Development of a Multirotor Aerial Vehicle capable of Autonomous Navigation

Project members:

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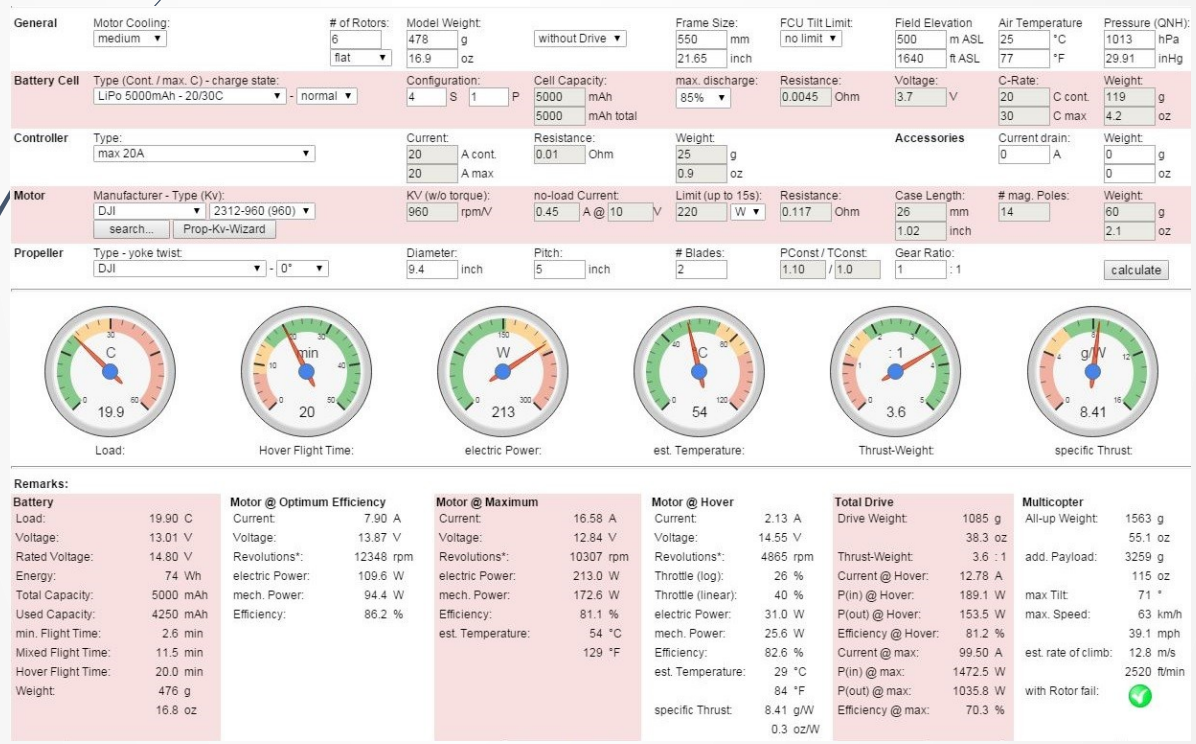
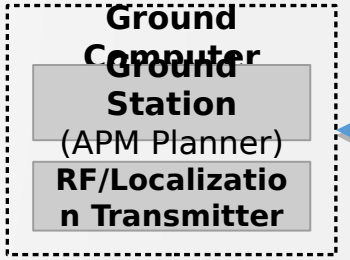
Motivation and Problem Description

- Development of a platform that is:
  - Small enough to fly indoors.
  - Powerful enough to carry higher payload.
  - Off-the-shelf parts:
    - Keep cost low.
    - Easily replaceable/repairable/replicable.
- A platform that can support different sensor modalities.
  - Monocular Vision.
  - Stereo Vision.
  - Sound Localization.

Proposed Approach

- System Design:
  - Reiterative approach.
  - Initial system weight guess (~1700).
  - Design for Thrust to Weight ratio of 2.5-3.
- Modular Design:
  - Each Sensor on with it's on mounting mechanism.





