Review Navigation of Mobile Robot in the Presence of Static Obstacles of Different Shapes Stable Obstacles

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ABSTRACT

Robots can be used to replace worker to finish a lot of complex works in harsh environments. Recent years, many investigates have been seen in the application field of robots. For example, robot navigation has become one of the most popular research fields. The used algorithm from optimal control is presented as a method for optimal path planning for a robot. The analysis allows the robot to plan a collision-free path through static obstacles by minimizing a cost path.Here shows value for continued development as an optimal path planning method since it initializes easily, creates a feasible path on each iteration, and can find solutions where other solvers may fail.

Keywords: Path Optimisation, Obstacles, Robotics, Route decision, Path cost.

I. INTRODUCTION

In the current era of technology research is going on to make the machine as intelligent as human for it the various machine learning algorithms are applying to infuse the artificial intelligence in machine. The latest area in this field is intelligent car and intelligent robots.A new point growth optimization-based technique is proposed in this thesis to find the obstacle free optimal path from source to destination for a robot [1].Way arranging is a basic issue of robot route which has across the board applications in apply autonomy and in day by day routine works. Noticeable traditional strategies comprise of cell decomposition technique (CD), potential field strategy (PFM), guide strategy (RM) and sub-goal technique (SG). Heuristic techniques incorporate neural system (NN), fluffy rationale (FL) and nature propelled strategies, for example, hereditary calculation (GA) and Particle swarm optimization (PSO). Each of the above methodologies has its own particular constraints thus far, one individual technique can't impeccably take care of the robot way arranging issue. Subsequently, specialists have been calmly looking for all the more capable coordinated techniques for this issue. The point of those techniques is to make sense of an ideal crash freeway from a beginning position to an objective position under specific limitations. Since there are many sorts of robots with various qualities, imperatives and applications, it is almost difficult to present a correct definition for the expression "ideal way". Nonetheless, it can be centred around a few angles, for example, security, smoothness, short separation methodologies and vitality[2].

II. RELATED STUDY

Et al.	Researchers	Manuscript Title	Used Approach	Publication
[1]	Belinda Matebese, Daniel Withey and Mapundi K. Banda	PATH PLANNING WITH THE LEAPFROG METHOD IN THE PRESENCE OF OBSTACLES	The Leapfrog path is initialized using the RRT planning algorithm and refines the RRT result to produce an optimal path. The Leapfrog algorithm can generate optimal paths in the presence of obstacles and has the potential to be useful in optimal path planning for mobile robots. This was shown through simulation and experimental solutions.	IEEE, 2016

[2]	B.T. Matebese, D.J. Withey and M.K. Banda	APPLICATION OF THE LEAPFROG METHOD TO ROBOT PATH PLANNING	Application of the Leapfrog method to mobile robot path planning was introduced. This was done by solving the mobile robot kinematic model as an optimal control problem to find optimal trajectories. The Leapfrog method generates optimal paths and produces a feasible path on each iteration. It also may find solutions in cases where other solvers fail. These features were demonstrated in simulation experiments.	IEEE, 2014
[3]	Hao-dong Zhu and Bao-feng He	PATH PLANNING OF MOBILE ROBOT USING OPTIMIZED ACA	The discussed algorithm improved the transition rule of node state to increase the probability of searching optimal path, designed an improved the heuristic function to improve the searching efficiency of the algorithm, and updated the pheromone avoid falling into local optimum. The improved algorithm obtains the optimal path in the environments of different complexity levels and it shows the efficiency and feasibility of the improved algorithm, which has good optimization ability and can be applied to path planning for mobile robot in the environments of different complexity levels.	AITA, 2016
[4]	Prithviraj Dasgupta	COVERAGE PATH PLANNING USING MOBILE ROBOT TEAM FORMATIONS	The multi-robot coverage path-planning problem involves finding collision-free paths for a set of robots so that they can completely cover the surface of an environment. This problem is non-trivial as the geometry and location of obstacles in the environment is usually not known a priori by the robots, and they have to adapt their coverage path as they discover obstacles while moving in the environment.	IGI Global, 2015
[5]	Andrea I. Schäfer, Gordon Hughes and Bryce S. Richards	RENEWABLE ENERGY POWERED MEMBRANE TECHNOLOGY: A LEAPFROG APPROACH TO RURAL WATER TREATMENT IN DEVELOPING COUNTRIES	In this paper, current estimated costs for water, membrane plants and infrastructure are compared to indicate the window of opportunity for these exciting renewable energy powered membrane (RE-membrane) technologies. General estimated costs for decentralized membrane systems are within the range of some untreated water costs in developing countries.	Elsevier, 2014
[6]	S. Sekar and K. Prabhavathi	NUMERICAL SOLUTION OF FIRST ORDER LINEAR FUZZY DIFFERENTIAL EQUATIONS USING LEAPFROG METHOD	the Leapfrog method has been successfully employed to obtain the approximate analytical solutions of the first order linear fuzzy differential equations. Compare to STHWS method, Leapfrog method gives less error from the Tables. Also, it is clear that from the Leapfrog method introduced in Section performs better than STHWS method.	IOSR Journal of Mathematics, 2014
[7]	Noor Hazarina Hashim, Jamie	BANDWAGON AND LEAPFROG	This paper underscores the critical relationship between innovation	International Journal of

