# Finding Shortest Distance Path and Object Detection and Avoidance Using Image Processing and Artificial Intelligence.

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## ABSTRACT

*In this work we will be implementing Shortest distance path finding algorithm and object detection avoidance using Image Processing and artificial intelligence. The work will be focused on generating shortest path using A star algorithm and object avoidance using Image Processing. Work will also represent inserting static map with the help of images. Insertion of object will be tested with different shapes and sizes to be represented on the graph.*

**Keyword :** - *Image Processing, Open CV2,Artificial Intelligence, and A-Star .*

## INTRODUCTION

One of the important aspects of Artificial Intelligence is Computer Vision. Computer Vision is the science of computers that can recognize and understand images. Computer Vision also contains different aspects such as image recognition, object detection, image generation, image super-resolution and more. Object detection is the most important aspect of computer vision. The work presented focuses on finding shortest path and object detection using image processing and artificial intelligence. Image processing is processing of images in order to improve its quality. The project is divided into two parts: (I) shortest path finding using Static Map (II) Object Detection using machine learning and artificial intelligence analysis and manipulation of a digitized image, especially in order to improve its quality. For shortest path we used the A star algorithm which uses heuristic method . Object detection shows the capability of computer to locate objects in an image and identify each object. Object detection is used for face detection, vehicle detection, pedestrian counting, web images, security systems and driver less cars.

## 1. RELATED WORK:-

### 1.1 "Shortest Path Searching for Road Network using A* Algorithm ":-

In city area the shortest path finding is very difficult in a road network having traffic. Shortest path searching is very important in some special case such as medical emergency, spying, theft catching, fire brigade etc. There are various path searching algorithm like A* algorithm, Dijkstra etc. It uses heuristic to find the path. At present only one directional search algorithm are used, we will use the Bi-directional search method for path searching instead of Dijkstra algorithm due to demand of time and situations because of its robustness and variants. This method reduces the searching time of the system and gets the fastest and best path.

### 1.2 "Path planning and obstacle avoidance based on shortest distance algorithm" :-

A modified algorithm called shortest path is presented for trajectory planning and obstacle avoidance .This method guarantees both smoothness and obstacle avoidance in the trajectories of the robots .The digital differential algorithm is used in this method to implement a linear and circular movement of robots and the Dijkstra's algorithm to search for the shortest path. Three simulation scenarios are used to implement this algorithm: The first one, includes the building of a tree of paths between robot and goal,the second one is for choosing the shortest distance from the source to target, and the third scenario is for comparison the length of the path and the time of arrival for different target locations.

### 1.3 "Object Detection and Obstacle Avoidance for Mobile Robot using Stereo Camera" :-

The objective of this research is to develop a real time obstacle detection and obstacle avoidance for autonomous navigation of mobile robots using a stereo camera in an unstructured environment. Autonomous navigation of mobile robots demands a) Exact determination of position and orientation of Robot and b) Accurate determination of size, shape, depth and range of potential obstacles in the environment. Simple kinematic model is used for mobile robot and stereo camera with pan and tilt provision is considered for long range operation. Complete 3D reconstruction of object/obstacle is obtained from the stereo matching algorithm and with triangulation method. The pose (position and orientation) of mobile robot is formulated from the static object observation with stereo reference matching points using RANSAC (RANdom SAmple Consensus) in successive frames. Potential field based obstacle avoidance formulation is carried out by using the obstacle range, size information, mobile robot position and orientation. Finally, proportional derivative
navigation control loop along with obstacle avoidance algorithm is formulated and verified.

### 1.4 "Intelligent Maze Solving Robot Based on Image Processing and Graph Theory Algorithms" :-

The most important task for maze solving robots is the fast and reliable finding of its shortest path from its initial point to its final destination point. This paper proposes an intelligent maze solving robot that can determine its shortest path on a line maze based on image processing and artificial intelligence algorithms. The image of the line maze is captured by a camera and sent to the computer to be analyzed and processed by a program developed using Visual C++ and OpenCV libraries and based on graph theory algorithms. The developed program solves the captured maze by examining all possible paths exist in the maze that could convey the robot to the required destination point. After that, the best shortest path is determined and then the instructions that guide the car-like robot to reach its desired destination point are sent to the robot through Bluetooth. The robot follows the received

guide path to reach its destination. The proposed approach works faster than the traditional methods which push the robot to move through the maze cell by cell in order to find its destination point. Moreover, the proposed method allows the maze solving robot to avoid trapping and falling in infinity loops. Applications of maze solving systems include intelligent traffic control that helps ambulances, fire fighters, or rescuing robots to find their shortest path to their destination.

