help users improve their efficient when typing. Users are able to configure, generate, and practice a keyboard layout personalized specifically to them. Our goal is to make typing easier and more efficient, as well as move the world away from the unquestioned norm of QWERTY keyboards.

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KEYWORDS

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

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1 INTRODUCTION

The 'QWERTY' keyboard layout is the standardized keyboard layout for almost all computers in the world today. People have become content with this layout as it is about 150 years old and very few seem to question it due to this. However, the problem with this keyboard layout is that it is not the most efficient keyboard layout depending on the user and/or the task they must complete. To combat this, in the past there have been alternative keyboard layouts made such as Dvorak, Colemak, and Workman. While these solutions may have been helpful, the main problem of keyboards being efficient for a certain task still existed and that's where our

solution comes into play. Our website allows a user to configure a personalized keyboard layout, generate a keyboard layout using data, and then practice that keyboard layout that was generated. To evaluate our product we conducted an observational study targeting people who intend to improve the efficiency of their typing. From the study we concluded with sufficient results, we found that most of our features and our navigation were accessible and intuitive, with just a little bit of confusion to users who weren't familiar with computer code.

2 RELATED WORK

There have been studies upon studies done for the problem that we are addressing. The original problem that we are addressing is 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. A related study that has been done was by a youtuber named adumb who used AI to create the Perfect Keyboard. He generated a keyboard that he thought was most efficient, however, one shortcoming of his keyboard was that it was universal rather than specific to each person. His keyboard didn't necessarily help with people that are trying to specific tasks when a keyboard is involved to type and do other things. Since the making of the keyboard, researchers have only focused on how fast and efficient an average person can type on it which is a huge problem because the keyboard layouts (QWERTY, QWERTZ, AZERTY, and DVORAK) are universal. There have been plenty of other studies to find the best keyboard, but all of them have this similar shortcoming. Based on these related works, we were able to think of an idea on how to actually create the perfect keyboard; by letting the user essentially make his or her own keyboard. No related study tried to create the perfect keyboard by letting the user create their own, so we are addressing that problem/ shortcoming by designing a website like this that lets users try out different key patterns in different locations and then actually save the keyboard. This solves the problem of these standard keyboard layouts being universal and efficiently helps every single person finish their tasks quicker.

3 SYSTEM DESCRIPTION

For our application, we decided to focus on three main features: a landing page guiding you through the site, a keyboard layout creation tool, and a keyboard layout testing platform. The back end of our application is implemented with the Python programming language. The front end of our application was created using HTML and CSS. We decided to use a landing page to allow users who are unfamiliar with the app to have an intuitive introduction to how it works. For our landing page, we decided to have it allow users to access all of our other features from within the same tab. This prevents clutter in the user's web browser and allows for a seamless transition between the aforementioned features. Our keyboard layout creation tool was the toughest feature to implement within our application. This is the "main" feature of our application. We decided on this feature to help those looking to improve their typing efficiency. We wanted this tool to be specialized and customized specifically to the user and their preferences. This feature relies on an algorithm to learn the typing patterns of the user and calculate what would work best for them. From the "Generate" tab, users will download our generation tool and use it to create their best keyboard layout. Our final major feature is a practice tool for new and existing keyboard layouts. We figured that in order to help users maximize the efficiency of their new keyboards, it would be wise to give them a platform to practice. The practice tools allow users to practice their own keyboards, popular existing keyboard layouts, as well as the keyboard layouts of other users to truly discover what is best for them. The tool overwrites existing key bindings on the user's keyboard to match that of the new layout and provides a practice prompt for the user to type. For aesthetics, We chose a more muted color palette for our background, as well as a higher contrast color palette to display the finger mappings on the layouts. The muted background allows users to focus more on the features themselves as opposed to having their attention drawn to the background. The higher contrast finger mapping color palette allows users to more easily differentiate between what fingers should be used for what keys on a given layout.

4 EVALUATION

To evaluate the effectiveness of our product, we have decided to use a social study. Our target demographic is those looking to improve typing efficiency for whatever keyboard-related task they want. Our goal is for our product to be intuitive to use as a whole across all features (landing page, keyboard configuration tool, keyboard testing tool).

