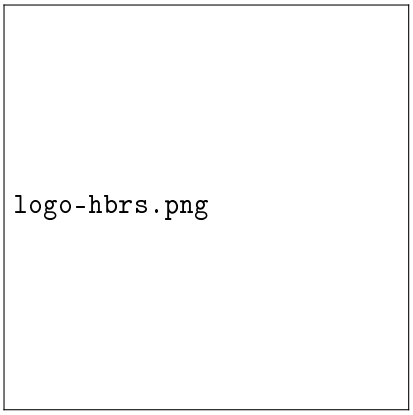

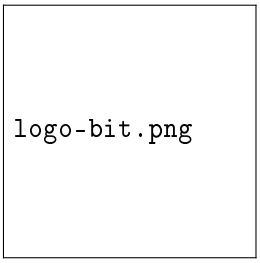

Master Thesis Proposal

Graph Optimization for View Motion Planner

Allen Isaac Jose

Supervised by

Prof. Dr. Sebastian Houben
Prof. Dr. Maren Bennewitz
Sicong Pan, M.Sc.
Tobias Zaenker, M.Sc.

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1 Introduction

Crop monitoring and understanding the phenology of crops are crucial for ensuring optimal yields and analyzing their anomalies. Typically, plants are cultivated in controlled environments such as glasshouses, which, due to their considerable size, make manual human monitoring a time-consuming task.

This project addresses challenges in both coverage and total motion cost by proposing a graph optimization solution that generates the shortest motion cost path with maximum information gain under a given time budget.

2 Related Work

Next-Best View (NBV) methods[6] are commonly employed in active perception to target unknown voxels surrounding Region of Interest (ROI) contours and sample viewpoints capable of observing them. The local path planning method described above is adapted into a global view motion planning approach[7] through the construction of an undirected graph and by generating a sequence of view poses.

3 Project Plan

3.1 Work Packages

WP1 Literature review

T1.1 Gather literature on view motion planning methods.

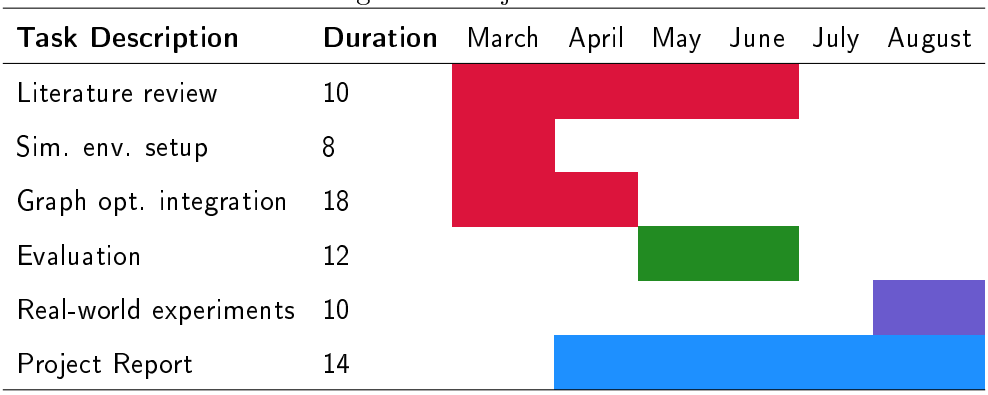
T1.2 Investigate into Set-Covering Problem, Travelling Salesman Problem, and Shortest Hamiltonian Path Problem.

WP2 Simulation environment setup

T2.1 Setup the view motion planner framework [7].

3.2 Project Schedule

Figure 1: Project timeline



3.3 Deliverables

Minimum Viable

- Literature review on view motion planning.
- Setup simulation environment of published view motion planner [7].
- Final draft of the report.

References

References

[1] Armin Hornung, Kai M. Wurm, Maren Bennewitz, Cyrill Stachniss, and Wolfram Burgard. OctoMap: An efficient probabilistic 3D mapping framework based on octrees. *Autonomous Robots*, 34(3):189–206, Apr 2013.

[2] Rohit Menon, Tobias Zaenker, Nils Dengler, and Maren Bennewitz. NBV-SC: Next Best View Planning Based on Shape Completion for Fruit Mapping and Reconstruction. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 4197-4203, 2023.