**1.5 "Path Planning with Real Time Obstacle Avoidance":-**

One of the most important areas of research on mobile robots is that of their moving from one point in a space to the other and that too keeping aloof from the different objects in their path i.e. real time obstacle detection. This is the basic problem of path planning through a continuous domain. For this a large number of algorithms have been proposed of which only a few are really good as far as local and global path planning are concerned as to some extent a trade of has to be made between the efficiency of the algorithm and its accuracy. In this project an integrated approach for both local as well as global path planning of a robot has been proposed. The primary algorithm that has been used for path planning is the artificial Potential field approach and a* search algorithm has been used for finding the most optimum path for the robot. Obstacle detection for collision avoidance (a high level planning problem) can be effectively done by doing complex robot operations in real time and distributing the whole problem between different control levels. This project proposes the artificial potential field algorithm not only for static but also for moving obstacles using real time potential field values by creating sub-goals which eventually lead to the main goal of the most optimal complete path found by the A* search algorithm. Apart from these scan line and convex hull techniques have been used to improve the robustness of the algorithm. To some extent the shape and size of a robot has also been taken into consideration. The effectiveness of these algorithms has been verified with a series of simulations.

**1.6 "Path planning and Obstacle avoidance approaches for Mobile robot":-**

A new path planning method for Mobile Robots (MR) has been developed and implemented. On the one hand, based on the shortest path from the start point to the goal point, this path planner can choose the best moving directions of the MR, which helps to reach the target point as soon as possible. On the other hand, with an intelligent obstacle avoidance, our method can find the target point with the near-shortest path length while avoiding some infinite loop traps of several obstacles in unknown environments. The combination of two approaches helps the MR to reach the target point with a very reliable algorithm. Moreover, by continuous updates of the onboard sensors' information, this approach can generate the MR's trajectory both in static and dynamic environments. A large number of simulations in some similar studies' environments demonstrate the power of the proposed path planning algorithm.

**1.7 "An Image Based Path Planning And Motion Planning for Autonomous Robot":-**

The aim of this paper is to plan a path for autonomous robot, based on image processing techniques in the unknown environment. The proposed system finds and analyses an optimal path for a robots, while avoiding obstacles along the way. The environment is first captured as an image using a camera. Obstacles detecting methods are then performed to identify the existence of obstacles within the unknown environment. Shortest path is obtained by A-Star algorithm.

**1.8 "Vehicle Detection from Satellite Images in Digital Image Processing":-**

Nowadays, a new agenda of extracting small scale objects as vehicles from high resolution satellite images have been evaluated. Less research is performed using high resolution satellite imagery as it is a challenging task. Though various studies have been performed,still there is a need to develop a fast, robust, and suitable approach. The approach described in this paper gives out the accuracy rate of vehicles captured from satellite images It simply

workout the full numbers of vehicles within the desired space in the satellite image and vehicles are shown underneath the bounding box as a small spots.

**1.9 "TWO-STAGE ALGORITHM FOR PATH PLANNING PROBLEM WITH OBSTACLE AVOIDANCE":-**

The path-planning problem is considered for mobile robot inside environment with motionless circular obstacles in different sizes. The robot is expected to reach a given target by following the shortest path and avoiding the obstacles. The two-stage algorithm is proposed to solve the problem numerically. In the first stage a line-arc based path is found by using geometric techniques. This path cannot be minimal. However, its length can be used to restrict search space to an ellipse, which contains the minimal path. Thus, the reduced search space makes the next stage more efficient and endurable for real-time applications. In the second stage of the algorithm, by discretization of the restricted elliptic region the problem results in finding the shortest path in a graph and is solved by using the Dijkstra' s algorithm. The proposed two-stage algorithm is verified with numerical simulations. The results show that the proposed algorithm is successful for obtaining an optimal solution. The applicability of the proposed algorithm is validated by practical experiment.

