Special Course Proposal

Subject: Visual-Inertial sensor fusion for image stiching

Learning Objectives:

1. the representation of rotation, transformation: Euler angles, Quaternion, Rotation Matrix, etc.
2. the principles of feature detection & matching, tracking.
3. learn robust estimation like RANSAC.
4. camera model calibration.
5. learn two view geometry: fundamental, essential, homography matrices.
6. know how to use direct linear method for homography & fundamental matrices estimation.
7. know how to decompose homography matrix.
8. the principle of Inertial Measurement Unit.
9. Sensor fusion for attitude estimation: Kalman filter.
10. Image stiching.

Content:

1. Evaluate the performance of feature detection + matching/tracking, runtime, accuracy, robustness.
2. Evaluate matching pre-filtering techniques, runtime, false positive left.
3. Homography estimation & decomposition.
4. Attitude estimation using Kalman filter.
5. Image stiching with the help of IMU.

Data:

Open dataset

Tools:

C++ or Matlab (Part of the code will be provided)