Automatic object detection and target using Ultrasonic Sensor

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Abstract - *The main objective of this paper is to secure border areas using Robotics. As one of the trends in the development of automation in war machinery in 21st century, has been researched and developed. The aim of this paper is to reduce human effort on Border areas, reflex time of response, precision to target a distant object. Until now the border security was totally dependent on soldier. In highly secured area the soldier detects the enemy and targets him. But if the soldier was not able to detect the enemy, the enemy could easily enter the secured area. So for increasing the security level microcontroller based automatic projectile system is introduced. The basic idea of this automatic projectile. Current system is capable to detect any radiation in the range of border and automatically target its position. The proposed system is based on Ultrasonic sensor. The ultrasonic sensor provides 2cm to 400cm of non contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each ultrasonic module includes a transmitter, a receiver and a control circuit.*

Key Words: U**ltrasonic sensor, H BRIDGE , Stepper motor, Laser, ARM CONTROLLER.**

1. INTRODUCTION

A basic concept in automatic gun targeting system is to detect presence of living object and target its position. Targeting mechanism is automated as it uses ultrasonic sensor to detect the living object, its range and Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. The echo signals are reflected back to the sensor, when the object is hit, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. The Border security forces serve as first line of defence.

It has a land frontier of 15,200 km (9,445 mi) and a coastline of 7,516.6 km(4,671 mi) and hence it becomes necessary to secure this area. The proposed system does not take full responsibility but is an effort to reduce mistakes by security personnel at border. In the robotic system the sensor is mounted at the front side of the system to detect an object it provides information about the distance between the target and the Laser that is mounted

on sensor. This information is displayed on the LCD screen of type 16X2 which means two rows of 16 characters each. It has LED back light. If the distance is very far, then there is no change in the speed of the dc motor. If the distance is little far, then the speed of the motor is slow down. If the distance

is very near, then the motor is stopped. This is the operation of the H BRIDGE driver circuit involved in this project and now the targeting gun targets the living object. In future the system can be enhanced using Bluetooth technology and increase the credibility of the system.

2. System Overview

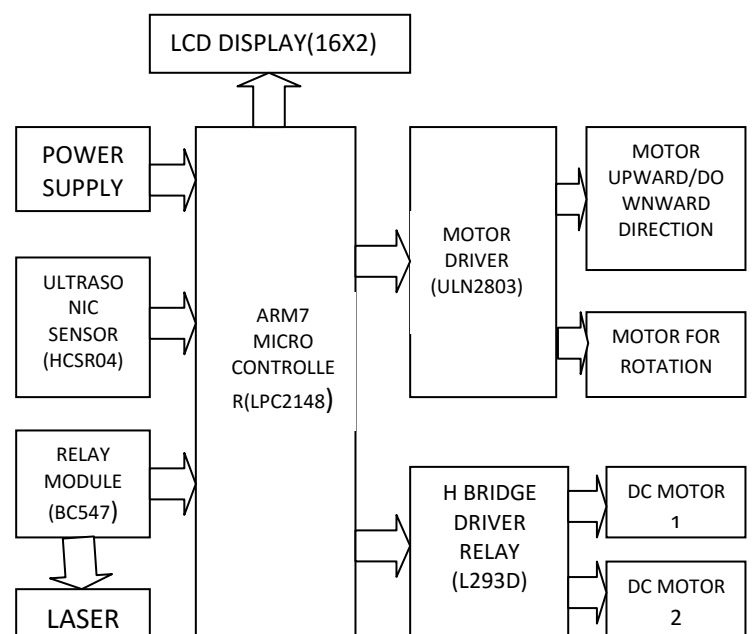### 2.1 Block Diagram of proposed method
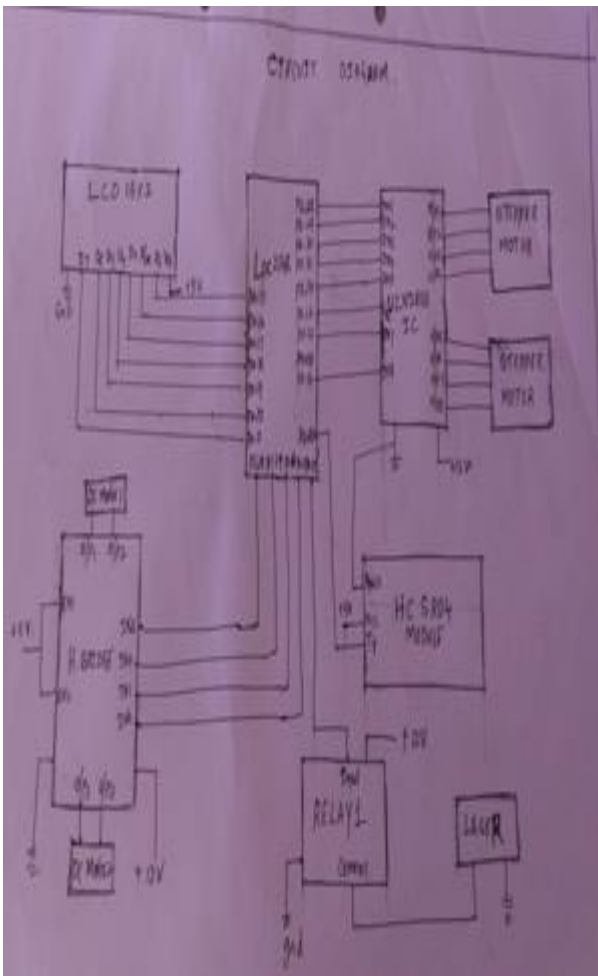

