PERCEPTION FOR ROBOTICS

LiDAR

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TOPICS

I- What’s a LiDAR

II- Why LiDAR

III- How LiDAR works

IV- Types of LiDAR

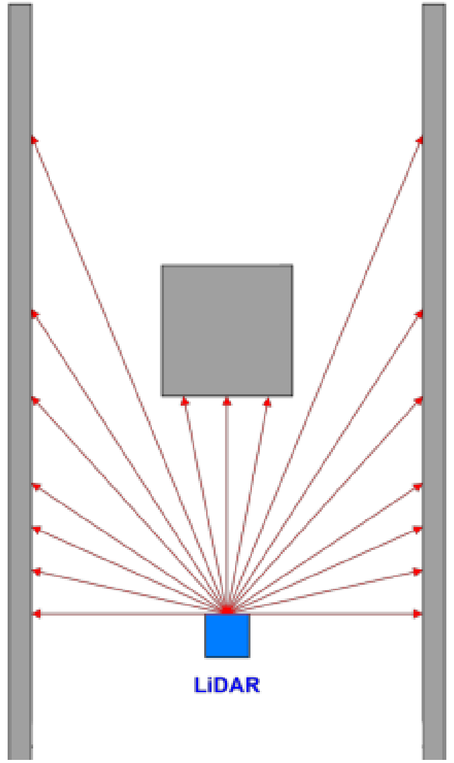
V- LiDAR in robotics

VI- Limitations

What’s a LiDAR

LiDAR

(Light Detection And Ranging)



Why LiDAR ?

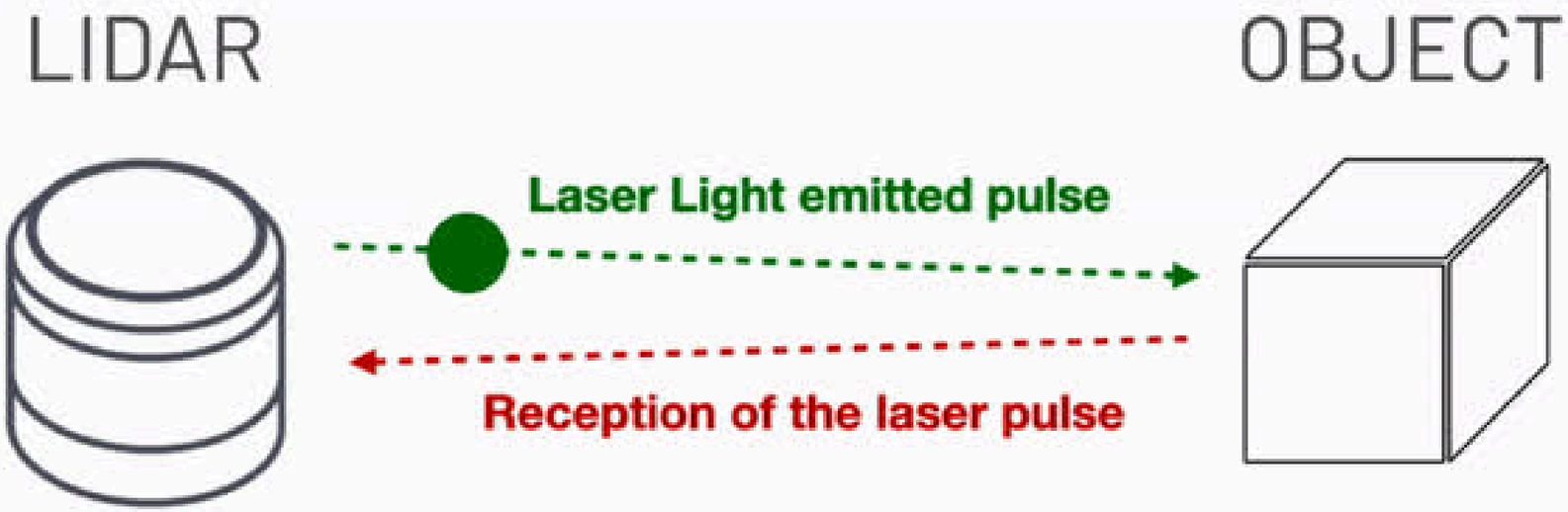
-High accuracy in distance measurement.

-Works in low-light conditions.

-Essential for autonomous navigation, SLAM, obstacle avoidance.

-Long detection range.

How it works ?



