An Improved the Robotic Path Optimisation in Presence of Different Shapes Stable Obstacles

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ABSTRACT

Path planning is a very important in our daily life because of several reasons reducing the path distance and energy consumption so here we choose this path optimization process. Several sectors robotics take the place of human and gave better performance. Nowadays widely uses of robotics like robotic car, robotic serviceman etc. In the process of robot movement, it has chance of collision with obstacles. So, need to configure their size and avoid it. Robots can be used to minimize the labour work and get the more accurate work. Last decade we are used frequently robot in several purpose or application in different sectors. Here, robot path navigation has become one of the highest demanding research fields. This research used plant grow optimization algorithm for the selection of path in obstacle environments. The plant grow optimization algorithm is multi-objective optimization technique with multiple constraints such as growing of leaf and competition of branch. The plant grow optimization enriched the search space for the selection of path in free environments.

Keywords: Robotics, Path Optimization, Obstacles, Plant Grow Optimization, Leapfrog

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INTRODUCTION

Path planning for a versatile robot includes finding a course from a given beginning state to a given objective state while evading deterrents in the earth. Regular methodologies incorporate testing-based techniques, lattice based strategies, and counterfeit expected fields. Probabilistic guides and quickly investigating irregular trees (RRT's) are instances of examining based techniques, and the notable A* calculation and its varieties are instances of network based strategies. Fake potential fields can likewise be utilized to coordinate the robot by giving a capacity over the state space, the angle of which characterizes state-subordinate movement vectors to be applied to the robot to move it past deterrents and towards the goal[1].

In their least complex structures, be that as it may, these techniques don't normally incorporate the robot kinematics and elements and consequently are predominantly appropriate to holonomic robots which can deal with straight-line directions between self-assertive states. Nonholonomic movement arranging is a functioning territory of examination that investigates strategies relevant to a more extensive scope of robots, for example, those with vehicle like controlling and those with differential-drive limitations. In the system of hindrance evasion, the utilization of counterfeit potential fields was examined by Khatib. This methodology has picked up notoriety in way anticipating portable robots because of its numerical straightforwardness and polish. Different takes a shot at counterfeit potential fields have been talked about to expand the underlying idea. The objective state is apparently the worldwide least of the fake likely field. Nonetheless, the fundamental downside of the strategy is that it is delicate to nearby minima, i.e., the robot can get caught at a point a long way from the objective. To dodge this issue various capacities like route potential-based capacities, the Gaussian capacity have been utilized as potential-based capacities. The route work was presented. In contrast to other potential field techniques, the route work has just a single least point (at the objective) so that there are no nearby minima. In Ren, a Gaussian capacity was utilized to show the attractor and a high request Gaussian-like capacity to demonstrate deterrents so as to dodge nearby minima. The Gauss work and an adjusted recreated tempering technique was actualized for obstruction shirking of multi-connect robots. Korayem et al. introduced an ideal movement arranging approach for non-holonomic portable robots within the sight of numerous hindrances dependent on the potential field technique. The creators applied the possible capacity to the file execution of the ideal issue, to evade the potential field limitations[1].

Monwar, Momena, Omid Semiari, and Walid Saad Et al. [1] Autonomous examination of enormous geological regions is a focal prerequisite for proficient peril recognition and calamity the executives in future digital physical frameworks, for example, shrewd urban communities. In such manner, misusing automated elevated vehicle (UAV) swarms is a promising answer for assess immense territories effectively and with ease. Actually, UAVs can undoubtedly fly and arrive at examination focuses, record observation information, and send this data to a remote base station (BS). Regardless, much of the time, for example, activities at distant territories, the UAVs can't be guided straightforwardly by the BS progressively to discover their way.

They have talked about a novel way arranging calculation that limits the general vitality utilization by a UAV multitude to self-rulingly examine a geological region. The examined system has considered various measurements that sway the vitality utilization, including flying, floating, and information transmission by each UAV. they have indicated that the talked about calculation takes care of the way arranging issue in polynomial time, while considering the individual vitality imperatives of the UAVs. Recreation results have demonstrated that the talked about methodology significantly beats the gauge arrangement with separation-based way arranging, both regarding required review vitality and time.