Fig1: block diagram

2.1.1 Circuit diagram

Fig 2: Circuit diagram

As shown in the figure the living object is detected by presence of sensor which uses sound waves. The HC SR04 sends a ping as the submarine does and measures the time between sending and receiving anything back when an object (target) is in front of the sensor. Because using sound for its measurements we can reach up to 4 meters. The module has 4 pin connection. To power the module with 5volts, two pins are needed. One pin is trigger ping and last one is to read result of measurements, the echo pin. The measuring angle from HC SR04 is 15 degree and we mount this structure onto stepper motor so the angle can be effectively maximized for object detection.

One ping of the HC-SR04 actually exists of 8 pulses at 40 kHz to do the measurement. To start a ping u need to provide a 10 us pulse on the trigger input. When the distance is measured by 8 pulses the HC-SR04 puts a pulse on echo pin and calculate length of echo pulse and speed of the sound. The speed of sound is 340 m/s and to divide length of pulse by this value to obtain results in mm. The ping is travelling

towards a target and back to sensor again. Because of this we need to divide result by two.

Multiple sensor modules can detect a single object and generate codes which in result generates signal on the multiple ports of the microcontroller. Under such situation, it depends on the microcontroller to take the input of multiple sensors at a time and then decide the correct location of the object on the basis of received data

2.1.2 Rotating of stepper motor and conversion of echo signal for target detection

The microcontroller, H Bridge circuit along with dc motors measures to move the robot. The following is based on ARM CONTROLLER and executes all measuring procedure, it generates signal of trigger, start of timer, measures the length of echo signal conversion of it to distance in specified unit.

It certainly depends on how much of the motor rotates and targets itself to the object location and then, as the targeting function is complete with the help of interface between the ULN2803 IC and the microcontroller. The targeting system(LASER) gets activated, and light source starts focusing over the destined location. The fire lasts(beam lasts) until the sensor stops sensing the OBSTACLE.

2.2 Software

Keil Micro version 4 software is used to program ARM 7 microcontroller LPC 2148. The software is capable to program the microcontroller and then generate the .hex file which is the hardware programming assembly language file. The .hex file is applied to microcontroller to function as per our design.

The steps involved to program the microcontroller using Kiel Microvision 4 are

1) Install evaluation version of Kiel Microvision 4 or 5 into the computer. Install the specific serial drivers for the connectivity from the PC to the PCB.
2) when you Open Kiel Microvision 4, it supports the programming in C language. Select appropriate settings related to the specified Microcontroller and then a window of program editing pops out.
3) Write the code in C language
4) A hardware file .hex file is required to be generated, to embed that logic into the microcontroller,
5) Go to Run>Generate .hex file and click on it to generate the .hex code of the specified C code.
6) Using Keil software embed .hex code into microcontroller
7) Once code embedded to microcontroller, switch the controller on and it will function as per the embedded code.
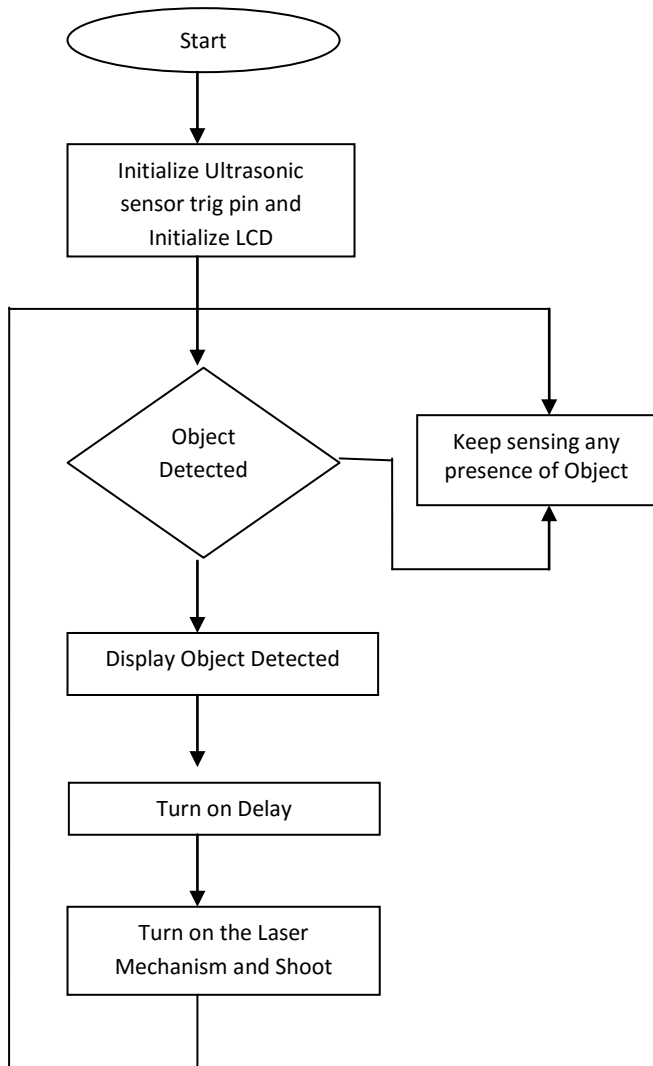
2.3 FLOWCHART