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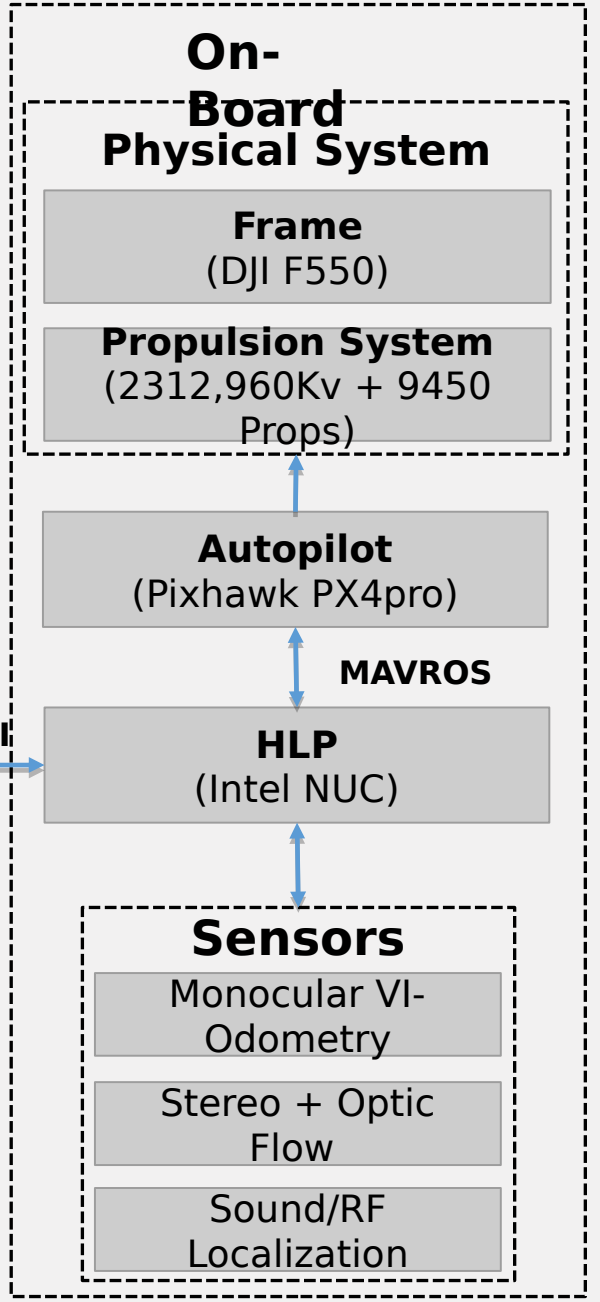
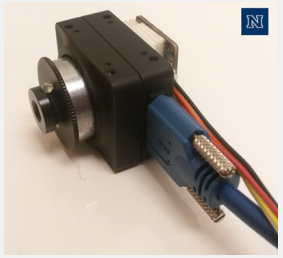
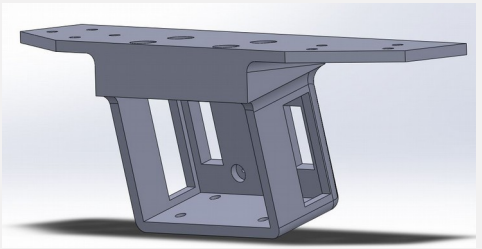


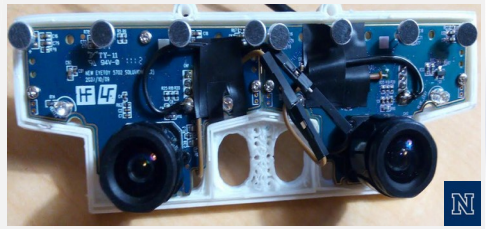
System Description

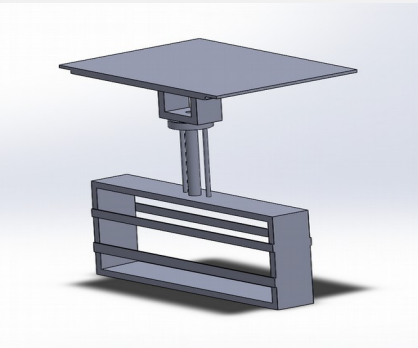
- Monocular System:
  - Purpose: VI-Odometry.
  - Hardware: Pointgrey Chameleon 3 + UM7 IMU.
  - Software: ROVIO[1].



