**Inter-distance vehicle estimation using displaced stereoscopic vision**

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### Problem Description

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### Proposed Methodology

This research seeks to explore stereoscopic vision [2] in which camera 1 is on a wheeled robot and with camera 2 overhead above the vehicle, such as on a UAV or fixed on the ceiling, to estimate the distance between the wheeled robot and detected objects.

Step 1 - Detection: object is observed and detected on both cameras. Camera 2 is an overhead camera [3] that sees both the mobile robot and the object while being able to differentiate them.

Step 2 - Direction / angle estimation: The angle of the detected object, relative to both cameras is calculated [5] from the imagery and properties of the cameras (focal length, field of view). The challenge is having both cameras identify the same point in 3D space [4].

Step 3 - Position calculation: The direction to the object from camera 1, and direction to the object from camera 2 are known from step 2. The positions and orientations of both cameras are known. This is sufficient information to calculate the position of the detected object.

Step 4 - Distance calculation: The distance between the detected object and the wheeled robot is the difference between their positions.

This method of vision based distance estimation can be combined with existing for formation control such as the monocular vision method in [6] or to support flocking behaviour as proposed by future work in [7]. Tentatively, the technologies that will be used to implement this method will be ROS, Gazebo and Opencv.

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