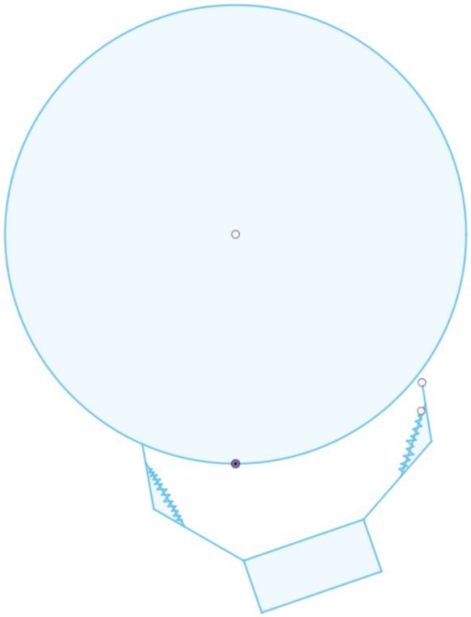
Aerial Manipulator for Drone Stabilisation
Proposal Document

Problem Statement:
The ideal inspection zone of a horizontal asset is the bottommost point as it is the point of maximum corrosion. Practical piloting limitations do not enable the centring of the inspection probe of a drone under the ideal inspection zone. A stabilising manipulator with self-centring capability has to be designed, tested and incorporated on the drone for ideal inspection. This should also ensure the prevention of swaying sidewards upon contact.



Proposal - Compliant Manipulator with Adaptive Fingers:

A pair of double-link 1R manipulators are implemented on the drone in the plane of the cross-section of the asset. The angle between the first link and the drone body is fixed whereas the angle between the two links in each manipulator is passively controlled using a linear spring. Each manipulator is equipped with a pair of adaptive fingers which can grip the asset's surface with atleast 3 points of contact for each finger using the upward thrust of the drone. When there is a small offset in the approach of the drone to the asset, one manipulator contacts the asset before the other manipulator. The sideward thrust of the drone will enable pivoting of the drone about the first contact point until the second manipulator makes contact with the asset. During this, the joint angle of the first manipulator will be contracting thereby compressing the spring. After this, a controlled manoeuvre with the reduction in upward thrust along with continued sideward thrust will result in the relaxation of the joint angle in the first manipulator while contracting the joint angle in the second manipulator until the drone stabilises under the ideal inspection zone.