ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

IJARCCE

International Journal of Advanced Research in Computer and Communication Engineering

ICRITCSA

M S Ramaiah Institute of Technology, Bangalore

Vol. 5, Special Issue 2, October 2016

The Grid Based Approach to Find an Optimal Path for an Independent Robot

Jashwanth N B[1], Sachin Acharya T[2]

Assistant Professor, Dept. of Computer Science & Engineering, ATME College of Engineering, Mysore, India[1, 2]

Abstract: The proposed system gives a method to explore static hindrances. It avoids the danger of impacts and allows the robot to reach the destination without any crash. The estimated test results with our proposed idea make a way for choice calculation that will have the capacity to lessen impact hazard, travel time and travel separations in huge element situations.

Keywords: Grid based approach, Artificial Intelligence, Optimal path for robots, Line Follower.

I. INTRODUCTION

Artificial intelligence (AI) focuses on building a machine which can be a flexible rational agent which can perform activities done using human intelligence. It focuses on observation and the capacity to move and control objects. The AI field is interdisciplinary, in which various sciences merge which includes software engineering, arithmetic, brain science, etymology, theory and neuroscience. These consist of particular capabilities that researchers expect an intelligent system to display. They should either deduce, reason or solve a problem.[1]

Robotics is the branch of computer science which deals with the design, construction, operation and application of robots. The robots 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 and also resemble a man in looks and behavior.

The proposed system deals with the path selection algorithm for mobile robots in the large dynamic environments. The proposed algorithm allows a mobile robot to navigate through the static obstacles and reaches the target without collision. The main idea of this work is to reduce the risk of collisions and the time following routes where the robot traverses repeatedly between the start and target points. The algorithm is reduces the risk of collision, travel time and travel distances in large dynamic environments.

II. EXISTING SYSTEM

A. Line follower

The line follower is a self-operating robot that detects and follows a line that is drawn on the floor. The path which is drawn consists of a black line on a white surface or a white line written on a black surface. The developed robot must sense the line and allow the robot to stay on course and should constantly correct the wrong moves using feedback mechanism a forming a simple and effective closed loop system [2].

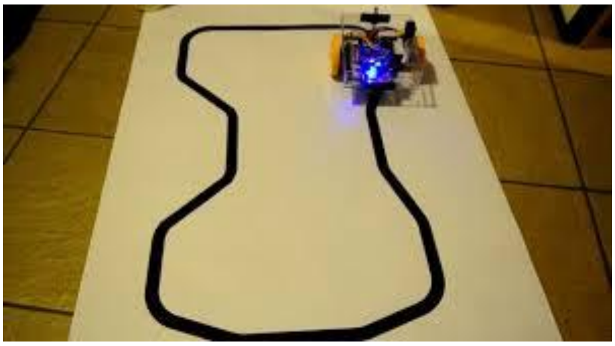

Fig 1: Line Follower robot

B. Robot map creation using sensor data

This system uses an algorithm by which a robot can construct a map when it flies and localize itself to the self-constructed map. In the given system, the robot begins by taking sonar readings to generate a polar distance map of the robot's immediate neighborhood. These initial soundings are taken to be the robot's initial map [3]. Then the robot starts to move in some direction, stops at a particular location, and takes another sounding. The assumption is taken that there is no major changes in robot’s environment, which contributes the best fit sounding map. The best fit returns a most likely location of the robot relative to the origin. The soundings are then shifted with respect to the robot's current location and used to modify the map. Several iterations of this cycle are performed until the robot has finished exploring.

The disadvantages of Existing system are that the instructions are predefined and are line driven. The environment must also be predefined. It works on pre-processed orders and does not suit for element

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

IJARCCE

International Journal of Advanced Research in Computer and Communication Engineering

ICRITCSA

M S Ramaiah Institute of Technology, Bangalore

Vol. 5, Special Issue 2, October 2016

environment. It mainly requires picture preparing which is comparatively costly.

III. PROPOSED SYSTEM

We have endeavoured the idea to design and develop an autonomous optimal path selection for a robot.

Our proposed system is to provide a path selection algorithm for mobile robots in large dynamic/unknown environments. The proposed algorithm allows a mobile robot to navigate through static obstacles and finding the path in order to reach the target without collision.

The aim of this work is to reduce the risk of collisions and time for the path computation in cases where the robot repeatedly traverses between predefined target points (e.g. for transportation or inspection tasks). The idea is usable even if there is a very less knowledge about the environment or if the environment gets completely restructured during the mission. We are aimed in showing our vision with our proposed path selection algorithm that will be able to reduce collision risk, travel time and travel distances in large dynamic environments [4].

The approach we are heading forward is motivated by the fact that our robot is made to repeatedly travel between the predefined target points (from source to destination via. different paths) in a dynamically changing environment. Examples of this kind of implementations are fetch-and-carry task of industrial and agricultural applications or visiting certain checkpoints in security and surveillance applications. An efficiently operating robot is expected to fulfil its assignment in a quick and safe way.

