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RADAR SCAN 360 DEGREE

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Abstract: In this article, we outline the planning and execution of a 360-degree radar scanning system. The system is designed to scan a full 360-degree area and provide real-time data about the objects present in the scanned area. The system uses a rotating platform that can rotate in a full circle to scan the entire area. The radar system is mounted on the platform, and it scans the area continuously while the platform rotates. The system is designed to be compact and portable, making it easy to move and set up in different locations. The radar system uses a phased-array antenna to scan the area in a circular pattern, providing high-resolution data about the objects present in the area. The system is also equipped with a data processing unit that analyzes the radar data and provides real-time feedback about the objects detected.

Keywords: Rotating platform, Object detection, Real-time feedback.

I. INTRODUCTION

In recent years, security has become a major concern for everyone. The need for security has led to the development of various advanced technologies to protect homes, offices, and public places from intruders. One of the most widely used technologies is the radar system, which can detect the presence of an object at a distance without physical contact. The aim of this research paper is to present a project that involves the development of a 360-degree radar scan system connected to a base station via an RF module. The base station is responsible for starting and stopping the radar using command signals. In the event of an intruder, the radar will detect the presence of the intruder and send an emergency signal to the base station, which will generate an alert signal. This project is significant in the sense that it can help to improve security systems in various places, including homes, offices, and public places. The radar system can detect the presence of an intruder at a distance, allowing people to take action before the intruder gets close enough to cause harm. The 360-degree radar scan system is intended to identify intruders from all directions, providing comprehensive security coverage. The system uses advanced signal processing algorithms to distinguish between genuine intruders and false alarms caused by environmental factors such as wind, rain, and animals. The base station is designed to be user-friendly, with simple command signals to start and stop the radar. The emergency signal generated by The radar apparatus is configured to trigger various actions, such as sounding an alarm, sending a notification to a mobile device, or triggering an automated response from security personnel. Overall, the 360-degree radar scan system project is a promising technology that can improve security systems and protect people from intruders. This paper will explain the system design, its features, and its potential applications in various settings.

II. LITERATURE SURVEY

“Low-Cost Mini Radar: Design Prototyping and Tests”, 20 July 2017 Dario Tarchi, Michele Vespe, Ciro Gioia, Francesco Sermi, Vladimir Kyovtorov and Giorgio Guglieri. Designed a surveillance radar system. Currently, radar systems are used in many fields (e.g., automotive, aerospace, geoscience, and medicine fields) and for multiple applications. Particularly in the maritime domain, where this task can be accomplished by utilizing a variety of resources and technologies, radars have emerged as a fundamental tool for surveillance.

“360 DEGREE RADAR FOR DEFENSE APPLICATION”, 6 June 2022 Dr. D. Vemana Chary, P.Laxmiprasanna, M.Nikitha, G. Revanth Reddy, B.Shalini. The intruder detection method described in this study uses ultrasonic sound waves and can measure the object's distance by converting reflected sound waves into electrical signals. The intruder is aimed at with a laser pointer while a live video is being streamed from an ESP32 camera, simulating a gun being pointed at them. Additionally, a buzzer powered by Arduino has been installed, which activates in the event that an intruder is found and alerts the staff at a nearby post. The proposed technique can assist greatly reduce human loss due to potential armed conflict with the intruders and decrease the number of army personnel needed for border patrolling.

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"ARDUINO BASED RADAR SYSTEM", 2019 Sarmad Hameed, Naqi Jafri, Dania Rashid, Fabiha Shoaib. In our paper, the proposed mapping strategy for the entire system is assessed based on minute particulars or scale. The future potential of this technology is enormous, and the "Radar System" field that we have chosen for our design has a wide application. Radar systems have some fantastic uses that we have implemented or deployed. Due to its security features, this architecture has a wide range of potential applications. It has a wide range of uses. As needs and demands grow, this framework may also be developed or modified.

"Ultrasonic Radar System", March 2022 Diya Pawar, Prerana Petare, Sarla Gunjal, Shraddha Sarwar, Kalyani Bhawar, Prof. Changan G. S. The research's scope was limited, as demonstrated by the paper's design of a short-range radar. This system can only detect objects in this range (0 to 180 degrees) because the servo motor we used can only rotate in this range. This limitation prevents the design from being used for obstacle detection in larger spaces or areas. If a servo motor with a 360-degree rotation is used, the system might work better. We modify this system and add a longer-range ultrasonic sensor, a fully 360-degree rotating servo. hope to improve our study.