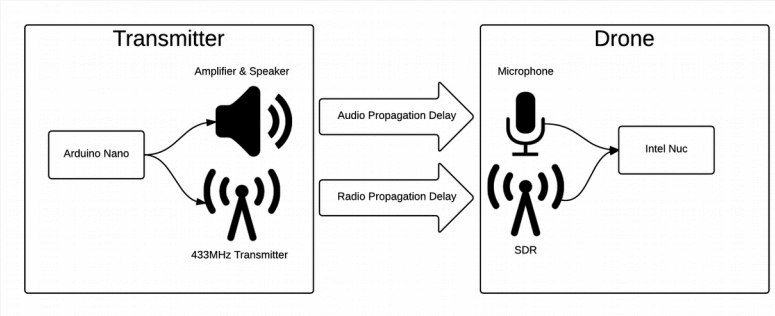


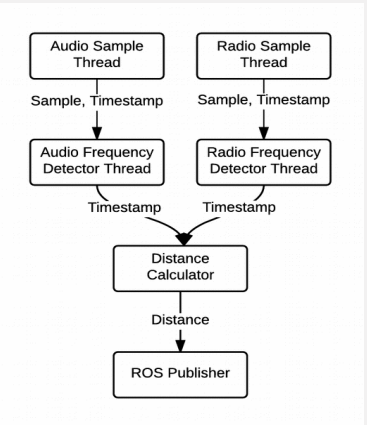
- Stereo System:
  - Purpose: Optic Flow / VI – SLAM.
  - Hardware: PSeye Camera + UM7 IMU + Gimbal System.
  - Software: Custom ROS package.





- Sound/RF Localization:
  - Purpose: Distance Estimation using sound and RF delay propagation.
  - Hardware: Arduino + Transmitter/Receiver.
  - Software: Python Script + ROS Package.

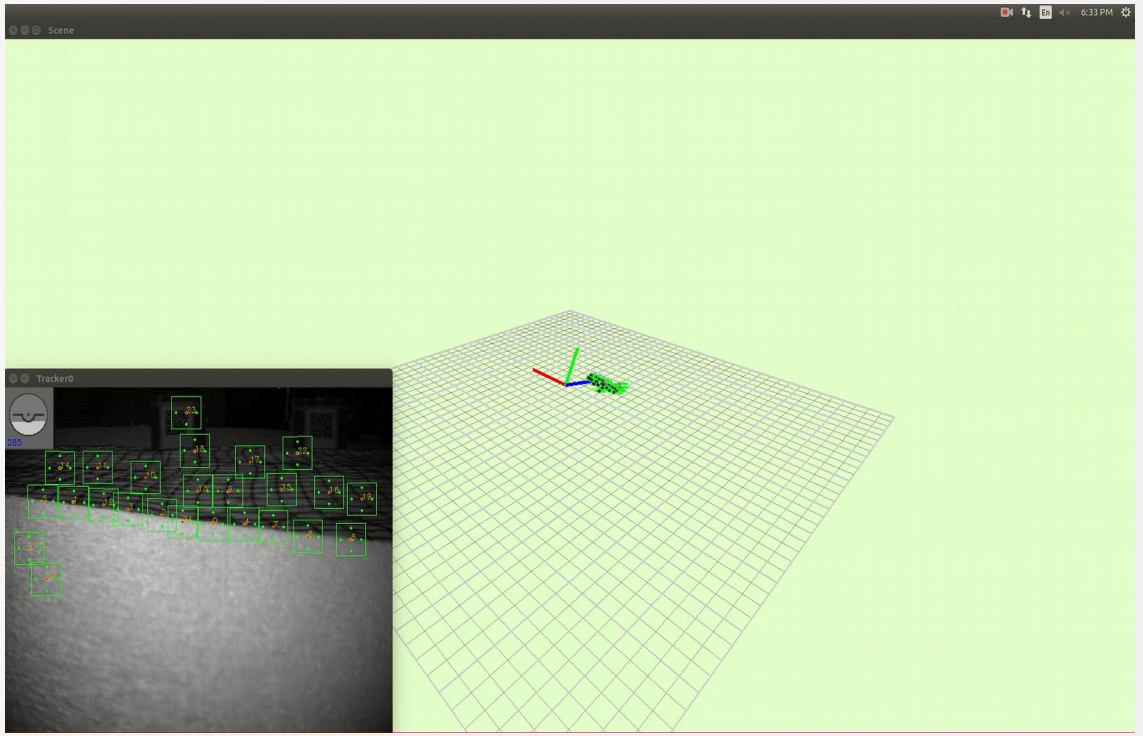




[1]Bloesch, Michael, Omari, Sammy, Hutter, Marco and Siegwart, Roland Yves. Robust Visual Inertial Odometry Using a Direct EKF-Based Approach. ETH-Zürich (IROS 2015).

Results

- Working Robot capable of carrying heavier payloads.
- Computational and Sensory Capability of doing autonomous indoor navigation.



Thank you

Questions, Comments, Suggestions, Criticism, Witticism.....