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Social Distance Monitoring Model for Students in Unlock Phase

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Abstract - **The onset of pandemic due to Corona virus (COVID-19) had made the world to undergo a lock down phase. Many experts including World Health Organization (WHO) advised people to follow social distancing in order to avoid rapid growth of the virus. However due to unlock of many institutions and organizations such as schools, colleges and theatres, social distancing can be violated especially for the children who were not aware of social distancing. Due to which many students and teachers can be infected by the virus. An example incident is, in Andhra Pradesh over 575 students and 829 teachers were affected. So in order to avoid such incidence we propose a model to monitor/measure the distance maintained by everyone with the location coordinates of each and every individual. It is shared to a system with the help of NodeMcu which is connected with the same network as with the system. The system compares each and every individual's coordinates by converting into meters. If the calculated distance is less that 1m then the system finds out that two or many persons violate the social distancing and sends the message to the respected persons accordingly via NodeMcu with the help of their host ID. The NodeMcu alerts the user by turning ON the LED light which is attached with it. The people are warned to maintain social distancing thus they stay safe.**

Keywords- *Coordinates, Haversine algorithm, NodeMCU, Social distance.*

I. INTRODUCTION

One way of minimizing the spread of an infectious disease is to practice social distancing, for example, COVID-19. As most cultures have been conscious of the importance of staying away from people who have suffered from an infection for many years, this is not a new idea. The goal is to decrease incidence, delay the peak of the epidemic, lower the magnitude of the peak of the epidemic, and distribute cases over a longer period of time to lessen the strain on the health-care system. Currently, the virus that causes COVID-19 transmits easily from person to person [1-4]. The goal of social distancing is to reduce contacts between possibly infected people or between high-transmission population groups and non-transmission or low-transmission population groupings in order to reduce or obstruct COVID-19 transmission in a community. It is an action taken in order to avoid interaction with other people, maintaining a distance of approximately two meters from another human has been proposed to result in a marked reduction in the transmission of most strains of the flu virus, including corona virus. In reality, this means that avoiding intimate contact with other individuals will help reduce the spread of contagious illnesses.

COVID-19 can be reached and spread to anyone. Everyone has a role to play in reducing the spread and in protecting themselves, their communities and their societies. In addition to practicing routine measures to mitigate COVID-19, we must avoid being exposed to this virus and postpone its dissemination through communities to establish space between you and others. The objective of the

proposed work is to alert the people if social distance is violated. This is device is will change the colour from green to red and buzzing sound will alert you to remain more than a meter away from other people [5-7].

The paper's structure is as follows: Early research is discussed in Section 2. Section 3 discusses the proposed system in further detail. Section 4 describes the result and subsequent discussions. Section 5 contains the conclusion of this work.

II. RELATED WORK

Cristani et al. [8] proposed Visual Social Distance (VSD) Estimation method in images. Generally, the estimation of social distancing is a crucial task in two-dimensional images. Also, it isn't very easy to calculate the distance with respect to the physical conditions. To improve the social distancing accuracy, this paper introduced the method called VSD that detect the distance between the human objects in the image. Furthermore, this paper discussed and related to exiting related work how it was managed in the Social Signal Processing (SSP) and Computer Vision (CV). Also, this paper discussed the real-time applications of VSD.

Yang et al. [9] developed a social distance detection using AI to minimise the transmission of the dangerous disease link COVID-19. Keeping a social distance is an important aspect in preventing the transmission of sickness. The individual people are very difficult to maintain the social distance among the large population countries like India, China, etc. So, we need new tracking system to monitor the people. This paper proposed AI based social distance detection algorithm to detect the distance and finally, it will be send the warning to the people. Furthermore, the proposed system is taken into account the key factors such as, calculate the distance is based on the current frame, the warning will be send to the respect person, it is completely automated and it is open source. To analyse the social distancing on the video frame, this paper is used Deep Learning algorithm to measure the accuracy accurately. The proposed work is compared with recent popular existing work. The proposed work outperforms than existing work.

Mu Mu [10] proposed an IoT based system to monitor the crowd in the University campus. In this pandemic situation, this kind of system plays a major to reduce the spread of COVID. This system is combined Software Defined Network (SDN) concepts in IoT to assist the WiFi to monitor the crowd very effectively. This system is created the crowd behaviour model and it is tested in the University campus. Finally, the notification will be send to the respective person to short out the crowd.