Hoang, V. T., Manh Duong Phung, Tran HiepDinh, and Quang Phuc Ha Et al. [2] a novel and doable way arranging method for a gathering of automated airborne vehicles (UAVs) directing surface review of framework. A definitive objective is to limit the movement separation of UAVs while at the same time stay away from snags, and keep up elevation limitations just as the state of the UAV development.

Parker, Lauren, James Butterworth, and Shan Luo Et al. [3] Molecule Swarm Optimization (PSO) is a ground-breaking streamlining calculation that can be utilized to find worldwide maxima in a hunt space. Ongoing enthusiasm for multitudes of Micro Aerial Vehicles (MAVs) makes one wonder with respect to whether PSO can be utilized as a strategy to empower genuine automated multitudes to find an objective point. Be that as it may, the first PSO calculation doesn't consider crashes between particles during search. In this work they talked about a novel calculation called Force Field Particle Swarm Optimization (FFPSO) that assigns repellent power fields to particles with the end goal that these fields give an extra speed segment into the first PSO conditions. they contrast the exhibition of FFPSO and PSO and show that it can diminish the quantity of molecule crashes during search to 0 while additionally having the option to find an objective of enthusiasm for a comparative measure of time. The adaptability of the calculation is likewise exhibited by means of a lot of trials that thinks about how the quantity of accidents and the time taken to discover the objective fluctuates as per swarm size. At long last, they show the calculations materialness on a multitude of genuine MAVs.

Sangeetha, V., K. S. Ravichandran, Sellammal Shekhar, and Anand M. Tapas Et al. [4] way arranging is one of the critical dynamic procedures in an automated self-governing framework. Numerous wise ways to deal with pathfinding and age have been determined in the previous decade. Vitality decrease (cost and time) during pathfinding is an enormous assignment. Ideal way arranging implies the briefest way as well as finding one in the limited expense and time. In this work, a smart addition based subterranean insect province improvement and increase based green-insect (GG-Ant) have been talked about with an efficient way and least calculation time than the ongoing cutting-edge clever methods. Recreation has been done under different conditions and results outflank the current subterranean insect settlement streamlining (ACO) and green-subterranean insect procedures regarding the calculation time and way length. The work can be expanded further for vitality decrease put together way arranging with respect to a 3D domain. Additionally, way proposal framework can be created.

Artuñedo, Antonio, Jorge Godoy, and Jorge Villagra Et al. [5] An understanding on various methodologies for way arranging is done in this work, where a wide scope of potential blends among a few natives, advancement techniques and calculations are thought about. The outcomes are expected to help in future choices about the most suitable methodology for nearby way arranging in various conditions or applications. Keeping that in mind, the primary commitments of this work are a correlation system to benchmark distinctive way arranging natives for on-street urban driving, the assessment of various crude configurations and streamlining strategies for way arranging, and the open distribution of the outcomes and its ensuing examination, in view of a set KPIs identified with the previously mentioned fundamental highlights.

Jiang, Ao, Xiang Yao, and Juan Zhou Et al. [6] They have primarily contemplated the way arranging of mechanical arm obstruction evasion dependent on GA. Initially, D-H is applied for the demonstrating of the portable mechanical arm and kinematic and dynamic examination is led to build up the kinematic and motor conditions of the mechanical arm. At that point, the substance of GA is introduced and the way is improved by considering how to make the movement season of the mechanical arm most brief, the spatial separation littlest, the way length most brief and simultaneously, the force not surpass the limit of joint set worth. At that point, the arrangement cycle of GA is examined and the strategy is demonstrated through recreation tests in workplace with a solitary hindrance and numerous snags, the trial results show that the relating imperative conditions are fulfilled and the position, speed and increasing speed bend of the way gotten smooth and constant. The reenactment results show that the technique is attainable, all inclusive and viable and that it can improve the productivity of way arranging of hindrance shirking.

