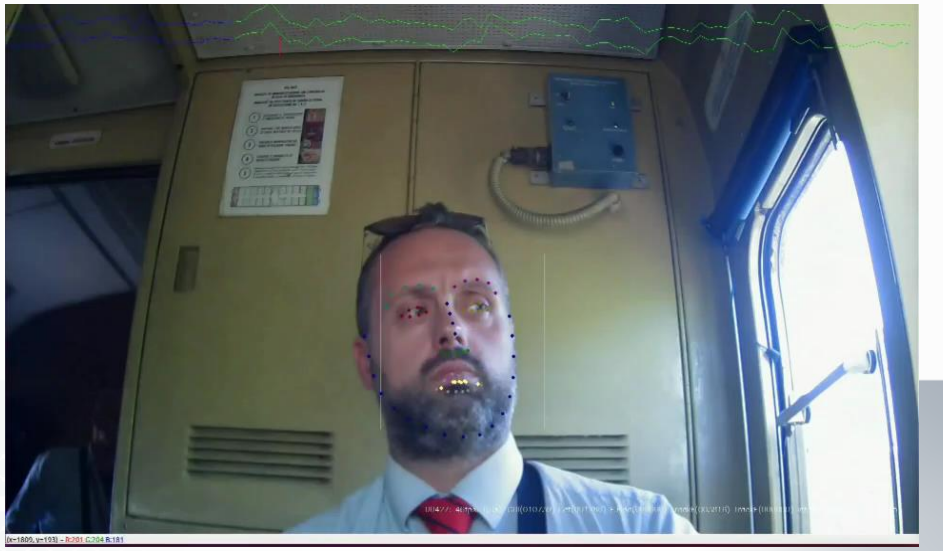
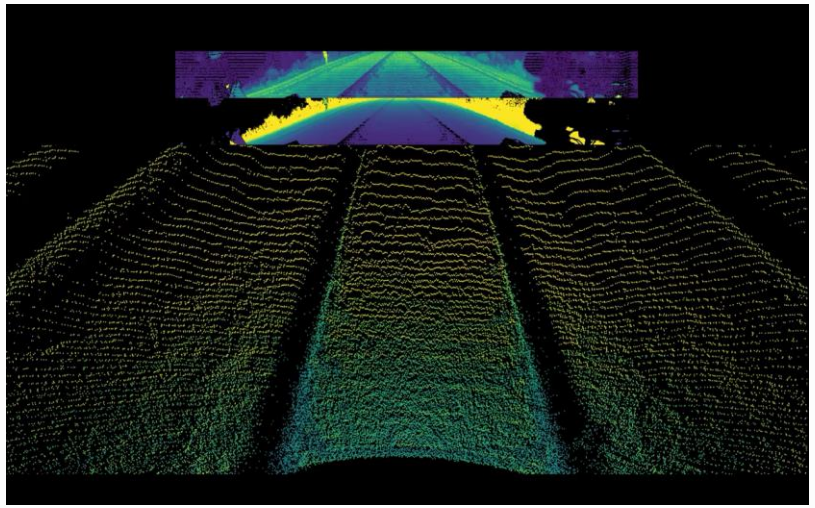
PERCRO Lab.

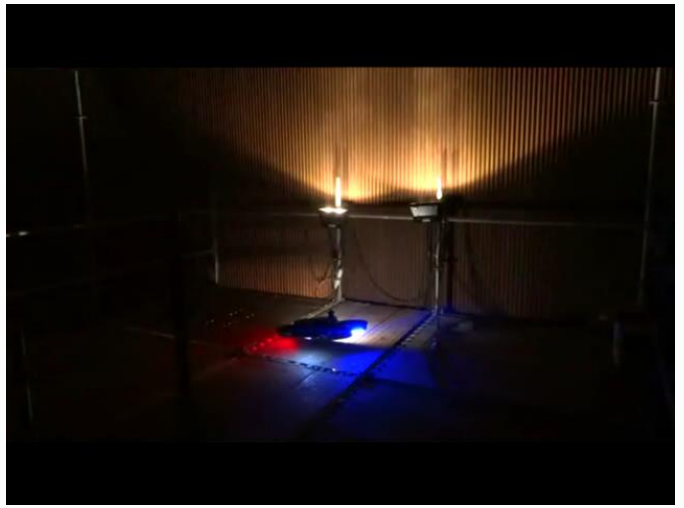
- Haptics
- Wearable Robots
- Advanced Sensing
- Embedded Intelligence
- Telepresence
- Augmented Reality
- Artificial Intelligence

