

A flower pollination algorithm for efficient robot path planning

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Over the past decade or so, researchers worldwide have developed increasingly advanced techniques to enable robot navigation in a variety of environments, including on land, in the air, underwater or on particularly rough terrains. To be effective, these techniques should allow robots to move around in their surroundings both safely and efficiently, saving as much energy as possible.

Researchers at the Indian Institute of Technology Kharagpur in India have recently developed a new approach to achieve efficient path planning in mobile robots. Their method, presented in a paper published in [Springer Link's *Nature-Inspired Computation in Navigation and Routine Problems*](#), is based on the use of a flower pollination [algorithm](#) (FPA), a soft computing-based tool that can identify ideal solutions to a given problem by considering a number of factors and criteria.

"Flower pollination algorithms (FPAs) have shown their potential in various engineering fields," Atul Mishra, one of the researchers who carried out the study, told TechXplore. "In our study, we used the algorithm to solve the problem of path planning for mobile robots. Our prime objective was to plan, in the least time possible, the most optimal path in terms of minimum path length and energy consumption, with maximum safety."

Initially, Mishra and his colleague Sankha Deb evaluated different existing approaches for [robot](#) path planning and decided to base their approach on an FPA, a computational technique that imitates the pollination mechanisms of flowering plants to tackle a variety of problems. The researchers specifically designed their FPA to plan ideal paths for mobile robots.

"The modifications we made were necessary, as the operators could yield infeasible paths during the run of the algorithm," Mishra explained. "Since the algorithm is not based on graphs, we expected it to have an

edge over graph-based approaches, which typically become computationally expensive as the search space expands."

When trying to identify the best paths for a mobile robot to reach a given location, the FPA-based method devised by Mishra and Deb considers a variety of factors, including the robot's location, the distance it needs to cover, and the number of turns it needs to take to reach the desired location. It also considers the safety of different paths available to the robot, ultimately calculating the optimal solution.

"The proposed algorithm can successfully plan and can yield one of the most optimal paths available to the mobile robot," Mishra said. "Another important thing that a planning algorithm such as the one we developed must consider is the finite shape and size of the mobile robot in finding the best route plan."

Mishra and Deb evaluated their approach in a series of experiments where a robot had to complete different navigation tasks. These tests yielded very promising results, as the FPA-based technique was generally able to plan ideal paths for the robot. In the future, their FPA-based method could ultimately enable efficient and safe navigation in both existing and newly developed mobile robots.

"The future focus of our work will be attaining a precise mapping of the [path](#) with the robot motor movements and developing the algorithm we developed so that it also has an online planning module," Mishra said.

More information: Atul Mishra et al. Mobile Robot Path Planning Using a Flower Pollination Algorithm-Based Approach, *Nature-Inspired Computation in Navigation and Routing Problems* (2020). [DOI: 10.1007/978-981-15-1842-3_6](https://doi.org/10.1007/978-981-15-1842-3_6)

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