Wang, Yubing, Peng Bai, Xiaolong Liang, Weijia Wang, Jiaqiang Zhang, and Qixi Fu Et al. [7] in this work, different dispersed molecule swarm streamlining (DPSO)- based way arranging calculations are talked about for UAV swarms leading a surveillance crucial, which targets are accumulated as bunches and diverse strategy needs are mulled over. Three calculations named the most extreme thickness union DPSO calculation (MDC-DPSO), the quick traverse DPSO calculation (FCO-DPSO), and the exact inclusion investigation DPSO calculation (ACE-DPSO) are examined compare to the necessities of quick assembly, irregular traverse, and precise pursuit, separately. Diverse fitness capacities and search methodologies are specifically planned considering the versatility and correspondence limitations of the UAV swarms. Furthermore, the leap out system and return to instrument are intended to spare invalid hunt endeavors and abstain from falling into neighborhood ideal. The recreation results exhibit that the examined calculations are compelling in producing ways for UAV swarms leading an observation strategic, can be effortlessly applied to huge scope swarms. In this work, they have introduced way arranging calculations for a surveillance strategic by UAV swarms dependent on DPSO calculation, where targets show up as groups, and every molecule compares to a genuine UAV without earlier information on bunches.

Li, Hongluo, Yutao Luo, and Jie Wu Et al. [8] Intelligent vehicles are relied upon to dodge impact through crisis path change when a vehicle out of nowhere shows up. Hence, it is extremely important to design a way for crash free path change with a vehicle in front, which finds some kind of harmony between vehicle execution and driving solace. Reproduction results show that their strategy functions admirably at various vehicle speeds and gives an attractive device to design a unique way in genuine traffic condition. The fundamental commitment of this examination lies in the way that their way arranging technique doesn't need the earlier information on the objective to produce an ebb and flow consistent path change way with no fiasco point, which is more in accordance with the real conditions. This interesting property gives an assurance to the crash free path change of the host vehicle. In this way, their strategy has an extraordinary application potential.

Qie, Han, Dianxi Shi, Tianlong Shen, Xinhai Xu, Yuan Li, and Liujing Wang Et al. [9] One of the significant exploration themes in automated ethereal vehicle (UAV) shared control frameworks is the issue of multi-UAV target task and way arranging (MUTAPP). It is a convoluted advancement issue in which target task and way arranging are fathomed independently. In any case, recalculation of the ideal outcomes is excessively delayed for continuous activities in unique conditions in view of the enormous number of figurings required. In this work, they examined an artificial knowledge technique named synchronous objective task and way arranging (STAPP) in light of a multi-operator profound deterministic strategy angle (MADDPG) calculation, which is a sort of multi-specialist fortification learning calculation. In STAPP, the MUTAPP issue is first built as a multi-operator framework. At that point, the MADDPG structure is utilized to prepare the framework to understand target task and way arranging at the same time as per a comparing reward structure. The talked about framework can manage dynamic conditions adequately as its execution just requires the areas of the UAVs, targets, and danger territories. Continuous execution can be ensured as the neural system utilized in the framework is straightforward.

Dolicanin, Edin, Irfan Fetahovic, Eva Tuba, Romana Capor-Hrosik, and Milan Tuba Et al. [10] The utilization of the automated ethereal vehicles is quickly developing in ever more extensive scope of uses where military use is among the most seasoned ones. One of the key issues in the automated battle elevated vehicles control is the way arranging issue that alludes to set up the ideal course from the beginning situation to the objective, where optimality can be characterized from various perspectives. Way arranging speaks to a multi-objective obliged hard improvement issue. In this work, they balanced an ongoing multitude knowledge conceptualize enhancement calculation for finding the automated battle ethereal vehicle ideal way considering fuel utilization and wellbeing degree. The talked about strategy was tried and contrasted with eleven distinct strategies from writing. In view of the recreation results, it very well may be presumed that their talked about methodology is strong, shows better execution in practically all cases and has potential for additional upgrades. They balanced the talk streamlining calculation for automated battle flying vehicle way arranging issue. The fuel utilization and security of the UCAV were considered as standards for the way optimality. The examined technique was probed test conditions from writing with roundabout peril zones and diverse danger degrees and was contrasted with eleven different strategies from writing. In light of the recreation results, it tends to be inferred that the talked about talk advancement calculation showed exceptionally encouraging highlights. It would be wise to execution for littler issue measurements, while for bigger issue measurements more cycles were required. Nonetheless, the outcomes were additionally improved contrasted with different calculations.

Cap, Kam-Ming Mark, Daniel J. Marshall, Mitchell Gu, Jasmine Kim, Yijiang Huang, Justin Lavallee, and Caitlin T. Mueller Et al. [11] Architectural structures accomplishing high quality and solidness with insightful, however perplexing calculation may now be material is capable through added substance producing (AM). Be that as it may, regular layer-based AM likewise delivers leaves behind conflicting basic quality – along these lines restricting AM's end-use applications. Developing advanced mechanics empowered AM procedures tending to this constraint, a novel plan creation system for delivering fundamentally upgraded cross sections is introduced here.

