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Object Detection and Tracking for Short Range Surveillance Using ARM7

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Abstract: A radar system consists of a transmitter producing in the radio or microwaves domain, a transmitting antenna, a receiving antenna (often the same antenna is used for transmitting and receiving) and a receiver and processor to determine properties of the object(s). Radio waves (pulsed or continuous) from the transmitter reflect off the object and return to the receiver, giving information about the object. The proposed system "Ultrasonic radar for the object detection and tracking" employs ultrasonic module along with the LPC2148 microcontroller. Module rotates with DC geared motor for a specific time interval, microcontroller receive an echo signal back as response of the transmitted signal by transmitter. The distance between the object and system is measured by calculating time interval taken by the signal to transmit and the echo reception. The measured distance is displayed on LCD. After the detection the microcontroller tracks the object along with its movement.
Keywords: LPC2148, ARM7, Ultrasonic Sensor, Keil μVision, Flash Magic, CP210X UART Drivers.

I. INTRODUCTION

Radar is an object detection system that uses electromagnetic waves to recognize the range, elevation, path, or speediness of both moving and fixed objects such as aircraft, ships, motor Vehicles, weather formations, and terrain and when instead of electromagnetic waves, we use Ultrasonic waves, it is called an ultrasonic radar**.** In the moving object required a more no. of data to tracking its actual setting such as location, distance, speed. Technologies are used to tracking system mainly comprise microcontroller LPC2148, ultrasonic module and microwave distance meter. Distance detector is Device capable to measuring the distance between transmitter and the receiver. The techniques to measuring the distance between using ultrasonic of an object include the pulse echo method. In that technique burst pulse is send the 40 kHz Signal through transmission medium and is reflected by an object kept at specific distance from the ultrasonic module .the time interval between echoes reflected from object to the module is proportional to the distance of object. The main drawback of the ultrasonic module is it is a short range communication; it fails to measure the long distance communication. It tracks the object with in the several range of the module which use wave-propagation phenomena in air to measure physical variables.
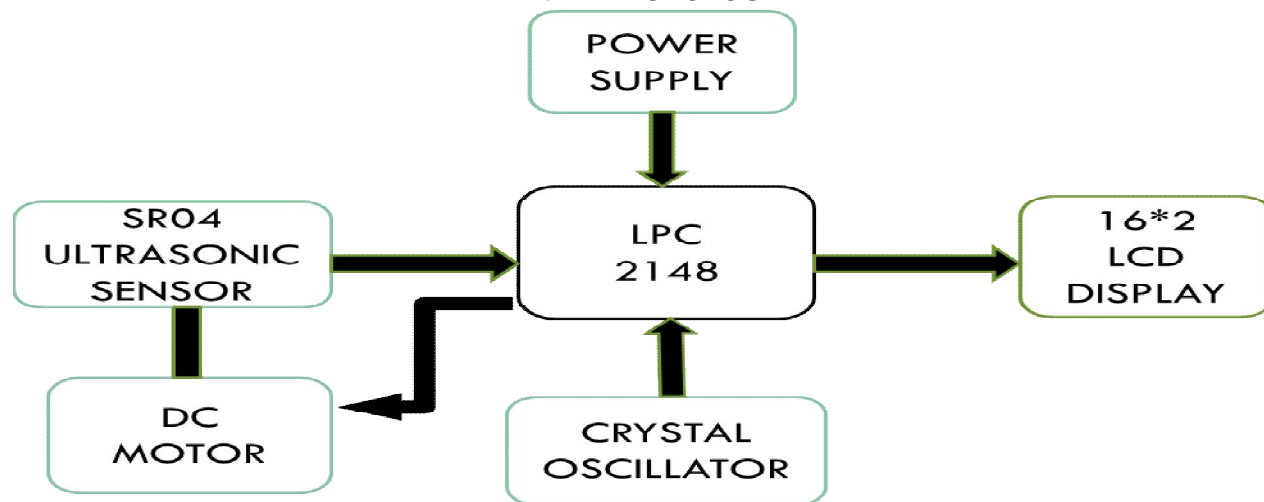
II. METHODOLOGY

Fig. 1 Architecture for Ultrasonic Tracking Radar

In this paper we have object detection and tracking radar using LPC2148.

