Drone Components

Hardware

> Pixhawk Mini 4
> Jetson AGX Xavier
> Mynt Eye D100

Cam Features

> Global Shutter
> FOV H:105° V:58°
> Range 0.3-10m
> 60 FPS
> IMU & Frame Sync <1ms

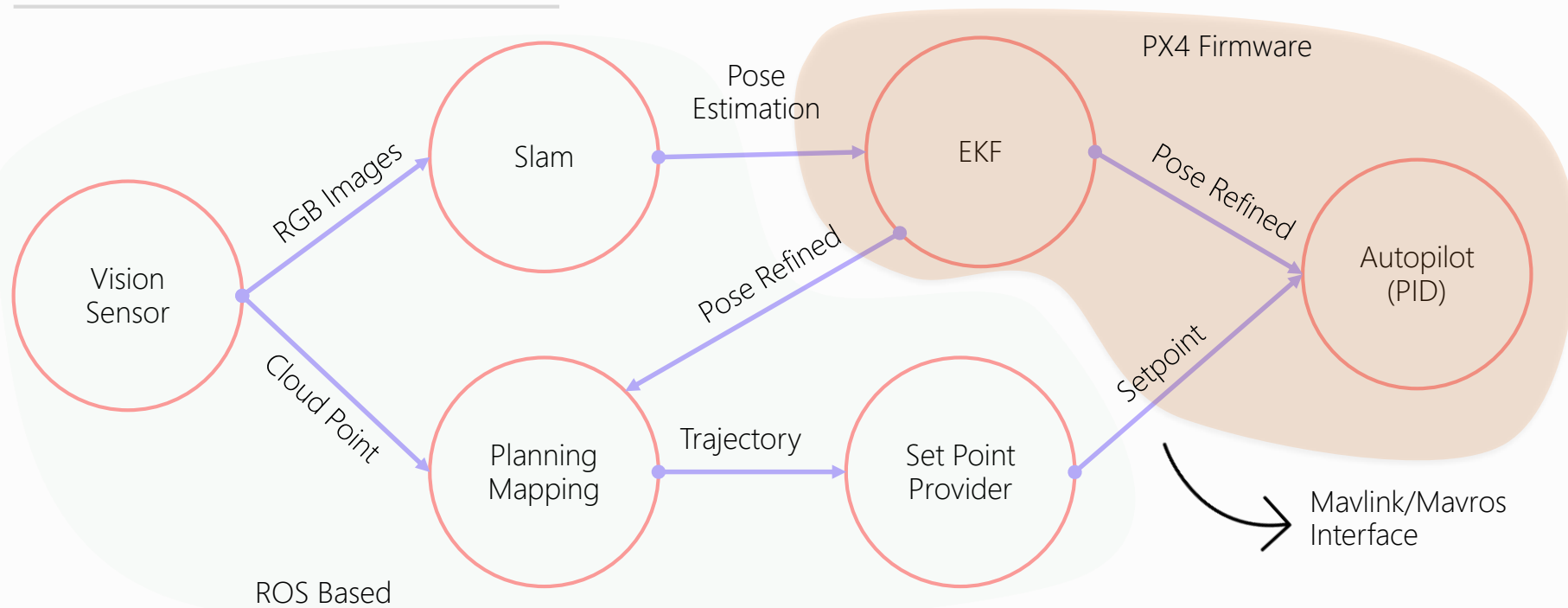### Sensor Suite

> Stereo - Depth Sensor
> Accelerometer
> Gyroscope
> Magnetometer

Physical Info

> Weight: 2216g
> W/T Ratio: 2.334
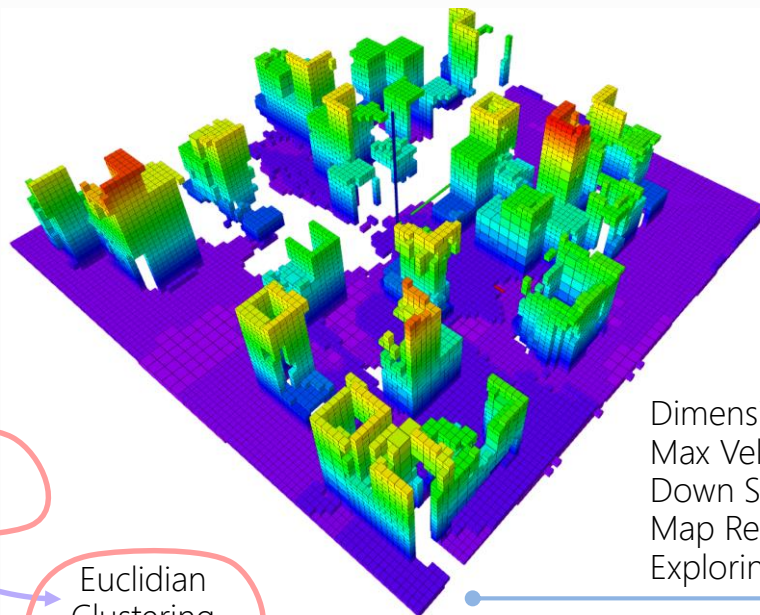> Autonomy: ~15'

