

# Improving Detection of Moving Obstacles Using Motion Cues

## Semester Project

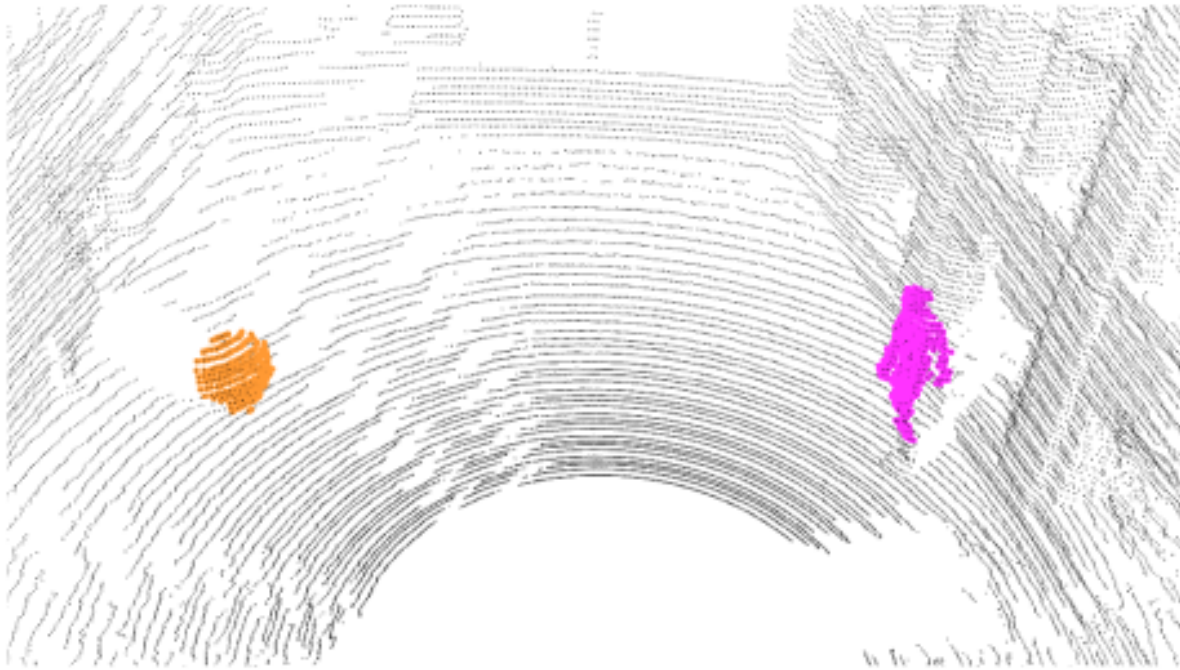


Figure 1: A high-res lidar sensor moving through an environment on a path intersected by a rolling ball (orange) and walking person (purple).

## Supervisor(s)



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## Description

In this project the student will examine novel methods to detect and track moving obstacles for autonomous robots navigating in real-world environments. While people detection in urban environments has received a lot of interest (see [2] for a recent example), in this project we seek to leverage motion cues that are agnostic of obstacle and environment type. For example, it should work robustly with people or other robots, in office spaces as well as underground mines. We have some promising preliminary results using high-res lidars and map-based motion cues based on Voxblox [1]. The goal of this thesis would be to find ways to improve and extend this approach into a real-time moving obstacle detection solution ready to be used on the robots in our lab. There could also be an opportunity to combine this with learning approaches if time permits, or as a separate project.

### References:

- [1] Oleynikova, Helen, et al. "Voxblox: Incremental 3d euclidean signed distance fields for on-board mav planning." 2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2017.
- [2] Eppenberger, Thomas, et al. "Leveraging Stereo-Camera Data for Real-Time Dynamic Obstacle Detection and Tracking." 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2020.

## Work Packages

- Literature review
- Improve motion cues for moving obstacle detection
- [Optional] Combine with a real-time localization solution
- [Optional] Possibly combine with learning techniques
- Thorough empirical evaluation

## Requirements

- Highly motivated student
- Experience with C++ is highly desirable
- Some experience with either ROS, working with lidar / camera, mapping or localization methods is highly desirable