DYNAMIC TRAFFIC BALANCING SYSTEM IN A DRONE NETWORK

Dmytruk K.S., Kasilov O.V.
National Technical University "Kharkiv Polytechnic Institute", Kharkiv

In new generation telecommunications systems, the concept of building mobile networks based on swarm structures of unmanned aerial vehicles (UAVs) is gaining popularity, where each drone not only collects data or performs tasks, but also functions as a full-fledged element of the wireless network, acting as a router, repeater and information aggregator. In such networks, the key task is to ensure a stable level of quality of service (QoS) in conditions of constantly changing topology caused by the mobility of drones [1]. Of particular importance is effective load balancing between devices that temporarily act as communication nodes of the network core [2].

The study developed a model for dynamic load distribution in a swarm wireless network based on unmanned aerial vehicles (UAVs). A traffic routing method was proposed that takes into account the mobility of drones, the current level of load, the quality of the wireless channel, and the remaining battery charge. The communication structure is modeled as a weighted graph with dynamic coefficients, which allows for adaptive route formation under conditions of constant change in the network topology.

The work presents a mathematical model for determining the weight of the connection between network nodes and formulates an optimization problem whose goal is to minimize the peak load. A modified Dijkstra algorithm was used to build routes, ensuring efficient data transmission. The results of the simulation conducted in the NS-3 environment demonstrated reduced packet loss, stabilization of delays, and more uniform energy consumption compared to traditional static approaches.

The results obtained indicate the feasibility of using the developed model in search and rescue missions, territory monitoring, and other scenarios using autonomous swarm systems. The proposed solution contributes to increasing the adaptability, stability, and efficiency of next-generation decentralized mobile networks.

References:

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