**1.10 "A PATH PLANNING AND OBSTACLE AVOIDANCE ALGORITHM FOR AN AUTONOMOUS ROBOTIC VEHICLE" :-**

Autonomous robotics is one of the most key topics of this generation of research. It has a wide range of applications, such as construction, manufacturing, waste management, space exploration, and military transportation. One of the main areas of research, in order to achieve successful autonomous robots, is path planning. Path planning in robotics is defined as navigation that shall be collision free and most optimum for the autonomous vehicle to maneuver from a source to its destination. This thesis concentrates on building a path planning algorithm for an all terrain vehicle (ATV) used for travelling in an open field or forest. The novelty of this algorithm is that it does not simply create a path between a source to its destination, but it makes sure that the vehicle covers the entire field area when navigating from the source to its destination.

## 2. Existing Model:

There are two types of existing models are available in market:-

**2.1 Object Detection:-**

1) The motive of object detection is to find all known object which are on the path

2) The information from the object detector used to obstacle avoidance and interaction with environment.

**2.2 Shortest path finding:**

1) The motive of shortest path finding is to find feasible path from number of paths.

2) Shortest path problem defined for directed, undirected and mixed graphs.

In market this two models are available and we are implementing these model simultaneously at a same time. System, leverages path finding with the help of shortest path finding technique. The motive is to predict feasible path with obstacle avoidance.

## 3. Proposed System:-

The main concept to determine shortest distance path and obstacle avoidance is provide user to reach at the destination with less time and with feasible path. It can predict as well as examine the shortest path from the number of paths. System can provide user-friendly interface for shortest path and obstacle .The user knows the source and destination address where he/she want to go, so by using this information our system will provide feasible solution. A mechanism of our system that can reduces manpower and it can improve performance of system. The source and destination address is provide as a input to the system and with the help of that input whole process is carried out. An long distance and complex path we are providing to the system for increasing the performance of the system.

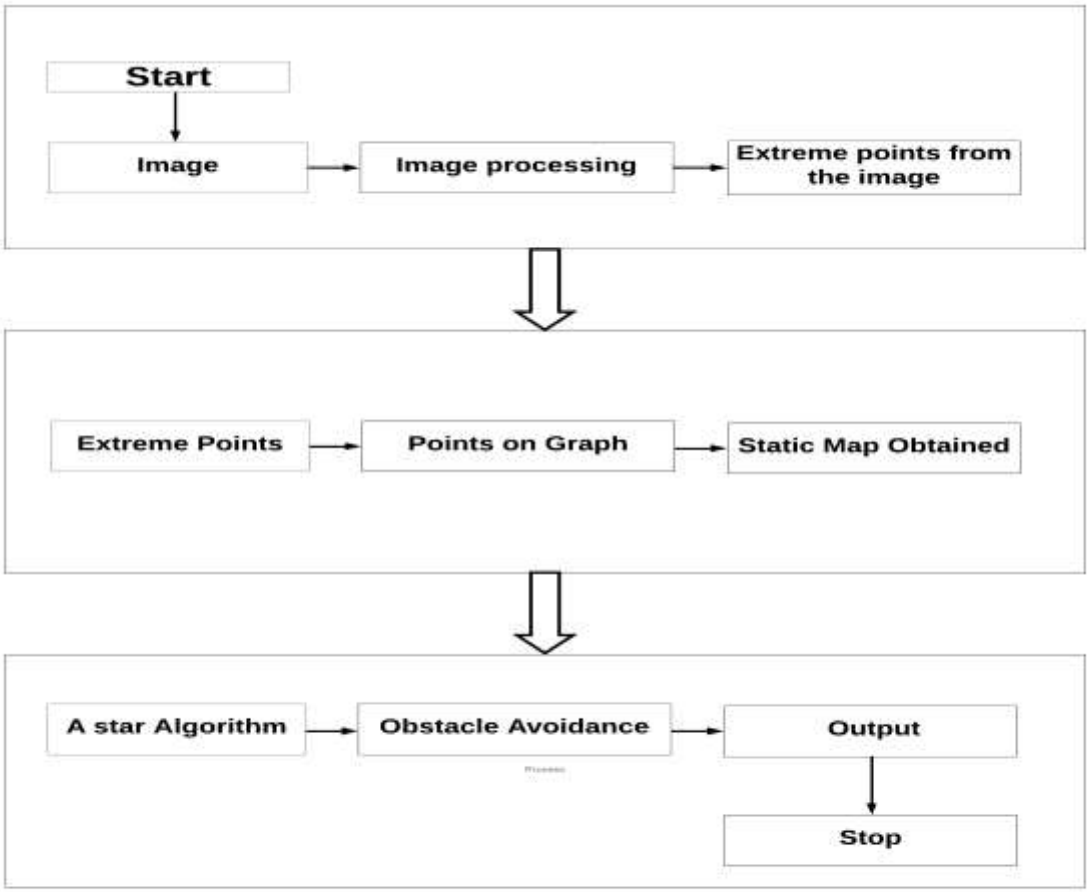


Fig :- System Overview

**4. Advantages:-**

1) The system can work with two major task simultaneously.