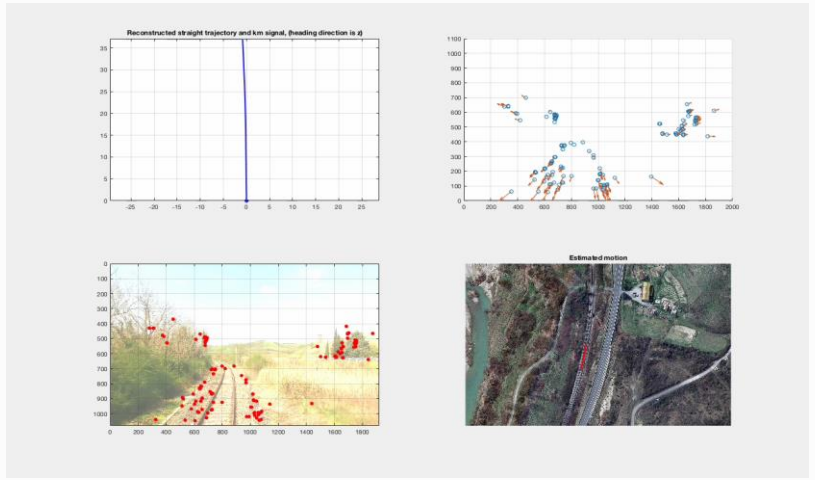


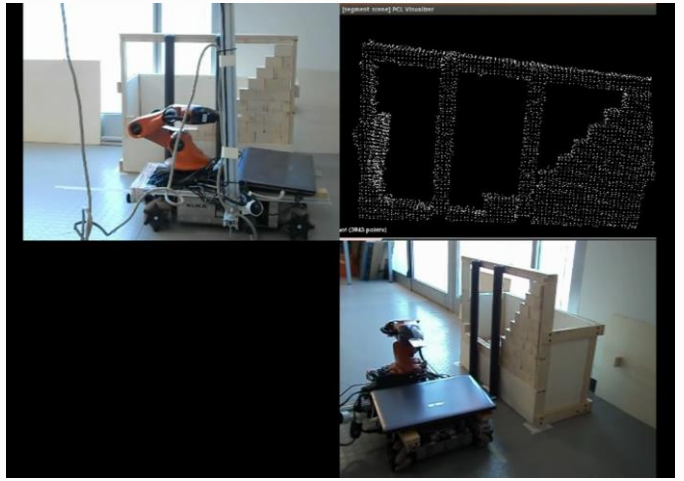
Drone Research

- Aerial, Marine and Ground Drones
- Automated inspection of plants
- Reasoning on 3D Shapes
- Anomalies detection
- Search and Rescue
- Operational Tasks