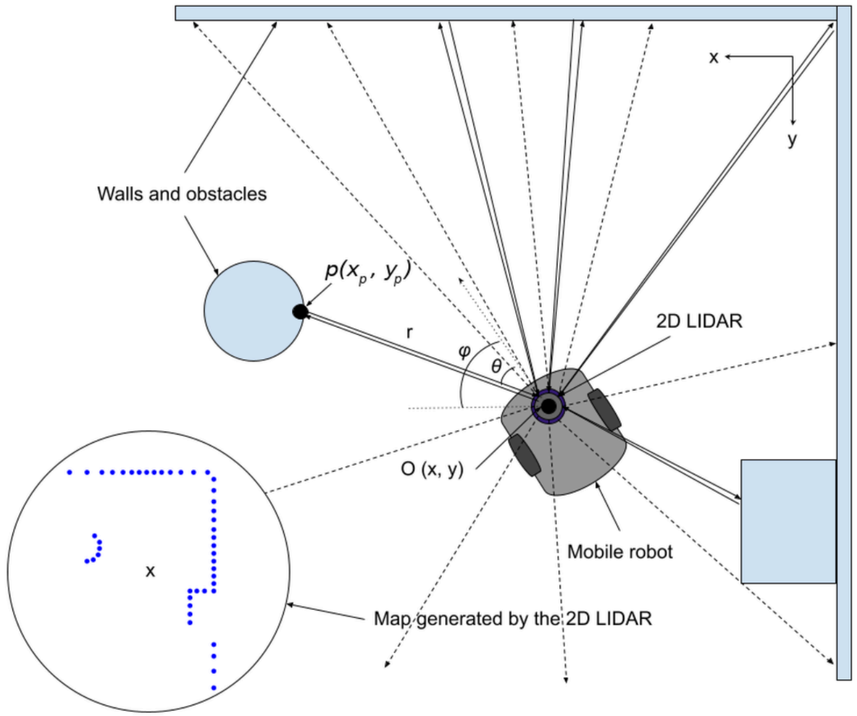
Laser pulse travelling at speed of light

$$distance = \frac{c \times t}{2}$$

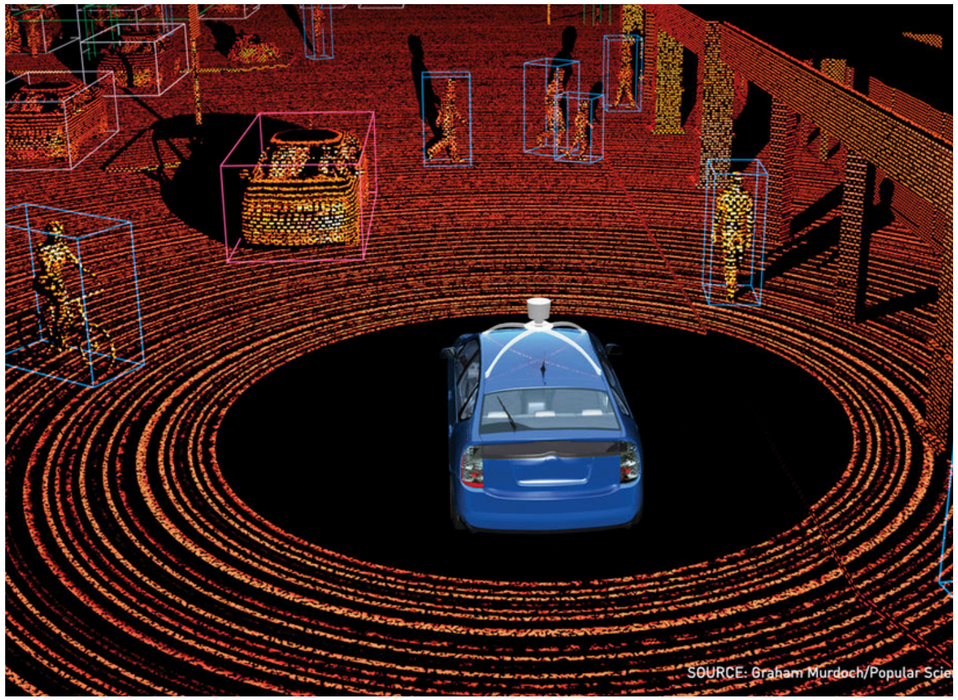
The speed of light is known and invariant