Lyu, Hongguang, and Yong Yin Et al. [12] The introduced reenactment results demonstrate the focal points and effectiveness for constant way arranging utilizing the talked about technique. Because of the deterministic and adequate arrangement inferred for the mind boggling impact shirking task, a low and practically steady computational time for each situation, redundancy and strength for the vulnerability of other boat's practices, it very well may be applied to an on board hostile to crash dynamic framework and advances the mechanization level of a USV or a self-ruling boat. The technique can be further refined by considering speed decrease practices and more precise boat elements, just as the vulnerability of ecological unsettling influences and zone based hindrances.

Franco, Antonio, Damián Rivas, and Alfonso Valenzuela Et al. [13] The enhancement of the airplane course considering breeze and temperature vulnerabilities is tended to in this work. These vulnerabilities are acquired from troupe climate figures. The overall structure for this work is the advancement of a philosophy to oversee climate vulnerability appropriate to be coordinated into the direction arranging measure. Specifically, a stochastic approach has been executed, which is fit for finding the ideal airplane way, thinking about an organized airspace, within the sight of questionable breezes and unsure temperature gave by an EPS.

Hui, Kin-Ping, Damien Phillips, AsankaKekirigoda, and Alan Allwright Et al. [14] They have introduced a versatile enhancement way to deal with a range augmentation issue in a urban situation with Opal. The situation involved two portable ground hubs and a self-governing UAV with arranging imperatives. This work exhibited that advancing the Network Connection Level (NCL) with regards to arranging limitations can improve the availability of a versatile interchanges net-work that would some way or another be separated. The utilization of system state expectation along a direction envisions future necessities of that direction and limits the vacation of interchanges in the close to term. The self-rule of the UAV and the consistent advancement empowers high beat help for interchanges in an exceptionally unique portable strategic radio system. Moreover, Opal shows keen conduct that diminished the detachment season of the system. Further work is wanted to explore the utilization of AI strategies to help the applicant age.

Ibraheem, Ibraheem Kasim, and Fatin Hassan Ajeil Et al. [15] Path organizers are commonly sorted as either direction enhancers or inspecting based organizers. The last is the transcendent arranging worldview for inhabitance maps. Most direction enhancers require a completely characterized counterfeit expected field for arranging and can't design legitimately on an incompletely watched model, for example, an inhabitance map. A stochastic direction streamlining agent fit for arranging over inhabitance maps was introduced. Notwithstanding, its versatility is restricted by the O(N3) intricacy of the Gaussian cycle way portrayal. In this work, they present a novel exceptionally expressive way portrayal dependent on piece approximations to perform direction improvement over inhabitance maps. This methodology lessens computational intricacy to O(m) where m x N. Also, to quicken intermingling they utilize a versatile testing technique. they present correlations with other best in class arranging strategies in both reproduction and with genuine inhabitance information, which show the critical decrease in runtime bringing about execution practically identical to testing based techniques. The arranging technique talked about in this work utilizes SGD to enhance a way spoke to by a rough portion highlight set. This model furnishes an exceptionally expressive way with a savvy portrayal. SGD joins the estimated part way model with a stochastic inspecting timetable to frame a computationally effective advancement measure with intermingling ensures. Utilizing arbitrary examples over the whole way space evades the need to focus on a from the earlier inspecting goal of the goal work. Thusly, the streamlining agent distinguishes progress territories around the outskirts of obstructions, which empowers the analyzer to conquer the clueless regions framed by the deterrents. Trial result exhibits the significance of arbitrary inspecting for arranging in inhabitance maps. Joined with a rough piece way portrayal, their technique offers an adaptable and quick strategy for direction advancement in inhabitance maps.

