

Ultrasonic Radar

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Abstract-Ultrasonic technique has been on the market for years and is still considered a trusted technology throughout the industry. The design of our project is very useful for many applications like homes, shops, military and object detection. The goal of this work is to build a surveillance system which is basically one kind of a radar system to get the exact distance and angle for fixed objects placed around the device based on the speed of ultrasonic waves. An Atmega 328 was used to transmit and receive the ultrasonic waves through 40 KHz in order to provide the flexibility of usage requirements.

Index Terms- Ultrasonic; Distance; Angle; surveillance.

1. INTRODUCTION

Radar is an object tracking system which uses radio waves to find the range, altitude, direction, or speed of objects. Radar systems comes in different sizes and with different performance specifications. Some radar systems are used for air-traffic control and some others are used for long range surveillance and early-warning systems. A radar system is the main part of a missile guidance system. Small portable radar systems as well as systems that occupy several large rooms are available.

Radar receivers are usually in the same location as that of the transmitter. Although the reflected radar signals captured by the receiving antenna will be very weak, they can be strengthened by electronic amplifiers. More sophisticated method of signal processing are used in order to recover the useful radar signals. Ultrasonic sensors work on the principle similar to radar or sonar which calculates attributes of a target by interpreting the echoes from radio or sound waves respectively. Radar relies on its own transmissions rather than light from the Sun or the Moon, or from process of providing artificial radio waves towards objects is called illumination electromagnetic waves transmitted by the objects themselves, such as infrared wavelengths (heat), although radio waves are invisible to the human eye or optical cameras.

2. PROPOSED METHOD

Today technology is rocketing at a greater speed searching for more and more instruments to make life of humans even sophisticated. There is tough competition among manufacturers to provide very best of electronic gadgets at the very least cost. A lot of equipments has been developed which has improved efficiencies in all fields. Moreover, in this fast moving world there is an intense need for the tools that can be used for the betterment of the mankind rather than destructing their lives. Hence, to make some of the changes and taking the advantage of the processing capabilities of arduino, it is decided to make up the module more application specific. Nowadays, radar systems are important for providing informations to air-defence, anti-missile system, flight control systems and in other important fields.

Ultrasonic Radar system is a simple circuit which works with the help of arduino board. A radar system has a transmitter that emits radar signals in previously determined directions. When they come into contact with an object they are usually reflected or scattered in several directions. Radar signals are reflected especially by materials of considerable electrical conductivity that is by most metals. Radar signals that get reflected back towards the transmitter will be the desirable one that makes radar work. If the object is moving toward or away from the transmitter, there is a slight equivalent changes in the frequency of radio waves, caused by the Doppler effect.

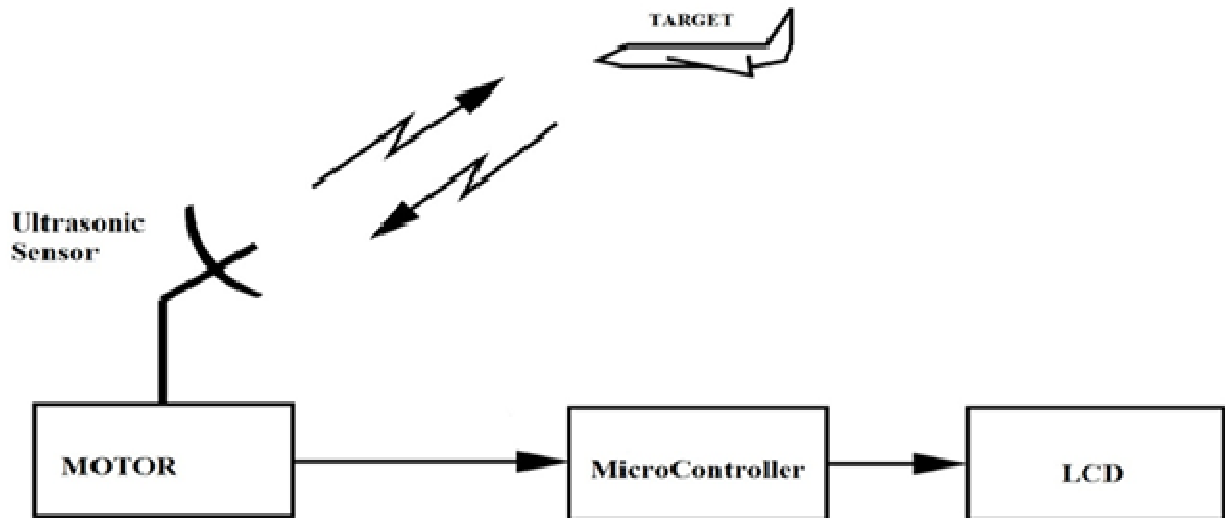


Fig.1. Block Diagram

2.1. Practical implementation

- Boot loading an Atmega328[1] using an Arduino board by uploading the boot loader program to the Microcontroller.
- Making the connections on general purpose PCB, connecting the crystal oscillator, capacitors, connectors for the connections to Arduino board etc.
- Providing the power supply, it is usually 5 volts.
- Arduino is ready for use.