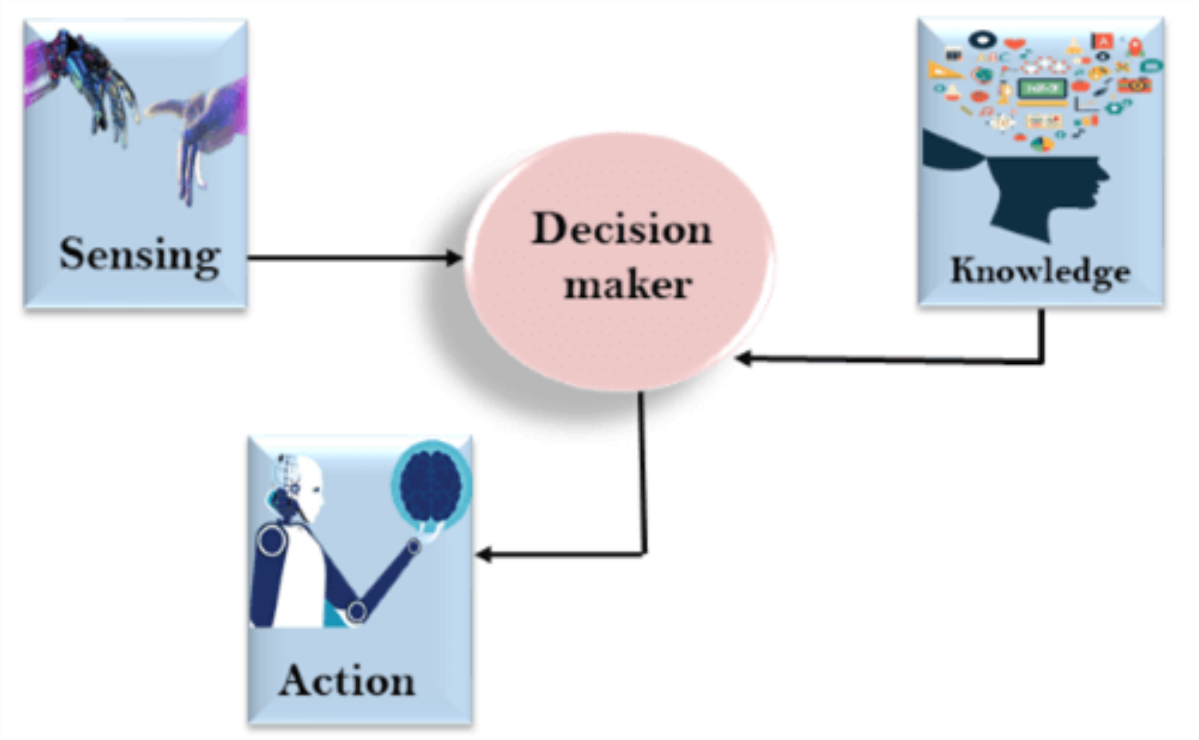






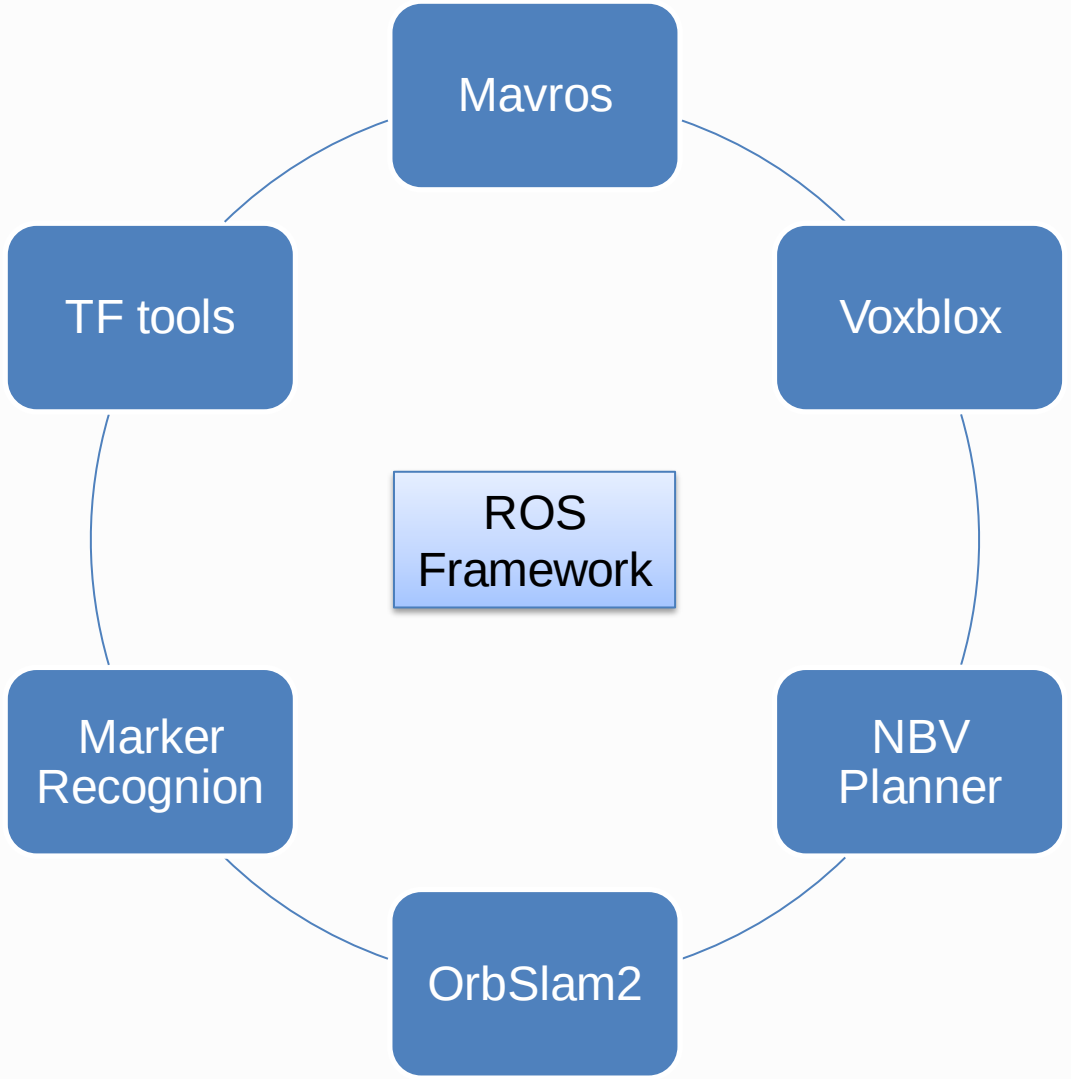
First-year Activities

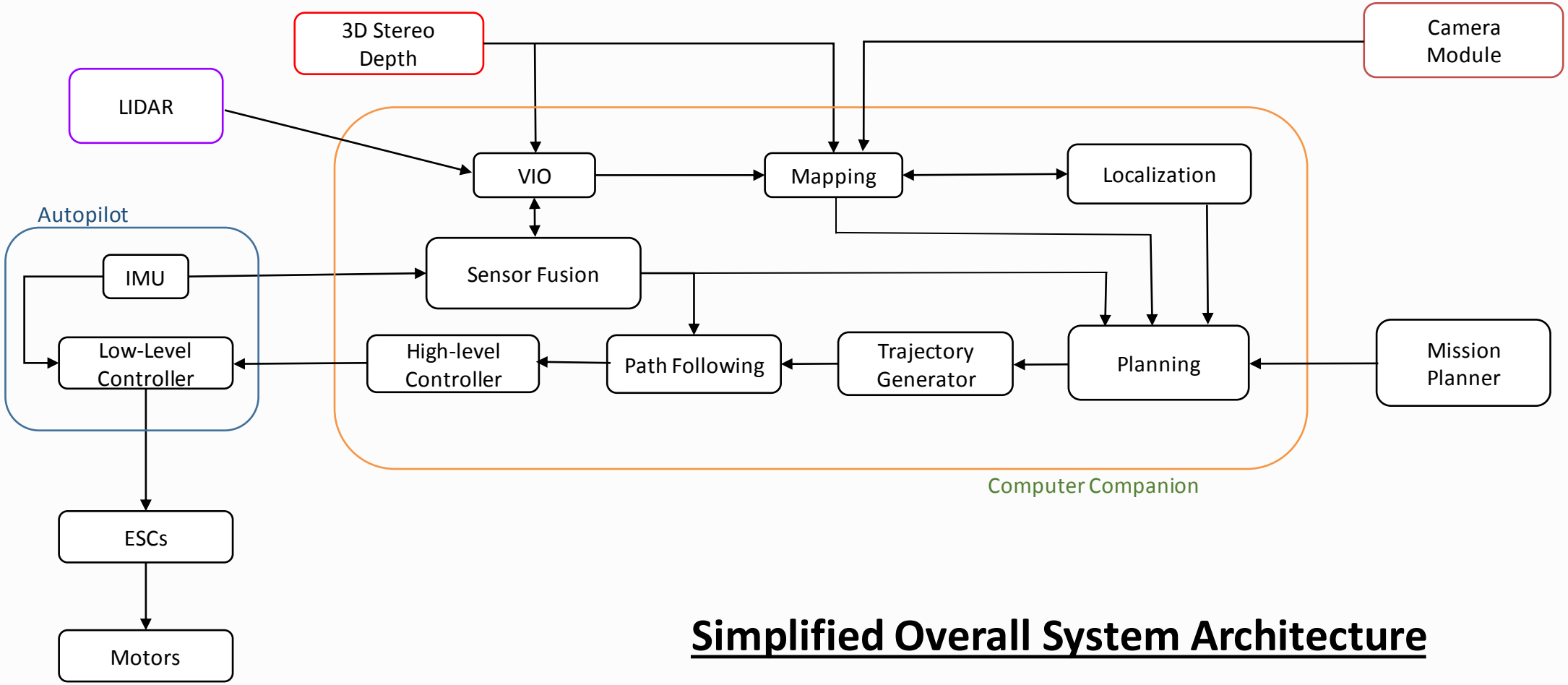
- **State-of-the-art and Implementation**
- Framework Design
- Architectural Design
- Simulated Scenario
  - Navigation Test
  - Mapping Test
- Drone Perception
  - Knowledge Representation
  - Behavioral Modeling
  - QR Recognition Test



Framework Design (2/7)