Types of LiDAR

2D LIDAR



3D LIDAR



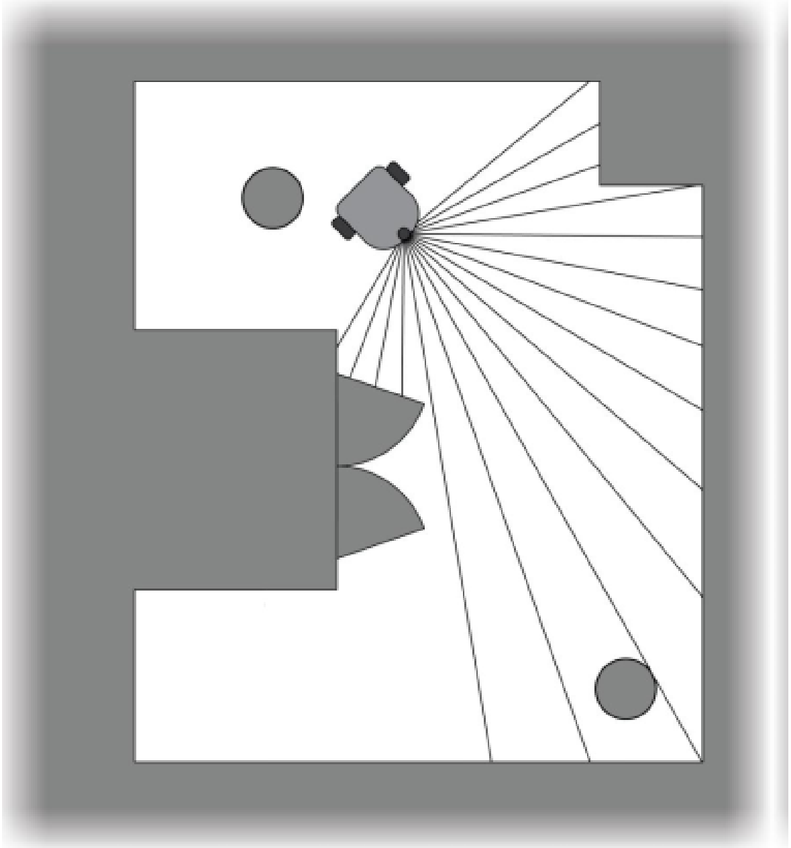
LiDAR in robotics

SLAM (SIMULTANEOUS LOCALIZATION AND MAPPING)
-Building maps of unknown environments.
-Localizing robot position within the map

