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Computer Vision and Route Planning for Humanoid Robots

Washkewicz College of Engineering

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Faculty Advisor: Dan Simon

Abstract

Our research focuses on vision-based route planning for the NAO humanoid robot. The robot is required to visually observe a scene and decide the shortest possible route for visiting the points of interest in that scene. A robust method for processing image information is used to determine the locations to be visited. We use a perspective projection algorithm to map points from a camera image to locations in three-dimensional space. A camera calibration algorithm finds the distance from the camera to the image plane. Linear regression is used to obtain the equations of camera calibration lines. Thresholds and binary masks are used to distinguish locations in the camera image. Connected component algorithms are used to label and group objects. We use brute force optimization to solve the path planning problem. A matrix containing distances between all pairs of objects is computed, and then a brute force search is used to find the shortest path between those objects. In case the number of objects is greater than about 10, brute force is not computationally feasible, and so artificial intelligence algorithms are used to find the shortest path.