METHOD OF MUTUAL AUTHENTICATION OF UAV SWARM ELEMENTS UNDER UNCERTAINTIES

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Today, the problem of individual UAVs authentication in a swarm is becoming more and more relevant. The goal of this work is to develop a method of mutual authentication of UAV swarm elements under uncertainties based on reinforcement learning for automatic detection and authentication of other UAVs in the swarm., using two parts of cryptographic keys – static and dynamic (which found out via learning process).

There are many approaches to authenticating swarm elements [1], [2], [3] but they rarely use reinforcement learning during the authentication.

A method and algorithm for mutual authentication of UAV swarm elements under uncertainties based on reinforcement learning was developed. The algorithm includes a set of static keys, pre-distributed among the UAV swarm elements, and dynamic keys, which are used together with static s to form a session key. Dynamic keys are never shared, instead other swarm elements learning to generate the dynamic keys of all other elements using reinforcement learning and the epsilon-greedy strategy. Practical experiments showed the applicability of the proposed method.

References

1. Bansal G., Biplab S. S-maps: Scalable mutual authentication protocol for dynamic uav swarms // IEEE Transactions on Vehicular Technology. – 2021. – 70.11. – P. 12088-12100.
2. Han P., Sui A., Wu J. Identity management and authentication of a UAV swarm based on a blockchain // Applied Sciences. – 2022. – 12.20. – P. 10524.
3. Hulianytskyi L., Ogurtsov M., Korolyov V. Development of the “friend-or-foe” identification system on the basis of programmable radiomodems // CEUR Workshop Proceedings. – 2023. – 3538. – P. 222–231.