An Autonomous Robot for Finding Optimal Path during Dynamic Environment Using Grid Based Approach

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ABSTRACT- The Proposed framework is to give a way choice calculation to versatile robots in extensive element/obscure situations. The proposed calculation permits a portable robot to explore through static hindrances, and finding the way keeping in mind the end goal to achieve the objective without crash. The point of the work is to diminish the danger of impacts and time of way following in situations when the robot over and again navigates between predefined target focuses (e.g. for transportation or review errands). The calculation is usable regardless of the fact that almost no is thought about the earth or on the off chance that it gets totally rebuilt amid the mission. We are pointed in demonstrating our test results with our proposed way choice calculation that will have the capacity to lessen impact hazard, travel time and travel separations in huge element situations.

Keywords -Dynamic Environment, Navigation, Obstacles, Optimal Path, Robot

I. INTRODUCTION

Artificial Intelligence (AI) is the knowledge showed by machines or programming. It is furthermore the name of the scholastic field of study which thinks how to make PCs and PC programming that are fit for cunning behavior.

The focal issues (or objectives) of AI exploration incorporate thinking, information, arranging, learning, characteristic dialect handling (correspondence), observation and the capacity to move and control objects. General insight is still among the field's long haul objectives. As of now mainstream approaches incorporate factual strategies, computational insight and conventional typical AI. There are a substantial number of instruments utilized as a part of AI, including adaptations of inquiry and scientific streamlining, rationale, strategies taking into account likelihood and financial matters, and numerous others. The AI field is interdisciplinary, in which various sciences and callings merge, including software engineering, arithmetic, brain science, etymology, theory and neuroscience, as they as other particular fields, for example, simulated brain science.

The proposed system is to provide a path selection algorithm for mobile robots in the large dynamic environments / unknown. The proposed algorithm allows a mobile robot to navigate through the static obstacles, and find the way to reach the target without collision. The goal of the work is to reduce the risk of collisions and the time following routes where the robot traverses repeatedly between the preset target points (eg for transportation or inspection tasks). The algorithm is usable even if very little is known about the environment or if it is completely restructured during the mission. They are intended to show our test results with our path selection algorithm project that will be able to reduce the risk of collision, the travel time and travel distances in large dynamic environments.

A robot is a machine designed to perform one or more tasks repeatedly, with speed and accuracy. There are so many different types of robots as there are tasks they perform. Robotics is the branch of computer science that deals with the design, construction, operation and application of robots, as they used as computer systems for control, sensory feedback, and information processing. These technologies dealing with automated machines that can take the place of man in hazardous environments or manufacturing processes , or resemble humans in appearance, behavior and cognition or . Many robots today are inspired by nature contributing to the field of bio-inspired robotics

II. EXISTING SYSTEM

Through framework clients is allocated to draw different courses between a source and the destination. At long last when our applications are begun, it forms every course and changes over it into robot justifiable directions and helps our application to controls the robot over a serial connection with any remote innovation for robot correspondence. The line devotee robot they have arranged which utilizes line directions through framework will maintain a strategic distance from the overhead of drawing a physical line on the floor in such vast environment which is supporter as the present idea in numerous line adherent robots.

Fig1:Line Follower Robot

III. PROPOSED SYSTEM

The approach they move forward is motivated by the fact that our robot is made repeated traversal between the preset target points (from source to destination through. Various Paths) in a dynamically changing environment. Examples of such implementations are fetch-and-carry task of industrial and agricultural applications or visiting certain checkpoints in applications for security and surveillance. Efficient operation of robot should fulfill its mission as quickly and as safely as possible. This means that it is worth to avoid situations where the robot is forced to re-plan your itinerary, make a detour, can lead into a dead end or collide with unexpected obstacles by modeling the environment or learning of its properties, delays can be minimized and the risk can be reduced and helps to choose a path that is easy to follow, which if free of obstacles. In a dynamic environment with an unknown obstacle to distribution, the best path to the goal is not necessarily the shortest. Depending on the nature of the environment, there may be roads that are longer but easier to follow. By introducing a path generation algorithm, the robot can test several predefined alternatives to achieve the goal. Remembering his experiences following way, he can learn to follow the paths that save time and reduce risk. As the environment changes, the robot will re-evaluate its past experience and to adapt to using new roads easily passable.

Dynamic Obstacle handling - sensors will be installed in the front of the robot. When an unknown obstacle appears in the following location on the line, it is detected by the sensor. All the distance covered by the robot will be displayed on the PC screen.

