

## Development of Radar Model with Remote Voice and Text Alert System Using Zig-Bee Communication

**Preeti Pannu**

Assistant Professor  
Department of ECE  
SRM University, NCR Campus  
Modinagar

**Pulkit, Alok Kapoor**

B.Tech Student  
Department of ECE  
SRM University, NCR Campus  
Modinagar

### ABSTRACT:

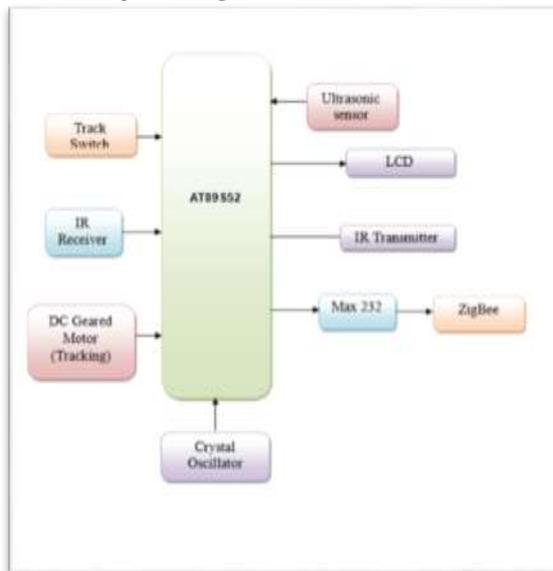
RADAR is an acronym for Radio Detection and Ranging. It is an object detection system which uses electromagnetic waves specifically radio waves — to determine the range, altitude, direction, or speed of both moving and fixed objects. The radar dish, or antenna (parabolic), transmits pulses of radio waves or microwaves which bounce off any object in their path. The object returns a tiny part of the wave's energy to a dish or antenna which is usually located at the same site as the transmitter. This project is used to identify the direction of the target from which it is coming and position of the object. This project uses AT89S52 Microcontroller which is interfaced with Radar Target Identifier system has an array of IR sensor pairs. These IR sensors are keeping track with the target in all the directions. If the target is found to be moved in any direction and then it gives a control signal to the microcontroller and the status is displayed on the LCD for user identification. This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer

**KEYWORDS:** Radio waves, Parabolic Antenna, Microcontroller, IR sensors, Full wave rectifier, Voltage regulator, Radar Target Identifier, Ultrasonic sensor, ZigBee.

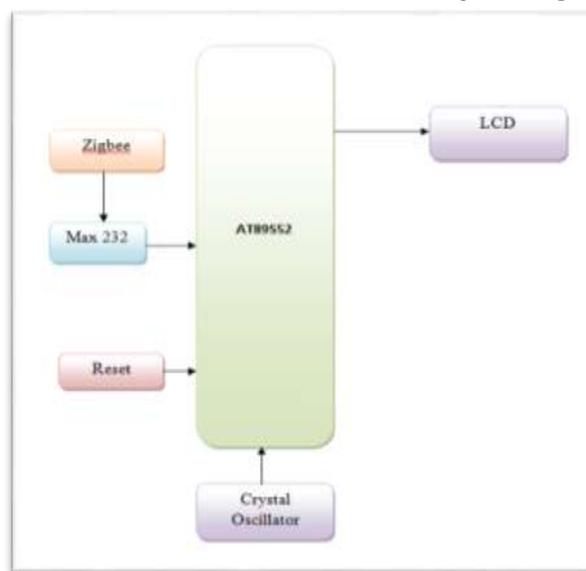
### 1. PROLOGUE:

The main objective of this project is identifying the radar target direction with remote station alert system. Radar signal containing selected target simulations modulates an optical, infrared signal, in accordance with the selected target simulations. Radar target system is provided with selectively direct modulated IR radiation onto selected areas of an RF (Radar Frequency) array. Radar target identifier is selected with areas of the RF array function to add target angular simulations and target space position and scintillations to the other simulations contained in the radar signal. The IR radiation is converted to a radar frequency signal in the RF array and is transmitted to the radar test system. This Project basically has two phases: Parabolic antenna and AT89S52 Microcontroller. Firstly, a parabolic antenna is an antenna that uses a parabolic reflector, a curved surface with the cross-sectional shape of a parabola, to direct the radio waves. The most common form is shaped like a dish and is popularly called a dish antenna or parabolic dish. The main advantage of a parabolic antenna is that it has high directivity. Secondly, The AT89S52 microcontroller belongs to family of 8052 controller which is an 8-bit processor, meaning that the CPU can work on only 8 bits of data at a time. Data larger than 8 bits has to be broken into 8-bit pieces to be processed by the CPU. 8052 is available in different memory types such as UV-EPROM, Flash and NV-RAM.

