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Mobile Application Based Oil Tank Security System

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ABSTRACT: In this paper, a mobile application has been developed to enable or disable security protection around oil tanks to overcome theft. From the mobile application, we can make the protection enabled or disabled. When the protection is enabled then if any person or animal goes near the oil tank then automatically the buzzer alarm starts blowing. Then the officers in charge can take immediate action against it. When the protection is disabled by the application then there is no alert sound if anyone approaches towards the tank. Ultrasonic sensor has been used for measuring the distance of the person or the animal. If the distance is less than a threshold value then only the alert buzzer is activated. The application is password protected and the administrator only can access the protection control. The application is for Bluetooth device and is interfaced with the microcontroller which is interfaced with the sensor and the alarm.

KEYWORDS: Mobile Application, Ultrasonic Sensor, Microcontroller [Arduino Uno], Bluetooth, Alarm Buzzer [LED].

I. INTRODUCTION:

[1].In the age of technological advancement, theft has been alarmingly increased. With the price hike of the fuels like petrol, diesel, other solvent oils, the oil theft has been increased. Due to pollution, green house effect and other atmospheric evolution, the underneath layer of the oil in our mother earth is getting down. In spite of that, the theft of oil has been increased a lot day by day and the oil is black marketed. That is why necessity of the oil preservation is a must. There are several literatures [1-3] on the oil security system design and all the systems incorporate security locally that means at the place of the incidence but there is no information or alert process to the central office from where the oil tanks are monitored.

[2].Our work is purely a combination of hardware and software where the security system is controlled by an application. If any unknown person or animal approaches to the vicinity of the oil tank then automatically central office gets the alert information. But if some office staffs approaches toward the oil tank then he or she can disable the security system from the central office earlier and then can approach towards the oil tank. This idea is new to the best of our knowledge and belief.

[3].Here we aim to enable or disable the protection around oil tanks to get rid of oil theft. In this equipment a password protected application is designed to enable or disable the security system. The password is only known to the main administrator. The security system is hardware based which is controlled by the application. The work is totally new to the best of the knowledge of the authors and therefore can't be compared with other similar works**.**

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II. WORKING PRINCIPLE:

In this work, as a microcontroller Arduino Uno AtMega328P has been used though Arduino Mega 2560 can also be used. It is a 16MHz microcontroller and run by 5V volt DC power supply.

The ultrasonic sensor (HC-SR-04) uses sound wave with ultrasonic range of frequency (almost in Mega Hertz range) which is inaudible.

The protection is activated and the circuit is connected. When the obstacle (here the hand) is less than or equal to 20 c.m. distant from the sensor then the LED is switched on.

Next we perform the operation to disable the protection. As a result, the sensor is unable to sense the obstacle.

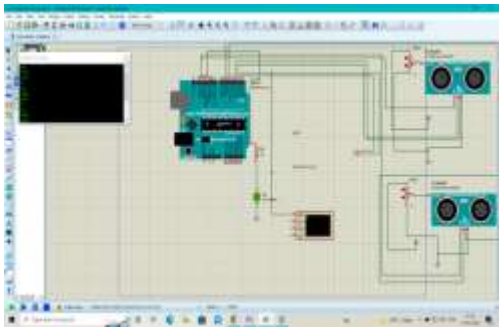

Figure 1.1 : Circuit Working Figure

III. METHODOLOGY:

- **MOBILE APPLICATION** :

The application has been developed in MIT APP INVENTER platform. Here few code blocks have been used to develop the entire application. Fig. 2 shows the entire layout of the mobile application.

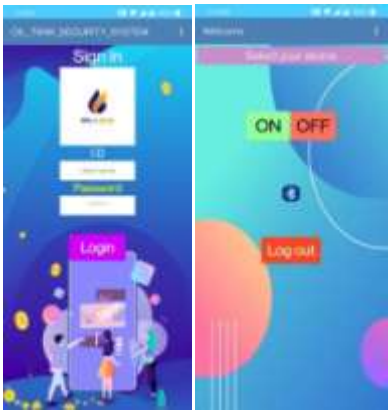

Fig. 1 Layout of the application

The yellow colored box in Fig. 1 is the list picker where the paired devices are shown. When the mobile Bluetooth is turned on then the paired devices are listed in the list picker. When the user selects the required device and if it is turned on then the label showing "No Connection" is changed to "Your device is connected". To turn on and off the device, there is a provision for user ID and Password which is kept to the administrator. When the administrator put the user ID and password correctly then the button for activation of the system is accessible. Now if the button is slid to on then the security system is active.