	Murphy, Olaru Doina and Peter O'Connor	EFFECTS IN INTERNET IMPLEMENTATION	adoption and innovation implementation, particularly how two contrasting effects bandwagon and leapfrog relate to organizational Internet diffusion. Leapfrog effects, however, attenuate adoption and often lead to effective technology use relative to early adopters. Drawing on and combining related Malaysian hospitality studies, this paper illustrates these two effects and extends the literature by showing that early, and late, adoption can relate positively to successful Internet implementation.	Hospitality Management, 2014
[8]	S. Sekar and M. Vijayarakavan	NUMERICAL INVESTIGATION OF FIRST ORDER LINEAR SINGULAR SYSTEMS USING LEAPFROG METHOD	In this paper numerical investigation of first order linear singular systems of time-invariant and time varying cases using Leapfrog method is considered. The obtained discrete solutions using Leapfrog method are compared with the exact solutions of the first order linear singular systems of time-invariant and time varying cases and single-term Haar wavelet series (STHWS) method. The present method is very convenient as it requires only simple computing systems, less computing time and less memory.	International Journal of Mathematics Trends and Technology, 2014
[9]	Ki-Baek Lee and Jong-Hwan Kim	MULTIOBJECTIVE PARTICLE SWARM OPTIMIZATION WITH PREFERENCE-BASED SORT AND ITS APPLICATION TO PATH FOLLOWING FOOTSTEP OPTIMIZATION FOR HUMANOID ROBOTS	They look at Multi target Particle Swarm Optimization with Preference-based Sort (MOPSO-PS) was discussed. It could deal with the Multi target Optimization Problems (MOPs) in light of the customer's slant by applying slant-based sort, for which the cushioned measure and fleecy key were used. The sufficiency of this figuring was appeared by connection with NSGA-II, MQEA, and MOPSO through the DTLZ limits. The relationship happens showed that the customer's slant was honest to goodness reflected to enhanced game plans by MOPSO-PS with no loss of general game plan quality and contrasting qualities.	IEEE, 2013
[10]	P. Raja and S. Pugazhenthi	OPTIMAL PATH PLANNING OF MOBILE ROBOTS: A REVIEW	This article reflects the research progress that has taken place in path planning of mobile robots, including on-line planning. Although many efficient algorithms have been developed, the diversity of path planning problems has been constantly increasing. Up to 90s, determination of collision-free path remained the main objective. Currently, though collision-free path is a necessary condition, other significant issues such as modelling of dynamic environment, multiple optimal functions, dynamic constraints, etc. are also to be addressed.	International Journal of Physical Sciences, 2012
[11]	Jonathan Binney, Andreas Krause and Gaurav S.	INFORMATIVE PATH PLANNING FOR AN	they assume that the quantity which they are measuring is time-invariant; this is only reasonable over short periods of	IEEE, 2010

