Flying Cars: Introduction to Autonomous Flight

Aircraft types:

- Fixed-wing aircraft → Faster
- Rotary-wing aircraft → VTOL capability

Main parts of a quadrotor:

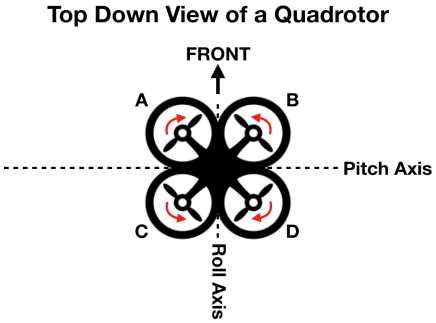
- Frame → X shape.
- Motors → brushless motors.
- Electronic Speed Control (ESC).
- Propellers.
- Flight computer and AutoPilot
- Sensors:
    - GPS.
    - Cameras
    - IMU
        - Accelerator
        - Gyroscope
- Battery and Charger.

Propellers characteristics

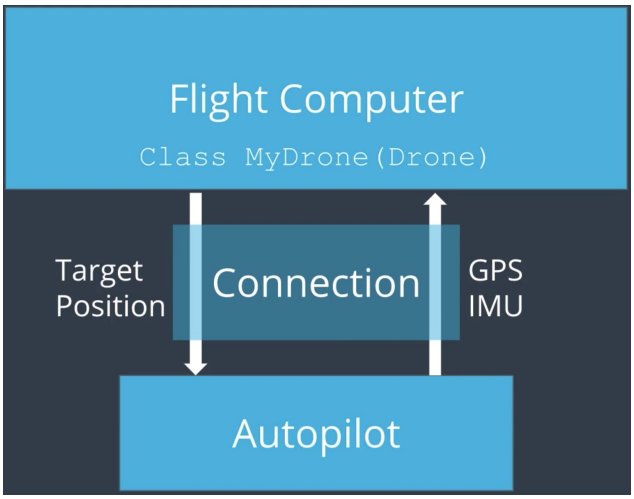
- Tractor: Air ↑ Quadrotor ↓ vs. Pusher: Air ↓ Quadrotor ↑
- Clockwise vs. anticlockwise
- Radius
- Pitch: linear movement of the vehicle with one revolution.

Quadrotor Axis

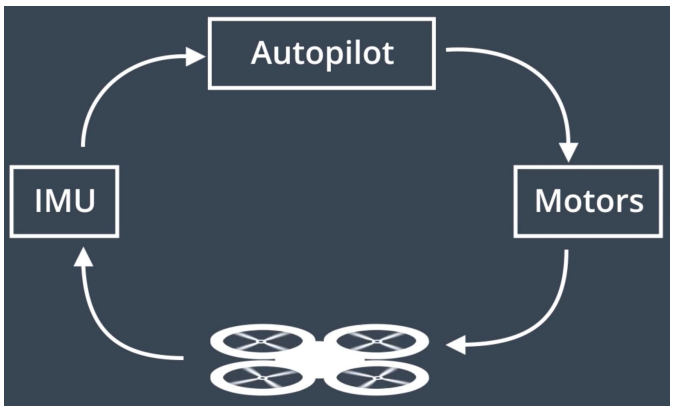
- Pitch: Forward and backward
- Roll: Left and Right
- Yaw angle: tilt around the vertical axis



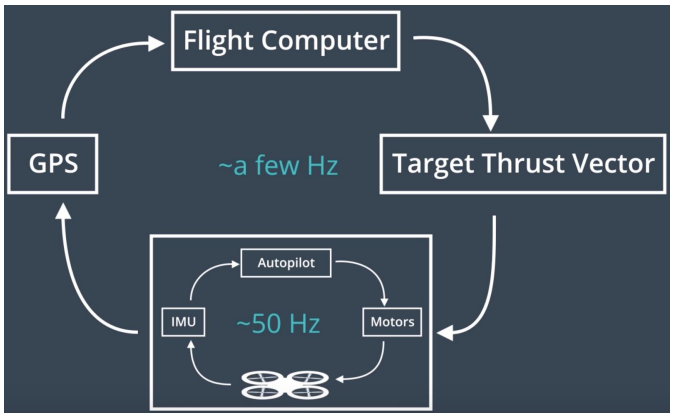
Flight Computer Controlling loops



1. Attitude control loop (Autopilot):



2. Position control loop (Flight Computer):



Programming Paradigms

- Sequential programming.
- Event-driver programming.

Event-Driven Programming

a programming paradigm in which the flow of execution is determined by external **events** rather than a pre-defined sequence of steps.

Phases (states) of Flight