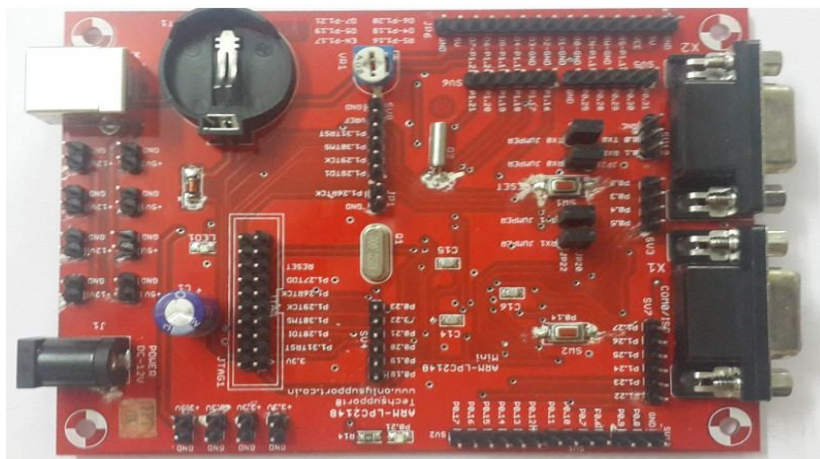## III. COMPONENTS

A. LPC2148

Fig. 2: LPC2148

The NXP (founded by Philips) LPC2148 is an ARM7TDMI-S based high-performance 32-bit RISC Microcontroller with Thumb extensions 512KB on-chip Flash ROM with In-System Programming (ISP) and In-Application Programming (IAP), 32KB RAM, Vectored Interrupt Controller, Two 10bit ADCs with 14 channels, USB 2.0 Full Speed Device Controller, Two UARTs, one with full modem interface. Two I2C serial interfaces, Two SPI serial interfaces Two 32-bit timers, Watchdog Timer, PWM unit, Real Time Clock with optional battery backup, Brown out detect circuit General purpose I/O pins. CPU clock up to 60 MHz, On-chip crystal osillator and On-chip PLL.
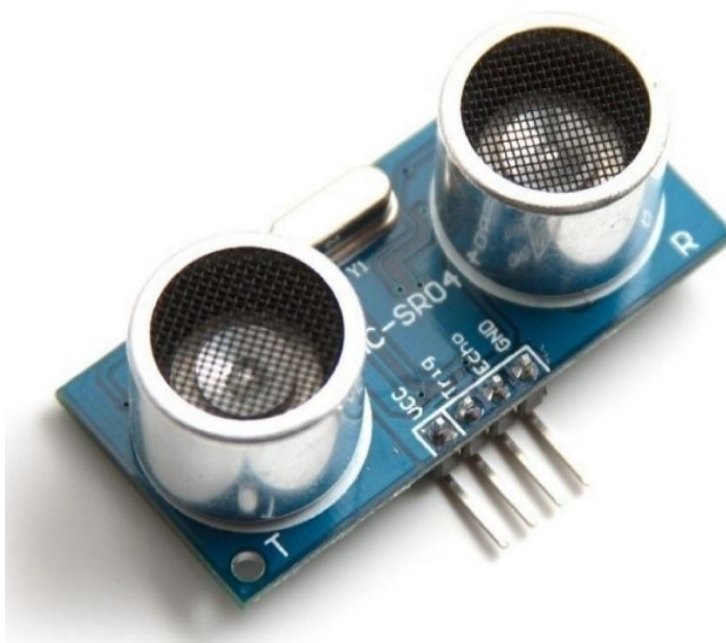
B. Ultrasonic Sensor

Fig. 3:Ultrasonic Sensor

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats or dolphins do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. From 2cm to 400 cm or 1" to 13 feet.The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, (like a tiny speaker), the other receives them, (like a tiny microphone).

C. Dc Gear Motor

Fig. 4:DC Geared Motor

A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction.

D. Motor driver (l293d)

Fig. 5:L293D

The function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive amotor.L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction.

E.   KEIL µVISION Software

Fig. 6: KEIL uVision Logo

With the µVision Project Manager and Run-Time Environment you create software application using pre-build software components and device support from Software Packs. The software components contain libraries, source modules, configuration files, source code templates, and documentation. Software components can be generic to support a wide range of devices and applications.