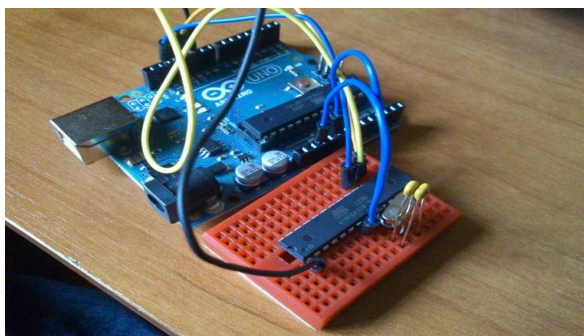


Fig.2. Boot loading Atmega328 using Arduino Uno

2.2. Arduino IDE

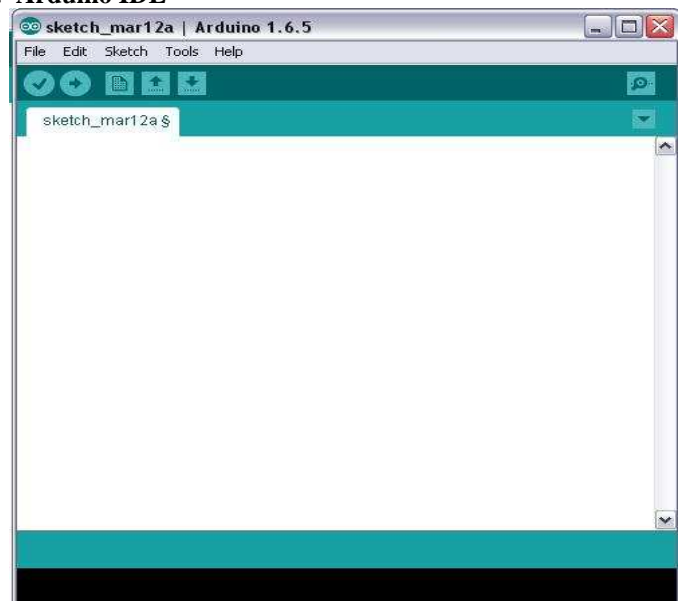


Fig.3. Selecting the Board in Arduino IDE

The Arduino programs are written using C or C++ languages. The Arduino IDE comes with a number of libraries which makes the operations of the microcontroller much easier.

2.3. Processing software

Processing software is an integrated development environment with open source programming

capability. It helps to create sketches according to our requirement. In ultrasonic radar processing software is used to create radar screen.

2.4. Ultrasonic sensor

Ultrasonic sensors[3] continuously emits waves in ultrasonic range of wavelengths 18khz. This wave hits on a target and the echo is received by the receiver. The echo is processed and the time required for the echo to receive is calculated. Thus it detects the distance in between the target and the sensor.

2.5. Servo motor

A servo motor[4] is basically a rotary actuator which gives precise control of angular velocity, position and acceleration. Servo motor is basically a motor which uses servomotor mechanism to rotate. It requires PWM pulses to rotate. As arduino have PWM outputs it is easy to use it with arduino.

3. COMMUNICATION THROUGH PC

In order to display the output on the processing window we can use a RS232 cable connected with arduino. Serially transmitted data from arduino is received by the processing window and it will display it on the sketch.

4. EXPERIMENTAL RESULTS

As mentioned earlier existing radar systems are costlier and they are bigger in size. They only belong to government authorities like army, navy etc. By introducing proposed system the cost and complexity of the entire system reduced drastically. It accurately indicates the presence and angle of the object within the specified range of the system. Final system has a satisfactory output and it completely meets the requirements.

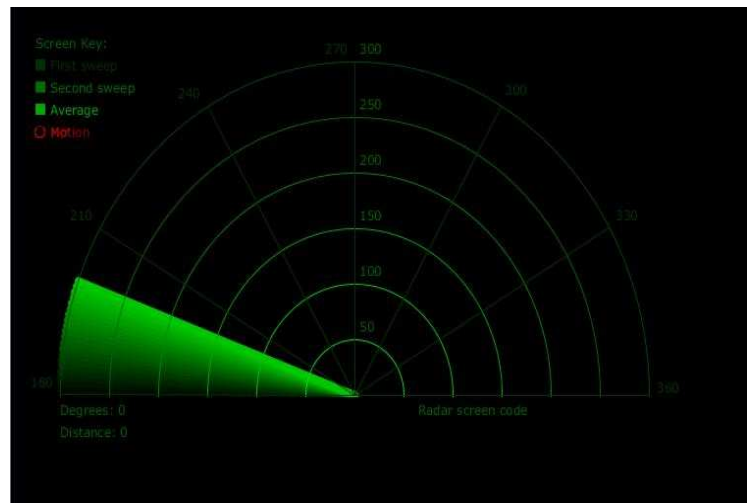


Fig.4. Radar Screen

Acknowledgments

First of all, we are very much glad to take this opportunity to thank God Almighty for his blessings and for helping us to complete the work successfully. We would like to express our gratitude towards Mr. Shiju Jose, for his constant encouragement and support. We are also grateful to our guide Ms. Sreeju Rajan for her kind guidance.

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