Nadikattu et al. [11] proposed a smart device for maintaining social distancing for COVID. According to the WHO statement that maintaining the social distancing is a only solution to the spread of COVID. This paper proposed a novel localization method to track the people in the outdoor environment. Also, it is used AI algorithm in smart devices to create alert among the people in the public area. This concept is entirely new and also cost wise is very cheap. The experiment is conducted several times. It is provided the better accuracy that reduces the spread of corona.

Rusli et al. [12] suggested a technique for measuring social distances effectively. This system monitor the people and instantly keep on provide the alert. The number of COVID spread can be reduced due to the high accuracy of alerting the people to maintain the social distance. This system is used the smart phone is integrated with Bluetooth, Wi-Fi, LTE and GPS. Furthermore, this type of system is most needed to reduce the spread of COVID. However, this system is concentrated on only the present data.

III. PROPOSED WORK

This paper proposes social distance maintenance monitoring, that alerts the person by turning ON the LED light, if they had violated the social distancing by having an average gap of 2m. The NodeMCU identifies the user's location coordinates by using a location API. These coordinate where shared to a computer (server) which converts the degree into radians to determine the angle. We may then calculate the distance between each user using the Haversine approach. Any time the distance between any two devices is less than 2 metres, an alert message is sent to NodeMCU, which is shown by the sensor's LED light being illuminated. Unlike any other methods, our model can work precisely in case of bio bubble and can work on any direction and cost to implement is comparatively less than other models.

NodeMcu(ESP8266) is an open source development board and firmware, it is specially used for IoT based projects. Its software is based on the ESP8266 WiFi System on Chip (SoC), while its hardware is comprised of the ESP-12 wireless module. In our model the responsibility of this is to identify the user's location coordinates with the help of Location API and to share it with the system (server), and to turn ON the light after receiving the alert message from the server. Since NodeMcu operates at an average voltage of 3.3V for battery, we are using a voltage (V) divider to reduce the number of volts at top and bottom by using resistors (26k and 10k respectively).

$$V_{out}=V_{in} * R_{bottom} / R_{bottom} + R_{top} \quad (1)$$

Radians are a unit to measure angles. It is used in place of degrees. A complete circle is over 6 radians (6.28 radians approximately). In our model it is used to convert user's coordinate degrees into radians.

A. Haversine Distance measurement

International Journal of Recent Trends in Computer Science and Applications, 2022, Vol:1, Issue:1, Page Number:5-8

Haversine formula determines the distance between 2 points in a sphere based on their respective latitudes and longitudes. It can be determined by the below formula.

$$a=\sin2(\Delta\ \varphi/2) + \cos\varphi1 * \cos\varphi2 * \sin^2(\Delta\lambda/2) \quad (2)$$

$$c= 2*\text{atan2}(\sqrt{a}, \sqrt{(1-a)}) \quad (3)$$

$$d=R*c \quad (4)$$

where R - Earth's radius(radius=6,371), λ –longitude of the Earth and φ –latitude of the Earth.

The algorithm 1 represents Location coordinates from the NodeMCU. Predicting whether the two or many persons were violating the social distancing or not by turning ON/OFF the LED light.

Algorithm1: social distance measure

```
Establish a connection with NodeMcu
{
Function to measure distance based on Longitude and
Latitude
{
Convert degree to radians
Use Haversine formula to determine the distance
Function sends Message to node MCU
Fetch the coordinates (In our example case 2 coordinates)
and their IP address
Compare calculated distance with 2 meters (0.71)
if (decimal(p).compare(0.71)=!=1)
{
sendMessage(True)
Distance obtained > 2
        No Message passed
Else
        Message passed to NodeMcu
        LED ON
}
}
```

To establish the connection with Location API over Wifi the algorithm 2 is used. The output will be the coordinates of the location.

Algorithm 2: establish the connection with Location API over Wifi

```
Connect with the LocationAPI
Establish a connection with a WiFi network
{
User enters the ID and Password
Hostname & Geo-location URL is obtained
Initially
longitude=0.0;
latitude=0.0;
accuracy=0.0;
}
connect with client and call the API
{
Update the longitude and latitude value
Update latitude=["lat"]
Update longitude=["lon"]
Accuracy=[“acc”]
}
 if (data == 0)
{
 digitalWrite (LED_value, LOW);
}
Else if (data == 1)
{
 digitalWrite (LED_value, HIGH);
}

}
close the connection
}
```

The table 1 denotes the actual distance and the predicted distance for which the graph and the values are noted in figure 1.

