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Social Distance and Notification Alerting System using IoT

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Abstract:Coronavirus (COVID-19) a deadly disease originated in China has spread exponentially across the world since it started, affecting people's [10] lives, social economies, and medical systems greatly. So far, incredibly little information about this infection is being considered and extraordinary efforts are being made by foundations of government and clinical examination to discover immunizations and solutions to prevent further spread of this disease among individuals, thus reducing the amount of passages due to this disease. The doctors and researchers have suggested that in the absence of therapeutic drugs the only possible and effective way to reduce the disease from further spreading is to maintain social distancing among people. To relieve the blend of vulnerable and irresistible people and the danger of airborne particles coming down with the infection, it is encouraged to keep up at any rate 6 feet of gap between the individuals in open regions. Therefore, keeping this in mind this project mainly focuses on developing a social distance surveillance system using ultrasonic sensor and deep techniques that focus on monitoring the distance maintained by people in public areas like supermarkets and other workplaces. This automated system, when incorporated into the local area, identifies people in the Iot technology and monitors providing alerts about distance violation. [1] In case of excessive violations, it sends an SMS alert notification to the assigned person for further measures to be taken regarding the situation. Through this system, the spread of COVID-19 could be reduced to a greater extent.

Key Word: COVID-19, SMS alerts

I.INTRODUCTION

COVID-19 is a type of virus that causes cold, fever, headache and for some people it causes severe problems like shortness of breathing, lung damage which in turn leads to death. WHO declares that the virus spreads from people to people more easily by the droplets from the nose and mouth. The spread is mainly due to the physical contact with the people who has affected by COVID-19 [6]. Due to this, the death rate has been kept on increasing in the past years. Therefore, government announced a lockdown for some period of time. Now the death rate decreased to a certain level, but still the scariness 9 of the COVID-19 does not drop. The Government released the lockdown with some conditions like social distancing and covering the faces with a mask so that the spread can be kept in control [8]. With the precautions followed the Government allowed the college people and school people are started their regular flow of going to the colleges and schools. But it is difficult to maintain the social distance in the colleges. Because of this, the widespread of COVID-19 may occur again in a huge amount. Therefore monitoring the social distance among the college is more important. 1 To monitor the people, the existing systems by different researchers use different techniques to detect the people safety movement using Computer Vision, sensors and deep learning methods. However, the accuracy, time complexity and the realtime working of the system show fewer scopes [7] [10]. In the wake of the COVID-19 pandemic, social distancing has become a crucial aspect of preventing the spread of the virus. To ensure that individuals maintain a safe distance from each other, we can use ultrasonic sensors and Arduino to create a social distance monitoring system. This system can be used in public places like parks, schools, malls, and hospitals.

II. METHODOLOGY

The ESP32 is a powerful microcontroller that has gained popularity in recent years due to its wide range of capabilities and low cost. It is manufactured by the Chinese company Espressif Systems and was first released in 2016. 2 The ESP32 is the successor to the ESP8266 microcontroller, which was also developed by Espressif Systems.One of the key features of the ESP32 is its dual-core processor, which consists of two Tensilica LX6 cores that can operate at up to 240 MHz. This provides significant processing power, making it suitable for a wide range of applications. In addition to its processing power, the ESP32 has 520KB of SRAM and 4MB of flash memory, which provide ample storage for program code and data.The ESP32 also includes built-in Wi-Fi and Bluetooth connectivity, making it an ideal platform for building [7] IoT devices and other wireless systems. The Wi-Fi connectivity supports both 2.4 GHz and 5 GHz bands, while the Bluetooth connectivity supports both Classic Bluetooth and Bluetooth Low Energy (BLE). This makes it easy to connect the ESP32 to other devices, such as smartphones, laptops, and other microcontrollers.

[2] In addition to its wireless capabilities, the ESP32 includes a wide range of peripherals and interfaces, including 18 analog-to-digital converter (ADC) channels, 2 digital-to-analog converter (DAC) channels, 3 UART interfaces, 2 I2C interfaces, and 2 SPI interfaces. It also includes 16 PWM channels, a built-in temperature sensor, a real-time clock (RTC), and a touch sensor interface. This makes it easy to interface with a wide range of sensors, actuators, and other devices.One of the key advantages of the ESP32 is its low power consumption. It includes power-saving features such as sleep modes and dynamic voltage scaling, which help to reduce its power consumption. This makes [2] it an ideal platform for battery-powered IoT devices, which need to operate for extended periods without being recharged.The ESP32 is also highly customizable. Espressif Systems provides [1] a range of modules and development boards that are based on the ESP32. The hardware design and software code are also open-source, which means that they are freely available for anyone to use and modify. This makes it easy for developers to customize the ESP32 to meet their specific needs.In conclusion, the ESP32 is a powerful and versatile microcontroller that offers a wide range of features and capabilities. Its dual-core processor, [2] built-in Wi-Fi and Bluetooth connectivity, and wide range of peripherals and interfaces make it an attractive option for developers building IoT devices and other embedded systems. Its low power consumption, customizability, and affordability further enhance its appeal.