The specifics of our evaluation design include an observational study performed on three subjects using our application for the first time. These subjects will be pulled from a sample of UMass Amherst students via social media recruitment, and ideally, will each have a different use case for keyboards created by the application (for example, an essay writer, a programmer, and an accountant). For example, we will post an Instagram story explaining who we are, what we created, and what the viewer can do to help us. Each participant will undergo a trial with an observer and a questionnaire portion. To begin the trial, we will have participants start on the home page and have them navigate to the configuration page. Then we will have them create a layout and download it on the configuration page. After that, participants will be told to go through the instructions on the generate page. Finally, the participants will be asked to complete one practice prompt on a preset layout of their choice as well as the one that they had made prior. After the trial, we will have the subjects rate each of our three features and our navigation on a scale of 1-5 for ease of use (1 meaning the feature/navigation was very hard to use, 5 meaning the feature/navigation was very easy to use). The observer will be taking any notes on where participants struggled, especially noting how long it takes the subject to complete tasks. In addition, we will allow them to provide any additional comments on the specifics of what they found to work well and what needs improvement. Our numerical rating data will be analyzed with measures of central tendency (for example, a lower mean/median average rating will tell us what new users found most difficult to use) and we will look to the comments for what specifically could cause this issue. We will record all of this feedback for improvement purposes, specifically

looking to determine if our interfaces and navigation are intuitive for our users.

5 RESULTS

Our evaluation consisted of 3 unique users using our webapp. All participants were gathered through social media and were all from the University of Massachusetts: Amherst. Each participant was chosen based on their different needs when it came to typing. One student was a computer science student who is mostly typing code. The second student was a English major who mostly types papers. The final student was an accounting major who uses the number keys more than the typical user. The intention behind this was to make sure that all different types of users would find our webapp accessible and intuitive.

Upon completing our evaluation, we found that most of our features and our navigation were accessible and intuitive. The configure a keyboard feature had an average usability rating of 4.33 out of 5. All subjects found this feature to be relatively easy to use. One subject expressed that they found the home and fingerprint buttons to be a little bit confusing at first glance, but they quickly figured it out: "A little confusing on what the fingerprint button does vs the house". The generate a keyboard feature was the worst rated feature when it came to usability. The generate feature received a 3.67 rating. We discovered that some users, specifically those who aren't familiar with command lines and python, were confused when following the instructions. The English subject said in their comment on the generate page: "Too involved, not familiar with commands and python". The computer science subject found this to be simple and easy, while the accounting subject stated: "I do not like to use external programs outside of the site, it scares me into thinking a virus might install". Using external programs was a necessary part to our generate page, but we failed to realize that people might find this difficult to follow if they don't have prior experience and that they might find this sketchy to use. The practice a keyboard feature gave the most positive feedback. It received a 5 out of 5 on usability. All subjects found this feature to be intuitive and had no issues using it. One subject stated that they really liked how the keyboard highlights what keys on the keyboard need to be hit next. They found it rather helpful when learning a new keyboard. Another subject actually pointed out a bug with our words per minute implementation which we overlooked. The WPM calculation actually increased even when an incorrect key was being pressed, making the calculation inaccurate. We plan to fix this bug in the near future.

Aside from having our subjects rate our features from 1 to 5, we also had them give the webapp a score for navigation, as well as their overall opinion. The navigation received a 4.67 out of 5 for usability. One subject found it to be a little confusing that the navigation moved around depending on what page you were on. For example, when you are on the practice page, all the ribbons for navigation are at the top versus the landing page they are on the bottom. This was something that we overlooked by us and will required some further thinking when developing the webapp further. Overall the webapp scored a 5 out of 5 regarding subjects experience on the site. The computer science subject even stated "I love it". They were especially happy with their experience on the webapp because their coding efficiency would increase from further visits. Our evaluation showed that our features, navigation, and overall experience were all accessible and intuitive for all types of users. Without the evaluation, we overlooked a few concepts when it came to buttons specifically. When further developing our webapp, we will consider the comments and feedback we received, especially to the generate page's instructions.

6 CONCLUSION

From this project we learned various things such as concepts for design principles in which we incorporated into our project, as well as how to form personas and tasks and incorporate them into the making of a prototype. Working with multiple members allows for there to be multiple ideas in which can be helpful in many instances. Above all this, there can always be improvement in anything especially in a prototype. This project can surely be extended in the future, this is a prototype that can actually be used in real life. It handles the problem of efficiency when typing to perform a task. Being able to generate a keyboard can be used at all times, and in the future different keyboards could be added that could potentially have no letters and just numbers or just symbols, which allows for certain tasks to be done more efficiently than they've ever been done!

7 PARTICIPATION

7.1 Noah Krueger

I contributed to the results and system description.

7.2 Kenny Drewry

I contributed to the evaluation results and the abstract.

7.3 Victor Chen

I contributed to the design and description of our evaluation. I also contributed to the system description.

7.4 Piyush Makkapati

I contributed to the related works section.

7.5 McAddai Owusu

I contributed to the introduction and conclusion section.