LiDAR based navigation of mobile robots. Lecture 01.

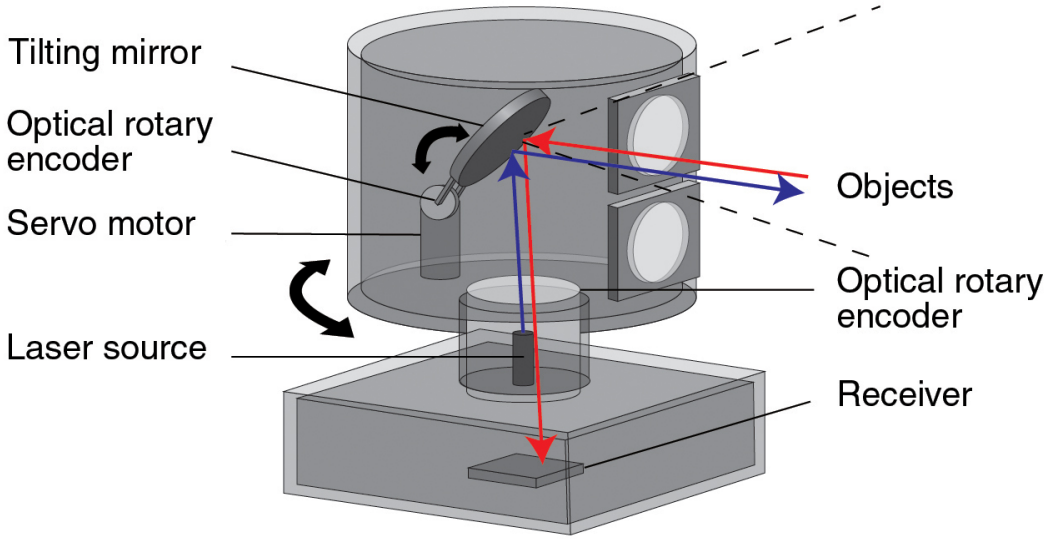
Artyom Pavlov, 2019.

What is LiDAR?

- **Lidar (also called LIDAR, LiDAR, and LADAR) is a surveying method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor. – wiki**
- **Extensively used in robotics and many other areas.**

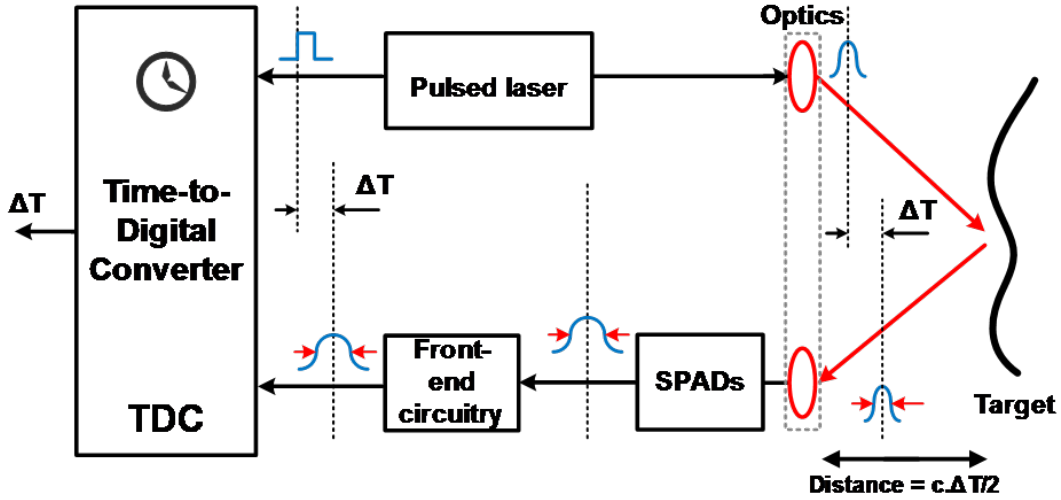
LiDAR types

- **Impulse (time of flight) based**
- **Modulation based**
- **Triangualation based**



