

论文与技术报告

基于优选数据准则的空基多平台协同定位方法

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摘要:

在多无人机(unmanned aerial vehicle, UAV)协同定位地面固定辐射源的应用环境中,UAV编队中的各机利用携带的电子支援措施(Electronic Support Measurement, ESM)探测目标的方位角,并利用各观测机获取的辐射源入射角(arrival of angle, AOA)对目标实施协同定位。假设UAV所携带传感器设备测量精度相同,且测量误差服从正态分布,在此条件下,UAV编队的队形会对多机协同定位的精度产生影响。为了进一步研究编队队形与协同定位精度的关系,首先,利用两机的相对几何关系建立了基于AOA的双机定位模型,并在此基础上推导出基于测向交叉定位方法的多无人机协同定位误差模型;其次,基于该误差模型分别分析了观测机处于不同的观测点对定位误差模型的影响和不同的观测角组合对定位精度的影响,并给出UAV编队队形与定位误差关系的结论;最后,基于上述结论提出了基于测向交叉定位方法的多机数据融合优选定位数据对的优选函数,并利用该优选函数对多机协同定位方法进行了改进,仿真验证了改进算法的有效能。同时,本文得出的结论对于UAV机群的路径规划有一定的指导意义。

关键词: 测向交叉定位; 多无人机; 协同定位; 定位精度

Bearing only method based on optimal data in Multi-UAV co-location

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Abstract:

In the application environment of using unmanned aerial vehicle (UAV) formations to locate the fixed target on the ground, which is radiant point, the angle between UAV and the fixed target, which transmit electronic signals, could be detected by using the Electronic Support Measurements (ESM) which carried on the UAVs, which compose the UAV formations, and the coordinate of the fixed target could be calculated by using the arrival of angle which is got by ESMs at each scan time. Suppose the sensors on the UAVs have identical measurement accuracy, and the measurement-error of the ESM is a zero mean Gaussian process noise. Under this condition, the accuracy of co-location would be affected by the formation of UAV formations. In this paper, we researched the relationships between the formation of UAV formations and the accuracy of co-location, which used the method of AOA. At first, we established the co-location model of two UAVs by using the geometry relationship of two UAVs, and derived an error model of co-location with UAV formations which based on the method of direction finding cross location. The second, Analyses the influence of positioning accuracy in different sensors' distance and different combination of azimuth angles by using the error model of co-location which derived at the first stage, Based on the analysis above, We got the conclusions about the relationship between the formation of UAV formations and the accuracy of co-location. Finally, we propose a function of data fusion selection for measurement data based on the method of bearing-only location and use the function to improve the method of AOA location. The validity of the improved method is verified by the results of simulation. At the same time, the conclusions, proposed in this paper, which described the relationships between the formation of UAV formations and the accuracy of co-location could be used in optimal UAV formations path planning.

Keywords: direction finding cross location multi-UAV cooperation locate positioning accuracy

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