SmartPATH:
A hybrid ACO-GA algorithm for robot path planning

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Introduction

- There are many Mobile robots' applications challenges. One of those challenges is path planning that classified as a major problem.
- Path planning aims to path without obstacles for the robot from start to target location.
- SmartPATH, is a new hybrid ACO-GA algorithm for robot global path planning using powerful mechanisms in the ACO to improve the searching space, search time and solution quality.

Objectives

- Find the shortest path.
- Creating a new hybrid ACO-GA algorithm.
- Solving the problem of global path planning in a static environment.
- Improve the searching space, search time and solution quality.
- Compare the performance of smartPATH with other algorithms.

Methodology

❖ **Environment Model:**

1- Locate the mobile robot

2-Guide the robot to goal destinations

❖ **SmartPATH Algorithm**:

1- IACO: improve Ant colony optimization

- 1.1 : Path finding: the ants find the shortest path using two functions :
  - The Heuristic distance information probability
  - Modified transition rule probability:
- 1.2 : Path optimization: elimination of bad solution and minimize the search space.
- 1.3 : Pheromone update : the amount of pheromone is updated from each ant after each iteration.

2 - GA : genetic algorithm

optimize the current solution found by IACO

- 2.1: improve it using modified crossover operator , selecting randomly two paths that have a common nodes.
- 2.2: after that creating three sup-parts, then compare all the parts and select the new solution path .

Result

Complexity of environment

Path length

Execution time

Conclusion

Finding the optimal path is a common problem solved by many algorithms, but the time and quality of solution is different. Hence (smartPATH) is developed. The smartPATH showed great results comparing with other algorithms .

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