Chapter 4
UAV Path Planning

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Abstract Path planning of unmanned aerial vehicle (UAV) is a rather complicated global optimum problem which is about seeking a superior flight route considering the different kinds of constrains under complex dynamic field environment. Several significant considerations for an ideal path planner includes optimality, completeness, and computational complexity, last one of which is the most important requirement since path planning has to be executed quickly due to fast vehicle dynamics. This chapter mainly focuses on path-planning problem for UAVs, from 2-D path planning to 3-D path planning, from path planning for a single UAV to coordinated path replanning for multiple UAVs. Under the assumption that the UAV maintains constant flight altitude and speed when on a mission, a chaotic artificial bee colony (ABC) approach to 2-D path planning is proposed. Besides, a new hybrid meta-heuristic ant colony optimization (ACO) and differential evolution (DE) algorithm is proposed to solve the UAV path-planning problem in three-dimensional scenario. Then path-smoothing strategies are adopted to make the generated path feasible and flyable. Finally, based on the construction of the basic model of multiple UAV coordinated path replanning, which includes problem description, threat modeling, constraint conditions, coordinated function, and coordination mechanism, a novel Max–Min adaptive ACO approach to multiple UAV coordinated path replanning is presented.

4.1 Introduction

Unmanned aerial vehicle (UAV) is one of the inevitable trends of the modern aerial weapon equipments owing to its potential to perform dangerous, repetitive tasks in remote and hazardous environments (Beard et al. 2002). Research on UAV can directly affect battle effectiveness of the air force, therefore is crucial to safeness of a nation. Path planning is an imperative task required in the design of UAVs, which is to search out an optimal or near-optimal flight path between an initial location and the desired destination under specific constraint conditions. There are

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