

Call for Papers

Pathfinding algorithms using weighted graphs in autonomous mobile robots

Recently, bio-inspired algorithms have been increasingly explored for autonomous robot pathfinding using weighted graphs. Autonomous mobile robots including ground robots, underwater robots and unmanned aerial vehicles play an increasingly important role in work and lives. Path planning algorithm is the core technology for achieving autonomy in mobile robots and they will determine the application predictions of mobile robots. For mobile robots, effective path planning strategies can save significant time and minimize wear, slit and assets outflow. One representative example of algorithm for pathfinding in autonomous mobile robots is multi-objective evolutionary particle swarm optimization (MOEPSO). It is suitable for mobile robot path planning in situations where the environment can be represented as a graph, such as grid-based or road networks. However, these approaches tolerate concert degradation as problem complexity increases, often resulting in extensive search times to find an optimal solution. This limitation is particularly critical for real-world applications like autonomous off-road vehicles, where high-quality path computation is essential for energy efficiency. MOEPSO algorithms using weighted graphs in autonomous mobile robots face several challenges, including computational difficulty, handling dynamic situations and the need for effective path planning in real-time. Additionally, ensuring robustness and reliability in various environmental conditions and robotic limitations are critical considerations.

The primary objective of pathfinding algorithms is to determine a collision free path that allows a robot to navigate from its initial position to its target position whereas avoiding the obstacles. These algorithms assign weights to edges in the graph, representing factors like distance, cost, or difficulty of traversal, allowing the robot to prioritize paths that minimize these costs. For example, MOEPSO considers the degree of mutation, crossover, and selection to improve the efficiency of each particle. Furthermore, a weight adjustment method is proposed for the movement of particles in each iteration to increase the chance of finding the best fit solution, and build feasible waypoints by considering path length, smoothness and safety using MOEPSO, which improves the process of weighted value adjustment for the movement of particle swarms in each iteration to fit path planning. Next, a method is applied to improve the feasible waypoints whose positions are located within a radius of obstacles or blocked by obstacles to allow robots to avoid obstacles they are facing. Finally, obstacles are detected using a single sensor that can detect obstacles in all directions to build obstacle-avoiding paths.

The thematic collection mainly focuses on issues such as dynamic obstacles, real-time obstacle avoidance, and path smoothing. This Special Issue seeks original, high-quality submissions in the domain of any algorithm-based solution for autonomous mobile robots and environmental monitoring. Submissions addressing, scalability, and sustainability for real-world applications are welcome, and also research that investigates new emerging pathfinding technologies still at the proof-of-concept stage is encouraged. Submitted papers must not be under consideration elsewhere. Finally, the papers will propose potential research directions in this field that are worth studying in the future.

Possible topics include, but are not limited to:

- Real-Time Path Planning in Autonomous Mobile Robots Using Optimization Algorithms.
- Adaptive MOEPSO for Dynamic Obstacle Avoidance in Weighted Graph Robotic Environments.
- Optimized Pathfinding for Unmanned Aerial Vehicles (UAVs) Using Weighted Graphs.
- Enhancing Autonomous Navigation in Mobile Robots with Graph-Based Algorithms.
- Evolutionary Computation for Real-Time Path Smoothing in Autonomous Underwater Robots.
- Hybrid MOEPSO-DIJKSTRA Framework for Scalable Robot Path Planning on Complex Weighted Graphs.
- Graph-Based Environmental Modeling for Real-Time Robotic Pathfinding Using Evolutionary Algorithms.
- Energy-Aware Pathfinding in Autonomous Robots Using Graph-Based Algorithms.
- Integration of Edge Computing with pathfinding Algorithms for Low-Latency Autonomous Navigation.
- Future-Proofing Robotic Pathfinding: AI Techniques for Next-Generation Mobility Systems.
- Obstacle Radius-Aware Feasible Waypoint Selection in Path Planning for Mobile Robots.
- Multi-Objective Optimization of Smoothness, Safety, and Efficiency in Path Planning.

Important Dates:

Submission deadline: 28 November 2026
 First notification: 28 January 2027
 Revised version submission: 28 March 2027
 Final decision notification: 26 May 2027

The correspondence with ROMJIST including the paper submission will be carried out using the address romjist@nano-link.net respecting the instructions for authors specific to ROMJIST posted at <https://www.romjist.ro/info-for-authors.html>. Authors should indicate in the first submission message that the paper is submitted to this special issue.

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School of Software

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