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RADAR SYSTEM USING ARDUINO UNO

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ABSTRACT:

Radar is the short form of radio detection and ranging. It is used to locate and identify the location of any stationary or flying object. In is used in military and commercial uses like airplane navigation systems. It utilizes electromagnetic waves to detect the objects. The advanced radar system not only identify the objects but they can give the information about distance, size, speed, position, direction etc. In this research navigation technology of the radar system has been examined. This radar system is made with the use of Arduino Uno which is one of the best hardware in which programing can be done. This system also required various hardware which are discussed below.

Keywords: Arduino, objects, Ultrasonic sensor, Servo motor.

Introduction:

Radar is a system which is used to detect and find the distance between the system and an object. In this system a signal with the frequency range of about 20KHz is used. This frequency is referred as ultrasound or ultrasonic frequency. This frequency is sent toward the object which is to be identified. When the waves are stroked to the object then some of the waves are reflected in the direction of the radar system. Now with the help of the antenna the reflected wave is captured and given to the system which calculates various parameters and according to the calculation; direction, speed, position, distance etc. can be identified. The ultrasonic sensor consists of a transducer which can convert sound energy into the electrical energy and vice versa. They are one of the most important device which may be used to measure the orientation and position of the objects. They may also be used in collision avoidance system and surveillance system. To understand the working of a radar system; a prototype model has been implemented with the hardware which consists of Arduino Uno, servomotor, ultrasonic sensor etc. Hardware description is given below.

Hardware Description:

The main purpose of this project is to calculated the position, distance and speed of an object which is places to a certain distance from the system [1]. The ultrasonic sensor emits the ultrasound waves in a almost all the direction. For this purpose servo motor is to be used. These transmitted waves travel in the air and if any object comes in their path; then these waves are reflected back towards the system [2]. These releted waves are given to the receiver of the system which calculate some of the parameters which may help to give the idea about the position, distance etc. about a particular object[3]. These parameters are displayed in the LCD screen [3]. The Arduino IDE is used for writing the code which is uploaded to the Arduino. Servomotor is used to rotate the transmitter in various direction so that any object can be detected which is present in the vicinity of the radar system. The output of the system is displayed using processing the software which provides the final output on the display screen [4]. The time taken by the ultrasound waves to transmit and returing back is used to find the distance between the object and radar system[5].



Fig. 1 Ultrasonic sensor

A servomotor is an example of rotary actuator which is used to control the angular position, velocity and acceleration precisely[6]. It consists of an appropriate motor paired along with a sensor with position feedback. A realtively advanced controller is required which is a dedicated module. It is designed specifically for the use of a servomotor [7]. It does not represent a distinct class of motor which is based on the fundamental operating principles. Servomotor utilizes a servomechanism which is used to achieve closed loop control with an open loop motor. This motor is used in various applications viz. CNC machinery, automated manufacturing, robotics etc.[8]



Fig. 2 Servo motor

Arduino is an open source electronics platform. It is the combination of hardware and software. It is designed in such a manner that it is very user friendly and it can be operated easily. Software used in Arduino is open source platform. Coding can be written and it can be uploaded in the board [10]. Arduino is compatible many operating system viz. MAC OS X, Linux, Windows etc. The environment is developed in the software language java[11]. The software coding is uploaded in the Arduino board. Arduino software IDE has a text editor which is used to write the coding. It has a message area, toolbar and text console with some small buttons for common functions [12]. These buttons are used to connect Arduino and other hardware to upload the program and communication is done between them.



Fig. 3 Ardrino UNO

Breadboards are the most important component while designing any system and the circuit. Fig 4 shows a breadboard in which circuit can be constructed. Circuit connection can be easily changed according to the desire as the circuit made in the breadboard are not hardwired [13].



Fig. 4 Bread board

Design Implementation of Radar System:

Fig. 5 shown below is the illustration of the development of life cycle of a radar system. It includes designing of different components, testing of the system and its implementation. These steps can be further divided into various stages viz. hardware system design, circuit design, system implementation, unit testing, GUI system design, GUI implementation, GUI unit testing, System integration and entire system testing.



Fig. 5 Development life cycle of Radar System.



Fig. 6 Hardware System Design of Radar System

(a) Hardware system design for Arduino: The hardware system consists of total three main components. (a) Arduino, (b) Servomotor and (c) Ultrasonic Sensor[14]. The ultrasonic sensor iis mounted on a servomotor in such a way that it can transmitted the wave in space. Servo motor is used for turning mechanism. Both the servomotor and ultrasonic sensor are powered by Arduino.

