AERIAL MANIPULATOR GRASPING BENCHMARK

Reference No / Version	RAL-SI-2020-B-19-0826_AM_Grasping-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 Grasping Protocol (RAL-SI-2020-P-19-0826_AM_Grasping-V1.0)
Scoring	The performance of the aerial manipulator in the realization of the task is measured in terms of the following metrics: - Total execution time in [s], from the take-off to the object retrieval phase. - Execution time in [s] of the four phases: take-off, approach to tool bench, grasp object, and go up to initial height. - Maximum position deviation of the aerial platform during the grasping phase $\|\boldsymbol{\varepsilon}_{UAV}\| = \|\boldsymbol{r}_{UAV}^{ref} - \boldsymbol{r}_{UAV}\|$ in [mm], taking as reference the position at the beginning of the phase. - Dimensionless index $\rho_{UAV} = \|\boldsymbol{\varepsilon}_{UAV}\|/L$ obtained dividing the maximum position deviation by the reach of the arm, considered for comparison purposes. - Success rate of the grasping task in % for at least 5 trials. It is assumed that the UAV reaches a position reference when the error is below the 25% of the reach of the manipulator. The robot fails if 1) the target object is not grasped, 2) the object falls down the tool bench, 3) if a risky situation involving a potential crash arises.
Details of Setup	- Aerial manipulation robot. - Tool bench (support structure) located at distance d_{goal} and height h_{goal}, according to the size S_{UAV} of the aerial platform. - Bar or object to be grasped, with a weight above the 25% of the lift load capacity (referred to the base joint – shoulder). - 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, position of the objects in the testbed.

	• 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. • Identification of the factors determining the success rate, accuracy and reliability. • Comments about the required / convenient improvements.