It means that it is worthwhile to avoid situations where the robot is forced to re-plan its route, take a detour, can drive into a deadlock or collide with unexpected obstacles. Real world environments are dynamic by nature. Therefore, all the possible situations that can delay the robot or imply a hazard that cannot be foreseen. However, by modelling the environment or learning its properties, the time delays can be minimized and the risk can be reduced which helps in choosing a path that is easy to follow which if free from obstacles.[5][6]

In a dynamic environment with an unknown obstacle distribution, the best path to the target is not a compulsion to be the shortest one. Depending on the nature of the environment, there may be routes that are longer but easier to follow. By introducing a path generation algorithm, the robot can test several predefined alternatives to reach the target. By remembering its path following experiences, the robot can learn to follow paths that can save time and reduce risk. As the environment changes, the robot will re-evaluate its past experience and adapt itself to use new and easily traversable paths.

Our autonomous robot for path finding and obstacle evasion is a vehicle, which follows the path in two different ways, which are:

A. Line Follower

Through system users, multiple routes are allowed to be drawn between the source and the destination. Finally when our applications are started, it processes each route and converts it into robot understandable instructions and helps our application to controls the robot over a serial link with any wireless technology for robot communication. The line follower robot we have planned uses line instructions through system that will avoid the overhead of drawing a physical line on the floor in such large environment which is followed as the current concept in many line follower robots.

B. Obstacle Handling

The sensors will be mounted at the front end of the robot. When an obstacle at the unknown location appears on the following line, it will detect through a sensor. All the distance covered by the robot will be displayed on the PC screen.

‘Breadth First Search’ algorithm and ‘Moore Neighbourhood counter’ algorithm can be possibly used for implementation of the proposed idea.

The ‘Breadth First Search’ algorithm initially visits the broadness of the grid and then explores the depth of the grid to search for any obstacles i.e static or dynamic. The shortest path found out becomes the optimal path for robot navigation. In this way the proposed idea finds out the most eligible path.

The ‘Moore Neighbourhood counter’ algorithm is used the convert the commands (viz forward, backward, left and right commands) into machine understandable signals.[7]

IV.APPLICATIONS

The proposed system can be applied to environments like mining, space, poisonous environment, unexploded bomb deployment, research, etc where human intervention is definitely riskier and environment is not feasible.

1. Transportation: Mobile Robots can be used in healing centers for transportation of pharmaceuticals, food and so on.
2. Inspection tasks: Autonomous mechanical technology would spare and safeguard human life by evacuating the serving officers who may somehow be executed during the administration of the war zone.
3. Industry and Agriculture: The autonomous robots can be used in farming at the reaping stage. Organic product picking robots, driverless tractor/sprayer and sheep shearing robots are intended to compensate the human

work. Robots can be used for other horticultural tasks such as pruning, weeding, spraying and monitoring. Robots can also be used in livestock applications (livestock robotics) such as automatic milking, washing and castrating. Robots like these have many benefits for the agricultural industry, including a higher quality of fresh produce, lower production costs, and a smaller need for manual labour.

CONCLUSION

The proposed estimation allows a compact robot to investigate the static obstacles and finding the route remembering the final objective to reach the target without any accidents. The purpose of this work is to decrease the risk of adverse effects and time taken for computing the path in the situations where the robot is powered on and explores a path between the predefined target centres. We are focussed in showing our proposed idea that will have the ability to decrease travel time and travel detachments in robot navigation.

The further enhancement with our idea can include adopting a GPS along with the robot and the usage of high definition cameras. But all these enhancements proportionately increase the budget for the implementation of the idea.

ACKNOWLEDGMENT

We acknowledge our sincere thanks to the management of ATME college of Engineering, Mysore for their immense support. We are also grateful to **Dr. Basavaraj L,** Principal, ATMECE and **Prof. M S Veerendra Kumar,** Head of the Dept., CSE, ATMECE for their continuous encouragement and guidance.

REFERENCES

[1] Hutter, Marcus (2005). Universal Artificial Intelligence. Berlin: Springer. ISBN 978-3-540-22139-5.
[2] Optimal Path Selection for Mobile Robot Navigation using genetic algorithm Tamilselvi, Mercyshalinie, Hariharasudan IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 4, No 1, July 2011
[3] Path Selection for Mobile Robots in Dynamic Environments, Kristo Heero, Maarja Kruusmaa, Jan Willemson
[4] Grid-Based Navigation for Autonomous, Mobile Robots Carsten BUSCHMANN, Florian MÜLLER and Stefan FISCHER, Institute of Operating Systems and Networks, Technical University of Braunschweig Braunschweig, Germany.
[5] The proposed path finding strategy in static unknown environments, O. Hachour, International journal of systems applications, engineering & development Issue 4, Volume 3, 2009
[6] A Grid Based Robot Navigation by Using Priority Algorithm, Lalit Gehlod, Vaibhav Jain, Mala Dutta, Devesh Kumar Lal, International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 8, August 2013
[7] Programming and construction of ahmedullahbot-a fast grid-solving robot Ahmedullah Aziz, Md. Shafayat Hossain and Mohammad Wahidur Rahman, International Journal of Information Technology, Control and Automation (IJITCA) Vol.3, No.1, January 2013