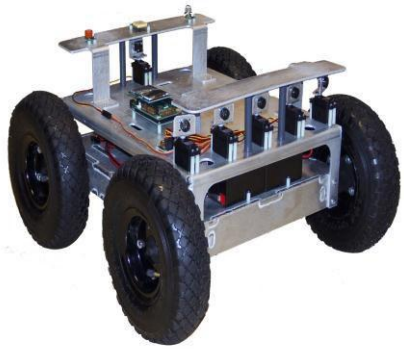

Fig 2: Autonomous Robot

IV. ALGORITHM

BFS (Breadth First Search) is a calculation that is utilized to cross the way from source to destination utilizing the most limited way. As the name itself says it first visits the broadness and after that goes to its comparing profundity, thusly it crosses to its destination utilizing the most limited way

HOW IT WORKS:

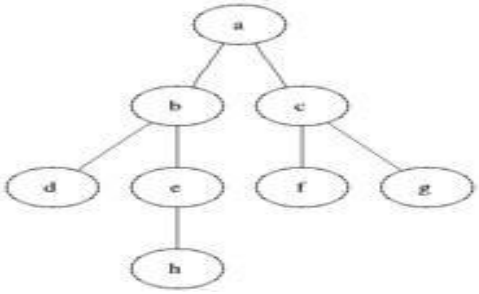

Fig 3. A tree structure.

PSEUDOCODE

Input: A graph Graph and a starting vertex rootof Graph
Output: All vertices reachable from root labeled as explored.
A non-recursive implementation of breadth-first search:
Breadth-First-Search(Graph, root)
For each node n in Graph;
n.distance = INFINITY
n.parent = NIL
create empty queue Q
root.distance = 0
Q.enqueue(root)
while Q is not empty;
current = Q.dequeue()
for each node n that is adjacent to current:
if n.distance == INFINITY;
n.distance = current.distance + 1
n.parent = current
Q .enqueue(n)

Moore Neighborhood counter algorithm

Moore Neighborhood of a pixel, P, is the arrangement of 8 pixels which impart a vertex or an edge to that pixel. The fundamental thought is: - When the present pixel p is dark, the Moore neighborhood of p is analyzed in clockwise heading beginning with the pixel from which p was entered and propelling pixel by pixel until another dark pixel in P is experienced. The calculation ends when the begin pixel is gone to for second time. The dark pixel strolled over will be the shape of the example.

.**ALGORITHM** Modified Moore's neighbor algorithm
Input: A square tessellation T containing a connected component P of black cells.
Output: A sequence B (b1, b2… Bk) of boundary pixels i.e. the contour line. We define M (p) to be the Moore neighborhood of pixel p, c denotes the current pixel under consideration i.e. c is in
M(p).
Begin
Set B to be empty.
From bottom to top and left to right scan the cells of T until a black pixel, s, of P is found.
Insert s in B.
Set the current boundary point, p, to s i.e. p = s.
Set c to be the next clockwise pixel in M(p).
While c is not in B do

If c is black
Insert c in B.
Set p =c.
End if
Advance c to the next clockwise pixel in M (p).
End while
End
In handling the portrayal, we separate what is thought to be the "principle bearing" of the item as for the robot and discrete it into one of 8 conceivable headings.

V.IMPLEMENTATION

The proposed system works on the basis of 5 modules they are namely Grid formulation modulation module, location and wall marking module, path finding module, command extraction module, command transmission module and last two modules works using Moore‘s neighbor contour tracing algorithm and as explained above it works based on grid based approach.

i. **Grid formulation module**: Create grid cells based on the given no. of rows and columns. This module uses graphic object to draw rectangles of cells in a control panel using an object colored pencil. The whole workspace is divided into grids. It creates grid cells based on the given no. of rows and columns. Here we are taking 5*5 grids as reference and constant cell size of 90 pixel, depending on the given workspace environment, the cell-size can be increased which proportionally increases workspace. The index always begins with zero(0).Since it is a 5*5 matrix, 0th index starts from bottom right and ends with index four(4) and (0,0) is always the default source index.
This module uses graphics object to draw cell rectangles over a panel control using a colored pen object.

