A common UAV system uses GPS position to correct IMU (Inertial Measurement Unit) data from drift in order to obtain the Unmanned Aerial Vehicle's (UAV) state. That is why any loss of GPS signal will cause serious problems in the UAV operation.

Therefore, the aim of this research is to propose a real-time vision-based pose estimation algorithm for aerial vehicles, so that the visual information can be used as a complementary sensor when the when the GPS information becomes unavailable or is unreliable (e.g. when flying close to obstacles, or during GPS dropouts).

The strategy we propose is based on a MR (Multi-Resolution) implementation of an image registration technique based on direct methods. An on-board camera in a downwards-looking configuration, and the assumption of planar scenes, are the bases of the algorithm. The motion between frames (rotation and translation) is recovered by decomposing the frame-to-frame homography obtained by the ICI-A algorithm applied to a patch that covers around the 80% of the image. When the visual estimation is required (e.g. GPS drop-out), this motion is integrated with the previously known estimation of the vehicles’ state, obtained from the on-board sensors (GPS/IMU). The subsequent estimations are based only on the vision-based motion estimations. Results demonstrate that the visual estimation can be used to provide a good approximation of the vehicle’s state when it is required (e.g. GPS drop-outs), at real-time frame rates.

Reference to key publications:


Contact:
- Pascual Campoy: pascual.campoy@upm.es
- Carol Martínez: carolviviana.martinez@upm.es