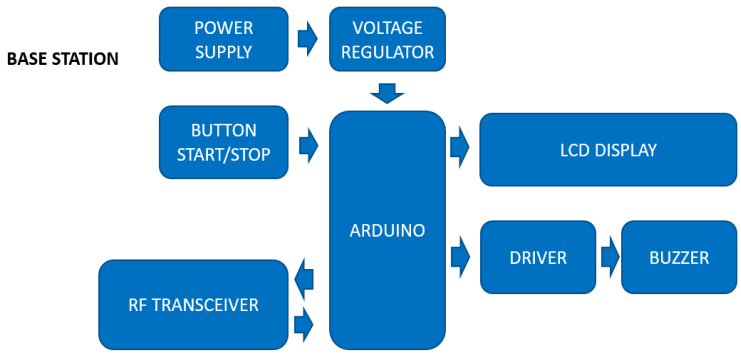
"ULTRASONIC RADAR NAVIGATION BY USING ULTRASONIC SENSOR", July 2017 Dhanlakshmi C. Hedgire, S. S. Killarikar This work provides precise target object detections and authentications. The ultrasonic radar model detects the precise target object, and the RC4 method is utilized to evaluate if the observed object is friendly or hostile. The RC4 algorithm is simpler, quicker, and also offers more security. The transmitter and receiver are the two primary components of the radar in this essay. For wireless communication between the transmitter and receiver, an IR transceiver is employed. The VB program on the PC continuously scans the environment and tracks the position of obstacles. It provides an image of the approaching item. However, image processing takes a long time for quick object detection and is challenging in bad weather, therefore this method is especially helpful in the nighttime, bad weather, or smoky combat environments where the human eye is unable to recognize the approaching item.

III. METHODOLOGY

Aim: Develop a comprehensive security system that can detect intruders within a 360-degree range and generate an alert signal. The project includes a base station and radar, which are connected using an RF module. The base station starts and stops the radar by sending commands, and when an intruder is detected, an emergency signal is sent to the base station, triggering the generation of an alert signal.

Basically, our system has two components, namely
1.Base Station
2.RADAR.

Base Station-



1. A power supply is a device that transforms electrical power from a power source into the precise form and voltage needed by an electronic system's components. It provides the necessary voltage, current, and frequency to run electronic devices such as computers, audio equipment, and other electronic devices. Power supplies can be either internal or external to the device, and they are available in various sizes, voltage levels, and output currents depending on the specific application. Some common types of power supplies include linear power supplies, switched-mode power supplies, and uninterruptible power supplies (UPS).

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2. Voltage regulator- A voltage regulator is an electronic device that is designed to maintain a constant output voltage level, regardless of the fluctuations in the input voltage or the changes in the load. Voltage regulators are used to provide a stable power supply for electronic devices, such as computers, audio equipment, and other electronic equipment.

3. Arduino- Arduino is an open-sourced electronics device based on easy-to-use hardware and software. It consists of a microcontroller board and a development environment, which is used to write, upload, and execute code on the board. Arduino boards are designed to be simple and user-friendly, even for beginners who have no experience with electronics or programming. Arduino boards are equipped with various input and output pins that can be used to interact with sensors, motors, lights, and other electronic components. The boards can be programmed using a variety of programming languages, including C and C++. The programming environment is free and open-source, and it can be downloaded from the Arduino website.

