DEVELOPMENT OF RADAR USING ULTRASONIC SENSOR

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ABSTRACT

Radio detection and Ranging (RADAR) are remote sensing system with military, scientific and commercial applications. E M waves are sends by the Radio detection and ranging in which we use the radio waves to find "the distance metallic objects". In this laboratory we disclose the earlier results in the development of radar network. Some developments of radar are given below

1. *Waveform design and diversity*
2. *Radar networks*
3. *Network capacity*
4. *MIMO radar*
5. *Medium Access Control (MAC)*
6. *Routing*
7. *Network coverage*
8. *Energy efficiency*
9. *Security and privacy*
10. *Navigation and positioning (localization)*
11. *Sensor fusion*
12. *In-network information processing*
13. *Target detection and tracking*
14. *Other applications*

Keywords: Radar Transmission, Radar Communication, Radio Waves, Radio Efficiency, Waveforms, Bandwidth, Radio Signal.

I INTRODUCTION

RADAR works as transmitter and receiver both. In which we use a common antenna which works as a transmitter and receiver. The dedicated transmitter is not available in Passive radar system. At the place of dedicated transmitter we use the environment, and from this we measure the time difference of signal sends from the transmitter and the signal sends via reflection from the object. To determine the object we use the bistatic-range. For bistatic range the passive radar which measure the bistatic Doppler shift of echo and the

direction of arrivel. And from this we find the location, heading and calculate the speed of object. Sometimes multiple transmitter and receivers are used for several measurements of bistatic range.

Sometimes "Passive radar" is used incorrectly to describe the passive sensors which detect and track aircraft by RF emissions. **E.g.-Radar**, communication, transponder emissions. All recent radars were bistatic cause of switched from transmit to receive mode technology was not developed.

II HISTORY

The first RADIO range experiment developed in 1924, when British physicist Edward Appleton used radio echo's to determine the height of the ionosphere. The first practical RADAR system (RADIO DETECTION and RANGING) was produced in 1935 by another physicist Robert Watson-Watt. Handley Page Heyford detecting the BBC shortwave transmitter at Deventry at 12 km distance blast by the use of radar principle. Before 1930s many countries uses bystatic system in defence. The passive bistatic system used by German in **world war||** passive bistatic system was also known as Heidelberg- great. It was used at seven sites (Limmen, Oostvoorne, Ostend, Boulogne, Abbeville, Cap d'Antifer and Cherbourg) and used as a bistatic receiver in British Chain Home and detect the aircraft in the southern part of north Asia.

In 1936 we used the bistatic radar as monostatic systems, development of the synchronizer . The monostatic systems were easier in implementation because of its geometric complexities of separate transmitter and receiver sites from this system its became possible the aircraft and shipborne and different types of application developed at small components. About 1950 when other new properties of the scattered radar energy were developed at the placed of "bistatic" then bistatic system were again considered for different different properties for new developed technology.

III DEFINITION OF RADAR

Radar is a system which disclose the object by the help of radio waves disclose, to define the range, phenomena such ships, rain and plan them. Speed disclosure is uniformed by the amount of Doppler Effect frequency shift of the signal which returns back. Radio waves are transmit by transmitter, and returned by the object, after that disclosed by a receiver, commonly in the same location as transmitter . In spite of the R F signal return back is maximally very small, R F signals can simply be magnified, then radar can determine objects at ranges where object is present, like vibrant could be too weak to detect. It is used in many contexts, including meteorological detection of rainfall.

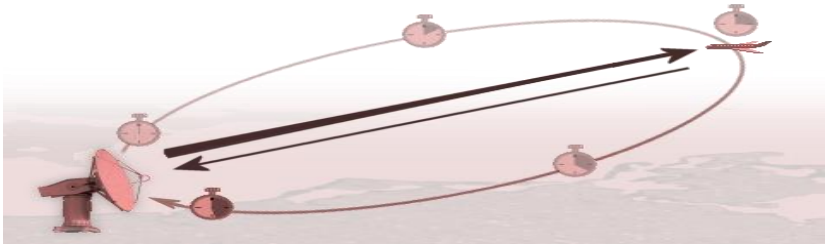

Fig. 1 The measuring of a round time of a microwave pulse

IV FUNDAMENTAL PRINCIPLES AND METHODS OF RADAR

The radar antenna find the target by the microwave signal, then from the target the microwave signal reflected and received by receive antenna. Which signal receive by the receiving antenna is known as echo. For the generation of radar signal required a powerful transmitter and also required a highly sensitive receiver for receiving the radar signal.

