World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:16, No:06, 2022

Path Planning for Unmanned Aerial Vehicles in Constrained Environments for Locust Elimination

Authors : Aadiv Shah, Hari Nair, Vedant Mittal, Alice Cheeran

Abstract : Present-day agricultural practices such as blanket spraying not only lead to excessive usage of pesticides but also harm the overall crop yield. This paper introduces an algorithm to optimize the traversal of an unmanned aerial vehicle (UAV) in constrained environments. The proposed system focuses on the agricultural application of targeted spraying for locust elimination. Given a satellite image of a farm, target zones that are prone to locust swarm formation are detected through the calculation of the normalized difference vegetation index (NDVI). This is followed by determining the optimal path for traversal of a UAV through these target zones using the proposed algorithm in order to perform pesticide spraying in the most efficient manner possible. Unlike the classic travelling salesman problem involving point-to-point optimization, the proposed algorithm determines an optimal path for multiple regions, independent of its geometry. Finally, the paper explores the idea of implementing reinforcement learning to model complex environmental behaviour and make the path planning mechanism for UAVs agnostic to external environment changes. This system not only presents a solution to the enormous losses incurred due to locust attacks but also an efficient way to automate agricultural practices across the globe in order to improve farmer ergonomics.

Keywords : locust, NDVI, optimization, path planning, reinforcement learning, UAV
Conference Title : ICCARS 2022 : International Conference on Control, Automation, Robotics and Systems
Conference Location : New York, United States
Conference Dates : June 02-03, 2022