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Radar Imaging In Two Dimensions

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Abstract- This paper is going to describe what is radar imaging in two dimensions, principles on which it works, it's application, what are the types of radar imaging ,what are the major problems occurring in it and the solutions of that problems.And have a small description about the radar and its uses in defence.
Keywords-Topography, Tomography, Resolution, Rebar's, Tripod

I. INTRODUCTION

Radar imaging is the implementation /application of the radar. These are used in finding the images in two dimensions like mainly of landscapes. Usually radar are used to display the position and motion of purely highly reflective objects(ships &aircraft).In radar imaging it form the images of the Landscapes on the basis of intensity receive from the reflected Signal of the object. Reflected signal is the causal of light scattering. These scattered lights help us two make images in two dimensions.

II. PRINCIPLE

The principles on which it work is Doppler Effect, Doppler Effect is the change in frequency of wave for an Observer moving relative to its source. This helps them to create a perfect image.

III. APPLICATIONS

Surface topography, crustal change

Medical microwave tomography

Through wall radar imaging

Environmental monitoring

A. Surface Topography

It is also called surface finish can be characterised by three characteristics lay, surface roughness and waviness Example 3D map of Earth from the space. Imaging radar bounces the radar signal from the ground ,then measures the time taken by the signal to come back after reflection from the ground and how it is strong. With the help of these information we can get the image of the Earth(mountains, hills, lakes, rivers).

B. Medical Microwave Tomography

Microwave tomography is a science which is generated from older techniques in order to find hidden or embedded objects in a media using electromagnetic wave in microwave regime (300MHZ-300GHZ).Recently, it is used for structural health monitoring.It occur when electromagnetic waves in low frequency penetrate inside concrete and reach toobject of interest which is usually rebar. When there is any rust found on the rebar ,sorust reflects less EM wave in comparison to the whole metallic rebar, it is used to distinguish between rebars with and without rust.It is also used to detect any anomaly inside concrete ex-crack or air voids.

C. Through Wall Radar Imaging

Sometimes in investigation we have to know that whether suspect is inside the building or not.The location of suspect inside the building is also needed. With the help of radar imaging we can look into the building at standoff distances and build the changing situations of suspect.

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Fig-1[15]

The "test range "for through-wall measurement Shows the 10cm and 20cm thick, solid concrete walls on the left and cinder-block on the right.

D. Environmental Monitoring

The satellite radar imaging is used in observing ocean and weather conditions as a high resolution data. It is used in mapping and studying of the behaviour of grounds. This prevent the collapse of mine areas, inhabitant areas.

IV. TYPES OF RADAR IMAGING

Presently there are two technique's used by radar imaging –

Synthetic aperture radar (SAR)

Inverse synthetic aperture radar (ISAR)

A. Synthetic Aperture Radar (SAR)

It is the form of radar which uses a method of moving a real aperture or antenna over a different position's to get distinctive coherent signal variation. This is used to get higher resolution.

There are problems occurs when an obstacle comes between the radar and the object of which we have to create an image. After long time invention of Synthetic Radar, there exist certain problems in it which are related to design of incident field related to a particular purpose.

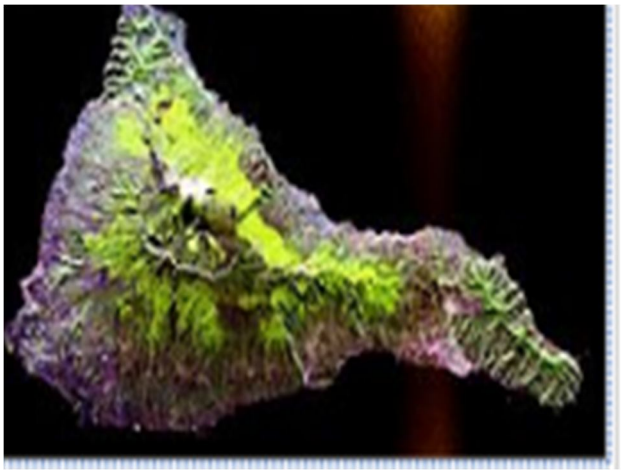

Fig-2[16]

An SAR radar image acquired by the SIR-C/X-SAR radar on board the Space Shuttle Endeavour shows the Tiede Volcano.

B. Inverse Synthetic Aperture Radar (ISAR)

It is just analogous to SAR but it has a unique feature that it utilizes the movement of the target rather than to use the emitter to create the synthetic aperture. This technique results in defocusing and geometry error in image. Target depression, Multipath, antenna motion, image blocking modelling errors etc are the errors occur due to ISAR. Example of Multipath-Multiple reflections can create a problem in ISAR imaging like distortions while taking the image of ghost trails from jet aircraft tail pipes .Both SAR and ISAR are based on known relative motion target and sensor, but this type of motiondoes not give well defined or well - focused images. For this we need methods. Better knowledge of finding algorithms so that we can determine the exact position of antenna from the radar.