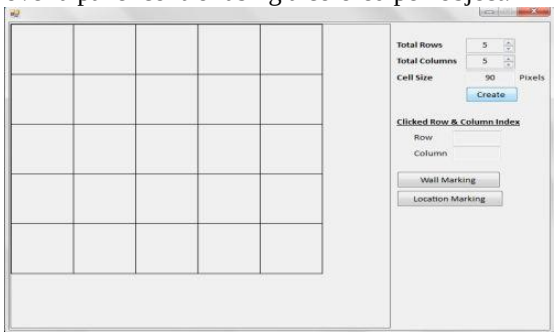

Fig 4:Grid formulation module

ii.**Location and Wall marking module:** This module uses graphic object to draw solid rectangles over a grid cell using an object selected brush color. This module uses different colored brushes for wall and marking place. This module uses graphics object to draw solid rectangles over a selected grid cell using a colored brush object. This module uses different colored brushes for wall and location marking. As shown in the below screenshot, we have marked the static obstacle using grey color. These grid are indicated in the pattern like (2, 4) (2, 2) (2, 1) (2, 0). The destination is marked using dark blue color. Index representing destination are (0, 2) and (0, 1). Multiple destinations can also be marked.

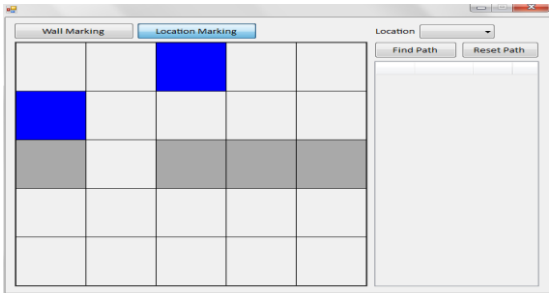

Fig 5: Location and Wall marking module

iii.**Path Finding Module**: This module helps you find the shortest path between the current position of the robot and a destination location algorithm using breadth-first search (BFS). This module is also responsible for recalculating alternate routes between the source and destination obstacle detection for dynamic.

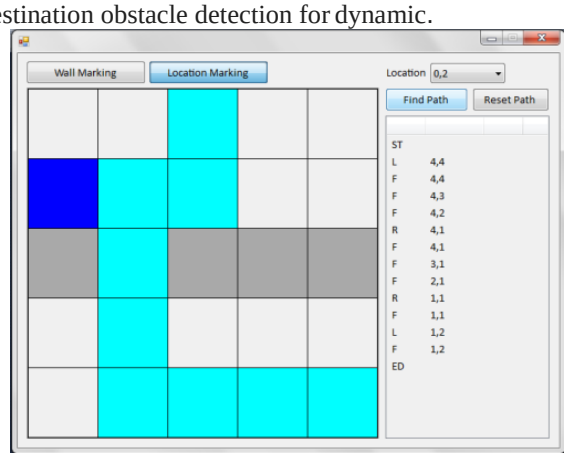

Fig 6: Path finding module

As shown in the screen shot above here the destination is selected as the (0, 2) and if we click the find path button the best feasible path from the source (0, 0) and destination (4, 2) is calculated and it is displayed by the light blue color. Clicking on the find path button will also list the instruction that has to be followed by robot. For example in this case, the robot will be in the upright position, the 1st command is _L‘ then it turn to the left move to the breadth of that particular grid using **BFS** algorithm. The next instruction is _F‘ and robot traverse to the forward direction and continues with commands generated **MVC** algorithm

iv.Command Extraction module(Using Moore Neighbor contour tracing algorithm) :This helps in converting the shortest route module is between the source and the destination location in understandable by our robot commands for navigation. Here commands like "L" will be computed for the manufacture of robot to move left, "R" to move right, "F" to advance and "B" to go back.

v.**Command Transmission / Receive module:** This module is used for transmitting commands to a robot via wireless RF / ZigBee transceiver connected to the COM port on our system. This module will also be responsible for dynamic obstacles receive alerts sent by the remote robot during its movement to the selected destination.