(b) System circuit design:



Fig. 7 Hardware Required

Working:

The main of this work is the calculation of the distance, speed and the position of any object which is placed in the radar range. Radar range is the maximum distance between the ultrasonic sensor and the object which can be calculated by the radar system. In this work the radar range is only 2cm to 40cm. With the help of servomotor; ultrasonic waves are transmitted in all the direction uniformly. This wave travels in the air and gets reflected back towards the radar ultrasonic sensor as soon as any object strikes. The reflected wave is sensed by the ultrasonic sensor and the characteristics of the reflected wave is to be analysed and after the analysis it is displayed in the screen which shows various paratemeters viz. distance and position of the object[15]. Arduino IDE is used for writing code and this code is uploaded in Arduino. Fig. 8 illustrates hardware system design which is created in Fritzing environment. Some of the most important pins are D8 pin of Arduino; which is connected to the ultrasonic sensor. Pin no D6 is connected to the servomotor and pin no D7 is connected to the echo pin. Arduino required +5V power supply. Another pin is grounded.



Fig. 8. Breadboard of the hardware system implementation

Results:

To know the working of implemented radar system; first of all ultrasonic wave is spread to the surrounding. For this purpose; servomotor is to be used. When the waves are stroke to the object then some of the waves are reflected back. The GUI system design and implementation involve the GUI. The programming language is written in the java script. Fig. 9 illustrates a line sweep from one direction to the other. A smudge creates in the graphical user interface if there is any obstacle found.



Fig. 9 GUI Implementation for the mapping interface.

Conclusion:

In this paper, a radar system is developed by the use of Arduino, a servomotor and the ultrasound sensor. This system is used to identify the distance and position between the system and an object. Ultrasound signals are transmitted to the surroundings using servomotor. Ultrasound wave travels in the air and if there is any object encountered then some of the waves are reflected back to the receiver of the radar system. This reflected wave is used to calculate various parameters and the result is shown in the form of the distance between the object and radar system. In future this radar system can be used with the robotics for more advanced system. This system has a range of 2cm to 40cm. In future its operating range can be increased by using more powerful ultrasound waves and ultrasonic sensors.

REFERENCES:

G. Bhor, P. Bhandari, R. Ghodekar and S. Deshmukh, "Mini Radar," International Journal of Technical Research and Applications, pp. 68-71, 2016.
D. B. Kadam, Y. B. Patil, K. V. Chougale and S. S. Perdeshi, "Arduino Based Moving Radar System," International Journal of Innovative Studies in Sciences and Engineering Technology (IJISSET), vol. 3, no. 4, pp. 23-27, 2017.

[3] T. P. Rajan, K. K. Jithin, K. S. Hareesh, C. A. Habeeburahman and. A. Jithin, "Range Detection based on Ultrasonic Principle," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 3, no. 2, pp. 7638-7643, 2014.

[4] P. S. Abhay, S. K. Akhilesh, P. Amrit and Kriti, "A Review on Ultrasonic Radar Sensor for Security system," Journal of Emerging Technologies and Innovative Research (JETIR), pp. 137-140, 2016.

[5] P. P. Arun, M. A. Sudhakar, P. MeghaSunil and S. S. Balaji, "Ultrasonic Distance Meter," SVERIAN Scientific, pp. 1-4, 2015.

[6] O. V. Amondi, "Collision Avoidance System," The University Of Nairobi, 2009.

[7] Shamsul A., Tajrian M., "Design of an Ultrasonic Distance Meter", International Journal of Scientific & Engineering Research, pp. 1 10, March 2013.

[8] U. Papa, G. D. Core, "Design of sonar sensor model for safelanding of an UAV", Proc. IEEE Metrol. Aerosp., pp. 346-350, Jun. 2015.

[9] Abbay P., Akhilesh S., Amrit P., and Prof Kriti, "A Review onUltrasonic Radar Sensor for Security system", Journal of Emerging Technologies and Innovative Research (JETIR), April 2016.

[10] Babu Varghese, "Collision Avoidance System in HeavyTraffic & Blind spot Assist Using Ultrasonic Sensor", International Journal of Computer Science and EngineeringCommunications-IJCSEC. Vol. 2, Isuue 1, February, 2014ISSN: 2347-8586.

[11] S. Bharambe, R. Thakker, H. Patil, K. M. Bhurchandi, "Substitute eyes for blind with navigator using android", Proc.Texas Instrum. India Edu. Conf. (TIIEC), pp. 38-43, Apr.2013.

[12] D. Sunehra, A. Bano, S. Yandrathi, "Remote monitoring and control of a mobile robot system with obstacle avoidance capability", Proc. Int. Conf Adv. Comput. Commun. Inf.(ICACCI), pp. 1803-1809, Aug. 2015.

[13] http://www.instructables.com/id/ ATMega328-using-Arduino-/

[14] Hauptmann, Peter, Niels Hoppe, and Alf Püttmer. "Application of inaudible sensors within the method trade." activity Science and Technology thirteen.8 (2002): R73.

[15] Idris, M. Y. I., et al. "Parking system utilizing wireless detector network and inaudible detector." data Technology Journal eight.2 (2009): 138-146.