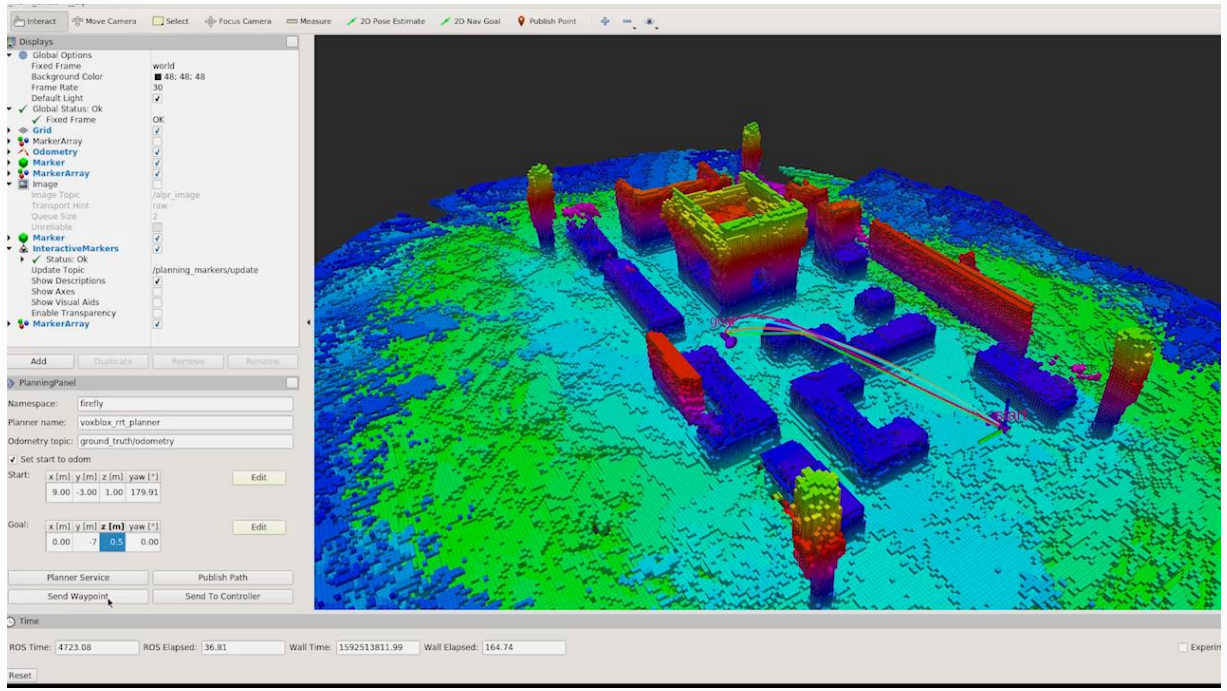
UBUNTU 18.04	ROS	OpenCV
DeepStream	Cuda	Python
C++	PX4 Autopilot	Realsense Libs