Autonomous Navigation

-Path planning

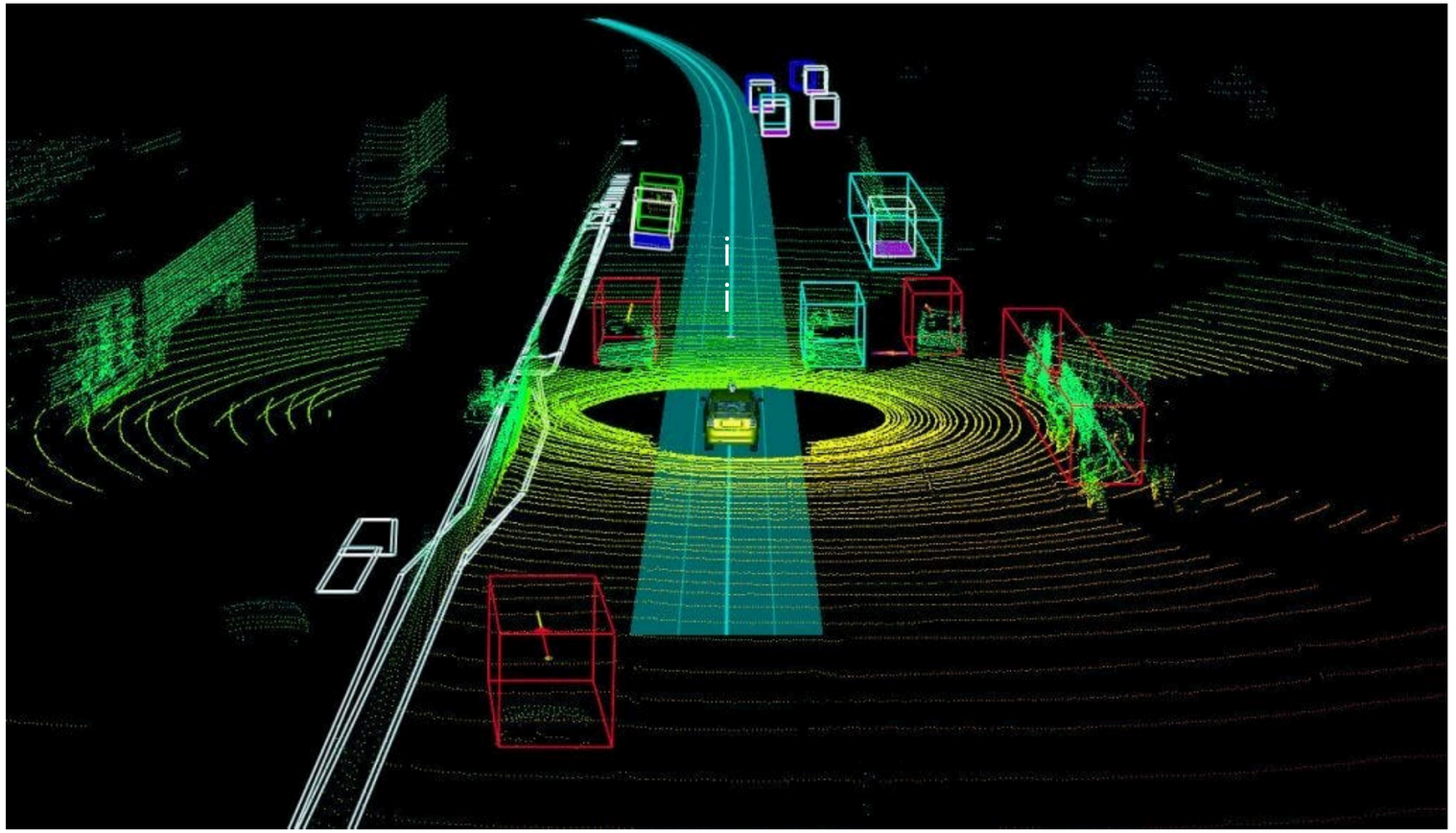
-Obstacle detection and avoidance



Object Detection & Recognition

-Identifies pedestrians, vehicles, or other robots.

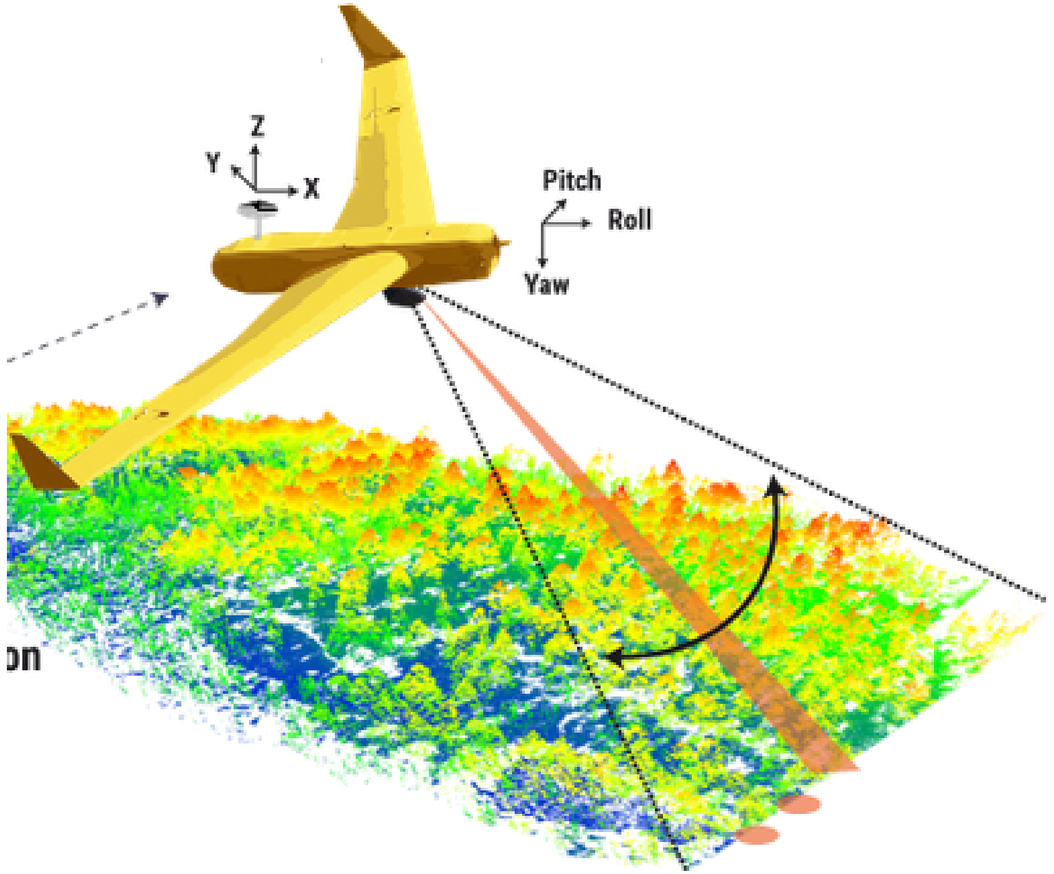
-Used in autonomous driving to track moving objects.



Drones & UAV Applications

-Terrain Mapping & Topography

-Altitude Management



Limitations

-High cost

-Sensitivity to weather

-Data volume

-Power consumption