The rest of the paper is organized as: Working Process is explained in Section [II], Basic Principle of Radar in Section [III], Conclusion in section [IV], Applications in section [V] and References in Section [VI].



**Fig: TRANSMITTER**



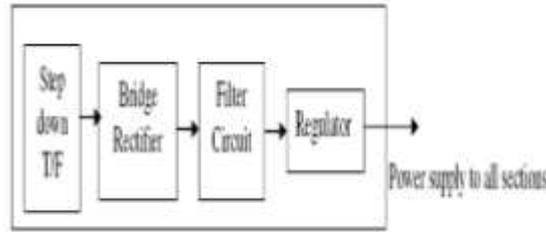
**Fig: RECEIVER**

## 2. METHODOLOGY:

Here, 30 volts AC supply is given to step down transformer which produces the output as 12 volts AC which is passed through the bridge rectifier. Rectifier output is pulsating DC that passes through the capacitive filter which blocks AC components and thus its output is DC that contains very less ripples, which is further given to 721 voltage regulator. The output of VR is constant DC. LED is used for power supply identification. Here, two power supplies are being used: 3.3V and 5V power supplies. 5V is required to drive all the components of the circuit and 3.3V required for microcontroller. There is also an Antenna which consists of Transmitter and Receiver, and is used for transmitting and detecting the signal. The AT89S52 Microcontroller is of 40 pins, out of which 32 pins are Programmable I/O Lines, three 16-bit Timer/Counters, Eight Interrupt Sources and contains Full Duplex UART Serial Channel.

Here in this project the radar is fitted with DC geared motors and to control its operation we are using AT89S52 as controller. In this project we are using DC Geared motor, IR sensors, Music generating system, and a Buzzer is used to indicate the presence of radar wave. In this project, L293D H-Bridge is used to drive the geared DC motor.

In this project RADAR antenna is placed at an altitude to track various frequencies emitted by different radio stations. The rotation of RADAR antenna is based on the signal tracked by a pair of infrared sensor based command signal generated through it. Once the signal is matched RADAR bowl will stop in that particular direction it indirectly turns ON the relay to switch ON the particular music indication system. Again if the user presses the TRACK switches automatically RADAR bowl will track for another radio frequency signal and turns ON the relay to switch ON the FM Radio. If track switch is pressed again another command based code is generated from IR remote automatically it turns ON relay to switch ON audio buzzer indication system. In this way we can track the signal and can switch ON the particular desired frequency channel. Rotation of RADAR antenna is based on the signal tracked by a pair of infrared sensor based command signal generated through it. Once the signal is matched RADAR bowl will stop in that particular direction it indirectly turns ON the relay to switch ON the particular music indication system. Again if the user presses the TRACK switches automatically RADAR bowl will track for another radio frequency signal and turns ON the relay to switch ON the variable source. If track switch is pressed again another command based code is generated from IR remote automatically it turns ON relay to switch ON audio buzzer indication system. In this way we can track the signal and can switch ON the particular desired frequency channel.



**Figure2. POWER SUPPLY TRANSMISSION**

**3. BASIC CONCEPT OF RADAR:**

A radar system has a transmitter that emits radio waves called radar signal in predetermined directions. When these come into contact with an object, they are usually reflected or scattered in many directions. Radar signals are reflected especially well by materials of considerable electrical conductivity especially by most metals, by seawater and by wet ground. The radar signals that are reflected back towards the transmitter are the desirable ones that make radar works. If the object is moving either towards or away from transmitter, there is a slightly equivalent change in the frequency of the radio waves, caused by the Doppler Effect.