Impulse based LiDARs

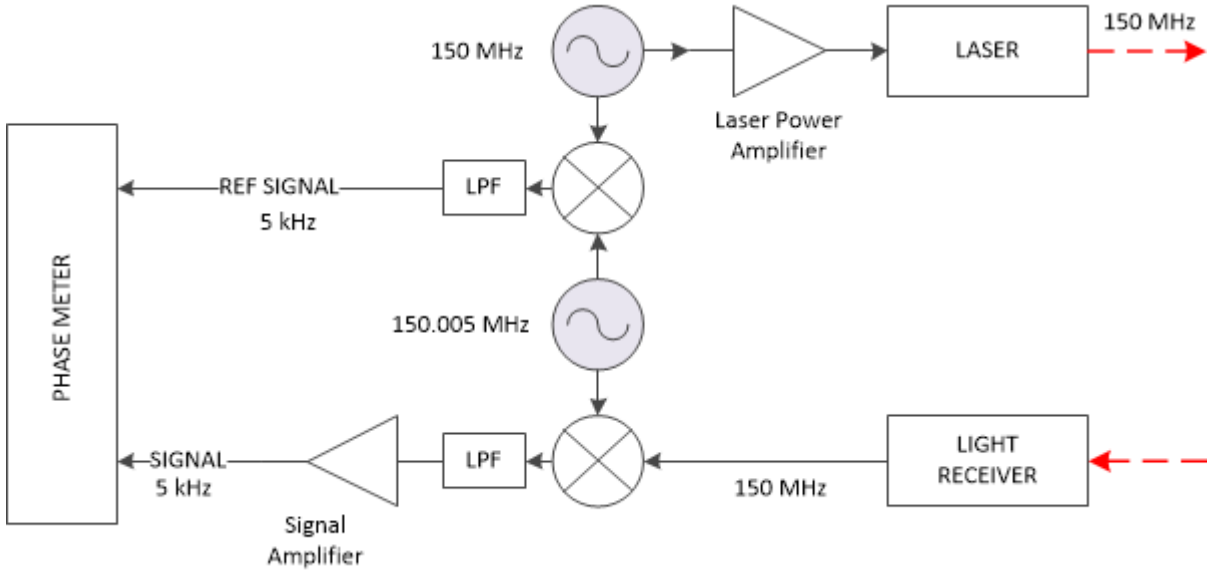
- **Can measure very long distances**
- **Requires high-precision time measurements**



Modulation based

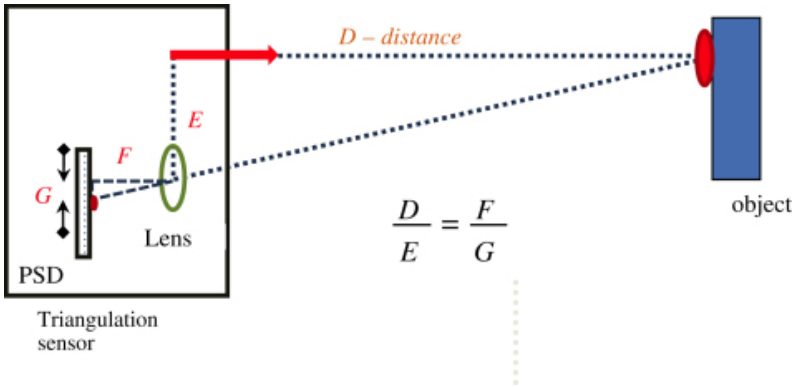
- **Use laser modulation, which makes it easier to measure distance**
- **Max. measurable distance depends on modulation frequency**

$$D = \frac{c}{2f} \cdot \frac{\varphi}{2\pi}$$



Triangulation based

- Use triangulation to measure distance
- Measurement error grows with a distance
- Currently the cheapest technology



Why LiDARs?

- They provide direct measurement of distances to objects in surrounding environment with a high refresh rate (20-40 Hz)
- It’s an active sensor, meaning measurements are mostly independent from lightning conditions
- Can work to some extent in adverse weather conditions (rain, snow, etc.)

LiDAR applications

How Does LiDAR Work?

https://www.youtube.com/watch?v=NZKvf1cXe8s

Indoor robotics

Eurobot

Robot Vacuum Cleaner

RoboCV

Hardware time!