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# Social Distance Detection Using Python

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## ABSTRACT
Due to COVID-19 pandemic, society needs to embrace and adopt a new norm that includes practising social distance to break the transmission. The smart social distance application or tracker can help people to be constantly monitored and reminded to adhere to this practice. Direct impact that can be seen from this application will be a lower or minimum number of COVID-19 cases due to high level of social distance compliance. This paper will present an innovative solution called MySD which stands for "My Safe Distance" that helps users or the public to observe social distance advice closely. It leverages smartphone hardware features that typically has Bluetooth transceiver as well GPS to determine safe distance and required level compliance.

***Keywords: Machine Learning, Python, Anaconda 3 etc.***

## 1.INTRODUCTION
In March 2020, WHO declared pandemic due to COVID-19. To date, there have been more than 10 million confirmed cases worldwide with more than 500,000 deaths reported [1]. In the presence of contagious diseases such as H1N1 and COVID-19, social distancing is an effective non pharmaceutical approach which plays an important role in managing pandemic from getting worse [2,3,4]. If implemented properly, social distancing can effectively reduce the transmission and severity of a disease, hence reducing the pressure on healthcare systems and allowing more time for government countermeasures [2]. In addition, the analysis suggests that social distancing initiatives and policies in response to the COVID-19 epidemic have substantial economic benefits. Many technologies have been deemed to be able to help people or authority to follow and comply with the social distance rules and regulation [5]. For example, wireless positioning systems can effectively remind people to keep a safe distance by measuring the distances between people and notifying them if they are too close to each other. Furthermore, other technologies such as Artificial Intelligence (AI) technologies can also be used to facilitate or even enforce social distancing. By leveraging the latest wireless technology in the form of mobile devices such as smartphones, tablets and notebooks we can develop a smart application that is capable of notifying or alarming people automatically whenever the social distance minimum requirement is not adhered to. In a public environment such as in the university that has many facilities where people convene in a classroom, lecture hall, offices and food court, the requirement to comply with the social distance will be higher and more important. Through smart application, a virtual fencing or wall that surrounds a person with minimum radius can be established. This can ease the pressure on the management or building owners

in terms of their responsibility to create awareness to the students, staff and visitors of the importance of maintaining the social distance in campus. In addition, to avoid being constantly notified of the breach of social distance requirement, the app will have a feature where users can set the place where social distance tracker can be automatically disable when the person is at home for example. The application can also be tied up to colour code zone information in real time that can set the level of urgency to comply with the social distance requirement. For example, if the place is considered red, full compliance is required whereas if green zone the requirement can be relaxed automatically. The technology that we have nowadays allows us to monitor the SD. The rest of the paper is organized as follows: Section II presents related works of this area. Section III introduces the system architecture of the MySD and follows with system implementation in Section IV. The results and discussion of system testing of MySD are discussed in Section V. Finally, conclusion and future work are presented in section IV.

## 1.RELATED WORK

Due to the importance of adopting social distance among people to contain the COVID-19 from continuously spreading, some initiatives have been introduced to implement and enforce it. Besides enforcement from authority to ensure people are complying to social distance rules, adopting latest technology such as internet of things (IOT) to increase the level of social distance compliance has also been considered. An Internet of Medical Things (IoMT) enabled wearable called EasyBand was introduced by Tripathy et. al. [6] to limit the growth of new positive cases by auto contact tracing and by encouraging essential social distancing Advancement of hardware and software especially smart phones with built-in GPS, Bluetooth, LTE and WiFi transceiver, faster CPU and real-time OS such as Android and IOS have given the opportunity for latest mobile application to be developed. For an application such as a social distance monitoring system, important modules to enable its main features are required. Modules such as distance tracker, location tracker and real time notification are necessary. To estimate the distance between users, a model that is based on wireless signal strength has been studied. Lam and She [7] has proposed a distance estimation on Moving Object using received signal strength (RSS) of BLE beacon

## 2.SYSTEM ARCHITECTURE

The system architecture of MySD can be seen in Fig. 1. MySD application integrates a number of objects or modules such as Bluetooth Distance tracker, GPS module, Google Maps API and COVID-19 Zone indicator. In general, MySD will monitor the distance between users using signal from Bluetooth Low Energy (BLE) transceiver

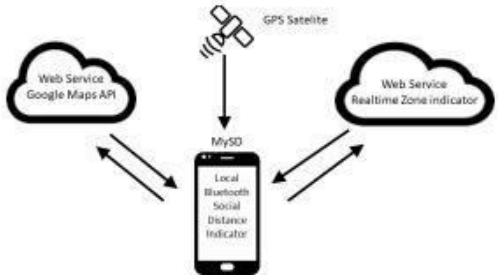


***Fig. 1: MySD System Architecture***

MySD leverages the BLE signal to estimate the distance between people based on several advantages that BLE has as compared to Wi-Fi [5]. In general, the BLE signals have a higher sample rate than that of the Wi-Fi signals (i.e., 0.25 Hz 2 Hz), consumes less power than Wi-Fi technology, more signals availability since it can be obtained from most smart devices

MySD is also equipped with the capability to determine the location of the user. It uses google map API that can inform the city or district the users are currently in based on the GPS information that the phone provides. By using this information, the app will be able to highlight the zone status based on the level set by the authority. In the case of Malaysia, the government has adopted a 3-tier zone level as shown in Table 1.

