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| **Title:** | Joint Optimization of Trajectory Control, Task Offloading, and Resource Allocation in Air-Ground Integrated Networks | | |
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| **Published Journal Name:** | IEEE Internet of Things Journal (IoTJ) | | |
| **Type of Publication:** | Journal | | |
| **Volume:** | 11 | Issue | 13 |
| **Publisher:** | IEEE | | |
| **Publication Date:** | July 1, 2024 | | |
| **ISSN:** | 2327-4662 | | |
| **DOI:** | 10.1109/JIOT.2024.3390168 | | |
| **URL:** | https://ieeexplore.ieee.org/document/10504534?source=authoralert | | |
| **Other Related Info.:** | Page 24273-24288 | | |
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| **Abstract:** |  |
| In an air–ground integrated network (AGIN), low-altitude unmanned aerial vehicles (UAVs) and a high-altitude platform (HAP) operate synergistically to support computationally expensive and delay-critical applications of mobile ground devices (GDs). UAVs obtain tasks from GDs, execute the tasks, and offload some of the tasks to the HAP. In AGINs, the trajectory control of a UAV swarm should provide optimal coverage to randomly distributed mobile GDs. The limited resources of UAVs, such as energy, computation, caching, and bandwidth, result in further challenges. Therefore, a joint optimization problem is formulated in this study to minimize the task execution delay and energy consumption of UAVs by optimizing the UAV’s trajectory, GD association, task-offloading ratio, and resource allocation. The limited resources, maximum task execution delay, task queue size, and mobility of UAVs are regarded as key constraints. Solving the problem is intricate owing to the complex mixed-integer nonlinear constraints coupled with a large continuous and discrete decision space. To track the dynamics in AGINs and efficiently solve the problem above, we utilize a swarming behavior-integrated multi-agent gated recurrent unit-based actor and multi-head attention-based critic network (SMA-GAC) framework. Results of simulative evaluation show that the proposed SMA-GAC outperforms baseline methods. | |