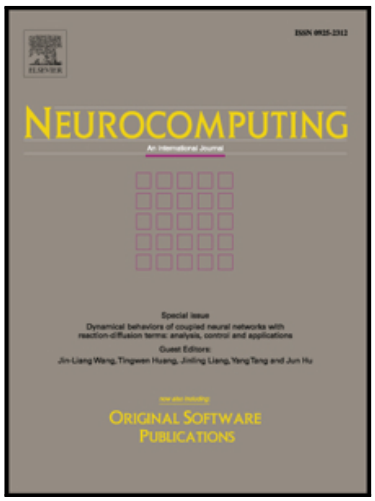

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Three-dimensional Unmanned Aerial Vehicle Path Planning Using Modified Wolf Pack Search Algorithm

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Abstract

The unmanned aerial vehicle (UAV) has been a research focus in recent years. The path planner is a key element of the unmanned aerial vehicle autonomous control module. In this paper, the modified wolf pack search (WPS) algorithm is applied to compute the quasi-optimal trajectories for the rotor wing UAVs in the complex three-dimensional (3D) spaces including the real and fake 3D spaces. Moreover, it adopts the multi-objective cost function. In the path planning process, some concepts in the genetic algorithm (GA) are applied to realize the WPS algorithm. Then, the crossover and mutation operators in the GA method are introduced to improve the original WPS algorithm. Considering the dynamic properties of the vehicle, the path smoothing process based on the cubic B-spline curve is used to make the planning path suitable for the fixed wing UAVs. Simulation results show that this approach is efficient for the rotor wing UAVs and the fixed wing UAVs when taking into account of all kinds of constraints and the path generated is flyable. Moreover, the comparisons of the four algorithms show that the trajectories produced by the modified WPS algorithm are far superior to the original WPS algorithm, the GA and the random search way under the same conditions.

Keywords: Unmanned aerial vehicle (UAV) path planning• Modified wolf pack search (WPS) algorithm• Genetic algorithm (GA) • Three dimensional (3D) space• Cubic B-spline curve.

1 Introduction

The Unmanned Aerial Vehicle (UAV) path planning has become one of the most important elements to define a UAV mission. It

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