Detecting Social Distance

Euclidean distance is calculated between all pairs of the centroids. Equation shows the Euclidean distance.

$$\square\square\square\square\square\square\square\square\square\ \square\square\square\square\square\square\square\square = \sqrt{(\square_2 - \square_1)^2 + (\square_2 - \square_1)^2}$$

Where (X1, Y1) & (X2, Y2) are the Centroid of two persons

With the Euclidean distance calculated, the calculated distance is compared with the safer distance suggested by WHO. As of now, the safer distance is 2 meters. The frames in which the people are not in the safer distance; that is if the calculated Euclidean distance is less than the safer distance, then the people are bounded with red color in the frame. Moreover, to instruct the people to maintain the social distance, the alert is sent to the respective coordinators through SMS. The message contains the frame in which the people exceeded the safety distance. So [1] that it is helpful to take further actions to avoid spreading COVID-19. The in-charge faculties need to create an account in the Twilio services, which is an online application. Twilio helps to send an SMS to the registered mobile number.

Step 1: Start

Step 2 : Set distance Value for Sensor

Step 3 : calculate distance from sensor

step 4 : if (distance > set Value)

Buzzer On

else

Buzer off

Step 5: Send to blynk cloud

Step 6: End

This [3] seems to be a basic algorithm for a distance sensor system that triggers a buzzer based on the measured distance value.

Here's a breakdown of the algorithm:

Step 1: Start This is the starting point of the algorithm.

Step 2: Set distance Value for Sensor A value is set for the distance sensor to detect a certain distance from an object.

Step 3: calculate distance from sensor The distance is measured from the sensor to an object in front of it.

Step 4: if (distance > set Value) If the distance measured is greater than the set value, the next step is executed.

Buzzer On The buzzer is turned on to indicate that the object is within a safe distance.

else 8 If the distance measured is less than or equal to the set value, the next step is executed.

Buzzer off The buzzer is turned off to indicate that the object is too close.

Step 5: Send to blynk cloud The measured distance and the status of the buzzer are sent to the Blynk cloud, which is an Internet of Things (IoT) platform that can be used to remotely monitor and control devices.

Step 6: End This is the end of the algorithm.

Reading of Esp32

2 The ESP32 microcontroller has a built-in LED that can be used for various purposes, such as indicating the status of the system or providing visual feedback.To control the built-in LED on the ESP32, you can use the Arduino programming language and 3 the ESP32 board package for the Arduino IDE. Here's a basic example code to blink the built-in LED 2 on the ESP32: 7.1Reading data from Esp32 module.The ESP32 microcontroller has a built-in LED that can be used for various purposes, such as indicating the status of the system or providing visual feedback.To control the built-in LED on the ESP32, you can use the Arduino programming language and the ESP32 board package for the Arduino IDE. Here's a basic example code to blink the built-in LED on the ESP32:In the setup function, we configure the LED_BUILTIN pin as an output. In the loop function, we use the digitalWrite function to 3 turn the LED on and off with a delay of one second in between.This is a simple example of how to control the built-in LED on the ESP32 using the Arduino IDE. However, it's 2 important to note that the built-in LED pin may vary depending on the specific ESP32 board you are using. In some cases, you may need to refer to the pinout diagram for your board to determine the correct pin to use for the built-in LED.In the setup function, we configure the LED_BUILTIN pin as an output. In the loop function, we use the digitalWrite function to 3 turn the LED on and off with a delay of one second in between.This is a simple example of how to control the built-in LED on the ESP32 using the Arduino IDE. However, it's important to note that 6 the built-in LED pin may vary depending on the specific ESP32 board you are using. In some cases, you may need to refer to the pinout diagram for your board to determine the correct pin to use for the built-in LED.

III. RESULT & ANALYSIS

IV. RELATED WORK

Researchers who worked on detecting the social distance from the video are using various techniques like Internet of Things (IoT), Computer Vision and Deep Learning techniques. Afiq Harith Ahamad et al. introduced a method “Person Detection for Social Distancing and Safety Violation Alert based on Segmented ROI” to detect social distance among the person using MobileNet Single Shot Multibox Detector (SSD) algorithm. The distance between the people is found using the central points of the persons. This method also finds the people who are in the restricted area and gives the alert based on Region Of Interest (ROI). Though the work gives good accuracy for indoor videos, the accuracy for outdoor videos is less [2]. In order to acquire more accuracy, Suresh K et al. proposed a solution “Social Distance Identification Using Optimized Faster Region-Based Convolutional Neural

Network” which detects the social distance of the person using Optimized Faster Region-Based Convolutional Neural Network (OFRCNN) which is a modified version of CNN. COCO dataset is used for training the model. The dataset is split into 6:1:3 ratio for training, validation and testing respectively. The person with the not safer social distance is marked with the red bounded box. The overall accuracy of the solution is 97%. Though the accuracy is better, the time for training the model is substantially longer [3]. In order to make the faster and more accurate training, Sergio Saponara et al. proposed the work “Implementing a real-time, AIbased, people detection and social distancing measuring system From the state of the art, researchers introduced various algorithms to identify social distance among people. But the accuracy in detecting social distance is less. Moreover, the approaches didn’t use the different videos taken at different times like in the morning and evening. In addition to that, the alert system to the respective in-charge or higher official is not maintained. Thus, the proposed work solves all the short comes of the existing methods.

V. CONCLUSION

One of the most significant precautions in avoiding physical contact that could contribute to the spread of coronavirus is social separation. Viral transmission rates will be increased as a result of non-compliance with these rules. system that detects the people who exceed the safety limits and also sends the alert or warning message to the respective coordinators through SMS.

VI. FUTURE WORK

The work shows better results in terms of identifying the person and Since covering the face with a mask also plays a vital role in preventing the attack of COVID-19, the work will extend to detect the face mask covering along with the social distancing.

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