2) mostly used in telephone network.

3) Simple to implement and easy to understand.

**5. Applications:-**

1) In hazardous area where human could not survive.

2) Autonomous car driving

3) Large warehouses eg:- Amazon warehouses.

## 6. CONCLUSIONS

Thus after a thorough survey in this field, we are going to implement two major modules that are object detection and avoidance and finding shortest yet feasible path into a single module with the help of OpenCV library of python and using the A star(*) algorithm in the field of Artificial Intelligence and Image Processing.

## 7. REFERENCES

[1].Durgesh Kumar Gupta Student (M.TECH.) CSE Department Amity University NOIDA(UP),Anant Kumar Jaiswal Student (M.TECH.) CSE Department Amity University NOIDA(UP) , "Path Planning with Real Time Obstacle Avoidance", International Journal of Computer Applications (0975 – 8887) Volume 70– No.5, May 2013.

[2]. Hoc Thai Nguyen 1 , Hai Xuan Le 2 Department of Networked Systems and Services, Budapest University of Technology and Economics, Budapest, Hungary ,2 Hanoi University of Science and Technology, Hanoi, VietNam "Path planning and Obstacle avoidance approaches for Mobile robot", IJCSI International Journal of Computer Science Issues, Volume 13, Issue 4, July 2016.

[3]. Heramb Nandkishor Joshi et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (4) , 2014, 4844-4847Heramb Nandkishor Joshi et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (4) , 2014, 4844-4847
.

[4]. Noorpreet Kaur Gill M.Tech Scholar CET, MUST, Lakshmangarh, India, Anand Sharma Assistant Professor, CSE Department CET, MUST, Lakshmangarh, India , "Vehicle Detection from Satellite Images in Digital Image Processing" , International Journal of Computational Intelligence Research ISSN 0973-1873 Volume 13, Number 5 (2017), pp. 697-705.

[5]. Mohammad O.A. Aqel Al-Azhar University – Gaza Ahmed Issa Al-Azhar University – Gaza ,"Intelligent Maze Solving Robot Based on Image Processing and Graph Theory Algorithms" , 2017 International Conference on Promising Electronic Technologies.

[6]. R. Lagisetty, N. K. Philip, R. Padhi and M. S. Bhat ,"Object Detection and Obstacle Avoidance for Mobile Robot using Stereo Camera" , 2013 IEEE International Conference on Control Applications (CCA) Part of 2013 IEEE Multi-Conference on Systems and Control
Hyderabad, India, August 28-30, 2013.

[7]. Abdulmuttalib.T. Rashid(1), Abduladhem A. Ali(2) (1) Electrical Engineering Department (2) Computer Engineering Department University of Basrah Basrah, Iraq , "Path planning and obstacle avoidance based on shortest distance algorithm ".

[8]. Mustafa Dogan and Nizami Gasilov Baskent University, Faculty of Engineering, Eskisehir Yolu 20. km, Baglica, 06810 Ankara, Turkey "TWO-STAGE ALGORITHM FOR PATH PLANNING PROBLEM WITH OBSTACLE AVOIDANCE" .

[9]. Sharayu Yogesh Ghangrekar The University of North Carolina at Charlotte ,degree of Master of Science in Electrical Engineering Charlotte 2009 , "A PATH PLANNING AND OBSTACLE AVOIDANCE ALGORITHM FOR AN AUTONOMOUS ROBOTIC VEHICLE".

[10]. Shrawan Kr. Sharma 1 , B.L.Pal 2 M.Tech Scholar, Computer Science & Engineering, Mewar University, Gangrar, Chittorgargh-312901, India ,"Shortest Path Searching for Road
Network using A* Algorithm", Shrawan Kr. Sharma et al, International Journal of Computer Science and Mobile Computing, Vol.4 Issue.7, July- 2015, pg. 513-522 .