



A BRIEF INTRODUCTION TO RADAR

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ABSTRACT

RADAR is an electronic device, electro-magnetic-system for the detection and location of the target-objects by using technology in air-craft, space-craft, traffic controls, Remote-sensing and natural-environment, it can reflect the signal back. Not only had enough research applications, in medical radar also progressed for breast cancer & tumor localization. The angle and range of objects are detected by electro-magnetic radio waves, developing engineering system best example for all areas, this paper focus on RADAR types, based on configuration, functional- operations, applications and principle. I have interest to implement the many applications. The RADAR detects accuracy and efficiency in sensing, no electronic-system is replaced.

KEY WORDS: Radar, Air-craft, Electro-magnet, Remote-sensing, Medical radar.

INTRODUCTION

Radio Detection and Ranging, It uses ultra-high frequency or radio frequencies. It is micro wave part an object and direction also detected by Radar.

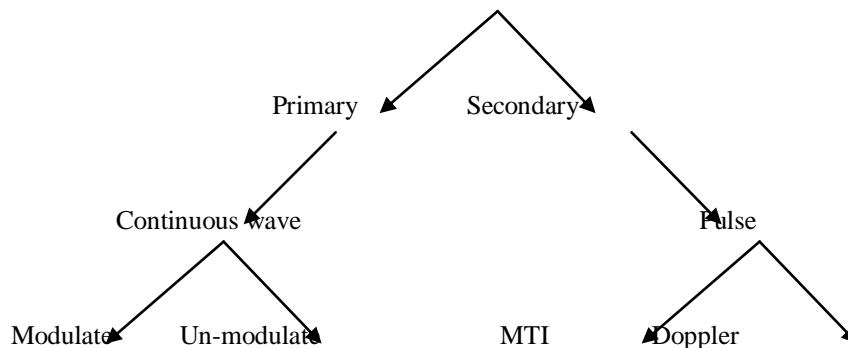
Basic Principle: Radar are uses electro-magnetic energy-pulses. The electro-magnetic energy is transmits, reflected from the reflecting object in the range of Radio frequency. The reflected energy-returns to radar-set by a small portion, this energy is called-ECHO. It is sound terminology.

Two types of pulsed–Radar:

- 1. Pulse-Doppler-Radar:**
It transmits high pulses frequency to avoid Doppler ambiguities, in this process the transmitted& the received echo signals are mixed in a detector to get Doppler shift and signals are filtered by Doppler filter. It is useful for rejected unwanted signals.
- 2. Moving-Target-Indicator Radar:**
Transmits low-pulse reflection frequency to avoid range of ambiguities. It begins with sampling 2 successive-pulses, sampling begins immediately after, and the radar transmits pulse ends. The sampling continuous until the next transmit pulse begins.

Rader classified based on their primary-functions

RADAR





Primary: The transmitted signals, gets reflected and received by the same Radar. It operates high-frequency signals.

Continuous wave:

- **Modulate:** Transmits the high -frequency signal, the reflected-signal is continuously processed. It can be bi-static (or) mono-static the Doppler shift using by the measuring the radial velocity of targets.
- **Un-modulates CW:** The Un-modulates CW measures only speed of target, not measures range of target.

Secondary:

- **Pulse Radar:** Pulse repetition-frequency decides the range and resolution of the target. It operates high frequency pulses to transmitters towards.
- **MTI:** Uses low pulse Radar frequency to avoid-range ambiguities, but has Doppler ambiguities.
- **Doppler:** uses high-primary radio frequency to avoid Doppler-ambiguities. Ex: SSR

Based on configuration emitter, receiver, and the antenna, and wavelength and scan strategies.

Different types of radars.

- 1 Biostatic-radar
- 2 Continuous-wave-radar
- 3 Doppler- radar
- 4 Fm-CW-radar
- 5 Monopoles radar
- 6 Passive-radar
- 7 Planar-array-radar
- 8 Pulse-dapple

RADAR MAIN PARTS:

Radar has four main parts:

1. Transmitter: That produces electro-magnetic-energy.
2. Antenna (or) Antennae: The part sends-energy and receives energy, can be parabolic reflector, planner-array (or) electronically steered- phased- arrays.
3. Receiver: It converts energy picked-up by antenna into understandable signals.
4. Processor: The processor makes sense from the signals that have been converted by the receiver.

Radars are classified based on applications

1. Primary application of Radar C
2. Tracking-Radar (or) control-Radars



3. Meteorological Radars
4. Imaging-Radar
5. Radar-altimetry

APPLICATIONS OF RADAR:

Radar applications in daily life.

I. Military:

- In air-defense it is used for target-detection, target-recognition and weapon-controls in missile-systems to guide the weapons, identifying, and enemy-location in map.

II. Remote-sensing:

- Radar can be observing weather (or) planetary position and monitoring-sea-ice to ensure smooth-route for ships.

III. Air-Traffic-Controlling:

- To control air-traffic near air-forts the air-ports are used by the air surveillance, Radar to detect and displays air-crafts position.
- The air-craft to land in bad weather conditions, before gives the signals by Radar.
- The air-port surface, air-craft, and ground vehicles positions are scanned by Radar.

IV. Ground-traffic-control:

- The traffic police to determine-speed of vehicles and controlling the speed by giving warning about presence of other-vehicles.

V. Space:

- Safe-landing on moon by guide of space vehicle by using Radar.
- To observe the planetary-system.

WORKING PROCESS OF AIR- CRAFT RADAR:

- It works on the several principles, which is displayed on a screen by the process of primary Radar sends out a signal, which bounces of solid objects and gives a return. This very crude-speed, height and course information.
- Commercial air-craft also have (SSR) means secondary surveillance Radar, SSR is transponder sends the air-craft's speed-heading and altitude-back to monitoring station. Out of primary-radar Coverage ATC can keeping. That is called ADSB new-version.
- The 3rd type of transponder is TCAS, one air-craft sends out a digital signal saying I am here at this speed and altitude and zone is (air craft) TCAS computer read this and make reply a safe-distance away.

Doppler radar sends out a signal which bounces of an object, but returns frequency an idea of something-its speed also. The train whistle effect where the train sound pitches up first as it is moving towards you then down as the train moves away, this is particularly useful in detecting weather and wind shear ahead.

Radar Operating Frequency:

Frequency is lower than 1GHz (such as L-band UHF VHF and HF as opposed to the use radar bands .the Radar range 2GHz and up (2GHz to 4GHz) than Radar cross section of any targets depend on the transmitted signals

The Radar operating frequency at a center of 12.38MHz worth a band width of 100 KHz at 30W Rf-power

The Radar frequency range sets from 5MHz to 130GHz .some frequency are also preferred of applications in lower-range of Radar systems operate at lower frequency below.



Latest frequency classification is given by NATO below 3GHz, below 10GHz are operated in air-ports, controlling radar in air-crafts.

BACK GROUND:

Sir Robert Watson-watt from British scientists in 1935 introduced 1st practical Radar, and a chain of Radar-station established in 1939 by England along its south-east-coasts to detect aggression in the air (or) on the sea. It was called Radar.

CONCLUSION:

RADAR products are made variety of applications, Radar can detects position of the objects and shape (or) size, Radar can gives the accurate of the measurements using Laser by light rays

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