F.   Flash Magic

Fig. 7: Flash Magic

Flash Magic is a PC tool for programming flash based microcontrollers from NXP using a serial or Ethernet protocol while in the target hardware.The data from the sensors is sent to the LPC2148 and we can read the data from the microcontroller and then we can send it to LCD display, where the distance parameter is visualized.
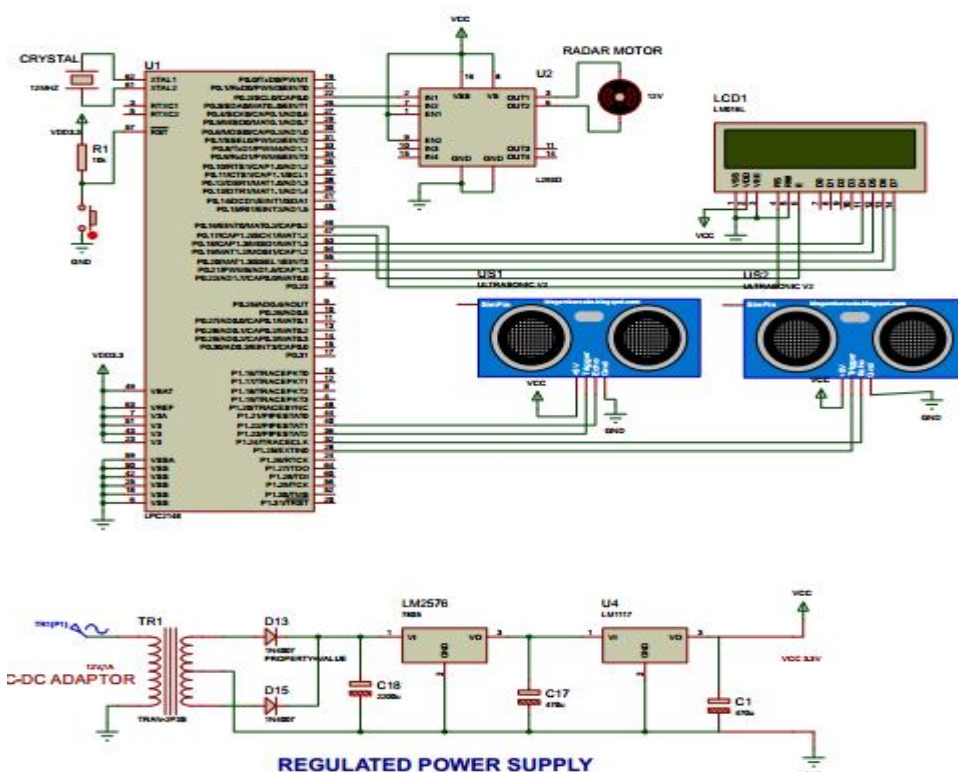
Fig. 8:Circuit layout of object detection and tracking radar

In this paper, the object detection and tracking are carried out with two ultrasonic sensors. First of all download the LPC2148 package and install it along with Keil and check the connectivity among the pins of LPC2148.Imply respective header files of LCD, ultrasoic and motor in Keil. Create a new project in Keil and add the source path of the programming file to it. In programming file using implied header files and predefined functions write the program according to the desired output
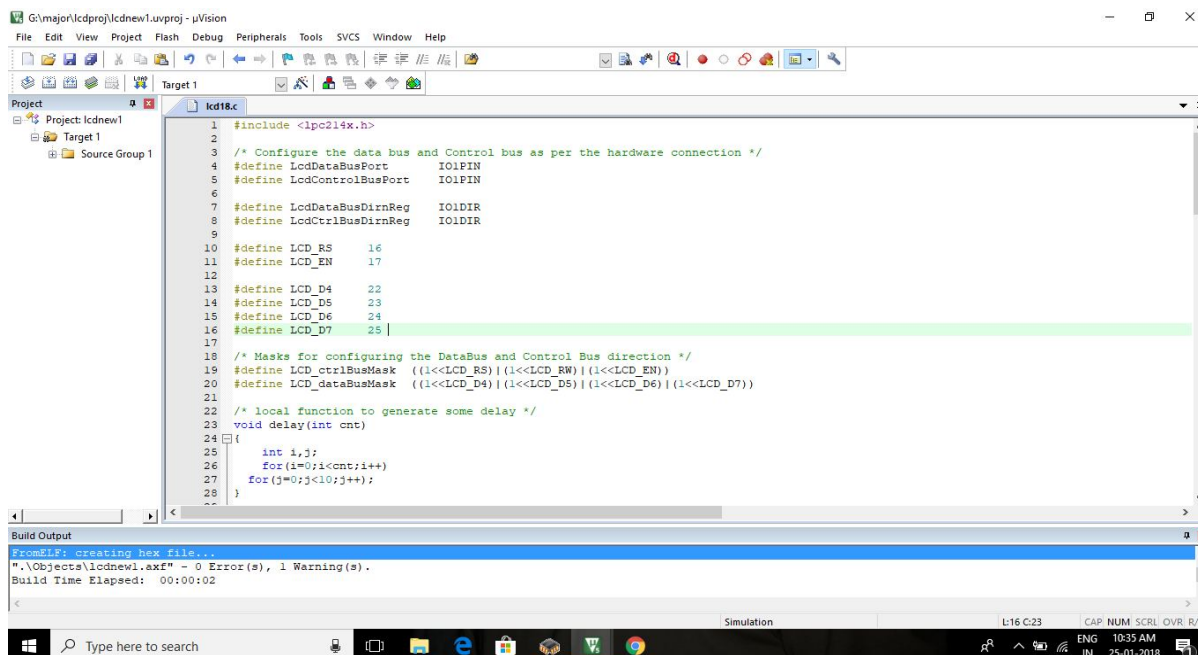