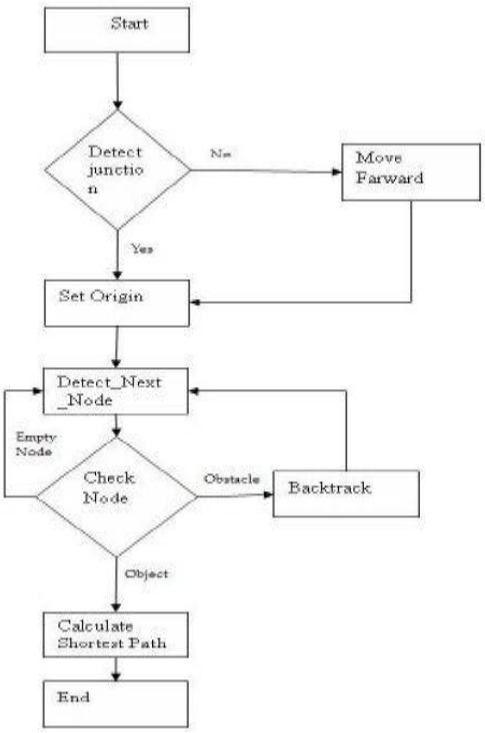

Fig 7: Implementation flow chart.

After setting the destination point the robot will be in the source node it first checks for the empty grids to move, if there is any obstacle in in the neighbor node it checks other child nodes using breadth first search algorithm based on that it will calculate optimal/shortest path.

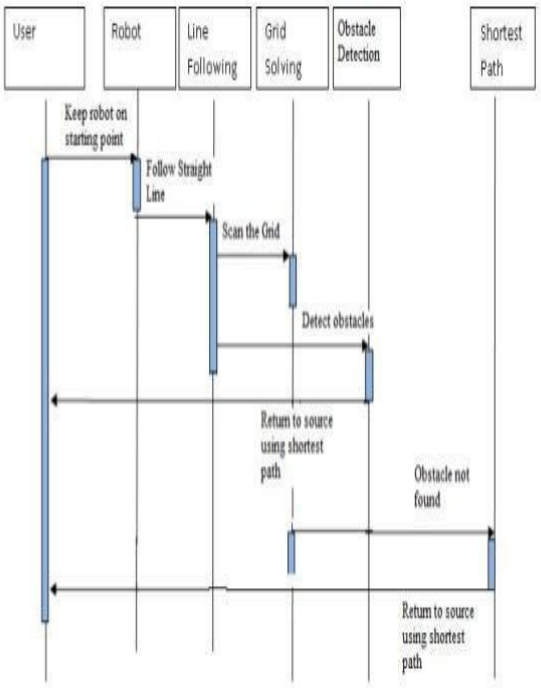

Fig 8: sequence diagram

After destination is set the robot will be in source position it will follow the straight line for empty grids using breadth first search algorithm and if there is any dynamic obstacles it will backtrack to source position using optimal path if there is no obstacles it will reach destination using shortest path

VI. APPLICATION

Case of this sort of usage is to bring and-convey assignment of mechanical and farming applications or going by specific checkpoints in security and reconnaissance applications. A proficiently working robot is required to satisfy its task as quick and as securely as could reasonably be expected. It implies that it is advantageous to maintain a strategic distance from circumstances where the robot is compelled to re-arrange its course, take a makeshift route, can crash into a halt or slam into surprising deterrents And How they were known by demonstrating nature or taking in its properties, the time postponements can be minimized and the danger can be decreased and helps picking a way that is anything but difficult to take after which if free from impediments. In a dynamic situation with an obscure hindrance circulation, the best way to the objective is not as a matter of course the briefest one. Contingent upon the way of nature, there may exist courses that are longer yet less demanding to take after.

1.Transportation: they utilize Mobile Robots in healing centers for transportation reason to convey examples, pharmaceuticals and dinners and so on.

2.Inspection tasks: Autonomous mechanical technology would spare and safeguard human life by evacuating serving officers who may somehow be executed, while in administration, from the war zone.

3. Industry and Agriculture: The principle region of use of robots in farming is at the reaping stage. Organic product picking robots, driverless tractor/sprayer, and sheep shearing robots are intended to supplant human work. By and large, a great deal of elements must be considered (e.g., the size and shade of the organic product to be picked) before the initiation of an undertaking. Robots can be utilized for other green undertakings, for example, pruning, they ding, splashing and checking. Robots can likewise be utilized as a part of domesticated animal‘s applications (animals mechanical technology, for example, programmed draining, washing and maiming. Robots like these have numerous advantages for the farming business, including a higher nature of crisp produce, generation costs, and a littler requirement for physical work

VII. CONCLUSION

We here by conclude that our project can be useful in application such as transportation, inspection tasks industry and agricultural security and surveillance where in human intervention can be dangerous and can be avoided like mining, poisonous gas environment etc.future enhancement include additional of sensors like infra red,radar and in order to match the obstacles digital camera with high pixels can be used

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