

Q-learning-based Path Planning Approach for Unmanned Aerial Vehicles in a Dynamic Environment

Authors : Raja Jarray, Imen Zaghbani, Soufiene Bouallègue

Abstract : Path planning for Unmanned Aerial Vehicles (UAVs) in dynamic environments poses a significant challenge. Adapting planning algorithms to these complex environments with moving obstacles is a major task in real-world robotics. This article introduces a path-planning strategy based on a Q-learning algorithm, which enables an effective response to avoid moving obstacles while ensuring mission feasibility. A dynamic reward function is introduced, causing the UAV to use the real-time distance between its current position and the destination as training data. The objective of the proposed Q-learning-based path planning algorithm is to guide the drone through an optimal flight itinerary in a dynamic, collision-free environment. The proposed Q-learning-based UAV planner is evaluated considering numerous commonly used performance metrics. Demonstrative results are provided and discussed to show the effectiveness and practicability of such an artificial intelligence-based path planning approach.

Keywords : unmanned aerial vehicles, dynamic path planning, moving obstacles, reinforcement-learning, Q-learning

Conference Title : ICFSR 2024 : International Conference on Field and Service Robotics

Conference Location : Dublin, Ireland

Conference Dates : August 29-30, 2024