Research Topic:
Single Camera based Computer Vision for Navigation

- Problem: Indoor Navigation is difficult because there is no absolute position reference.
- Solution: Use computer vision to find relative position changes

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Topics Explored

- Neural Networks
  - Used to run Computer Vision Algorithms
  - Image feature detection
- Data Assimilation
  - Stronger navigation algorithms when SLAM combined with GPS and Inertial Sensors
  - Measuring orientation and position (6 degrees of freedom)
  - Uncertainty Quantification needed for Kalman Filtering
    - How to compute?
- Two types of navigation CV
  - SLAM
    - Simultaneous Localization And Mapping
    - Positioning
  - Visual Gyro
    - Attitude

Additional Topics

- Camera Calibration
- Retinomorphic Vision Sensors
- Computer Vision Libraries
  - OpenCV
  - FlyCapture SDK
  - TensorFlow (frustrating on Windows)
- Building and testing a Raspberry Pi for real-time application
  - Computer Vision
  - GPS
  - Accelerometers
  - Gyros
  - Extended Kalman Filter