Pub.	Author	Index	Approach
IEEE, 2016	Belinda Matebese	• Methods • Problem Formulation • Numerical Results • Discussion	The Leapfrog method has merits in that it starts easily using a feasible, suboptimal path.
IEEE, 2016	Tugcem Oral	• Incremental path planning • Multi-objective path planning	It is compared with known and complete multi-objective off-line path planning algorithm, MOA*, well-known MOEA SPEA2 and with a novel evolutionary solution, MOGPP, based on solution quality and execution times.
IEEE, 2016	ThiThoa Mac	• The hierarchical robot path planning approach • Robot path planning formulation • Global multi-objective optimal particle swarm optimization algorithm	The results demonstrate the ability of the novel hierarchical approach based on CMOPSO to solve the robot path planning problem because it can provide high quality result at a very low actual execution time.
Automatica, 2016	Zhengyuan Zhou	• Pursuit-Evasion Games • Voronoi • Cooperative Pursuit	A decentralized, real-time algorithm for cooperative pursuit of a single evader by multiple pursuers in bounded, simply-connected planar domains.
Earth and Environmental Science, 2018,	C Brodnik	• Leapfrogging • Sustainable urban water management • Water sensitive city	This work presents a decentralized, real-time algorithm for cooperative pursuit of a single evader by multiple pursuers in bounded, simply connected planar domains.
IEEE, 2017	Ana C. Lopes	• Planning Approaches • HM Planner • Collaborative Navigation • Navigation Using Self-Paced BCI	The paper introduces what leapfrogging to a water sensitive city means and describes 3 catalysts that facilitate this transition: trans-disciplinary science, cross sectoral collaboration and innovation experiments.
Pattern Recognition Association of South Africa and Robotics and Mechatronics, 2016	Belinda Matebese	• Mobile Robot Kinematics • Path Planning Algorithms	Real time navigation is achieved since both the smoothing and the D-DWA algorithms are iteratively executed during navigation.

SJIE, 2017	B. Batinge, J.K.	• Leapfrogging as A Form of Transition • Potential of Leapfrogging to Renewable Energy in Unmet Electricity Markets	It is observed that the optimal path that Leapfrog produces does not depend on the initial path, nor on the method by which the initial path is formed.
Sustainability, 2018	Yu Xie, Yi-Fei Du	• Theory and Hypotheses	The paper conceptualized 3 potential transition paradigms: evolutionary, scattered, and coned pathways.
IC Conference, 2017	Aditya Vamsikrishna	• Leapfrog Algorithm • Pontryagin's Maximum Principle and Leapfrog Algorithm	The opportunity factors show the same important role as assets factors in promoting EMNEs executive's springboard behaviour.
Hindawi, 2017	Jiandong Zhao	• Model Establishment in Dynamic Paths Planning of Emergency Vehicles • Travel Speed Prediction Based on SFLA-KC Algorithm	They optimize a quadratic cost with the control objective of steering the mobile robot from an initial state to the origin in the plane with given final orientation.
CIE Conference, 2015	Sagar Chowdhury	• Path Planning • Controller Design • Computation of Currents • System Architecture	The dynamic paths planning problem of emergency vehicles is usually constrained by the factors including time efficiency, resources requirement, and reliability of the road network.
Neuro-computing, 2015	Yong Zhang	• Particle swarm optimization • Modelling of the robot workplace • The constrained MOPSO algorithm	They have developed a heuristics-based planning algorithm for generating collision-free trajectories for the microrobots that are suitable to be executed by the available magnetic field.
IEEE, 2016	Ki-Baek Lee	• Particle Swarm Optimization • Multi-objective Evolutionary Optimization • Fuzzy Integral	This paper proposes a multi-objective path planning algorithm based on particle swarm optimization for robot navigation in such an environment.
IJPS, 2015,	P. Raja, S. Pugazhenthi	• Path planning • Mobile robot • Off-line environment • On-line environment • Evolutionary algorithms	This paper proposes Multi-objective Particle Swarm Optimization with Preference-based Sort (MOPSO-PS) in which the user's preference is incorporated into the PSO update process to determine the relative merits of nondominated solutions.

PROPOSED METHODOLOGY

The automatic path planning is important area of research in the field of automation. In this dissertation used plant grow optimization technique for the planning of robot path selection. The plant grow optimization algorithm is inspired by the process of development of plants. The development of plants divided into three sections as describe below

1. Morphogen
2. Branching
3. Termination

The following parameter is used for the process of path, x1, x2,…………..,xn is the path component of robot. W is the Wight factor for the path, T is the value of morphogen, c1 and c2 is contour value of path.