Software Overview

Map Exploring

RGBD (Point Cloud)

Occupied and free voxel integration

Frontiers Computation

Euclidian Clustering

Frontier Selection

Algorithm Features

Octomap for mapping
Exploration by *frontier selection*
Pose estimation via *Orb Slam*
Loop working rate: 20Hz

Dimension: 20x20x6
Max Velocity: 1.5m/s
Down Sampling: 0.2m
Map Resolution: 0.2m
Exploring Time: 5'

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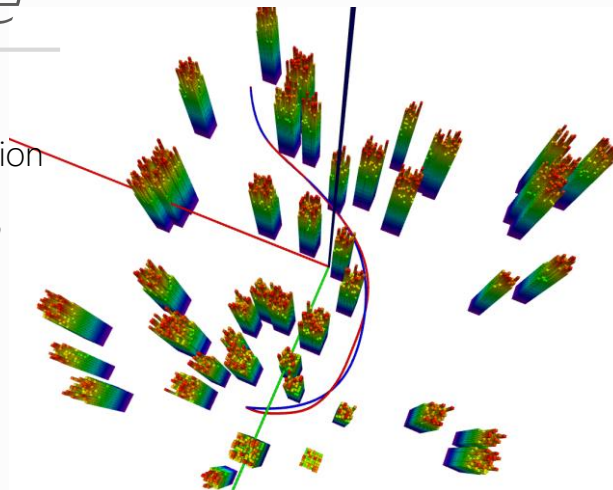
Path Planning Stage

- ✓ Classic A* search algorithm
- ✓ Nodes generated by state propagation
- ✓ Trajectory with minimum energy
- ✓ Trajectory parametrized by *B-Spline*
- ✓ *Control Points* position is optimized

Cost Function
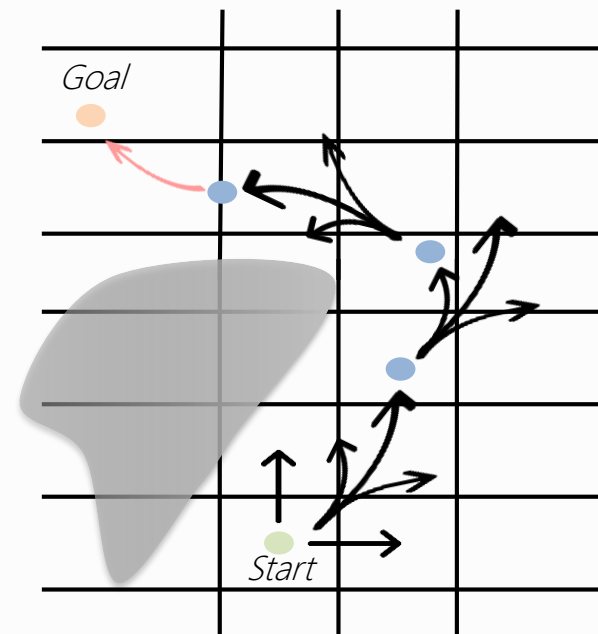
$$J(T) = \rho T + \int_0^T \|u(t)\|^2 dt$$

Algorithm Features

Variable acceleration resolution
Variable time resolution
Variable map resolution
Loop rate: 20Hz

In the image:
Red curve planned trajectory
Blue curve optimized trajectory

Start	= (1, 7, 0)
Goal	= (7, -7, 0)
Max Acceleration	= 1.5 m/s2
Max Velocity	= 2.5 m/2

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Global or Local Planning?

Loop rate 20Hz

Receding Horizon Implementation

Fast Obstacle Identification & Avoidance