V. RADAR

The full form of radar is Radio Detection And Ranging .It is mainly used in defence to detect the enemies in the sea and on the border line .The main component of radar is sensors. Sensors senses the parameters of any object and convert them into electrical signal. This signal is used by the radar to perform it's function . Radar is not affected by the day or night.

VI. BATTLEFIELD SURVEILLANCE RADAR SHOR- RANGE (BFSR-SR)

This type of radar have high degree of complexity. Therefor used to search ,track and identify the targets like moving single vehicle, walking man and moving heavy vans at different distances. This is a very large system that it is carried out by the three soldiers and is tripod mounted when it is operated. An infantry warrior install and make it to perform operation within 5min.This is basically used for border security force, police etc.

Battlefield surveillance radar–short range

Fig-3[14]

VII. CONCLUSION

It is concluded that radar imaging is a very useful technique to detect the suspects and study the nature of the earth .It help us to protect the earth from future calamities like tsunami, landslides etc . The detectives solve their various cases by using this technique.

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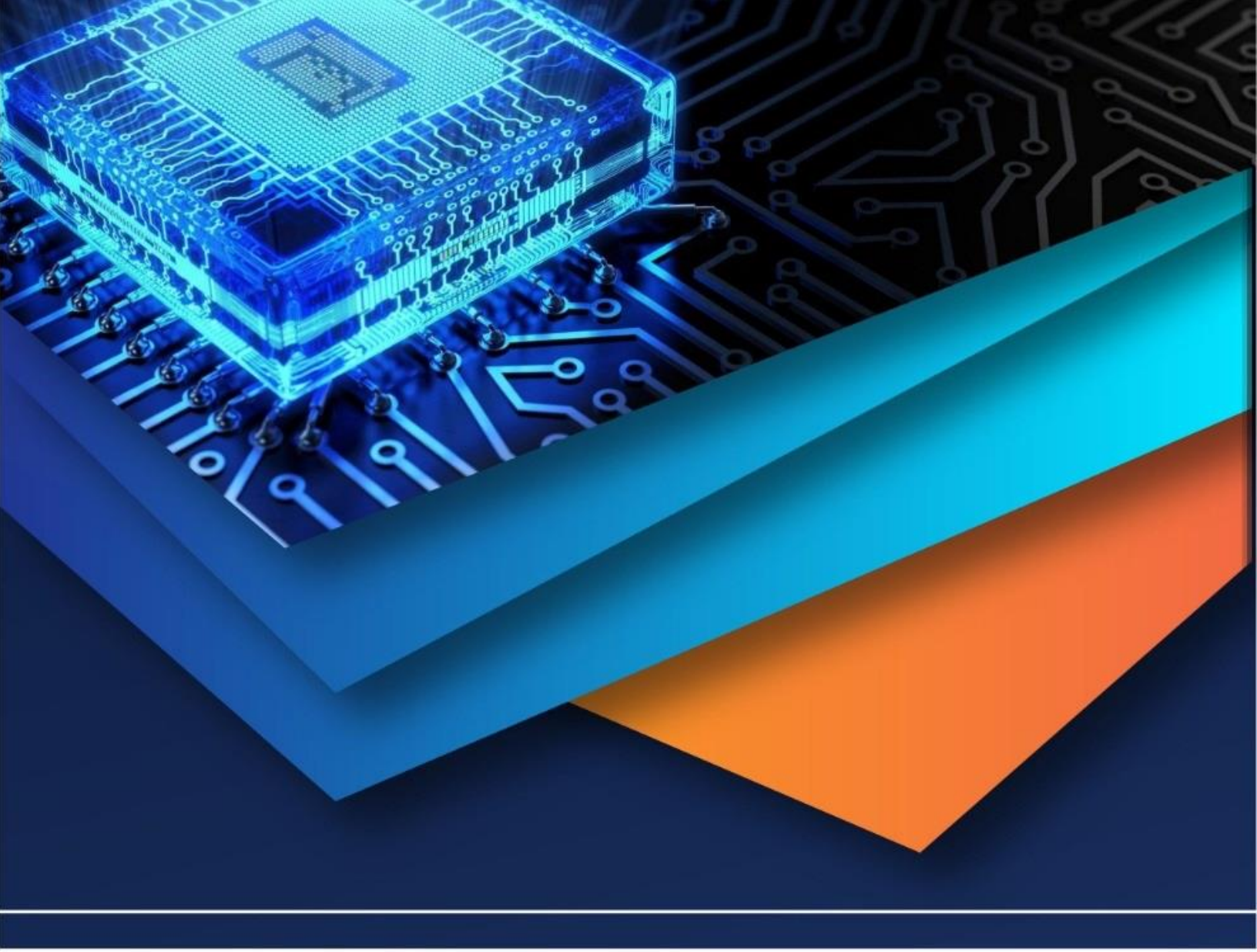

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