Probabilistically Voxelated Occupancy Map for Path-Planning

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1 Introduction

Map-building is one half of a solution to simultaneous localization and mapping (SLAM) problem. SLAM acts as a utility to solve robotic exploration in an unknown environment. SLAM is stochastic and involves error in data reading. Stochastic information from multiple sensors are used to form information gain through filtering and data fusion.

Map building requires the same data fusion for local map registration. The registration method involves filtering technique to transform local map into global map. However, most of the solution for three dimensional map-building are in the form of point clouds, occupancy grid map, and a variant of occupancy grid map. Point clouds involves rich representation of geometric data for autonomous robots. Unfortunately, point clouds increases computational load (Borrmann et al., 2008; Cole and Newman, 2006; Engelhard et al., 2011; Weingarten and Siegwart, 2005). These point clouds are discrete series of metrical data. A map suiting the robotic ability to move in three dimensional space requires three dimensional map that emphasize the geometric information of an environment.

In tandem to automatic motion, this map should represent the probabilistic nature of the sensor and the locomotion of the robot to be effectively used in SLAM solution. Hornung et al. (2013) introduced a three dimensional occupancy grid map, coined as Octomap, that extend the two dimensional grid map introduced by Elfes (1989).

Octomap uses grid cells seeded with binary values to represent occupancy in space. The grid cells are stacked continuosly in series of cubic primitives. Octomap thus far are used only to represent static environments. In this paper a variant of octomap, continous-octomap, to discern its feasibility to represent a dynamic environment for path-planning purposes.

References

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