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

by

Alfa Budiman

Student ID: 6796292

Mathieu Falardeau

Student ID: 300098492

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Department of Electrical Engineering

Faculty of Engineering

University of Ottawa

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### Problem Description

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### Proposed Methodology

Unless specific properties of the observed object are known, or estimated it is impossible to determine its distance [1]**.** To determine distance from the object to observer, stereoscopic vision can be used. This entails using 2 cameras of known positions to observe an object to determine its distance [2]**.** With regular stereoscopic vision, both cameras are on the same vehicle, on the same plane. This research seeks to explore stereoscopic vision in which camera 1 is on a wheeled robot, 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 - Object 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 - Relative 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.

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### References

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