Final Report
COMP5047 Pervasive Computing

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Abstract

People are spending more and more time in their chairs. To solve this problem, we proposed a system that can track the information about our user in terms of their sitting time for a day/week. We use a pressure sensor, two micor:bit board and one raspberry pi to gather and transfer the data. In the cloud we built a server that can receive and analyse the information. Data gathering: Kashif and Ning. Cloud server/dashboard: Yuhong and Jason.

1 Introduction & Background

In modern society, especially in workplaces, sitting for long period of time has become a norm. Most jobs require sitting in offices for at least 8 hours a day and sometimes longer.

Study has shown that physical activity helps reduce various health issues such as diabetes, cardiovascular disease and premature mortality [1]. According to a research on the average sitting time of Australian workers, the odds ratio for BMI 25 was 1.92 in men who reported sitting for more than 6 hours a day, compared with those who sat for less than 45 minutes a day [2]. Furthermore, prolonged sitting also has a negative effect on the passive stiffness of the lumbar spine and may increase the risk of low back injury [3].

Fortunately, people are starting to realize the health risks caused by prolonged sitting. Governments and media have already started to raise awareness around the issue among the public. Safe Work Australia established by the Australian government in 2008 has a website that helps identify and reduce excessive occupational sitting [4].

This project aims to provide a direct and accurate measurement of sitting time in a workplace and improve employees health by raising awareness and encourage periodic breaks during long work hours through visual feedback.

2 System Overview

SitTrack is a sitting length tracking system that accurately measures sitting time of employees in a workplace and provides simple yet comprehensive visual feedback to improve awareness and to encourage people to avoid long sitting times.

The system gathers information via the pressure sensor integrated with the chair.

Figure 1: Pressure Sensor

When someone sit on the chair, a signal will be sent to the manager of this room, which is central micro:bit board connected with a Raspberry Pi. The Raspberry Pi will then package all the information and send it to the cloud server through Wi-Fi.

Figure 2: Central micro:bit and Raspberry Pi

In the webpage, user can view their sitting time for today. They can also view their friends sitting/stand ratio and the overall ratio for his/her department or company.

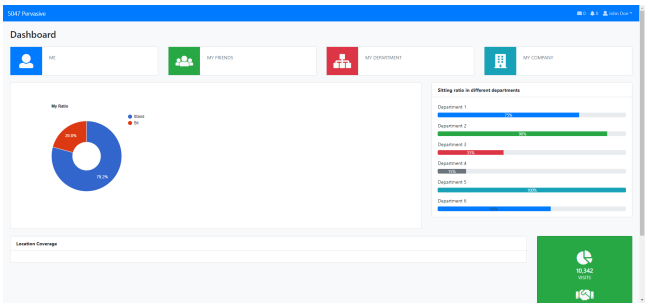

Figure 3: User dashboard

The dashboard is built with python as backend, bootstrap together with Google Chart to draw the front-end.