Fig. 9: Keil IDE

We have to program it in such a way that as soon as we switch on the LPC2148 the ultrasonic sensors should start working i.e., to acquire the target and to find the distance from it and display it on the LCD screen. After acquiring the target the ultrasonic sensors should track the moving target. The tracking will be done in a way that as the object moves towards the right side the distance between the object and sensor will reduce and the sensor rotates towards right and vice versa. After writing the code as per our requirement we have to execute and generate the hex file. N As the microcontroller takes input through UART we need CP210X drivers which provides the bridge between USB and UART. After installing the drivers hex is loaded into LPC2148 with the help of a programming tool called Flash Magic.
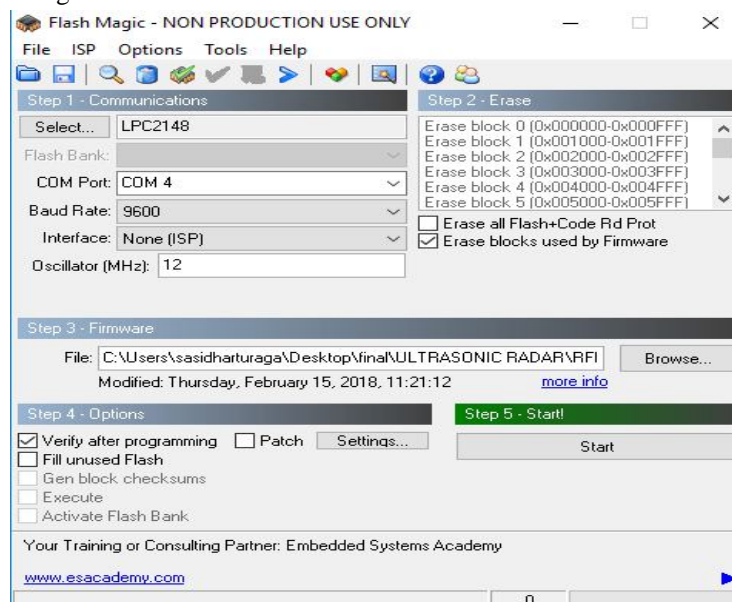

Fig. 10:Flash Magic tool
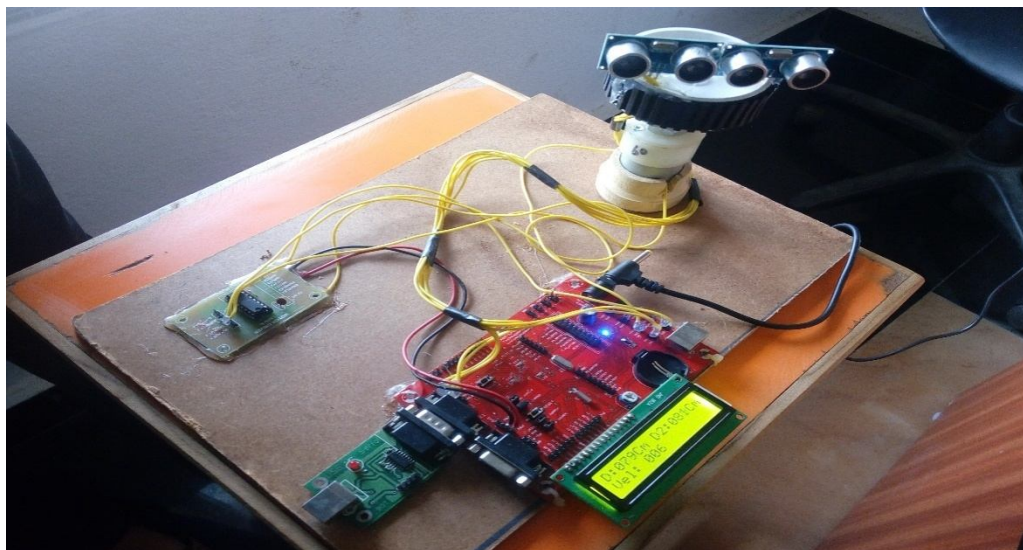
The final experimental set

Fig. 11:Detection and Tracking Radar final setup

IV. CONCLUSION

In this system we have detect any moving and fixed object/ person by using transmitting a ultrasonic echo sound. Also to calculate a distance of that object, if this object is moving then to calculate the distance and track it along its movement and the distance measured is displayed on LCD.

V. ACKNOWLEDGEMENT

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