

Testing End Effector of Aerial Manipulator

Objective:

To test if the end effector is strong enough to withstand the forces going through the part in operation.

Equipment Required:

- Suction hooks x2
- Drone and Weights x 5 in increments of 100g
- Cord
- Arm for attachment of end effector
- Rod to hang the drone

Setup:

1. Apply the suction hooks onto the surface that the test needs to be conducted on.
2. Attach the two ends of the cord to the arm and pass the rod through the loop created by the cord.
3. Place the rod on the suction hooks so that is the hinge for the system.

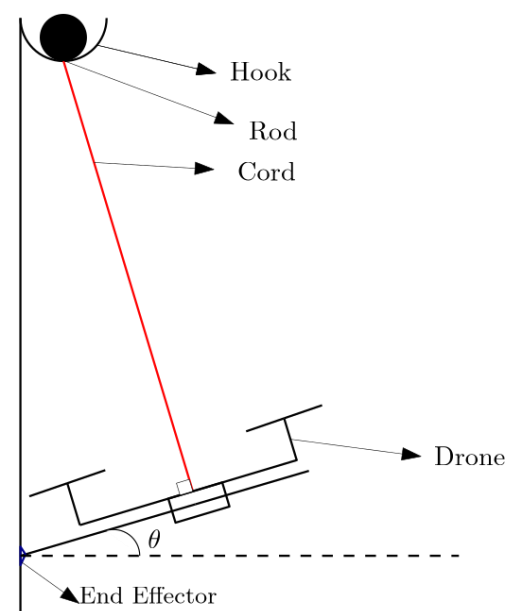
Make sure that the attachment points of the cord can move up and down the arm to allow a perpendicular attachment position in all cases.

Methodology:

The weight attached causes there to be a tension in the cord which replicates the thrust that the drone would create in practice. This thrust has a horizontal component and replicates the forces that the drone would create on the interacting surface. By moving the point of contact between the end effector and the surface away from the hinge, we increase the angle at the hinge, hence, increasing the force. This can either be done by fixing the attachment points of the cord or fixing the point of contact of the end effector with the wall. The first case works as we have constrained the angle formed at the attachment to always be 90° .

Procedure:

- 1) Fix the angle made between the arm and the horizontal to 10° . This can be done by fixing the attachment point of the cord on the arm. Check if the structure withstands the load. Record for pass or fail.



- 2) Repeat the procedure by fixing the angles at 20° , 30° , 35° , 40° and 45° or till the end effector cannot achieve a higher angle whichever comes first. Record for pass or fail as the same way as done previously.
- 3) At max angle, keep increasing the weight till the end effector breaks.

Outcome:

The limits of the end effector are clear and further experiments can be done to the end effector.