Step1. Define the value of path-set S1{x1, x2,………….xn} with population

Assign the value of contour and weight of path C1=0, C2=0 and W=0

a. Morphogen selection of plant function

$$F(s) = \frac{(Ffd - Fpf)}{Fd * fp}, wi\epsilon S(x1, x2 \ldots.. xn) \ldots\ldots\ldots\ldots.. (1)$$

Here F_{fd} is initial length and F_{pf} is final length of plant and w is set of path component of sum sets

The path components set the value of branch $F = \{fa1 \ldots\ldots\ldots an\}$. these branch value proceed for the estimation Competition condition of local leaf.

$$Fcom = \begin{cases} \dfrac{(T_i)^{\alpha}\left(LI_i^{S_j}\right)^{\beta}}{\sum_{g \notin S_j}(\tau_g)^{\alpha}\left(LI_g^{S_j}\right)^{\beta}} & if \quad i \notin S_j \\ 0 & otherwise \end{cases} \qquad (2)$$

Here T is target value of path, and LI is the value of path difference.

Step2. Branching condition

Input the selected path for the Competition

1. Calculate the value of relative path of C1 and C2

   $\mathrm{Rf} = \frac{\mathrm{LSI}}{\mathrm{Wd}}$ Here Lsi the difference of path length.
2. The PGO estimate the final path for selection.

   $$FS = \begin{cases} \dfrac{\max.(RF) \; - F(s)}{\max_{h=1:}(WS)} & if \;\; s_i \in f_j \\ 0 \quad otherwise \end{cases} \quad (3)$$
3. create the relative FS difference value of path

   $$\mathrm{Rd} = \sum_{\mathrm{fd}=1}^{\mathrm{n}} \sum_{\mathrm{pf}=1}^{\mathrm{m}} (\mathrm{xi} - \mathrm{fs}) \ldots\ldots\ldots\ldots\ldots\ldots.. (4)$$
4. if the value of Rd is zero the path termination condition is call

step 3 Termination

Where, $Rd$is the relative difference of $T(i)$; $f_z$is the fitness value; standard deviation $S_z$and local density $D_z$are defined in formula (5):

$$\begin{cases} R_d = \sqrt{\dfrac{\sum_{i=1}^{n}(z(i) - E(z))^2}{(n-1)}} \\ f_z = \sum_{i=1}^{n}\sum_{j=1}^{n}\big(R - r(i,j)\big)\, u(R - r(i,j)) \end{cases} \quad (5)$$

.

Defining $d\big(z(k), z(h)\big)$as the absolute distance between the two-optimal path

$$d\big(z(k), z(h)\big) = \sqrt{\big(z(k) - z(h)\big)\big(z(k) - z(h)\big)} = \sqrt{\big(z(k) - z(h)\big)^2}$$

$k = 1, 2, \dots\dots\dots.., N; h = 1, 2, \dots\dots\dots.., N$ and finally, path is terminated.

PROPOSED MODEL

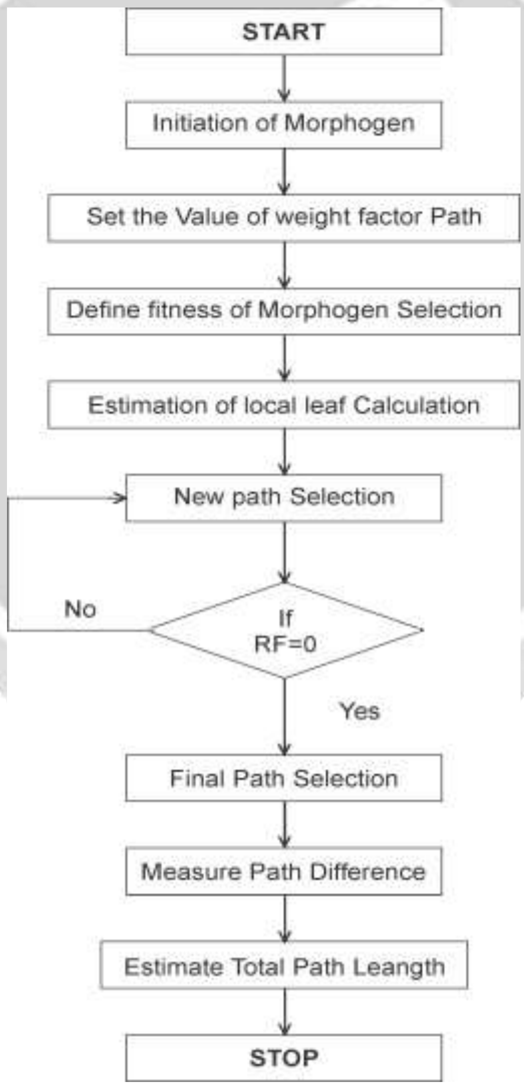

Figure 1: proposed model of automatic robotic path selection based on plat grow optimization.