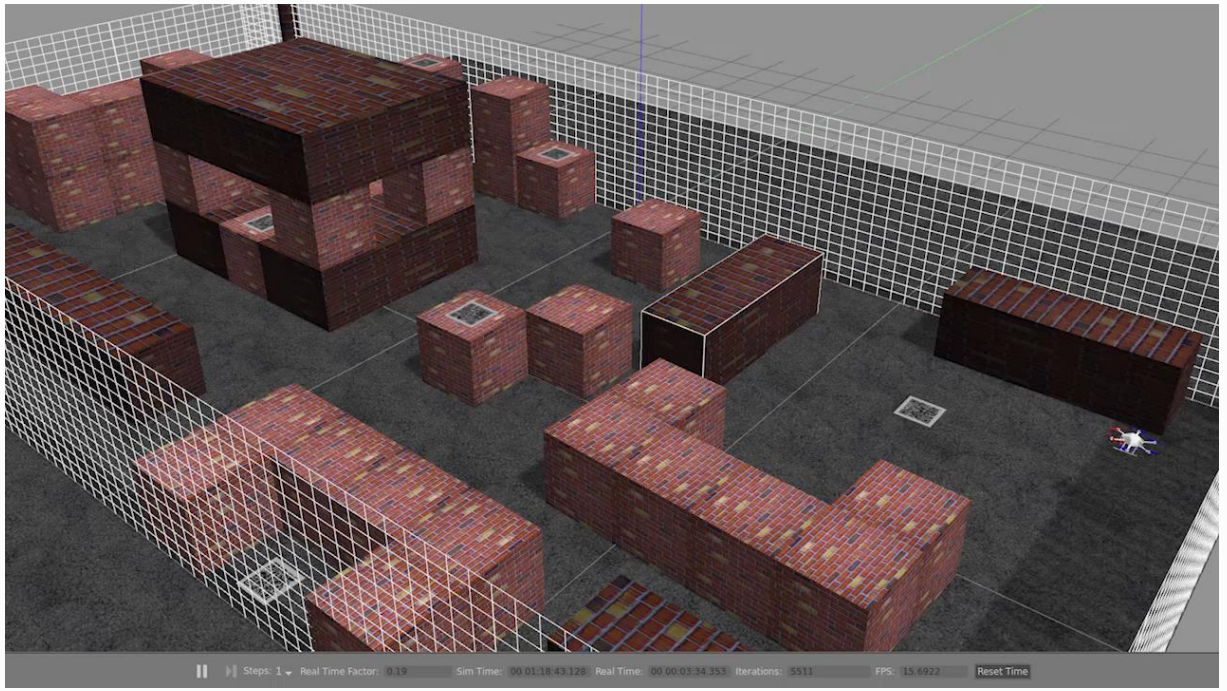




Simplified Overall System Architecture

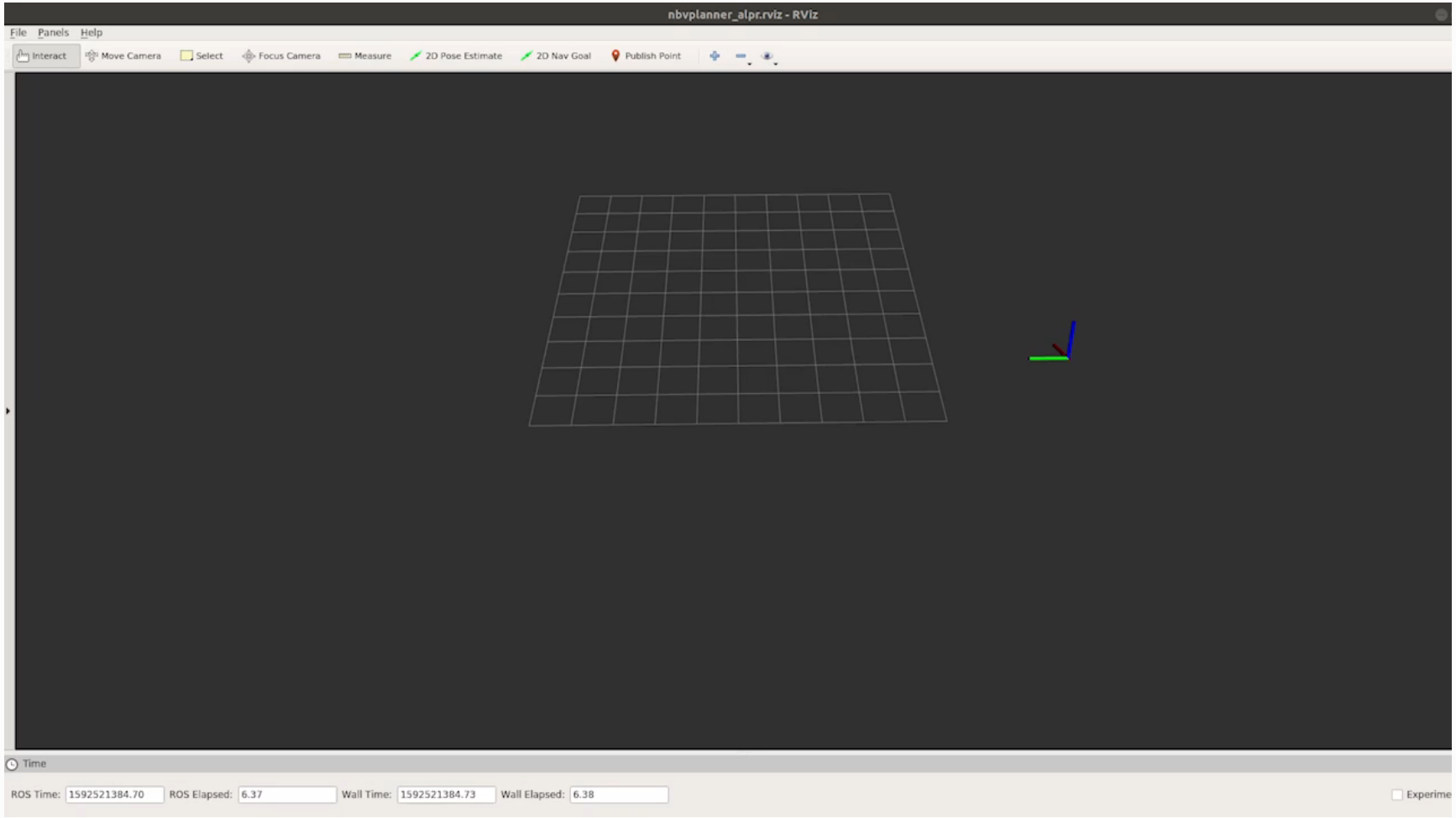
Test in simulates Scenarios (4/7)