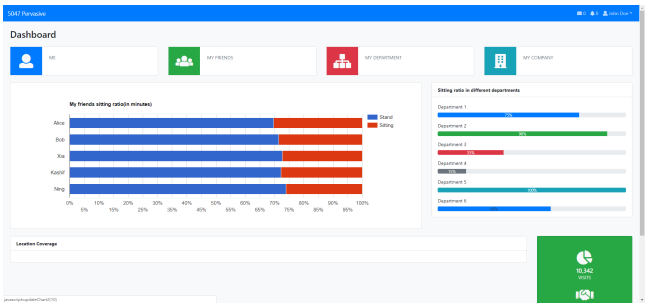

Figure 4: User dashboard- Friend

3 Architecture

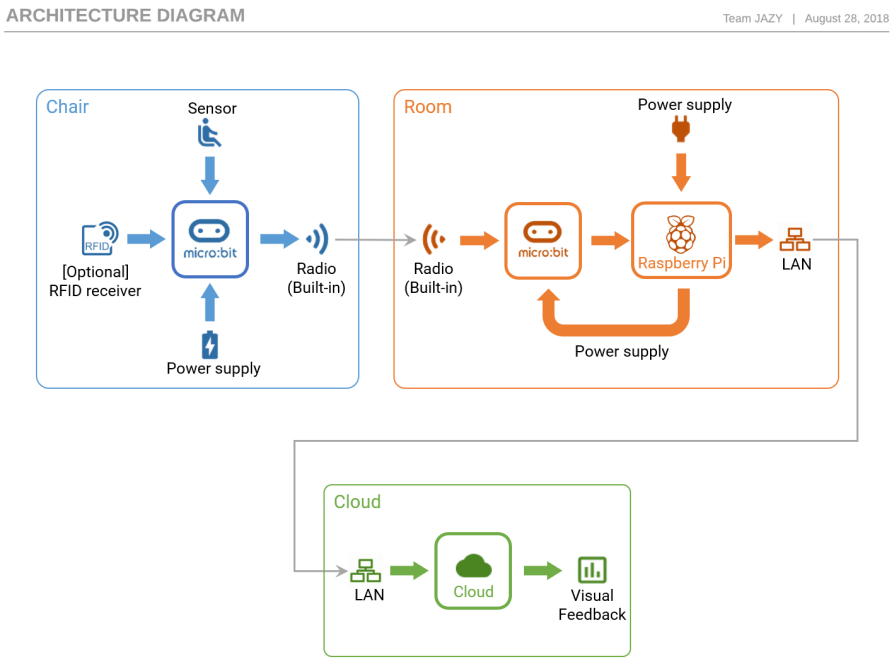

Figure 5: Hardware architecture

The hardware architecture is shown above. This is a three-tired architecture

including Chair bound device, Room level data gatherer and Cloud data processing.
When the user sits on the chair, the sensor would collect the pressure and send it by micro:bit. Then the Raspberry Pi will get the signal by another micro:bit and transfer the data by LAN or WiFi to the cloud. In order to keep the balance between data collection and power using, we also settle a sleep function in software architecture.

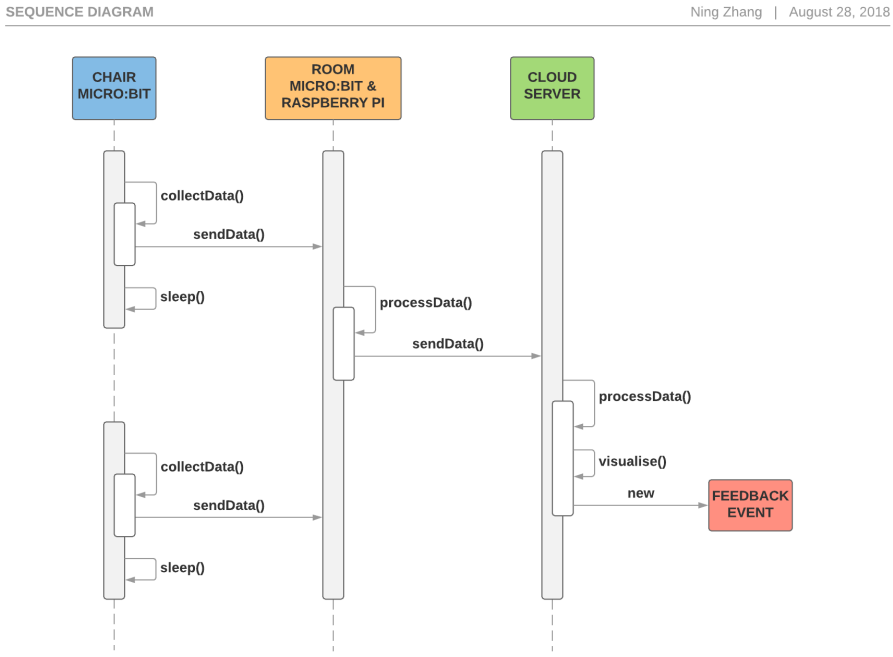

Figure 6: Sequence diagram of SitTrack

When there is no pressure on the sensor, it will get into the sleep mode and decrease the power consuming. When the data is transferred to the cloud server, it will displayed by a website and count the sitting time every 5 minutes. The final statistic result would be indicated on the chart. When the data is big enough, the result of whole building or whole campus would be given to help people work healthily.

4 Evaluation

A performance evaluation system is a key component of our project. When implemented effectively, it will greatly motivate our team to do our best in developing and promoting our product. In order to evaluate our system, we plan to follow 3 key steps:

1. Identify performance measures;
2. set guidelines for feedback;
3. set an evaluation schedule;

Performance measures include three aspects: the description of a task, the quality of a task and the quality description. For our project, we used this table below:

Description of Task	**Quality**	**Details**
1. Battery life for the chips		
2. Radio signal quality in long range		
3. The accuracy of data gathered from chairs		
...		

Table 1: Performance measure table

Also, we encourage our customer to give feedback on our product. It will help us get to know how well or bad our system works. In this way we can focus on the weakness and improve them. With the help of feedback, we should outline the expectations for improvements and how we intend to help our user to meet them.

Set up evaluation schedule is to decide when to conduct the evaluation. We measure the performance during the development of our prototype and once we have it, we can deploy the prototype into some chosen office area and gather feedback from people regularly.

5 Conclusion

With the implementation of this system, We want to make sure that our product does help people stay healthy both theoretically and in practice.

References

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