

Prototyping of a Mechanical Keyboard

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Abstract—The mechanical typewriter was invented in the 1800s [1], and through many iterations developed into today’s computers. The standard keyboard layout which computers use, QWERTY [2], is a direct descendent from the layout used in typewriters. In this paper, we explore methods to build a mechanical QWERTY keyboard. The goal is to create a keyboard which is ergonomic to use and with a visually appealing design, which has been done by carefully tailoring dimensions for the user’s needs. Techniques like CAD-modelling in Fusion360 [9] and CNC-milling with DATRON neo [10] were used for arriving at the result of a custom made mechanical keyboard. In this paper, we have managed to successfully build a custom made mechanical keyboard.

Index Terms—mechanical keyboard, CNC-milling, CAD-modelling, QWERTY-layout

I. INTRODUCTION

The first commercially successful typewriter was invented by Christopher L. Sholes, Carlos S. Glidden, and Samuel W. Soule in 1867 [1]. The keys was first laid out in alphabetic order, but to prevent the frequent occurrences of mechanical issues, the layout was replaced by the current standard, QWERTY [1].

Although the QWERTY layout was successful, it was not referred to as the universal keyboard before 1905 [2]. Meanwhile, the QWERTY layout had serious competitors like the above mentioned alphabetic layout and the Dvorak layout. The Dvorak layout was designed to balance the frequency of use of characters with respect to scientific writing. The typing was distributed with 56% on the right hand and 44% on the left hand [2].

In modern computer keyboards, QWERTY is still the standard and most common layout with small language variations, although some still choose to use different layouts.

In this paper, we explore how to design a mechanical keyboard based on today’s standard computer keyboard layout, the QWERTY layout.

II. MY IDEA

In this project, we aim to design and build a mechanical keyboard where ergonomic features and a visually appealing design are the key parameters. The creative process was focused on the design of a keyboard case, a wrist rest, choice of materials and the QWERTY keyboard layout.

The project was chosen based on the interest to learn about the process of building a mechanical keyboard from scratch. Which includes to create a functional and visually



Fig. 1. Soldered switches with keycaps without walnut case

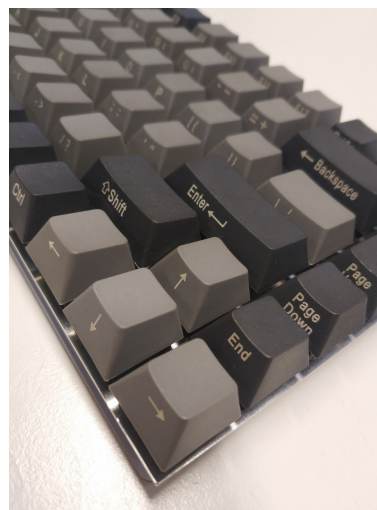


Fig. 2. Side printed keycaps

appealing design and to learn which components are needed for a keyboard to function.

Keyboard height was an important parameter when focusing on ergonomic features. This was to keep hand wrists positioned horizontally to prevent the user from bending the wrists while typing. Therefore, designing the keyboard with a maximum height combined with a wrist rest was considered important.

The color combinations and choice of material were important when creating a visually appealing design. We find dark color combinations visually appealing, which resulted in a walnut wood case and wrist rest with a combination of black and gray colored key caps.

The keyboard case, aluminum plate, and wrist rest design

were made with computer-aided-design(CAD) with the software Fusion 360 [9]. The set up and design of milling paths in Fusion 360 "Manufacture" were prepared before CNC-milling.

The main tasks involved in building the keyboard include:

- Planning and ordering all components needed
- Designing an aluminum plate to separate the keycaps in a fixed distance from each other
- To ensure that the dimensions are correct, several test prints of the aluminum plate and the keyboard case need to be performed
- To use the desired materials, CNC-milling is done to shape the aluminum plate, walnut case and the wrist rest
- To be able to convert buttons pressed into words, soldering all the switches to the pre-programmed printed circuit board is needed

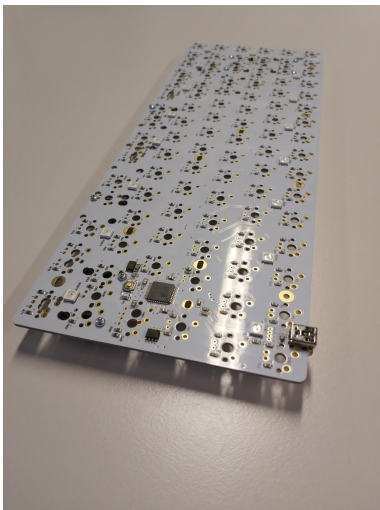


Fig. 3. Printed Circuit Board with mini-USB



Fig. 4. Blue switches on aluminium plate

III. RELATED WORK

Internet forums like the subreddit mechanicalkeyboards [3] and the youtube channel TaeKeyboards [4] were the main resources used for inspiration and practical guidance in this project. In these forums, people share ideas, designs and practical information with respect to custom made mechanical keyboards.

In order to get the correct dimensions and a desired layout, some helpful tools were recommended in the online keyboard community [3]. Among others, an online tool called keyboard layout editor [8] used together with a plate builder tool [7], were recommended to generate CAD files.

Machines like the Creality Ender-3-printer and DATRON-neo CNC-milling machine are used for both prototyping and manufacturing [5] [10]. These are in addition helpful for prototyping a mechanical keyboard. Today, inventions like 3D-printers have made it possible to build products that were almost impossible for an ordinary person to build.

IV. CONCLUSIONS AND FURTHER WORK

A. Conclusion

A mechanical keyboard was successfully built. It was tested by connecting it to a computer and using an online keyboard tester [6] to verify that all keys worked successfully.

The main challenges occurred during soldering. After soldering, some switches had a poor connection to the PCB. One could benefit from a better soldering technique or alternatively, buying plate mounted switches instead of PCB-mounted switches.

We bought parts from multiple vendors, when a part was delayed the progress stopped. This could be prevented by carefully planning delivery times and purchases. Additionally, research and reviews of all parts that were planned to buy should be carefully thought through.

When experiencing logistical challenges in a small project like this, we gained a clearer understanding of the importance and challenges faced with logistics for large companies.

B. Further work

For customizing a new keyboard, we propose adding other features to the keyboard. For instance a coffee holder or other creative features that might fit the user's need. Furthermore, the size of the keyboard is additionally user-dependent, which should be taken into consideration when building a custom made keyboard. Finally, due to the high material cost and time spent on CNC-milling the walnut wood, other materials should be considered. Materials such as materials used in 3D-printers would be ideal.

ACKNOWLEDGMENT

We would like to thank Mats Hoevin for the great help and support with our project. It would not have been possible without your help.

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