A Novel Hybrid Genetic and A-star Algorithm for UAV Path Optimization

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Abstract:
Unmanned aerial vehicles (UAVs) are essential in 5G/6G communication as they provide affordable and effective solutions. However, collecting data in an unfamiliar environment from various sensor nodes is challenging due to the limited energy resources of UAVs. Therefore, careful planning of the UAV's path is vital to conserve and effectively utilize available energy resources. Our paper presents a hybrid genetic and A-star algorithm that optimizes energy consumption, making it powerful and efficient. The genetic algorithm (GA) generates numerous potential paths for a UAV to take, while the A-star algorithm identifies the most optimal route from that pool. The results show that our algorithm outperforms the state-of-the-art system while increasing the number of data nodes.

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Contents

High data rate and reliability are crucial for 5G/6G communication services, especially in highly mobile environments [1], [2]. To meet this demand for high data rate, communication could be point-to-point or in line of sight (LOS), in order to reduce fading effects [3], [4]. To establish virtual LOS communication, Intelligent Reflecting Surfaces (IRS) could be utilized. Additionally, the use of base stations mounted on Unmanned Aerial Vehicles (UAVs) is an effective means of achieving LOS communication.

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