PROCESS

Step 1: Start the process

Step 2: Start the morphogen process. in this process check all the configurate our simulation. that means it is the 1st step of PGO.

Step 3: Based on configuration we configure all the weighted path.

Step 4: Based on PGO select the optimised path

Step 5: Based on PGO second step branching we configure the all route width because the robot cannot collide with obstacle

Step 6: In case of Path width facing a collision, it finds new route

Step 7: Finally select the final route

Step 8: Compare all the path

Step 9: Finally estimate the Path Length

Step 10: Terminate the Process

SIMULATION

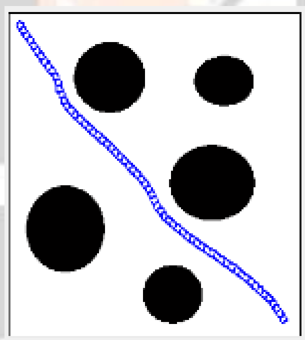

Figure 2: window show that the output result when using proposed method on input map-1 in our Robot path optimization project.

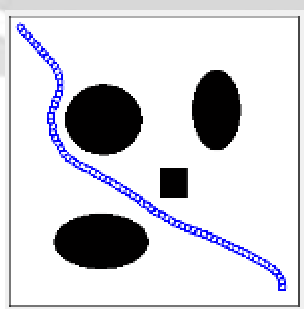

Figure 3: window show that the output result when using Leapfrog method on input map-2 in our Robot path optimization project.

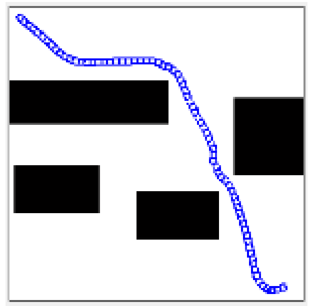

Figure 4: window show that the output result when using proposed method on input map-3 in our Robot path optimization project.

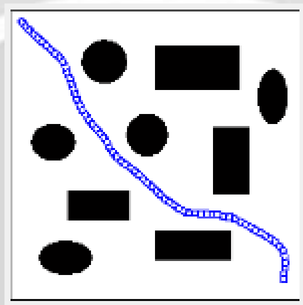

Figure 5: window show that the output result when using Leapfrog method on input map-4 in our Robot path optimization project.

RESULT AND PERFORMANCE EVALUTION

Here we were showing result of different initial points, destination points with different point of obstacle.

Map	Map 1	Map 2	Map 3	Map 4	Map5
Processing Time	1.465264	1.683478	1.643053	1.478920	1.559195
Path Length	11.039876	10.985088	11.009693	10.977740	11.000459

Table 1 Given Table Shows That Resultant of Our Implementation Robot Path Optimization Using Leapfrog Method On 5 Cases of Map.

Map	Map 1	Map 2	Map 3	Map 4	Map5
Processing Time	0.529982	1.154610	1.154370	0.857532	1.071636
Path Length	9.019856	10.965068	10.989673	10.957720	10.980439

Table 2 Given Table Shows That Resultant of Our Implementation Robot Path Optimization Using Proposed Method On 5 Cases of Map.

