JC2066 IT Professionals and Society (Semester A, 2023-24)

Project Part 2:

Using IT to help detect potential sudden illness

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Introduction

According to the Law Insider dictionary, sudden illness refers to a sudden and unforeseen deterioration of one's health that poses a direct threat to their life or well-being. Serious sudden illnesses, such as strokes, heart attacks, severe bleeding, or severe allergic reactions, can lead to sudden death.

There are various factors that may contribute to these illnesses.According to Albert.al(2000) research , engaging in vigorous physical exertion may have the risk of cardiac attack. Unhealthy habits, including poor dietary choices, can also lead to multiple health problems. An unhealthy eating style, such as consuming excessive amounts of high-cholesterol foods, can result in the accumulation of cholesterol in blood vessels, leading to blockages and the development of heart disease. Additionally, urban dwellers who consume excessive amounts of junk food and fail to engage in regular physical activity due to heavy workloads are at an increased risk of obesity. Then can increase the likelihood of experiencing a stroke or heart attack. Individuals with allergies may be aware of specific foods they cannot consume, but accidental absorption of allergenic ingredients can still occur. Severe allergic reactions may happen after consuming allergenic food. For example, Anaphylaxis is a severe potentially life-threatening hypersensitivity reaction with an estimated lifetime prevalence of 0.5–2.0% according to Bayer en.al(2012).

Our project focuses on reducing the likelihood of sudden illness by eliminating adverse factors. IT technologies can help with it.an app can be developed to prompt users for emergency assistance or automatically contact emergency services if any abnormal body data, such as unusually high heart rate, is detected by the application. This approach allows us to save valuable time and potentially decrease mortality rates.Moreover it can monitor users' health habits and provide suggestions to enhance their overall health situations in daily lives. Keeping healthy lifestyles may help reduce the probability of sudden illness.

Design Aims

The primary aim is to collect long term health statistics of the user. Built on these functions, medical suggestions will be given if there is a potential risk of sudden illness. For example, if the people' blood pressure is unusually high for a long period, the app may remind the user to seek medical help in the real world. It will also calculate the time of the user's action in daily life. For example, determining the user's fitness by some data heart rate, or the walking steps of the user. Those data can be a reference reflecting the user's health conditions. It can act as a long term supervisor of people's health and decrease the rate of sudden illness for long term.

The secondary aim of this project is to provide timely monitoring on the user's medical condition and provide emergency medical support automatically when needed. It will connect with other smart devices, and get the data from those. It will remind the user if their status is extremely unusual. For example, if the app detects the heart rate of users is unusually high when sporting, it will remind the user to stop for a while. It will also automatically call for emergency calls when there are extreme cases, like extreme low pulse, low heart rate with losing response within a specific time. To conclude, the function above can decrease the death rate of sudden illness.

