

Assignment - 02

LIDAR | GIS :

[R R AMBABU , SC22M075]

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LIDAR Applications other than Remote Sensing and GIS :-

Autonomous Vehicles :- LIDAR Technology is key component in Development of Self Driving cars. LIDAR Sensors can detect and measure distance to objects in environment allowing autonomous vehicles to navigate and avoid obstacles.

Industrial Inspection :- Used for Inspection and

Quality Control. LIDAR Sensors can detect defects in wind turbines blades or monitor thickness of paper in oil and gas pipelines.

Archaeology :- Used for Archaeology Surveys to create high resolution 3D maps of ancient ruins and landscapes. LIDAR can detect and reveal hidden features and structures that are not visible from ground.

Digital Twin Technology :- replicating the actual model that can be used and done by LIDAR. There are examples of LIDAR applications in Digital Twin Technology.

Building Information modelling :- LIDAR can be used to create 3D models of buildings that are accurate down to millimeters. These models can be used as basis for BIM which allows real time monitoring.

Asset management:- LiDAR data can be used to create Digital Twin of assets such as machinery equipment. These digital twins can be used to monitor performance, detect faults and optimize maintenance schedules and subsequently improve safety.

Augmented Reality:- LiDAR Sensors can be used to create more accurate realistic augmented reality experiences. By scanning the environment in real time, LiDAR can create high precision 3D maps that can be used to overlay virtual objects onto real world. This can be used in variety of applications such as gaming, education, retail and military training etc.

Crime Scene Investigation:- Used to create detailed 3D maps of crime scenes. This can help investigators to accurately document and analyze evidence such as blood spatter patterns, bullet trajectories.

Forensic Analysis:- LiDAR technology can be used for forensic analysis such as analyzing / identifying tool marks on objects.

3D metrology :-

Dimensional metrology:- measuring size, shape, of objects with accuracy and precision.

Reverse Engineering:- Used to create 3D models of objects for reverse engg purposes. This involves measuring the geometry of existing objects and using their data to create CAD models.

(2) Specifications of Space, Aerial, Mobile, Terrestrial

LIDAR Scanners:-

SPACE BORNE LIDAR :-

GLAS (Geo Science Laser Altimeter System) :-

- ① Operates with Infrared and Visible laser light pulses at 532nm and 1064 nm wavelengths or eye safe signals.
- ② GLAS to measure surface elevation of polar ice sheets accurately, establish a network of height data on Earth's land topography and profile the vertical distribution of clouds and aerosols on global scale.

GLAS Space borne laser Technical Specifications	Surface	Atmosphere
wavelengths	1064 nm	532 nm
Laser pulse Energy	74 mJ	30 mJ
Laser pulse Rate (Pulse Repetition Rate)	40 Hz	40 Hz
Laser pulse width	5 nsec	5 nsec
Detection Scheme	Analog	Photon Counting
Vertical Sampling Resolution	0.15 m	7.5 m
Surface ranging accuracy	5 cm	
Receiver Optical band width	0.8 nm	0.03 nm
Range	10 km	
accuracy = 10 cm (based on surface reflectivity characteristics)		
Foot print = approx. 10 m ²		

Air borne LiDAR (Leica ALS 80) :-

3 three Scan patterns

Sinusoid 200 Hz

Triangle 155 Hz

Raster 112 Hz

ALS 80

wavelength

Pulse Repetition Frequency (PRF)

point density

Range

Accuracy

lateral placement

vertical placement

Specifications

1064 nm

500 kHz

20 points / m²

5000-600 meters (above AGL)

5-38 cm

5-17 cm

Mobile LiDAR (RIEGL VQ 1HA) :-

VQ 1HA

Effective measurement rate

max Range reflectivity
≥ 80%

≥ 10%

Specifications

300 kHz	500 kHz	1000 kHz	1250 kHz	1500 kHz	1800 kHz
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475m	370m	255m	235m	235m	235m
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170m	130m	85m	85m	85m	85m
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Accuracy

5mm / 3mm

field of view

360°

Scan Speed

250 scans / sec

point Density

3000 points / m²

Terrestrial laser Scanner FARO FOCUS

Technical Specifications:

FARO FOCUS Premium 3D	Specifications
Wavelength	1553.5 nm
Beam Divergence	0.3 mrad (1/e)
Beam Diameter at exit	2.12 mm (1/e)
Laser class	Class 1 Laser (eye safe)
Scan Speed	97 Hz
3D Accuracy	2mm @ 10m, 3.5mm @ 25m
Range error	±1mm
Angular accuracy	19 arc sec
Max speed	2 million pts/sec
Range	
White 90% Reflectivity	350mtr
Dark grey 10% "	150mtr
Black 2% "	50mtr

RIEGL VUX 160 Scanner Specs:

RIEGL VUX 160	Specifications
Laser pulse repetition rate	300 kHz, 600 kHz, 1200 kHz, 1800 kHz
Reflectivity > 80%	1800m, 1390m, 980m, 820m
Accuracy	10mm
Precision	5mm
Wavelength	Near Infrared
Beam Divergence	0.4 mrad
Beam footprint	40mm @ 100m, 200mm @ 500mtr, 400mm @ 1000mtr.