

# A review: On Intelligent Mobile Robot Path Planning Techniques

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**Abstract**—Path planning is one of the vital and defining features of autonomous robots. Robot navigation is a process designed to avoid any hitch or obstacles to aim at a particular position. This paper presents a brief review of the intelligent robot navigation methods. A brief discussion on the approaches is made to understand the path planning techniques to identify their research gap. The artificial intelligence methods such as genetic algorithm (GA), fuzzy logic (FL), ant colony optimization (ACO), neural network (NN), firefly algorithm (FA), particle swarm optimization (PSO), bacterial foraging optimization (BFO), artificial bee colony (ABC), and other miscellaneous algorithms are reviewed. This paper further concludes with a discussion of the analysis of the reviewed articles and the challenges faced.

**Keywords**— Path Planning, A-Star, Artificial Intelligent, Mobile Robots, Neural network.

## I. INTRODUCTION

At first, the manufacturing sectors were the major areas utilizing the application of autonomous mobile robots. However, recently, it is frequently used in other sectors: Medical, Military, mining, agriculture, etc. For the mobile robot to model its environment, localize its position, detect and avoid using a specific path planning technique, it is required to be provided with intelligent information. Choosing the proper path planning method is necessary for the robot to navigate a clustered environment from a given initial position to the target without colliding with obstacles. Robot navigation can be classified into global and local navigation. In global navigation, the positions of the elements are defined based on a reference axis while moving towards the target. In the latter, the dynamic constraints of the environment have identified the relations among elements positions established. The basic steps in mobile robot navigation are described in figure 1 [1].

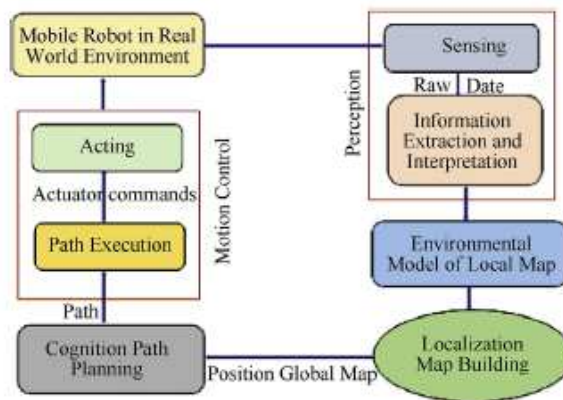


Figure 1: Robot navigation chart [1]

This paper provides a survey on the intelligent mobile robot navigation techniques with an in-depth of the algorithms and reported studies aiming to find the research gaps. Section 2 provides the literature survey and discussion, and then the conclusion in section 4.

## II. MOBILE ROBOT NAVIGATION TECHNIQUES

The nature-inspired approaches are metaheuristic algorithms that imitate the principle of nature which natural science provides [2]. Numerous researchers have attempted to solve robot path planning problems (path search and obstacle avoidance) using approaches that mimic the natural behaviors of animals (birds, ants, bees, fly cats) [3]. These stochastic techniques used in solving research problems are called nature-inspired methods [4].

These methods adopt the behavior used by nature in solving complex problems to achieve a robust solution within a short period. Some of the popular nature-inspired approaches include: [5]

- Artificial Neural Network (ANN)
- Fuzzy Logic (FL)
- Genetic Algorithm (GA)
- Particle Swarm Optimization (PSO)
- Ant Colony Optimization (ACO)

The nature-inspired approaches are said to perform better when compared to the conventional methods [6]. Some of these methods are briefly discussed in the sub-sections below.