

# A smartphone based quadrotor: Attitude and position estimation

**Abstract.** This paper describes the results obtained in the implementation of a solution implementing real-time precise and accurate attitude and position estimation algorithms designed for control applications based on an Android smartphone. The topic of the paper is in particular the application of this solution to dynamics sensing in a quadrotor Unmanned Aerial Vehicle (UAV). The attitude estimation is based on an Explicit Complementary Filter (ECF). The position estimation is implemented through a complementary filter using acceleration readings provided by the smartphone sensors and the position derived by a vision based motion capture system. The parameters of the algorithms are tuned through the minimisation of the estimation error for sets of sample acquisitions. Moreover, these settings are chosen in order to minimise the issues related with the fact that Android is not a Real Time Operating System (RTOS). Finally, it was verified that the chosen solution provides performances adequate to the quadrotor stabilisation. The results of a set of experimental tests are used to show the performances of the proposed solution. For the attitude estimation algorithm, a comparison is moreover provided in order to highlight the difference with standard Android orientation estimation algorithm.