

论文与报告

无人飞艇的基于计算机视觉导航和预设航线跟踪控制

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摘要

小型无人飞艇在反恐防暴、灾难监控、大气监测、广告、航拍、交通监控、应急通信中继平台等很多方面都有广阔的应用前景. 这些应用都要求飞艇具有自动跟踪预设航线的能力. 因此, 本文提出了基于计算机视觉导航和优化模糊控制的策略来实现预设航线的自动跟踪. 文中首先详细介绍了基于自然标志的视觉导航原理, 无人飞艇机载视觉系统通过跟踪这些特征点——易在图像处理中识别的自然标志, 例如城市中的高层建筑物, 再结合数字地图或GIS, 获取它们的位置和几何特征信息, 利用针孔模型成像的几何关系解算出飞艇的位置和方向; 接着根据无人飞艇的动力学特性, 设计了以视觉导航获取的飞艇位置和方向信息作为输入的模糊飞控系统, 并用GA算法优化了模糊控制器的成员关系函数. 最后进行了验证和分析.

关键词 [视觉导航](#) [飞控](#) [预设航线跟踪](#) [无人飞艇](#)

分类号

Computer Vision-based Navigation and Predefined Track Following Control of a Small Robotic Airship

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Abstract

Abstract For small robotic airships, it is required that the airship should be capable of following a predefined track. In this paper, computer vision-based navigation and optimal fuzzy control strategies for the robotic airship are proposed. Firstly, visual navigation based on natural landmarks of the environment is introduced. For example, when the airship is flying over a city, buildings can be used as visual beacons whose geometrical properties are known from the digital map or a geographical information system (GIS). Then a geometrical methodology is adopted to extract information about the orientation and position of the airship. In order to keep the airship on a predefined track, a fuzzy flight control system is designed, which uses those data as its input. And genetic algorithms (GAs), a general-purpose global optimization method, are utilized to optimize the membership functions of the fuzzy controller. Finally, the navigation and control strategies are validated.

Key words [Visual navigation](#) [flight control](#) [predefined track following](#) [robotic airship](#)

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