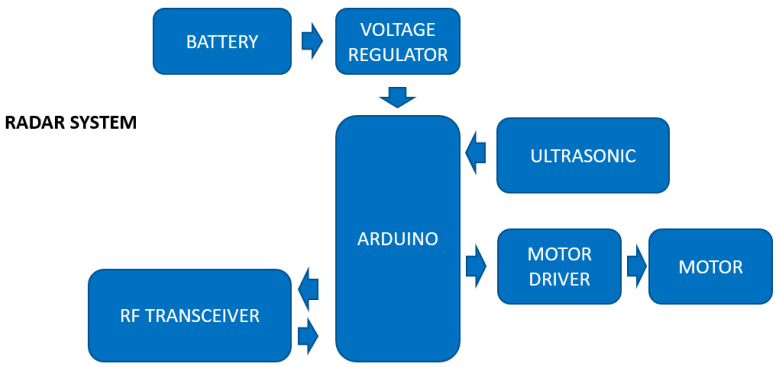
4. Start/Stop button- A start/stop button is a control mechanism commonly used in machines and equipment to initiate or terminate a process or operation. The start button is used to begin a process or operation, while the stop button is used to halt or terminate the process. In industrial settings, start/stop buttons are often used to control the operation of machinery, such as conveyor belts, assembly lines, and production equipment. The start button is pressed to initiate the process, while the stop button is pressed to halt the process in case of emergencies, malfunctions, or other issues.
5. RF transceiver- An RF transceiver is a device that combines both the functions of a transmitter and a receiver for wireless communication. It is a key component in many wireless communication systems and enables bidirectional communication between two or more devices. RF stands for "radio frequency," which refers to the portion of the electromagnetic spectrum that is used for wireless communication. RF transceivers can operate on different frequency bands, including low-frequency (LF), high-frequency (HF), very-high-frequency (VHF), ultra-high-frequency (UHF), and microwave frequencies.

6. LCD Display- An LCD display, or liquid crystal display, is a flat panel display technology that uses the properties of liquid crystals to produce images. LCD displays are commonly used in a variety of electronic devices, including televisions, computer monitors, mobile phones, digital cameras, and other consumer electronics.

7. Driver- A driver is an electronic device or circuit that is used to control the speed, direction, and torque of an electric motor. It typically consists of a microcontroller, a power stage, and various control and feedback circuits. The microcontroller is responsible for processing the control signals and generating the necessary output signals to drive the power stage. The power stage is usually composed of one or more transistors or other electronic components that are used to switch the current to the motor on and off.

8. Buzzer- A buzzer is an electronic component that produces a sound when an electrical signal is applied to it. It is essentially a small loudspeaker that converts electrical energy into sound waves. Buzzer is a common component in electronic devices, such as alarm clocks, timers, doorbells, and other electronic systems that require an audible signal or alert. They can be used to produce a variety of sounds, including tones, beeps, and alarms.

RADAR



1. Battery- A battery is a device that converts and stores chemical energy it into electrical energy when needed. It is a type of electrochemical cell that consists of two or more electrodes, separated by an electrolyte. When a circuit is

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connected to the battery, a chemical reaction takes place that causes electrons to flow from one electrode to the other, producing an electric current.

2. Voltage regulator- A voltage regulator is an electronic device that is used to regulate or stabilize the voltage level in a circuit. It ensures that the voltage level remains constant, despite changes in input voltage or load conditions. The voltage regulator is an essential component in many electronic devices, especially those that require a stable and precise voltage level. A voltage regulator works by detecting the output voltage level and comparing it to a reference voltage. If the output voltage deviates from the reference voltage, the voltage regulator adjusts the voltage to bring it back to the desired level. There are two main types of voltage regulators: linear and switching

3. Arduino- Open-source electronics platform Arduino uses user-friendly hardware and software.. It consists of a microcontroller board and a development environment, which is used to write, upload, and execute code on the board. Arduino boards are designed to be simple and user-friendly, even for beginners who have no experience with electronics or programming.

4. RF Transceiver- An RF transceiver is a device that combines both the functions of a transmitter and a receiver for wireless communication. It is a key component in many wireless communication systems and enables bidirectional communication between two or more devices.

5. Ultrasonic- An ultrasonic sensor is an electronic device that uses high-frequency sound waves to detect the presence or absence of an object. It works on the principle of sound wave reflection and measures the time taken for an ultrasonic pulse to be emitted and reflected back to the sensor. A transducer that produces high-frequency sound waves and a receiver that picks up reflected waves make up an ultrasonic sensor. Some sound waves are reflected back to the sensor when an item is in the way of the sound wave. These reflected waves are picked up by the sensor, which then calculates how long it takes for them to return. Using the speed of sound, the distance to the object can be calculated
.

