Towards Autonomous Thermal Imaging Robots for Heat Sensing

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ABSTRACT

- Heat sensing maps can be used to reduce overexposure risks to humans by
  1. Finding the most comfortable pedestrian walking routes
  2. Strategically placing shade structures
- Our goal is to automatically generate these heat sensing maps by creating a robot that utilizes SLAM and thermal imagery

MOTIVATION

- Environmental heat is a health concern
- Creating heat sensing maps is time consuming because it is not automated
- A platform that utilizes a thermal camera to both navigate and obtain heat sensing maps is cost-efficient and convenient

PROBLEM STATEMENT

- How can a cost-effective robot autonomously acquire a thermal map of the surrounding area?

METHODS

- Our final goal is to enable SLAM algorithms for autonomous navigation with a thermal camera outdoors
- Our robot platform will be used to develop and test different motion algorithms and image processing tools

- One semi-autonomous task: Follow a climate scientist as she collects data, and take a subsequent ground truth measurement using thermal camera. This helps speed up acquisition of data for the scientist
- We propose a Marker Following algorithm using template matching on a target to enable this functionality

PRELIMINARY RESULTS

- Optimized template matching code by comparing results from different templates
- Implemented multi-scale template matching to allow robot to follow the template

NEXT STEPS

- Apply feature matching to improve template matching under extreme viewpoints/perspective distortion
- Implement SLAM algorithms with ROS for autonomous navigation
- Determine optimal map navigation and location sampling required to capture thermal images of the surrounding area to obtain a full heat sensing map

REFERENCES


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