TABLE I
ACTUAL DISTANCE VS. PREDICTED DISTANCE

persons	Latitude	Longitude	Actual distance (m)	Predicted Distance (m)
1	11.664787	78.148148	0	0
2	11.664793	78.148146	2	1.96
3	11.664791	78.148147	3	2.84
4	11.664788	78.148149	1	0.93
5	11.664792	78.148153	4	3.89
6	11.664794	78.148155	6	6.12
7	11.664785	78.148146	2	1.87
8	11.664772	78.148132	15	14.75
9	11.664798	78.148159	10	10
10	11.664784	78.148145	3	3.05

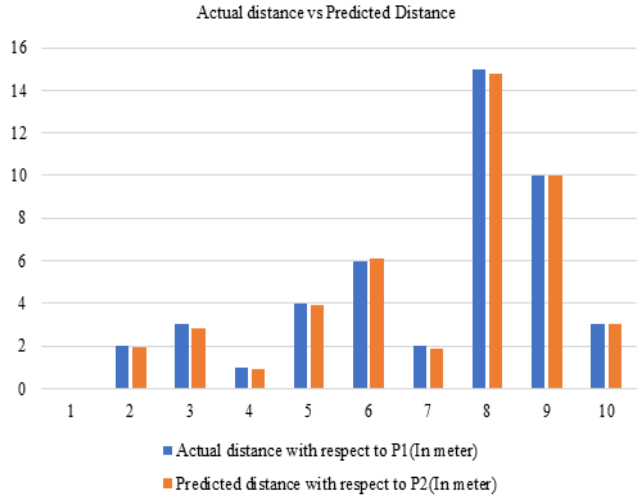

FIG.1 COMPARISON GRAPH

IV. CONCLUSION

The life of people has changed dramatically. The colleges and schools are planning to reopen that can be more dangerous. Out of several ways social distancing is one of a way to be safe. The purpose of social distancing is to reduce or eliminate COVID-19 transmission in a society by limiting contact between possibly infected people or between high-transmission population groupings and non-transmission or low transmission population groups. Using Haversine algorithm with Internet of things the coordinates are calculated. The proposed model alerts the user by turning ON the LED light which is attached with the host ID. Hence the people are warned to maintain social distancing. This can help the students in the unlock phase

REFERENCES

1. Dashraath, P., Wong, J. L. J., Lim, M. X. K., Lim, L. M., Li, S., Biswas, A., ... & Su, L. L. (2020). Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. American journal of obstetrics and gynecology, 222(6), 521-531.
2. Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., ... & Bullmore, E. (2020). Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. The Lancet Psychiatry, 7(6), 547-560.
3. Prasetya, D. A., Nguyen, P. T., Faizullin, R., Iswanto, I., & Armay, E. F. (2020). Resolving the shortest path problem using the haversine algorithm. J. Crit. Rev, 7(1), 62-64.
4. Soe, N. C., & Thein, T. L. L. (2020). Haversine Formula and RPA Algorithm for Navigation System. International Journal of Data Science and Analysis, 6(1), 32.
5. Prasetyo, S. E., Utomo, A. B., & Hudallah, N. (2018). Implementation of Google Maps API 3 with Haversine Algorithm in the Development of Geographic Information System Boarding House Finder. In Proceedings of the 7th Engineering International Conference on Education, Concept and Application on Green Technology, Eic (pp. 227-233).
6. Sangsanit, K., & Techapanupreeda, C. (2019, January). NodeMCU choreography automation by CoAP. In 2019 International Conference on Information Networking (ICOIN) (pp. 350-353). IEEE.
7. Azwar, A. G., Laluma, R. H., & Halim, R. P. (2019, October). Smart trash monitoring system design using NodeMCU-based IoT. In 2019 IEEE 13th International Conference on Telecommunication Systems, Services, and Applications (TSSA) (pp. 67-71). IEEE.
8. Cristani, M., Del Bue, A., Murino, V., Setti, F., & Vinciarelli, A. (2020). The visual social distancing problem. IEEE Access, 8, 126876-126886.
9. Yang, D., Yurtsever, E., Renganathan, V., Redmill, K. A., & Özgüner, Ü. (2021). A vision-based social distancing and critical density detection system for COVID-19. Sensors, 21(13), 4608.
10. Mu, M. (2020). WiFi-based Crowd Monitoring and Workspace Planning for COVID-19 Recovery. arXiv preprint arXiv:2007.12250.
11. Nadikattu, R. R., Mohammad, S. M., & Whig, D. (2020). Novel economical social distancing smart device for COVID19. International Journal of Electrical Engineering and Technology, 11(4).
12. Rusli, M. E., Yussof, S., Ali, M., & Hassan, A. A. A. (2020, August). Mysd: a smart social distancing monitoring system. In 2020 8th International Conference on Information Technology and Multimedia (ICIMU) (pp. 399-403). IEEE.

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