The Vault- Smart Desk

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Abstract

Efficiency and productivity are vital factors that individuals seek to encompass in their accustomed conduct. The developing desire to sit and stand desk has been seen as essential elements in an abundance of business corporations, universities, and personal establishments. A 2016 study complied by the Texas A&M Health Science Center School of Public Health, found that call center employees with sit-stand desks were almost 50% more productive than their colleagues who sat in the office. This correlates with our project due to our innovation of creating a smart desk with functionalities that were obtained from a survey our group conducted prior to developing the desk. Through this project, we are improving the workspace by creating an augmented desk along with many other features. We believe that with this product we can provide relief, comfort, and simplicity back to the common desk-user.

Introduction

The Vault - Smart Desk was conceptualized by one of our team members who saw the need for cost-efficient and more technical smart desks in the corporate world while completing an internship in Silicon Valley. The National Health and Nutrition Examination proposed in 2015 that "70% of people spend 6 or more hours each day sitting down which creates a relationship between prolonged sitting and increased risk from dying from all causes"[1]. According to statistics, prolonged sitting has led to an increase in mortality rate by 20% for men, an increase in mortality rate by 40% for women and 20% of all U.S. deaths (35+) are attributed to physical inactivity. Also, the study conducted by the Texas A&M Health Science Center School of Public Health[2] shows the benefits of a sit-stand desk. We developed our Smart desk to provide the benefits of standing and movement regarding health, wellness, and functionality in various environments. As stated in the research article[3], standing and movement help in maintaining blood flow, overall hear rate, strengthening core muscles and back, and minimizing muscle tightness.

Design

The Vault is a desk made of plywood bolted together to form legs and base. Two linear actuators of 12V power are mounted onto the legs to adjust the height of the desk. They are controlled by a Raspberry Pi using a 4 channel 5V relay and a 12V power supply. Raspberry Pi is also used for reading fingerprints from a red optical sensor, accepting user input through a keypad, displaying information on an HDMI display and communicating with cloud for user data via API calls. User Data includes height, weight, hip height, arm length, age, occupation, email id, password, and user settings if any. The software section is a python-based GUI hosted on Heroku. It hashes the user data

and makes API calls to access data stored in a SQL database. The information is displayed on an HDMI display. User needs to first register through the GUI and their fingerprint will be asked on the first login. User data is also used to determine the recommended height and time for which the user should sit/stand. After the user is authenticated, the desk height is adjusted, and user information is displayed on the screen. Additionally, the desk provides USB ports and wireless charging panel.
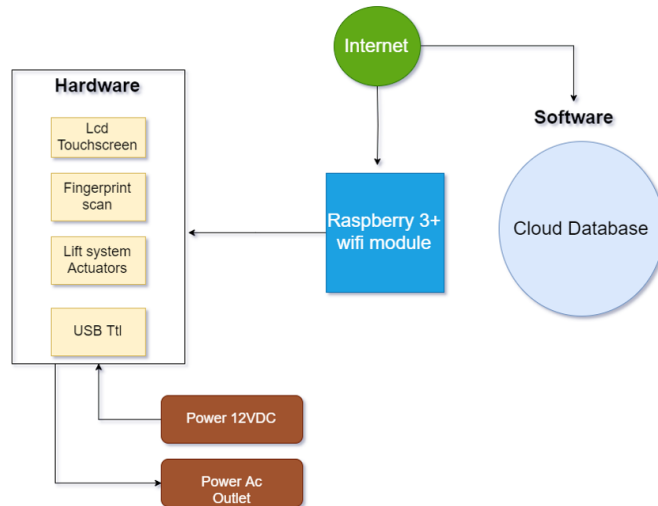

Fig 1: Block diagram of the Vault – Smart Desk

Fig 2: Picture of the model without lights and ports

Summary and Conclusions

Putting our knowledge of science and technology, we have created an automated sit/stand desk with user profiling, wireless charging, USB ports, and overhead lighting. Throughout our research, we have conjectured that studies show how adopting definitive sitting and standing positions while maintaining good posture can curtail various afflictions such as lowering one's risk of heart disease, diabetes, debilitated muscles, weight gain, and poor blood circulation. Although we have implemented basic operations, there are scope for improvements such as adding speakers, customization for each user and using the user's medical history and his environment for adjusting the desk with a better formula. This smart desk will ease the lifestyle of people using it. The desk will simply benefit the person allowing them to reduce their health risk while improving work quality.

References

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