

## Assignment - 02

LIDAR / GIS :

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① LIDAR Applications other than Remote Sensing and GIS :-

Autonomous Vehicles :- LIDAR Technology is key component in Development of Self Driving car. 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 pipes in oil and gas pipelines.

Archeology :- Used for Archeology 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 done by LIDAR. These 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 millimeter. 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 or 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 that 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 at 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	1064nm	532nm
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	0.15m	7.5m
Surface Ranging accuracy	5cm	
Receiver Optical band width	0.8nm	0.03nm
Range	10km	

accuracy = 10cm (based on surface Reflectivity characteristics)

Foot print = approx. 70m<sup>2</sup>

# Air borne LIDAR (Leica ALS 80) :-

## 3 Three Scan patterns

Sinusoid	200 Hz
Triangle	155 Hz
Rayter	112 Hz

## ALS 80

## Specifications

wavelength  
Pulse Repition frequency  
(PRF)

1064 nm

500 KHz

point density

20 points / m<sup>2</sup>

Range

5000 ~~to~~ meters (above AGL)

Accuracy

lateral placement

5-38 cm

Vertical placement

5-17 cm

## Mobile LIDAR (RIEGL VMQ 1HA) :-

## VMQ 1HA

## Specifications

Effective measurement rate

300 KHz

500 KHz

1000 KHz

1250 KHz

1500 KHz

1800 KHz

max Range Reflectivity

475 m

370 m

255 m

235 m

235 m

235 m

≥ 80%

170 m

130 m

85 m

85 m

85 m

85 m

≥ 10%

Accuracy

5 mm / 3 mm

field of view

360°

Scan Speed

250 scans / sec

point Density

3000 points / m<sup>2</sup>



# Terrestrial Laser Scanner FARO FOCUS

## Technical Specification

FARO Focus Peramium 350	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	350m
Dark Grey 10% " "	150m
Black 2% " "	50m

## LEAN Scanner Specs:

RIEGL VUX 160	Specifications			
Laser Pulse Repetition Rate	300 kHz	600 kHz	1200 kHz	1800 kHz
Reflectivity	1800m	1390m	980m	820m
Accuracy	10mm			
Precision	5mm			
Wavelength	Near Infrared			
Beam Divergence	0.4 mrad			
Beam Footprint	40mm @ 100m, 200mm @ 500m, 400mm @ 1000m			