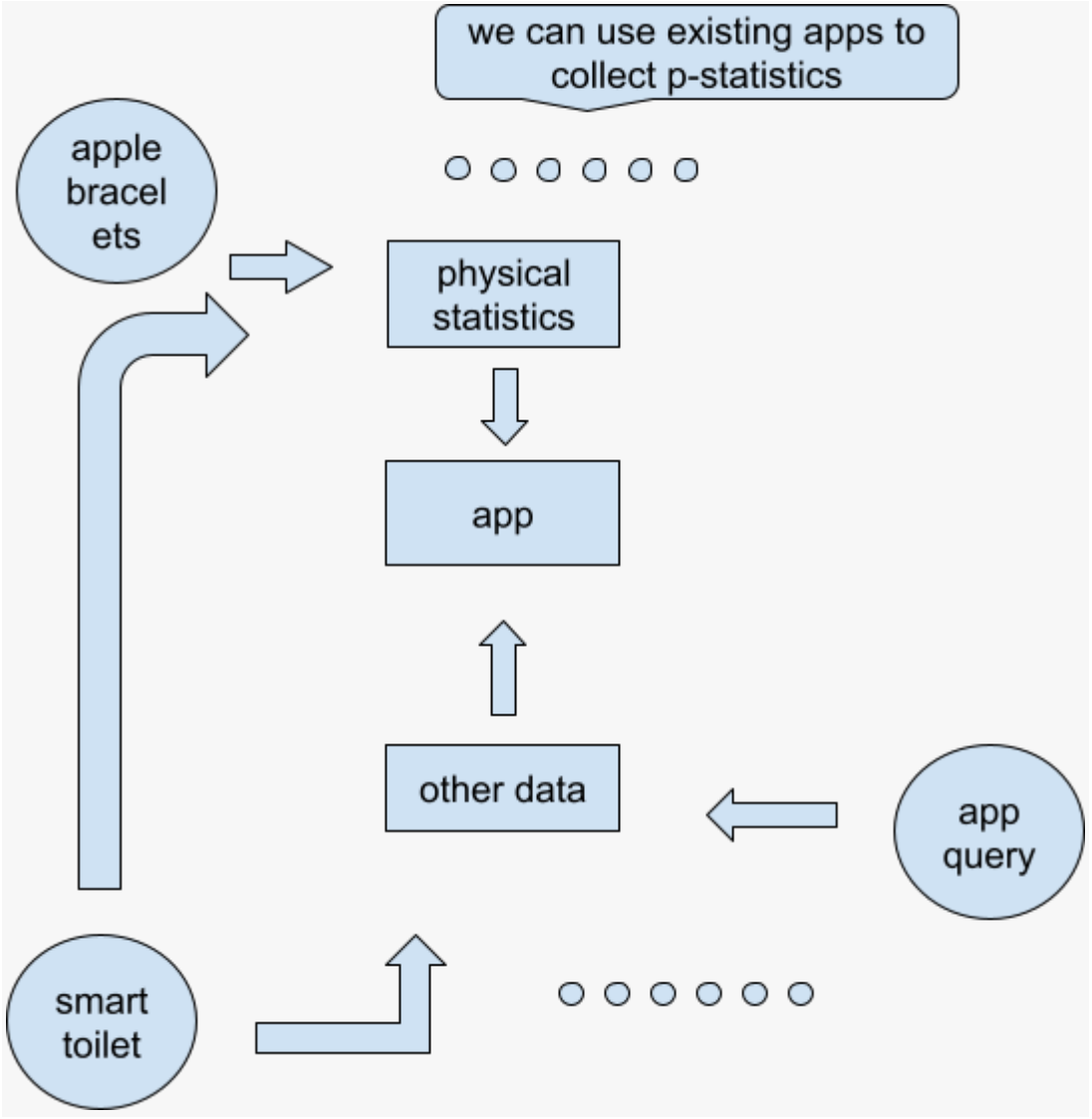
The third aim of this project is to create a digital platform that establishes a comprehensive database of the city's health condition. This platform can be constructed in various ways, such as allowing allergy sufferers to share their experiences in eating and prevent the consumption of triggering foods. This platform promotes preventive measures by preventing the incentive of sudden illness .It also provides a platform for healthcare professionals to share their knowledge with patients, a culture of health consciousness within the community can be further created.

The additional aim of this project is to concern about the question of privacy. This project requires a large amount of private data to analyze the condition of the user. For instance, the sleep quality, eating habits or sports data are required for analyzing a user's health condition, which is easy to cause security issues. So our other aim is to strengthen data security.)need or not?

Potential Implementation

To monitor the user's medical condition by 1.collecting physical statistics like blood pressure, heart rate; 2. using other data like sleeping hours and eating habits to predict the risk of getting sick(using big data and AI).

This requires an app-device network. Device for monitoring and App for interacting with users.



Advantage and Disadvantage

Advantage 1: Providing personal diagnose based on long term data

The existing solution of health care app in the market only provide some basic statistics like blood pressure and heart rate or some universal suggestion. Besides, FItbit keeps track of user heart rate and sleep quality in order to provide more personal health advice.

Our design considers a wide range of personal data collection, with which the algorithm will be trained more and more personally for the user. In other words, they will be more and more familiar with your normal physical condition in order to give accurate suggestions.

Advantage 2: Eliminating the negative impact on sudden illness

Existing solutions of apps in the market like Fitbit and MyFitnessPal can only provide health advice. This isn't enough in preventing sudden illness.

We use three ways to prevent sudden illness. Firstly if the algorithm judges that potential sudden illness may occur, the app will warn you. Secondly, emergency calls may be made automatically when sudden illness happens to users, therefore, the sudden death rate may decrease. Moreover,by the detection and monitoring of the system, people can look for their health status in the app.With the reminder of the app,They may be cautious about their health and improve what they miss.
For example, eating less cholesterol food. Therefore, the rate of sudden illness may decrease, such as stroke and heart vessels.

Disadvantage 1: Concern about privacy

As mentioned, the system collects a lot of data, such as the user's habits and sleep quantity, and analyzes the health performance of the patient. If this information leaks, it could potentially create serious problems. For example, an insurance company may obtain the information

and adjust insurance fees accordingly, which could raise concerns regarding legal issues. Telemarketing calls can potentially harass target customers by healthcare companies if they get target consumer's information, which may cause distress to users.