RADAR EQUATION: The power  $P_{rec}$ , returning to the receiving antenna is given by the equation:

$$P_{rec} = \frac{P_t G^2 \lambda^2 \sigma}{(4\pi)^3 R_{max}^4} = \frac{P_t G^2 c^2 \sigma}{f_o^2 (4\pi)^3 R^4}$$

$$P_{rec} = P_t G^2 \left( \frac{\lambda}{4\pi R} \right)^2 \frac{\sigma}{4\pi R^2}$$

range loss loss due to  
between transmit target reflection  
antenna & target & range

Where

$P_t$  =Transmitting Power

$G$  = Gain Of the Transmitting Antenna

$c$  = Effective Aperture of Receiving Antenna

$\sigma$  = Radar Cross Section =  $(c/f)$  = Wavelength

$R_{max}$  = Maximum Range of Radar

Our Project is based on the principle of DOPPLER EFFECT. Doppler Effect states that when the radar waves are sent towards a moving target or object, they are reflected back and received by the radar. If the frequency of the reflected wave is increased, it means that the target is moving towards the radar. If the frequency of the reflected wave is decreased, it means that the target is moving away from the radar. In our project we are showing the detection of signal by using IR pair sensor. The principle behind infrared sensors is the transmission and reception of infrared light. An element known as a light emitting diode (LED) transmits active infrared light, which is reflected and received by an optical receiver known as a photo diode (PD). As long as there is no movement or object in the path of the light beam, the light pattern is static and the sensor remains in stand-by mode. When a person or object crosses the beam, the reflection of the light is distorted. This is registered by the PD, which gives off an impulse. Sensors differ in the number of rows of active infrared spots. These spots are collectively referred to as the detection area.

**4. INFERENCE:**

Mainly, in our project we have taken three sources which are used to produce IR signals. These IR signals are produced by the pair of a LED and a Photodiode. The principle behind infrared sensors is the transmission and receiving of infrared light. An element known as a light emitting diode (LED) transmits active infrared light, which is reflected and received by an optical receiver known as a photo diode (PD). As long as there is no movement or object in the path of the light beam, the light pattern is static and the sensor remains in stand-by mode. When a person or object crosses the beam, the reflection of the light is distorted. This is registered by the PD, which gives off an impulse. The Antenna movement is controlled by the Motor Driver L293D circuit. The motor driver IC is controlled by the signal which is coming from the input pin of the AT89S52 Microcontroller and this input pin is connected to the motor driver circuit by the help of a wire. The L293D is based on a principle of H Bridge circuit. An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used to allow DC motors to run forwards and backwards. Now, when the antenna rotates & any source comes in its path, it will detect the signal corresponding to particular frequency and produces a respective output. The prime objective of our project is signal detection for both stationary as well as moving target. IR pairs are used for detecting stationary target and Ultrasonic sensor is used for detecting moving target.

**5. APPLICATIONS:**

The information provided by radar includes the bearing and range of the object from the radar scanner. It is thus used in different fields where the need for such positioning is crucial.

1. It can be used for: to locate air, ground and sea targets. This evolved in the civilian field into applications for aircraft, ships and roads.
2. Marine radars are used to measure the bearing and distance of ships to prevent collision with other ships, to navigate and to fix their position.
3. Doppler Effect in radars helps in identification of weather of any regions.
4. RADAR is found on ships and boats for Collision avoidance.
5. RADARS may be used in law enforcement and highway safety.
6. RADAR may also be used for remote sensing.

**6. REFERENCES:**

1. Penley, Bill, and Jonathan Penley, —Early Radar History – an introduction|. 2002.
2. Swords, Sean S., —Technical History of the beginnings of Radar|, IEEE History of Technology Series, Vol. 6, London: Peter Peregrinus, 1986.
3. E. Fishler, A. Haimovich, R. Blum, D. Chizhik, L. Cimini, R. Valenzuela, —MIMO radar: an idea whose time has come|, IEEE Radar Conference, 2004.
4. Mark R. Bell, —Information theory and radar waveform design|. IEEE Transactions on Information Theory, 1993.
5. Grisenthwaite, Richard, —ARMv8-A Technology Preview|. IEEE Conference, 2011.
6. Preeti Pannu, —Remote alignment of Dish Positioning by android application|. IJERMT, vol. 2, no. 2, March 2015, pp. 267-269.