On the left, the point to point flight planner integrating the obstacle avoidance system (based on the 3D cloud input), on the right the same tool using a texturized environment.

Test in simulates Scenarios – MAP (5/7)



Mapping tool integrated in the drone architecture

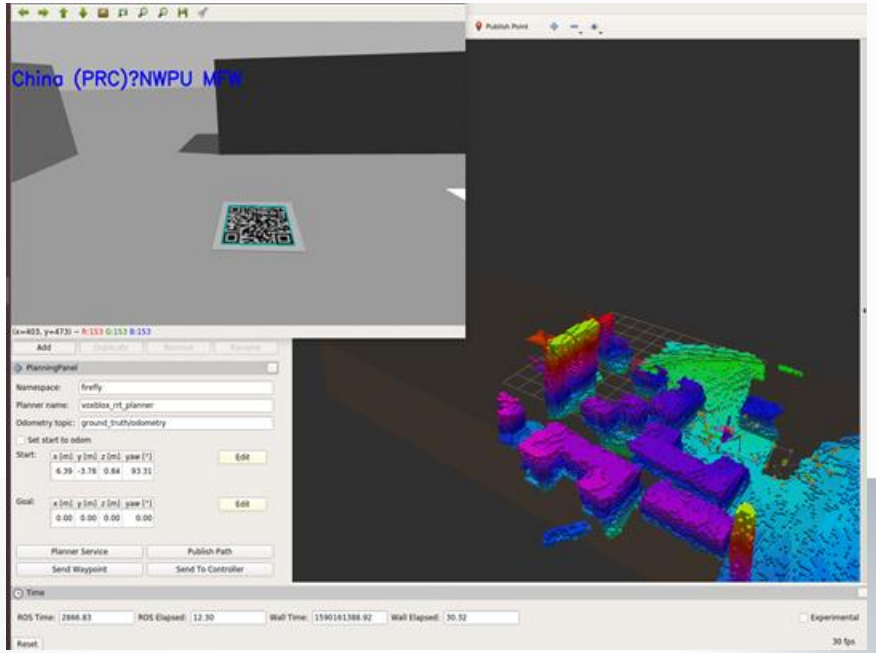
Perception Activities KR & BM (6/7)

- Implemented QR Code Detection, Tested accuracy and detection Ranges, self-localization from QR-code detection.

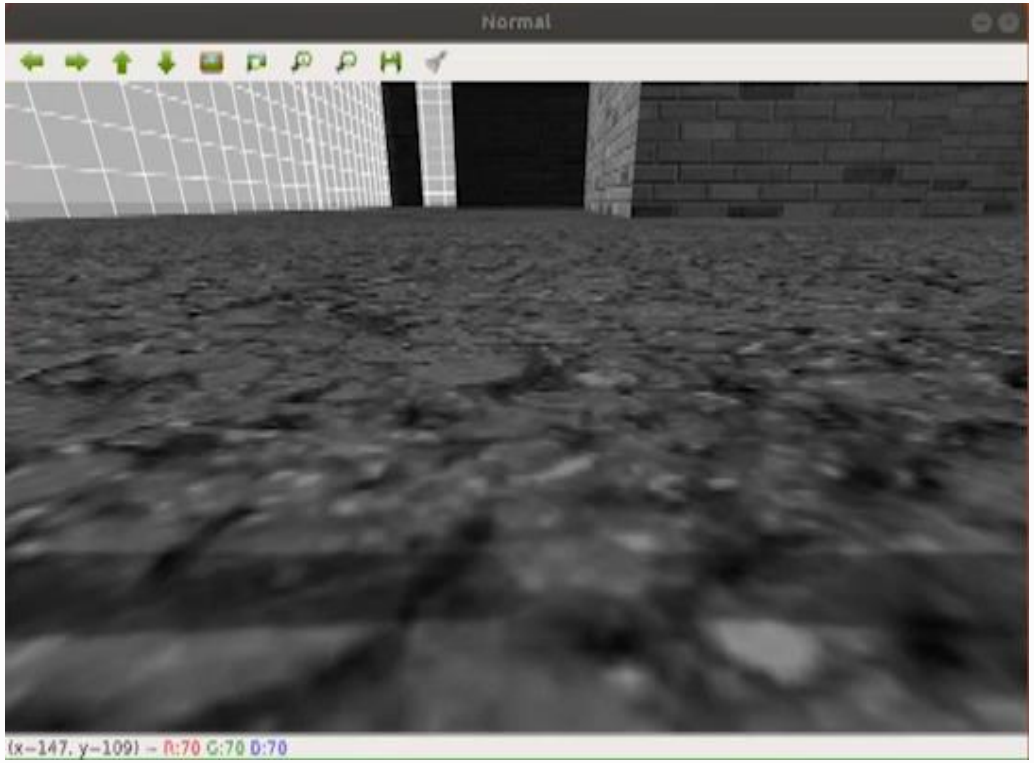
- Cross test in simulated environment. With 10 hidden markers in the environment.