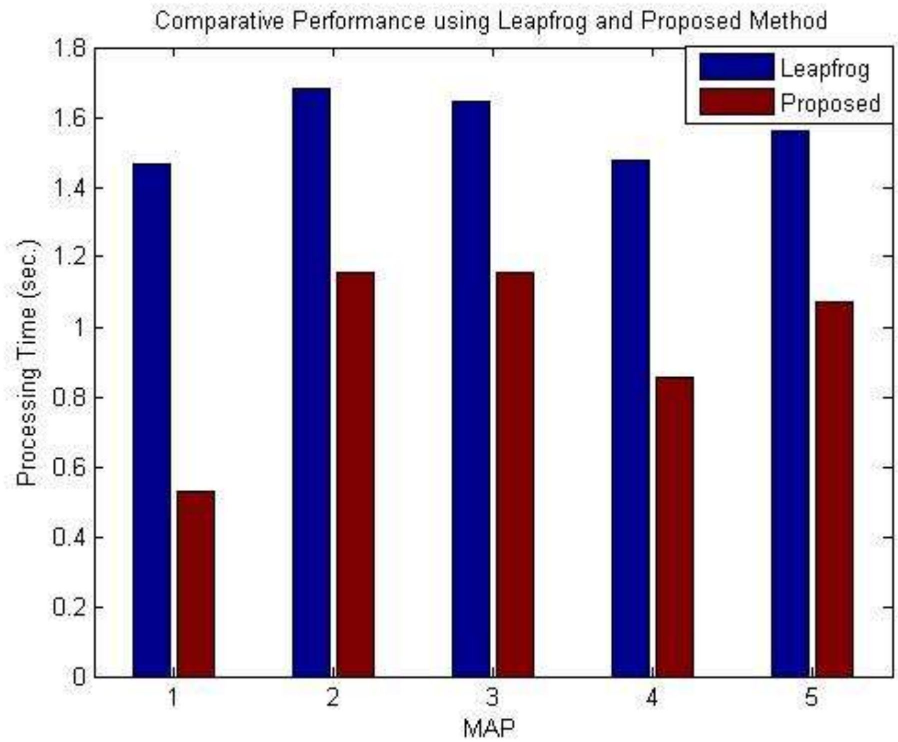

Figure 6: comparative performance show that the processing time for Leapfrog and Proposed method using map1, map2, map3, map4, map5 obstacles image. In the comparison, proposed method takes less time to process compare to Leapfrog method.

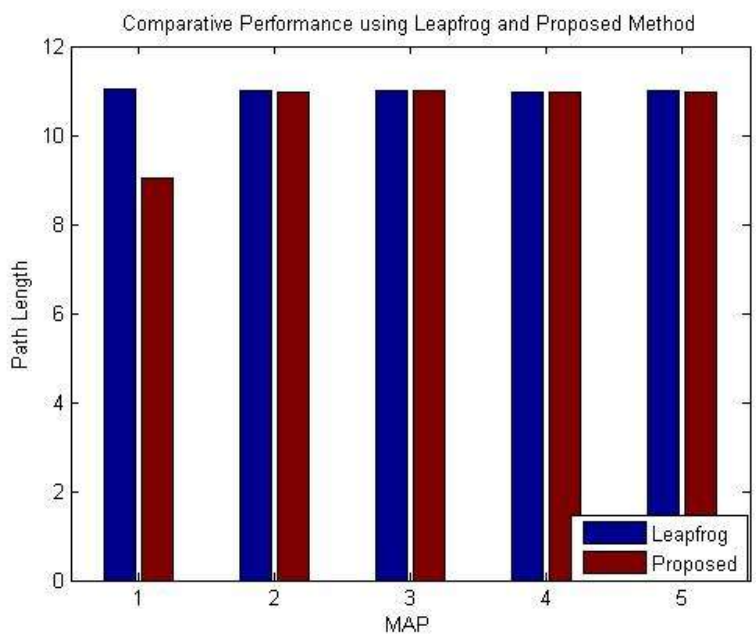

Figure 7: comparative performance show that the path length for Leapfrog and Proposed method using map1, map2, map3, map4, map5 obstacles image. In the comparison, proposed method gets less path distance compare to Leapfrog method.

CONCLUSION

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 paths with obstacle space. The selection of collision free path used multiple branch and leaf selection process. The selection of expenditure factor is an mainpart that has a vast effect on the optimal path. While a minimum branch is desired, some level of efficiency should be involved, particularly when dealing with multiple obstacle. A expenditure factorthat involves both a lowest time and a measure of less effort is desirable. The modified path selection algorithm validated in to simulation scenario one is image obstacle and fixed path, free space path selection with single obstacle. In all Two scenarios, the value of path length is optimal instead of leapfrog path selection algorithm. In some cases, the obstacle come in path and increase the value of path cost. In the process of plant theory optimization also reduces the path selection time instead of leapfrog algorithm.

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