Existed solutions: using end2end encryption like Telegram

Disadvantage 2: Concerns about the accuracy of analysis

First, there may be bugs in the smart devices. They may receive inaccurate data from the user, and give the wrong response to the app, therefore wrong estimation on user's health. For example the smart watch which has some problems and cannot detect the user's pulse. It reminds the user but the user is sleeping. Therefore it automatically makes emergency calls. According to AM730, there are many cases where the apple watch wrongly determines the user's status and therefore misuse of medical resources.

Existed solutions: open source code of the algorithm

Demo

The feasibility problem can be proven through three steps: accessing data, processing data, and displaying the results.

For accessibility, smart devices can be utilized to detect user data. For instance, a smartwatch can have features to measure the user's heart rate, pulse rate, and blood oxygen percentage. The device is connected to a corresponding app that analyzes the data and presents the results.
In addition to physical statistics, data such as sleep patterns and performance, steps taken, or exercise time and the level of exercise can also be accessed. However, determining this type of data is more challenging for the device as it involves various factors that may not align with the specific case. Two solutions can be implemented to solve this problem. The first is to directly request the user's status, for example, the user can press the sport function in the app or in the smart device. While the second involves integrating with other apps, such as Ketta, to get information about the user's eating habits.

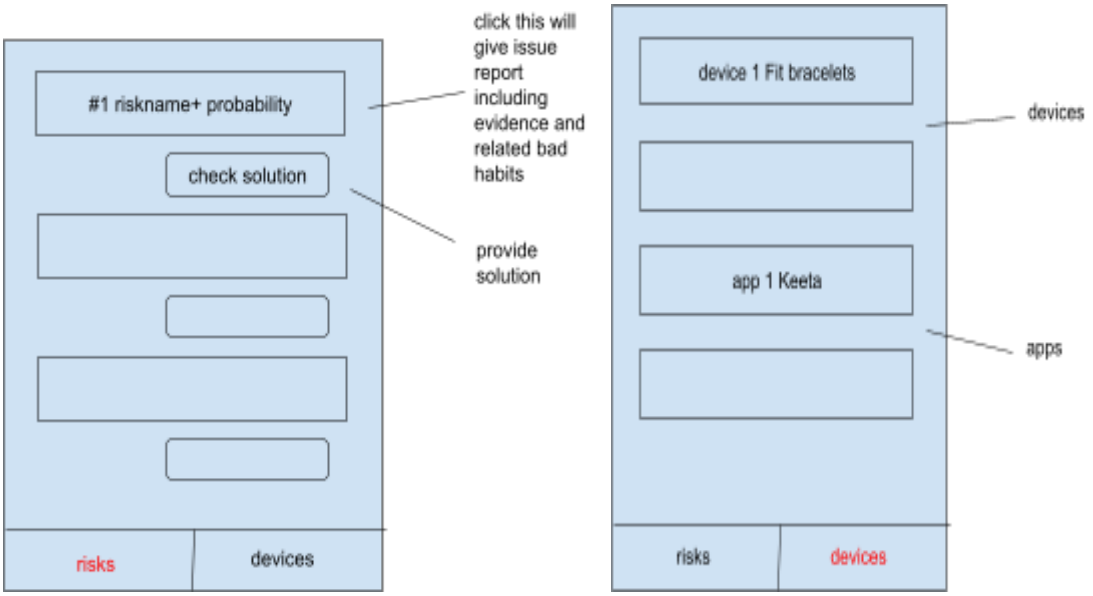
Process:

This requires a special algorithm.

Also, considering cyber security issues, we prefer to use end2end encryption to connect users and our server.

Display:

We want a clean UI showing important statistics and medical advice. Also, there will be a device page for users to control device connections.



Appendix:

Sudden Illness Definition | Law Insider

Albert, C. M., Mittleman, M. A., Chae, C. U., Lee, I. M., Hennekens, C. H., & Manson, J. E. (2000). Triggering of sudden death from cardiac causes by vigorous exertion. *New England Journal of Medicine*, *343*(19), 1355-1361.

Beyer, K., Eckermann, O., Hompes, S., Grabenhenrich, L., & Worm, M. (2012). Anaphylaxis in an emergency setting–elicitors, therapy and incidence of severe allergic reactions. *Allergy*, *67*(11), 1451-1456.

Apple Watch Series 6 M07P3LL/A B&H Photo Video (bhphotovideo.com)

Apple Watch經常誤撥緊急電話 美國警方疲於奔命 | am730