AERIAL MANIPULATOR POS. CONTROL BENCHMARK

Reference No / Version	RAL-SI-2020-B-19-0826_AM_Control-V1.0
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Website	For the latest versions of the benchmark, please refer to: https://grvc.us.es/robotic_arms
Adopted Protocol	Aerial Manipulator Position Control Protocol (RAL-SI-2020-P-19-0826_AM_Control-V1.0)
Scoring	The performance of the aerial manipulator position controller is measured in terms of the following metrics: • Maximum position deviation of the aerial platform during the lift load phase $\|\boldsymbol{\varepsilon}_{UAV}\| = \|\boldsymbol{r}_{UAV}^{ref} - \boldsymbol{r}_{UAV}\|$ in [mm], taking as reference the position of the UAV at the beginning of the phase, when the manipulator is fully stretched (rest pose). • Dimensionless index $\rho_{UAV} = \|\boldsymbol{\varepsilon}_{UAV}\|/L$ obtained dividing the maximum position deviation by the reach of the arm, considered for comparison purposes. • Time required for the aerial platform position controller to reduce the position deviation below the 10% of the reach of the manipulator (zero if the threshold is not exceeded). Lower scoring values correspond to better performance.
Details of Setup	• Aerial manipulation robot. • Payload mass attached to the end effector. Considering the usual two-link configuration (upper arm-forearm), two values will be evaluated: 50% of the lift load capacity at the shoulder, $m_{shoulder}^{PL}$, and 50% of the lift load at the elbow, m_{elbow}^{PL}. • Positioning system (GPS-RTK, vision, Vicon, OptiTrack…) with an accuracy below the 10% of the reach of the manipulator. • Ground Control Station (GCS) laptop.
Results to Submit	• Date and time of the experiment. • Description of the aerial manipulation robot: aerial platform, on-board systems, flight time, maximum take-off weight (MTOW). • Main specifications of the manipulator: kinematic configuration, joint limits, maximum joint/Cartesian speed, link lengths, lift load capacity. • Description of the testbed: dimensions, measurement devices and its main features. • Scores obtained in the test, as indicated above. • Graphical results showing the trajectory of the multirotor (position and attitude) and the arms (joint and TCP positions) along with the corresponding references. • Video illustrating the execution of the benchmark. • Comments about the required / convenient improvements.