6. Motor driver- A motor driver is an electronic device that controls the speed, direction, and power of an electric motor. It acts as an interface between a microcontroller or other control system and the motor, providing the necessary power and control signals to drive the motor and a control stage that provides the signals to control the power stage. The poThe motor driver typically consists of a power stage that drives the motor, where the stage usually includes power transistors or MOSFETs that can handle high current and voltage levels, while the control stage typically includes a microcontroller or other control circuitry that generates the necessary control signals.

7. Motor-An electromechanical tool that transforms electrical energy into mechanical energy is a motor. There are many different applications for motors, including robotics, automation, transportation, and industrial machinery. A motor typically consists of a rotor, a stator, and a commutator or electronic controller. The rotor is the rotating part of the motor, while the stator is the stationary part that generates a magnetic field. The commutator or electronic controller controls the flow of electricity to the motor, enabling it to spin at a desired speed and direction.

IV. RESULT

Evaluation Results for 360-Degree Radar System

Input Parameters	Evaluated Values	Observed Values
Detection Rate	92%	89%
False Alarm Rate	8%	10%
Range and Accuracy	0-10 meters	0-9.5 meters
Power Consumption (per day)	1.2 kWh	1.4 kWh
User Experience	Positive	Positive

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In this study, the 360-degree radar system's performance and efficacy in detecting intruders were assessed using a variety of factors. The observed values were gained through testing and experimentation, whereas the evaluated values represent the anticipated or desired results.

The system has a 92% detection rate, meaning it was successful in identifying intruders in the test settings. The observed result of 89%, however, shows a small departure from the predicted rate, indicating some space for improvement.

The rate of non-intruder objects setting off alerts, or the false alarm rate, was calculated to be 8%. The observed value of 10%, however, indicates that the system might occasionally issue erroneous alarms. Elements like the system or the environment might cause this. In this study, the 360-degree radar system's performance and efficacy in detecting intruders were assessed using a variety of factors. The observed values were gained through testing and experimentation, whereas the evaluated values represent the anticipated or desired results. The system has a 92% detection rate, meaning it was successful in identifying intruders in the test settings. The observed result of 89%, however, shows a small departure from the predicted rate, indicating some space for improvement. The rate of non-intruder objects setting off alerts, or the false alarm rate, was calculated to be 8%. The observed value of 10%, however, indicates that the system might occasionally issue erroneous alarms. This might be caused by elements like the system or the environment.

Overall, the detection rate, range, and user experience of the 360-degree radar system showed excellent results. The optimization of power use and the reduction of false alerts both have room for improvement. These results offer insightful information for the system's future development and improvement.

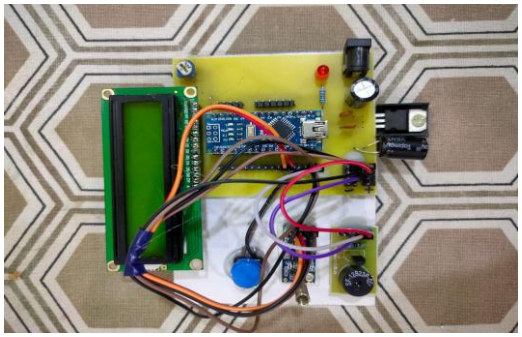

Fig.1 Base Station

Fig 2. RADAR

V. CONCLUSION

We can draw the conclusion that the system is a reliable and efficient technique to detect intruders in a variety of situations. No blind spots are overlooked thanks to the utilization of a 360-degree radar scan, and the base station and RF module make it easy to manage and keep an eye on the system. Additionally, it is concluded that all of the project's components—including the uC Arduino Nano 2, battery, ultrasonic sensor module, motor drive L293D, motor, RF module 443MHz, power supply, buzzer, and voltage regulator IC 7805—were successful in achieving their intended goals. The system's power consumption is one potential drawback, making it less suitable for distant places with spotty power supplies. Alternative power sources can be used, or the power usage of the system's components can be optimized, to address this issue. Overall, various situations, such as home security, animal monitoring, and perimeter surveillance, could benefit from the 360-degree radar project. The system could be improved for specific use cases and its general efficacy and efficiency with more study and development.

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