- **Application Algorithm :**

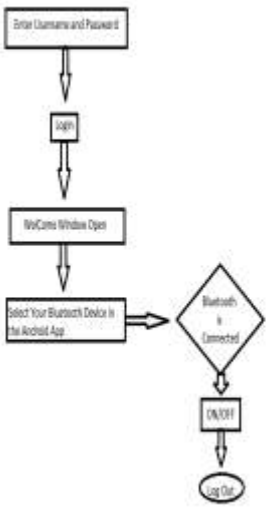

Fig. 2 Flowchart of the application

The flow chart for application is shown in Fig. 2. The application has been developed using MIT App Inventor by some code blocks.

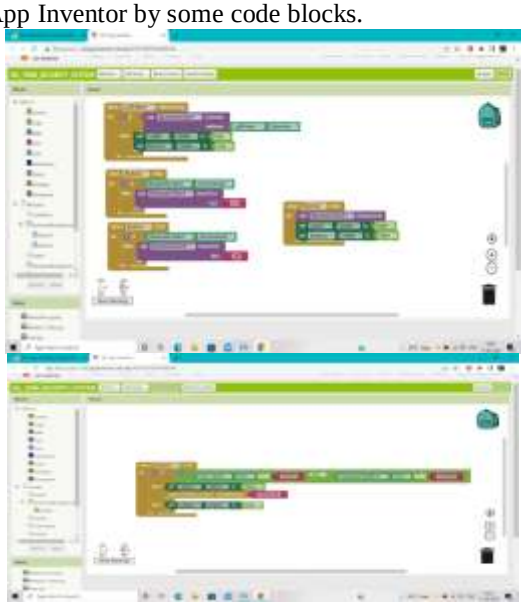

Fig. 3 Code blocks for the application

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Fig. 3 shows the figure of the code blocks for the application. It can also be designed using MIT APP INVENTER.

- **Hardware Application using Microcontroller :**

To get the information for the presence of any living object, ultrasonic sensor based system is used here. The sensors, surrounding the oil tank, are turned on or off based on the application. When the sensors are turned on then if any object approaches towards the oil tank then the sensors measure the distance of the object and accordingly sends alert signal to the main administrative office (only when the distance is less than an specified value). But when the sensors are turned off then there is no opportunity to send alert. This part is purely controlled by the mobile application.

- **Microcontroller Programming Fundamentals :**

In this work, as a microcontroller Arduino Uno AtMega328P has been used though Arduino Mega 2560 can also be used. Fig. 4 shows the diagram for the microcontroller board. It is a 16MHz microcontroller and run by 5V volt DC power supply. The programming language used here is embedded C. For serial communication, the code **"Serial.begin(9600)"** is used. Here 9600 is the baud rate or the data transfer rate. **"Serial.readString()"** converts the byte code to Unicode string. This string is then converted to integer (if there is only integer in the string) with the help of **"toInt()"** method which is inbuilt in the "**String**" class. To detect intrusion, ultrasonic sensors have been used around the oil tank. There are four ultrasonic sensors used in the four directions (north, south, east and west) of the oil tank. The switching on and off conditions of the sensors are controlled by the applications (the power connection is controlled here). Moreover there is a alarm buzzer which is controlled by the ultrasonic sensor.

