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Radar Based Security System Alert

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Abstract: Radar-based security systems are now a reliable option for both intruder detection and perimeter defence. This research presents a unique approach to integrate state-of-the-art signal processing methods to improve the performance of such systems. The suggested system tracks and detects moving objects inside an established region using radar technology. The system utilizes advanced processing of signals methods, such as fuzzy logic, neural networks, and wavelet analysis, to differentiate between everyday activities and possible security risks. The network of radar sensors that are placed strategically around the perimeter of the secured region makes up the radar-based security system. Every radar sensor keeps an eye on the environment and detects any moving objects that come within range. Wavelet analysis is used to analyze the collected signals in real-time and extract important properties, such as object velocity, direction, and size.

Keywords: Ultrasonic sensor, Esp32 cam, Security, GSM Module, Chloroform Spraying Motor, ESP32, DC Motor.

I. INTRODUCTION

It's more important than ever to have dependable and efficient solutions in the constantly-changing security landscape. In this field, radar-based safety measures have become indispensable due to their unparalleled ability to identify and monitor possible threats and intruders. These systems use radar sensors to detect items inside a predetermined region and notify security staff in real time. Compared to conventional security solutions, radar-based security systems provide a number of benefits. They are appropriate for indoors as well as outdoors since they can operate in a variety of atmospheric conditions, including fog, rain, and darkness. Furthermore, radar detectors have a wide field of view. The fundamental ideas of radar-based safety measures are explored in this study along with how they are used in asset monitoring, intrusion detection, and perimeter defence. It also looks at the different parts of these systems, such the alarm systems, signal processing techniques, and radar sensors. Additionally, the study looks at interference and environmental issues as well as possible solutions to these problems using radar-based security systems. offering full surveillance functionalities. Furthermore, relative to other sensor methods, radar-based devices are less likely to generate false alarms, allowing security staff to react quickly to real threats. All things considered, radar-based security systems are state-of-the-art technologies that provide a dependable and effective means of boosting security in a variety of applications. These systems can offer reliable security solutions that adapt to the changing demands of contemporary security concerns by utilizing the abilities of radar technology.

II. EXISTING SYSTEM

CCTV cameras are used by banks to keep an eye on activity within as well as outside of their buildings. These security cameras are placed in strategic areas at ATMs, teller counters, and access points to enable visual surveillance and store video for further analysis. With closed-circuit television (CCTV), signals are monitored but not publicly broadcast, mostly for security and surveillance reasons. CCTV depends on the careful positioning of sensors and the monitoring of their feed on external monitors. CCTV is widely used for a number of purposes, such as traffic monitoring, keeping an eye on places that would be dangerous for humans, like extremely radioactive as well as toxic industrial environments, monitoring the behavior of inmates and possibly hazardous patients in medical amenities, keeping perimeter security in medium- to high-security areas as well as installations, and guaranteeing building and reasons security.

III. PROPOSED SYSTEM

Using an ultrasonic module, we have created a radar system to add to the current CCTV cameras. Our ultrasonic sensor detects stealing activity, particularly at night, in locations such as diamond stores, bank lockers, and other protected areas, while CCTV cameras manage routine video recording. The ultrasonic radar emits and receives echo signals inside the enclosed region while it continuously monitors the surroundings. A tiny computer then examines these signals.

The device sounds an alert whenever an aberrant echo signal suggests something odd, such as the existence of thieves or other objects that are moving. It can use a GSM modem to make calls and send SMS messages. To further strengthen security, an ESP32 Cam takes a picture of the burglar and sends it to the user over Telegram. Through the Blynk app, the ESP32 Cam connection enables the user to think about taking action, such deploying countermeasures like spraying chloroform. Unlike traditional methods that require analysing CCTV footage the next day, our real-time warning system notifies users as soon as a burglar enters the area being tracked.

The block diagram for an alarm from a radar-based security system is shown below. The following elements are present in the diagram: ESP32 Controller, ESP32 Cam, Power Supply, Ultrasonic Sensor, IR Sensor, Buzzer, UART, Relay Module, Microcontroller(ESP32), GSM Module, Chloroform Spray and LCD.

Block Diagram

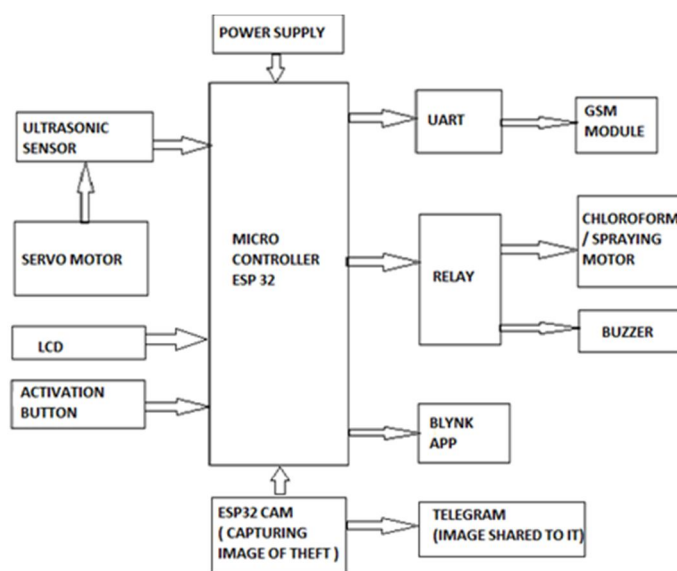


Fig 1 Block diagram

As an input device, the ultrasonic sensor senses movement and gives the system information. As output devices, there is the chloroform sprayer motor and the GSM Module. A popular microcomputer as well as system-on-a-chip (SoC) in a variety of Internet of Things applications is the ESP32. The ESP32 is a sophisticated replacement for the ESP8266, with a wide range of functions and functionalities. Interestingly, it has Bluetooth and Wi-Fi capability built right in, which makes it perfect for Internet of Things applications that need wireless connection. The ESP32 microcontroller in this setup is programmed with the code, that regulates the different parts. The associated LED turns on to show the status of the alert when the system senses an intruder.