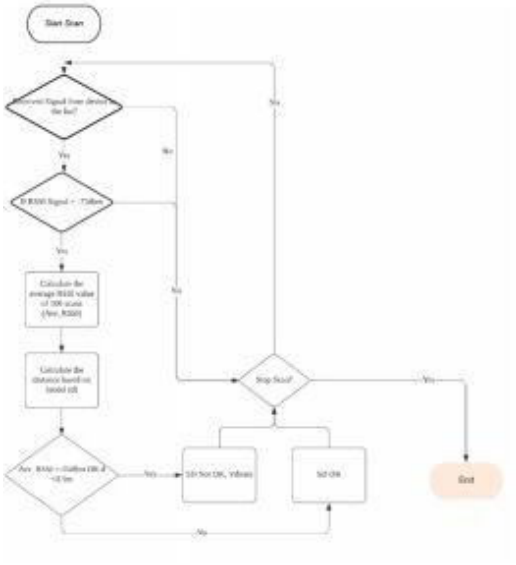

*Fig. 2.Social Distance Tracker's Flowchart.*

### *4. ALGORITHM*

1. Take an MRI photograph of a mammogram as an input.
2.Apply wavelet redecorate on the MRI photo to attain wavelet decomposed photograph resulting in 4 subbands. These are the LL (Lower decision model of photo), LH (Horizontal side records), HL (Vertical aspect statistics), & HH (Diagonal facet statistics) subbands representing approximation, horizontal, vertical and diagonal additives in the shape of coefficients, respectively. LL subband includes low diploma and the opposite three (LH, HL, and HH) contain immoderate level statistics. 3. Set approximation coefficients in LL identical to 0 and observe inverse wavelet redecorate to benefit an excessive pass photograph from the last (horizontal, vertical and diagonal) subbands. We name the ensuing image stage-1 (L1) detail image.
4. Add L1 to the particular picture to get a sharpened image.
5. Apply a K-way set of guidelines for segmentation of sharpened pictures.
6. Apply a thresholding approach to come across a tumor. We implemented Discrete Wavelet Transform (DWT) to MRI photographs due to the truth wavelets providing frequency records similarly to time-location localization. In addition, their multi-decision person lets us visualise images at several scales and orientations. The multi-selection assets offer records of approximately numerous high frequency components at clearly one in every of a type tiers of decomposition. Over-decomposition ought to however be prevented, because as the decomposition stages boom, there may be a fantastic threat that decrease frequencies become a part of element additives. This may restrict us to apply the simplest fewer degrees of decomposition due to the fact decrease frequencies will equal the old ok-technique set of hints , Input: the massive fashion of instructions and the populace U that Output: k instructions that satisfy the least rectangular errors.

### 5. RESULTS AND DISCUSSION

In this section, the observation and the performance of MySD will be presented. By incorporating geo location and zone level status, the user will be notified and reminded about the zone where they are. By enabling GPS tracking as seen in Fig. 4, MySD will check the COVID-19 zone level of the current location.


***Fig. 3: MySD with GPS Tracking Enabled***

In addition, the notification will be triggered by MySD by displaying the message in the notification list on the phone as shown in Fig. 5 as well as making the phone to vibrate temporarily

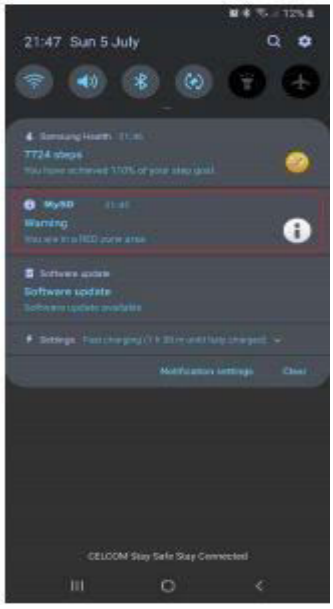


*Fig. 4: MySD - Alert and Notification*

We can also see that MySD will be able to determine different zone levels based on the location.


*Fig. 5: MySD - Zone Level Notification*

When the distance tracker is activated, MySD will start monitoring the distance between users who either carry smart phones or any other devices that can transmit BLE signals. In Fig. 7, we can see that if the distance is more than 0.5 meter or the average RSSI value is greater than -55dbm, MySD will consider the user is categorised as SAFE. Hence, no alert will be activated.


*Fig. 6: MySD - Zone Level Notification and Social Distance Monitoring (SAFE)*

in a situation that the user is too close and not adhering to social distance requirement, MySD will detect that the user is in category UNSAFE as shown in Fig. 8. When this is detected, MySD will trigger the phone to be continuously vibrating until the social distance requirement is met and the user is back to SAFE category again


*Fig. 7: MySD - Zone Level Notification and Social Distance Monitoring (UNSAFE)*

Based on the testing that have been tested, MySD is able to inform and monitor users who installed the application on their Android phones. In addition, all main features of MySD has been tested and are working correctly.

## 5.CONCLUSION AND FUTURE WORKS

Taking into account the importance of social distance in managing and reducing the probability of COVID-19 disease from continuously spreading which can cause the healthcare system to collapse due to high number of patient, MySD can offer a smart solution to public to monitor and remind them to maintain the distance when in public areas. MySD allows the creation of invisible safe zones surrounding the users to minimise the chances of getting infected with COVID-19 in the public or crowded areas. By incorporating the current zone information, user will be more alert to comply to social distance in the high risk areas (i.e. Red and Yellow zones). The alert which is in the form of notification and vibration will help further the user to force themselves to maintain a safe distance. In the future, additional backend processes will be included that allow advanced statistical analysis to be done which can be used by the authority, facilities or building owner to monitor the level of compliance among the people or visitors.

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