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LIDAR Technology

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Abstract:-**Lidar stands for Light Detection and Ranging. Lidar refer remote sensing method that uses light in the form of a pulsed laser to measure distance to the earth. Lidar uses laser energy in radar fashion to observe meteorological backscattering as a function of range. Light detection and ranging represent a key method to investigate vertically resolved properties. It is consist the component that is laser, scanner and optics, photo detector and receiver electronics, position and navigation systems and sensor. The light detection and ranging has only two types that isAirborne LIDAR and Terrestrial LIDAR.**

Keyword: Light detection and ranging (LIDAR).

INTRODUCTION:

Lidar refers to a distant sensing technology that emits sharp, focused beams of light and measures the time it takes for the reflection to be detected by sensor. And it is used to examine the surface of the earth. Lidar, which is popularly spelt Lidar and also known as LADAR or laser altimetry, is an acronym for light detection and ranging. Lidar beginning in the early 1960, shortly after in mintage of the laser and combined laser – focused imaging with the time for a signal to return using propensity sensors and data acquisition electronics. Its first application came in meteorology, where the national center for meteoric research used it to measure legion. The normal public becomes aware of exactness and usefulness of Lidar system in 1971 during the Apollo 15 mission, when astronauts used a laser altimeter to map the region of the moon.

DESIGN:

The two kinds of lidar detection that is "coherent" detection and "incoherent" detection or direct energy. Coherent detection is more sensitive than direct detection.Coherent systems generally use optical heterodyne detection. And the optical heterodyne detection is a method of extracting information encoded as modulation of the phase or frequency of electromagnetic radiation in the wavelength band of visible or infrared light. The light signal is compared with standard.
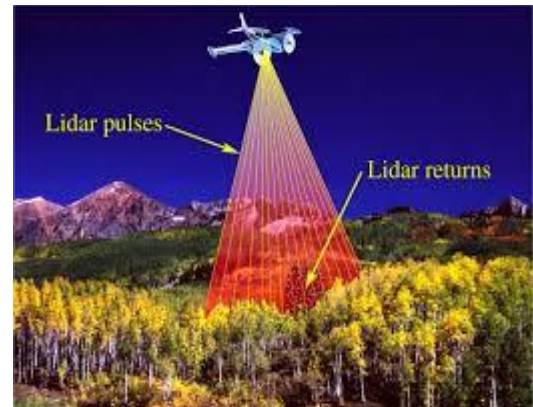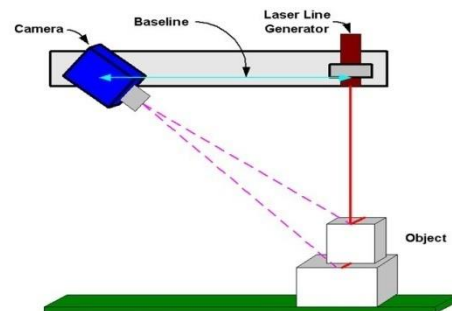

Figure: 1Lidar Technology

Figure: 2 Lidar Geometry Diagram

COMPONENTS:

Lidar system consist of several major component that is
1) Laser
2) Photo detector and receiver electronics
3) Position and navigation systems
4) Sensor
5) Solid state laser
6) Phase array
7) Flash lidar

1) Laser:
It is the process of to emits the light for optical amplification founded on the stimulated emission of electromagnetic light. This is called laser device. The word "laser" emerged as a short word for "light amplification by stimulating emissions of radiation.

2)Photo detector and receiver electronics:
In lidar two main technologies are used that is solid state photo detectors and photomultipliers.

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3) Position and navigation systems:
Lidar sensors mounted on mobile platforms that are airplanes or satellites require equipment to determine the ultimate theory position and orientation of the sensor.

4) Sensor:
The lidar uses the active sensor which supplies its own light source.

5) Solid state laser:
By definition, there is no moving part in solid state electronics.

6) Phase array:
A phase array can highlight any direction using individual antenna microscopic array. Controlling the time (phase) of each antenna is a consolidated signal in a specific direction.

7) Flash lidar:
Flash uses a light source that publishes   the viewing area in a pulse. Looking at the distance, a powerful explosion of light is required. Power is limited to those levels which do not harm human retina. Wavelength should not affect human eyes. However, low-cost silicon images do not read light in the safe spectrum of the eyes.

TYPES OF LIDAR:

There are two types of lidar that is
1) Airborne LIDAR
2) Terrestrial LIDAR

1) ***Airborne LIDAR:*** in airborne Lidar, the system is congealment in either a fixed-wing aircraft or helicopter. The infrared laser light is emitted toward the ground and recoil to the moving airborne Lidar sensor.

There are two types of airborne sensors
that is.
   a. Topographic LIDAR
   b. Bathymetric LIDAR

2) ***Terrestrial LIDAR:*** Terrestrial LIDAR get-together very compact and highly simple points, which allowed special identification of object. These compact points' clouds can be used to handling facilities, conduct highway and rail surveys, and even create 3D city model.

There are two main types of terrestrial LIDAR that is.
   a. Mobile LIDAR
   b. Static LIDAR

APPLICATION:

There is a wide variety of application for lidar.
1) In Agriculture field
2) In Archeology field
3) In Autonomous vehicles field
4) In Geology and soil science
5) In Corona field
6) In Law enforcement field
7) In Defense field
8) In Digging field
9) In Physical science and astronomy
10) In Rock mechanics
11) In Spaceflight field
12) In Surveying
13) In Transport field
14) In Wind farm optimization
15) In Solar photovoltaic deployment optimization
16) In Video games

CONCLUSION:

This technology has become an advanced technology which established method for collecting very dense & elevation data landscapes, LIDAR can assign high degree of accuracy & more detailed knowledge about the landscape than RADAR technologies so it is more applicable and efficient technology. It is used in world wide.

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