Fig. 4 Arduino Uno AtMega328P microcontroller board

- **Ultrasonic Sensor (HC-SR-04) :**

The ultrasonic sensor uses sound wave with ultrasonic range of frequency (almost in Mega Hertz range) which is inaudible. Fig. 5 shows the ultrasonic sensor interfaced with the microcontroller. The sensor has the operating frequency 40 KHz. It has four terminals (power, ground, trigger and echo). From trigger terminal, a 12 microsecond periodic pulse with 10 microsecond pulse width is generated. This periodic pulse is reflected by the thief or any other animal (say obstacle) approaching towards it. The reflected wave is received by the echo pin. The distance (d) of the sensor from the obstacle can be measured with the following equation.

$$d = \frac{T \times \text{Velocity of sound}}{2} \quad (1)$$

Where, T=time taken by the wave between transmission and reception (measured in microsecond).

Here velocity of sound = 343 m/second=34300 cm/10^6 microsecond= 0.034 cm/microsecond. Thus,

$$d = \frac{T \times 0.034}{2} = T \times 0.017 \quad (2)$$

Fig. 5: Ultrasonic sensor interfaced with Arduino microcontroller

- **Bluetooth Device :**

Fig. 6 Bluetooth Device

Bluetooth is a short distance very high speed wireless communication device. Bluetooth

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works in almost 2.4GHz speed but the covering distance is maximum 10 meters. Bluetooth devices can be paired using the AT commands. It has basically five pins: (1) Supply, (2) Ground, (3) Receive, (4) Transmit and (5) Enable. Bluetooth is connected to the microcontroller to receive the command sent by the mobile application.

- **Circuit Diagram :**

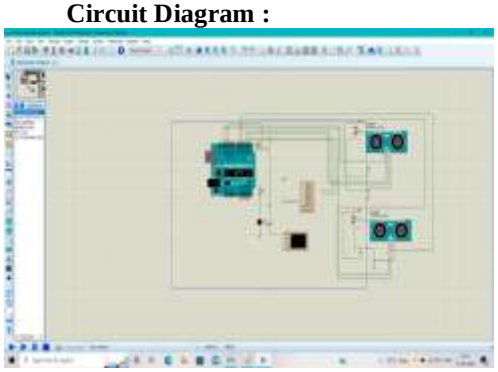

Fig. 7: Complete Circuit Diagram

- **Overall Operation :**

At first we perform the operation to enable the security system. To do so the user authentication is established by putting proper user name and password. Then the protection system is enabled that is the slider switch for turning on or off the system is enabled.

IV. RESULTS OF FINDING :

The research should have some successful outcomes which is called result of finding. It should be analyzed to exhibit its better performance than earlier reported similar works. Authors can use graphical approach to analyze the result. Fig. 8 and Fig. 9 are the output of our entire project.

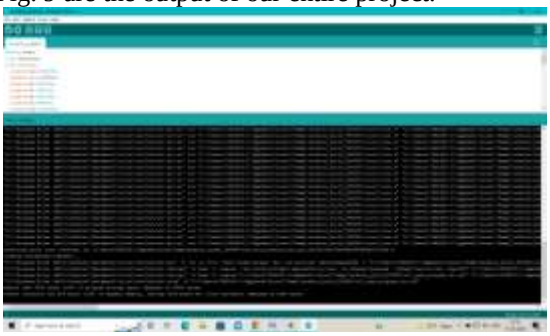

Fig. 8: Microcontroller Program Output

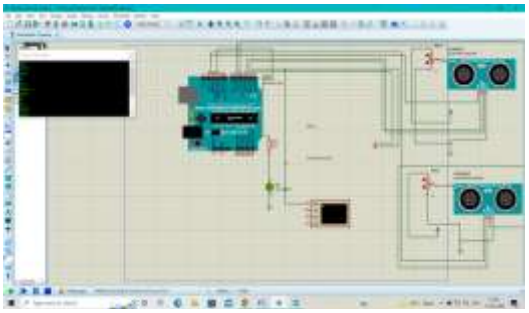

Fig. 9: Proteus Simulation Output

V. CONCLUSION:

In this paper, we designed a Proteus Simulation Software and the Mobile app designed by MIT APP INVENTER. The Mobile applications were developed to create MIT APP INVENTER experiments. Moreover, the reading of the experimental data was displayed on the applications' screen. The applications were developed in Code Block. The work was totally new to the best of the knowledge of the authors and so could not be compared with any other existing works.

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