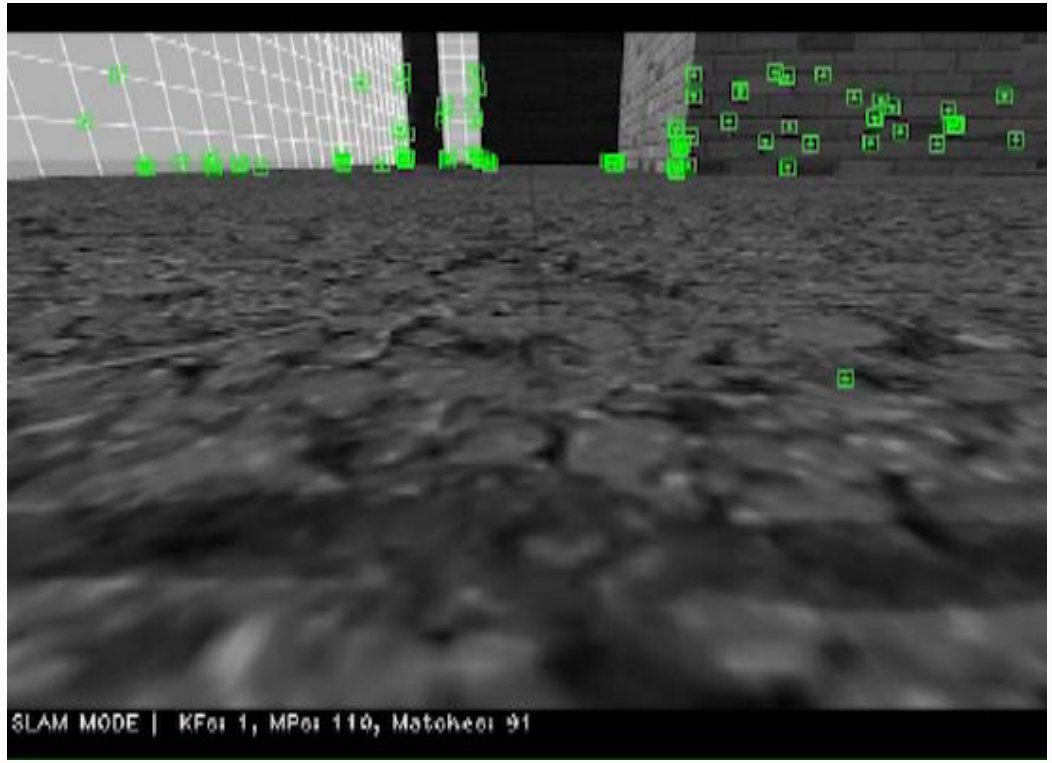
  ➢ 8 out of 10 markers were found. The final position is an average of all the samples taken when recognizing the markers. The error between the calculated and nominal position is inferior to 10 cm.

Marker Center		
Position	**Calculated**	**Nominal**
X (cm)	642.68	646.28
Y (cm)	-244.17	-246.66
Z (cm)	1.34	0



Drone Perception (7/7)





On the left the QR code recognizer, on the Right the Feature detector during visual slam

ONGOING Mission manager and Visual Slam with selected architecture