IV. RESULTS AND DISCUSSION

Implemented Radar Based Security System Alert, ESP 32 CAM, Ultra-sonic Sensor, IR Sensor, Buzzer, Servo Motor, GSM Module, Chloroform Spraying motor and LCD as shown in the figure 2

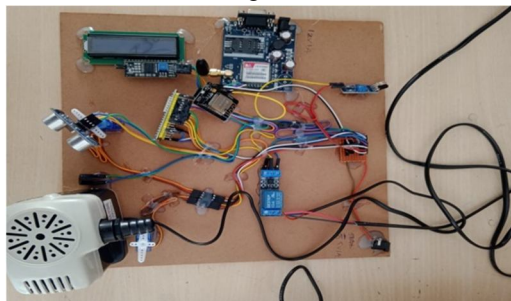


Fig 2 : Implemented Result

A. Person Detection

Ultrasonic sensor which works on based on trigger and echo. With the help of servo motor ultrasonic sensor rotates 180° and covers the entire room. When person enters into the bank it detects that person and calculating the distance of the person. This is shown in the fig 3. Fig 3 shows the distance of the person detected by ultrasonic sensor.

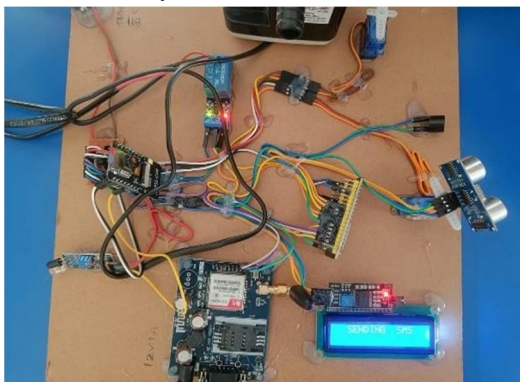


Fig 3: Ultrasonic Sensor detecting the person



Fig 4: Calculated Distance of person

B. Capturing the Image

ESP32 Cam captures the image of person as shown in the fig 5. When it capture its switches the light it indicates the working of cam.



Fig 5: Capturing the image

With GSM Module the data is the processed to ESP32 to control ESP32 Cam. ESP 32 will control the ESP32 Cam whether to click the image or not.

Esp32 Cam adds more security to our project. It share the image of person to the user. Captured image shared through telegram app. As shown in fig 6.



Fig 6: Captured image

C. Controlling the Spraying Motor

If the person is unknown to the user then he can take action by spraying chloroform through Blynk app. We can control spraying motor through Blynk app. As shown in fig 7.

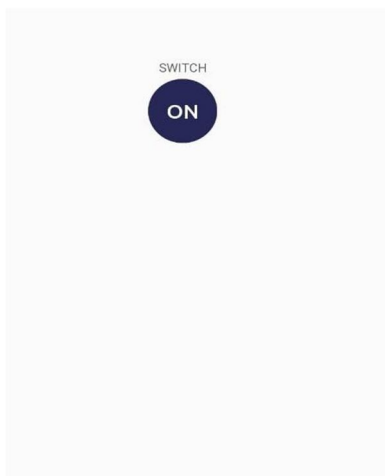


Fig 7: Controlling Spraying motor.

D. Chloroform Starts Spraying

When user starts the button as shown in Fig 8. The Chloroform spraying motor gets starts as shown in Fig 8 below. Which makes person to faint. It can help user to stop without getting robbery. Chloroform

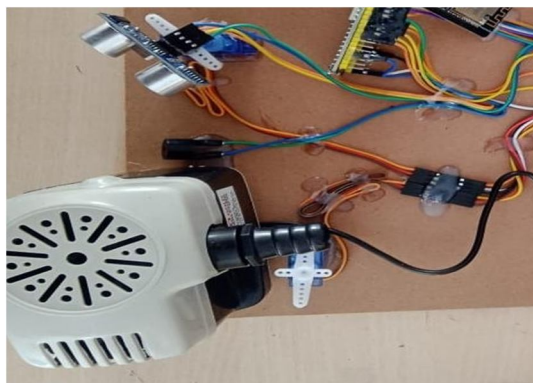


Fig 8: Spraying Chloroform

V. CONCLUSION

In order to identify human or object disturbance in sensitive regions, we presented the results of a research and testing study on an acoustic radar sensor for safety systems. The usefulness of the camera for security reasons is increased by its connection with GSM. The project's outcomes are authentic, demonstrating real effort and diligence. The system was put into place successfully, meeting all of its goals without fail. Thanks to its strong security features, this project has a lot of promise in the future. It may be tailored for a range of uses, and the product may be improved upon or changed to satisfy changing demands.

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