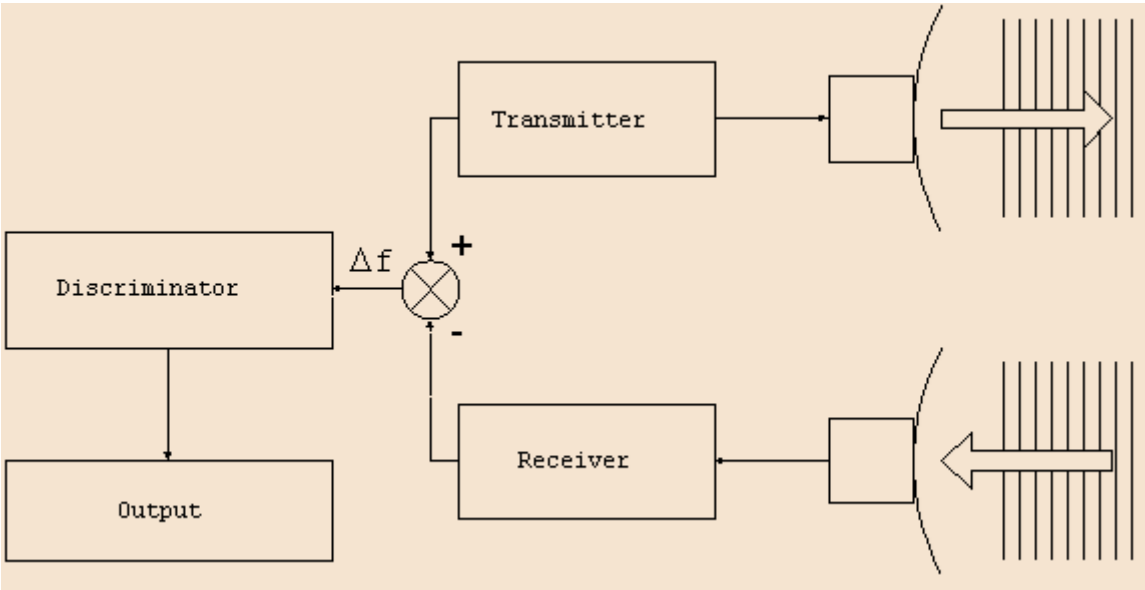

Fig 2:Basic Diagram of Radar

The radar system pulse transmission time and transmitted wave form are known. From these we can easily calculated the object range for a matched filter which used to achieve the optical signal to noise ratio in receiver. The receiver channel is known as the reference channel. Radar measure a distance to finding a range from the target point(range- finding), in which direction a signal is arrive (direction -finding).

4.1 Transmitter

The transmitter of the radar produces high power radio frequency pulses of energy for short duration, in the space by the transmitting antenna. Transmitter generates the required peak power and RF power.

1. The transmitter must have a suitable RF bandwidth.
2. The transmitter must have a high RF stability to meet signal processing requirements
3. The transmitter must be easily modulated to meet waveform design requirements.
4. By the use of transmitter the life is reliable and easier to maintain expectancy and cost of the output device must be acceptable.

4.2 Receiver

Radar receiver amplify the received radio frequency signal without adding noise or any type of distortion and also demodulate this signal. Radar receiver receives the reflected signals which reflect by the target. Radar

receiver provide a large dynamic range for accommodate large clutter signals. It rejected the interfering signal so the required information can be detected. It is difficult to avoid a noise from the radar receiver, so we design this very carefully. The noise is induced by the thermal motion of electron, so it is very difficult to avoid this. The thermal noise is proportional to the receiver banwidth so for the reduction of noise, we reduce the bandwidth. If the bandwidth is small to receiver does not amplify and signal echoes properly.

4.3 Discriminator

It produce a output after receiving a input pulse which amplitude can be vary.In this the magnitude of output is deviate by the pulse duration also ,Thus in this diagram discriminator produce the output according to the input

4.4 Output

In output we use the cathode ray tube in which we take distance with the help scale and at the output terminal different frequencies produced the beats from which we measure the distance. The digital receiver is used in passive radar system by which we find the output digitized, sampled signal.

V RADAR EQUATION

The total power P_r reflected to the reference antenna is given by the radar equation

$$P_r = \frac{P_t G_t A_r \sigma F^4}{(4\pi)^2 R_t^2 R_r^2}$$

Where,

1. P_t = transmitter power
2. G_t = gain of the transmitting antenna
3. A_r = effective aperture (area) of the receiving antenna
4. σ = radar cross section of the target
5. F = pattern propagation factor
6. R_t = distance from the transmitter to the target
7. R_r = distance from the target to the receiver.

In the common case where the transmitter and the receiver are at the same location, $R_t = R_r = R$ and then

$$P_r = \frac{P_t G_t A_r \sigma}{(4\pi)^2 R^4}$$

At the place of Rt^2 and Rr^2 we find R^4 which we show in the above formula, Thus here we see that the reflected power is become very –very small.

This equation is modified by using of radar set. The signal is receiving by the radar range equation which are retransmitted by a radar in radar we use two equation one for transmission and another for re transmission. In this systems are arranged in two ways. In first way we observe the target between the transmitter and receiver and in another way we observe the radiated signal which travels back.

VI APPLICATIONS OF RADAR USING ULTRASONIC SENSOR

There are some applications which will be given below

1. Underwater Communication
2. MIMO SONAR
3. Underwater Networks
4. Underwater Bell
5. Ultrasonic metal flaw detector
6. FM radio signals
7. Analog television signals
8. Police use radar to detect the speed of passing motorists.
9. The military uses it to detect the enemy and to guide weapons.
10. Radar uses in air traffic control to track plans on ground and air both.

VII ADVANTAGES

There are some advantages which is given below

1. Radar procurement cost is very low.
2. The operational and maintenance cost is low at the cause of moving parts.
3. Radar's jamming is difficult
4. Ultrasonic radar is small so it easily works at any place while simple radar can not work at that place
5. It s distance measurement resolution is high
6. Its measurement updates fastly
7. It also works in many types of weather and atmospheric conditions
8. NASA uses a radar to map the earth and other plants

VIII DISADVANTAGE

There are some disadvantage which is given below

1. Imaturity Problems are occured
2. Complexity of deployment
3. Problem are occurs in third-party illuminators
4. That is not work properly in 2D operation

IX CONCLUSION

In radar system many of things considered in reaching of current status .We begin by describing why it may be advantageous in some cases to share several functions in one piece of equipment. Ultrasonic radar is one of the applications of the radar in which transmitter and receiver both are operate at same frequency. Radar used to senses of observing environment and especially sense of vision. Its working voltage is *12 volt* and current is *30 mA* .In ultrasonic radar we increase the range of detection and it have not limit input signal to the accurate results. For the accurate ranges we adjust the sampling rate that detects smaller velocities. We can also set the algorithm in velocity for accurate results. We manage the sending signal for radar after that this signal return back from reflected by object at a specific distance at a certain velocity.

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