

Analytical Planning of Robotic Motion using Laplacian Technique

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Abstract

One of the most difficult problems in robotics applications is developing robust autonomous motion planning. In order to build a truly autonomous mobile robot, it must have the capability to efficiently and reliably plan a route from start to the goal point without colliding with obstacles in between. So Set up a proper Path is an important issue as it allows a robot to get from start point to goal point. In this study, we attempts to solve path planning problem for mobile robot based on potential field method that relies on the use of Laplace's Equation to constrain the generation of a potential function over regions of the configuration space of a mobile robot. AI would be a recreation of the human thought process a man-made machine with our intellectual abilities. This would include the ability to learn just about anything, the ability to reason, the ability to use language and the ability to formulate original ideas execution is complicated. First, the AI robot or computer gathers facts about a situation through sensors or human input. The computer compares this information to stored data and decides what the information signifies.

Keywords: *Robotic Motion, Laplacian Technique.*

Introduction

One of the most difficult problems in robotics applications is developing robust autonomous motion planning. In order to build a truly autonomous mobile robot, it must have the capability to efficiently and reliably plan a route from start to the goal point without colliding with obstacles in between. Path planning algorithms attempt to deal with the problem of establishing a medium of communication between initial and final configurations, so that the robot can traverse the field safely.

Problem Definition

We are using much method earlier for robot path planning. Earliest we use Grid-Based Search, Interval-Based Search, Sampling-Based Algorithms etc. All have fine accuracy but its path is not smooth. EGSOR ITERATIVE METHOD USING four - POINT LAPLACIAN to make it path smoother. But somehow there need smoother path.

Our Algorithm to Solve Problem

For more smooth movement of robots we need higher level of calculation required. We are using EGSOR ITERATIVE METHOD USING NINE-POINT LAPLACIAN. It gives much smoother path for Robots.

Literature Survey

Azali Saudi, Jumat Sulaiman[1] proposed a behaviour-based paradigm approach known as Laplacian Behaviour-Based Control (LBBC) for solving path planning problem for a mobile robot operating in a structured indoor environment. Gilberto E. Urroz[2] illustrate the numerical solution of the Laplace equation we consider the distribution of temperature in a two-dimensional. Here example is taken on temperature. But we can have good result out here so can be implanted in our thesis.

Christopher I. Connolly and Roderic A. Grupen[3] Harmonic functions are solutions to Laplace's equation. Such functions can be used to advantage for potential field path planning, since they do not exhibit spurious local minima. Harmonic

functions are shown here to have a number of properties which are essential to robotics application.

Avadhanula, Vamshi Krishna, Lingala, Narsing Mudhiraj[4] according to we primarily concentrate on control architectures for robot navigation. We classify these architectures into three parts, deliberative – which stores configured space information to determine appropriate path across the configured space, reactive system – which have no information about space (i.e. world space) and uses sensors and set of rules for safe navigation and neural network systems that make use of neural network to determine the navigation path.

James Bruce, Manuela Veloso[5] proposed that the path-planning problem is as old as mobile robots, but is not one that has found a universal solution. Specifically, in complicated, fast evolving straints, these methods suffer from the lack of lookahead, which can lead to highly non-optimal paths and problems with oscillation.

Benoit Vanholme[6] The legal safety concept proposes to base driving system design on traffic rules. This allows fully automated driving in traffic with human drivers, without necessarily changing equipment on other vehicles or infrastructure. The driving system uses traffic rules to predict legal or non legal trajectories of objects in its perception zone and worst-case objects outside its perception zone.

Vera Bazhenova [7] Find a sequence of valid configurations that moves the robot from the source to destination.

Azali Saudi, Jumat Sulaiman[8] This paper proposed a behaviour-based paradigm approach to the path planning problem of a mobile robot utilizing fast iteration technique to compute the configuration space rapidly. The technique employs Laplacian Behaviour-Based Control (LBBC) for robust exploration of the configuration space of the robot. The LBBC relies on Laplace's equation that constraint the potential function in the configuration space of the robot

Azali Saudi1, Jumat Sulaiman[9] proposed the solutions of Laplace's equation also called harmonic functions that represent temperature values distribution in the configuration space will be used to simulate the generation of path for mobile robot motion. In the past, various approaches had been used

to obtain harmonic functions, but the most common method is via numerical techniques due to the availability of fast processing machine and their elegant and efficiency in solving the problem

Jens-Steffen Gutmann Masaki Fukuchi Masahiro Fujita[10] gives that Path-planning is one of the fundamental problems in mobile robot navigation. It has been shown long before that the problem of moving an object through space is *PSPACE-hard* with a time complexity exponential in the degrees of freedom of the object

O.Hachour [11] This present work, we present an algorithm for path planning to a target for mobile robot in unknown environment. The proposed algorithm allows a mobile robot to navigate through static obstacles, and finding the path in order to reach the target without collision. This algorithm provides the robot the possibility to move from the initial position to the final position (target). The proposed path finding strategy is designed in a grid-map form of an unknown environment with static unknown obstacles. The robot moves within the unknown environment by sensing and avoiding the obstacles coming across its way towards the target.

N.I.M. Fauzi and J. Sulaiman[12].In this paper, iterative methods particularly a family of Successive Over Relaxation (SOR) methods are used to solve system of linear equations generated from discretization of second-order two-point boundary value problems through cubic spline approaches

P. Svestka and M. H. Overmars[13] The robot path planning problem, which asks for the computation of collision free paths in environments containing obstacles, has received a great deal of attention in the last decades. In the basic problem, there is one robot present in a static and known environment, and the task is to compute a collision-free path describing a motion that brings the robot from its current position to some desired goal position. Variations and extensions of this basic problem statement are numerous.

Alexander Kleiner, Bernhard Nebel[14] ,Sertac Karaman, Emilio Frazzoli[15] .Here we study[14] Van der Corput sequence for motion for Robot Path Planning.Sampling-based Algorithms for Optimal Motion Planning.[15] . This paper gives the idea for robot path by Sampling-based Algorithms for Optimal Motion Planning. The purpose of this paper is to fill this gap, by rigorously analyzing the

asymptotic behavior of the cost of the solution returned by stochastic sampling-based algorithms as the number of samples increases.

The use of potential functions for robot path planning, as introduced by Khatib [16], views every obstacle to be exerting a repelling force on an end effector, while the goal exerts an attractive force. Koditschek [17], using geometrical arguments, showed that, at least in certain types of domains, there exists potential functions which can guide the effector from almost any point to a given point. These potential fields approach to path planning, however, suffer from the spontaneous creation of local minima.

Problem and Modification

We use various algorithms exist trying to solve this problem but all have shortcomings. The difficulty is due to the complexity of path planning problem, where it increases exponentially with the dimension of the configuration space. We use Nine point laplacian method to get appreciable result and path complexity is been reduced. Here we also use of some geometrical analysis to reduce its path complexity.

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