	Sukhatme	AUTONOMOUS UNDERWATER VEHICLE	time. The recursive greedy technique could be extended to work with time-varying quantities by adding many copies of each node in the graph, one for each possible time that it could be visited. This would greatly increase the running time of the algorithm however, so another approach is needed.	
[12]	Yogita Gigras, Kavita Choudhary, Kusum Gupta and Vandana	A HYBRID ACO-PSO TECHNIQUE FOR PATH PLANNING	To solve the convergence problem best searching methods are required and these two searching methods give the optimal results for optimization problems for robotic path planning meta heuristic search set of computer instructions is better way of doing things because it is problem independent. It uses random solutions to (accomplish or gain with effort) the goal. It uses hit and trial method to reach the goal. Particle Swarm Optimization (PSO) is great idea from population-based optimization ways of doing things, which is based on familiar nature of bird coming together or fish education. The idea of Particle swarm optimization is that each particle randomly searches the problem space that is searching for best space to target or unemotional and factual function by changing itself with its own memory and the related information collected from other particles.	IEEE, 2015

III. PATH PLANNING

Path planning is one of the core content of mobile robotics research field in recent years, which is to find an optimal and collision free path from the starting point to destination. The problem of path planning has the characteristics of complex, more binding, and multi-objective. The traditional path planning algorithms include Dijkstra algorithm and A* algorithm[1]. Dijkstra algorithm is a classic path search algorithm, and it is a kind of greedy algorithm, though it can plan a optimal path, The algorithm will expand from the starting point to outside until find the destination node. Algorithm has high computational and low efficiency because of traversing the node. A* algorithm is a kind of heuristic algorithm, it determines the distance from the current point to the target point through the evaluation function. A non-ideal estimation function may lead to find a bad path in a complex environment. In recent years, the domestic and foreign experts and scholars have put forward to many bionic intelligent optimization algorithms, such as Genetic algorithm, artificial fish algorithm, leapfrog algorithm, neural network algorithm and ant colony algorithm, which have been applied to path planning [3].

Robot path planning is one of important issues in environment modelling. Modelling is the process of turning the reality of the physical space into the space which is understood by robot through the extraction and analysis according to the known environment information. It can effectively reduce the trouble in the process of path search. This paper divided the environment of robot into two dimensions by using the grid method, and the grids are numbered from left to right and from top to bottom[5].

Path planning for a mobile robot involves finding a route from a given starting state to a given goal state while avoiding obstacles in the environment. Common approaches include sampling-based methods, grid-based methods, and artificial potential fields. In path planning for mobile robots it is also important to generate an optimal path by optimizing a performance criterion such as distance, time or energy. Hence an optimal control problem needs to be solved i.e. one needs to find a control law for a given system such that a requisite optimality criterion is achieved. A solution to a set of differential equations describing the paths determined by the control variables that also minimizes a cost functional which is a function of a state and control variables is determined [1-3]. Optimal control problems are generally nonlinear hence in most cases analytical solutions are

untenable. Numerical methods are, therefore, used to approximate their solutions. Mobile robot is the hotspot in the field of robot research and the path planning is one of the important branches in the study and the basis of control system. A lot of robot path planning methods are used at present, traditional algorithms such as tabu search method, grid method and artificial potential field method[5-8]. Now, some bionic intelligent optimization algorithms such as genetic algorithm, the particle swarm algorithm, ant colony algorithm and immune algorithm are presented to solve the path planning problem. Motion planning or movement planning is a key terms used in path planning algorithm and this the major point when we plan a path for robot navigation and allocation of coordinate of route to be follow, so that it will satisfy all the constraints of robot movement and give the optimized solution [11].

IV. PROBLEM STATEMENT

Optimization of path is major issue in current scenario of robot path selection and planning. For the planning of path various authors are used various optimization and heuristic function. In heuristic function, the fitness constraint and modelling of path play an important role. In concern of path selection and linking of optimal path for the estimation of cost and length of path is critical issue. Various authors used optimization techniques, but certain limitation given below[1-3].

- Selection of intermediate path
- Cost value of path
- Mapping of obstacle model according to problem
- Complexity of time

V. CONCLUSIONS

This dissertation modified the optimal path selection using plant grow optimization algorithm. the plant grow optimization algorithm is multi-objective function for the selection of multiple path with obstacle space. The selection of collision free path used multiple branch and leaf selection process. The choice of cost function is an important element that has a major effect on the optimal path. While a minimum branch is desired, some level of efficiency should be included, particularly when dealing with multiple obstacle. A cost function that includes both a minimum time element and a measure of minimizing effort is desirable. Here we conclude all the able to optimise the problems and we try to improve the robotic performance. In future used another branch selection and cost function for path planning of robotics.

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