Fig 3: Flow Chart

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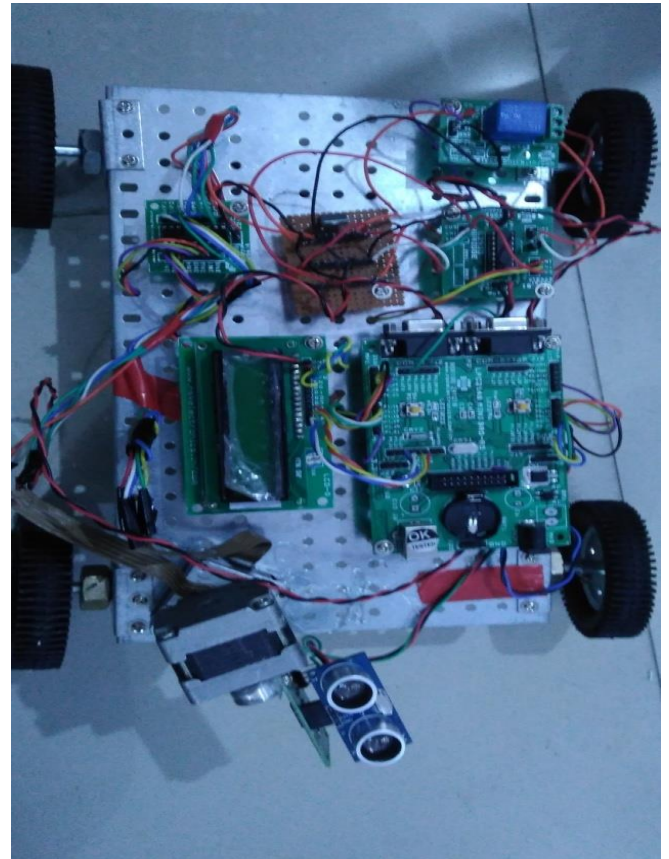
3. RESULT

Fig 4: Hardware Implementation of the proposed model

This proposed model locates an object and targets it. In the given circuit diagram the gun firing control mechanism uses LASER. The LASER connected to common point of relay circuit, and other end is grounded and input pin is connected to pin p1.21 of microcontroller. When p1.21 of microcontroller is zero then the LASER will not glow, means no object sensed by the sensor, so the gun will not fire means the LASER is off. When the port p1.21 will be high on the object detection by the sensor, the LASER detected the object completely and is destroyed by targeting gun.

Fig 5: Displays the status of LCD showing the name of project

Fig 6 : Displays the status of the implemented model in moving position

Fig 7: Display status when the object is detected

4. CONCLUSIONS

The project "OBJECT DETECTION ROBOT" here has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of all reasoned out and placed carefully thus contributing to the best working.

The automatic gun targeting system is feasible for highly secure area such as border. The system consist of microcontroller unit, Sensor module, Laser to target. The automatic gun targeting system is based on ultrasonic sensor. This system helps reduce the responsibility and efforts of soldier in border security area. The system is economical as it uses the microcontroller unit. The automatic object detection and targeting system is not taking full responsibility of security. The automatic object detection and targeting system can be easily implemented for the home security also. But the system shows better result in highly secured region.

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ACKNOWLEDGEMENT

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