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Title

Mission Planning of Manned-Unmanned Aircraft Teaming based on Reinforcement Learning: Suppression of Enemy Air Defenses(SEAD) Mission

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Abstract

By the United States Department of Defense (DoD)'s Unmanned Aircraft Systems Road map, efforts have been made to replace manned missions with UAVs. Since drones have no passengers on board, operators do not have to be directly exposed to danger and can perform the missions effectively through more diverse maneuvers than manned aircraft [1]. Recently, Manned-Unmanned Aircraft Teaming (MUM-T), an operation method that interacts with manned aircraft using UAVs, is being developed to study strategies for efficient mission performance in the United States, Germany, and South Korea. To collaborate, a method of reducing the workload of manned aircraft operators is necessary, and for this, artificial intelligence technology that gives autonomy to UAVs or performs mission planning is essential [2].

In this study, assuming the autonomy of UAVs as AFRL ACL Level 5 [3], we developed a Centralized Mission Planning technique to plan the mission of multiple UAVs in one manned aircraft. Centralized Mission Planning refers to a method of planning the mission of multiple UAVs in a single manned aircraft and shows a structure in which information on battlefield conditions is gathered in the manned aircraft and used in mission planning. The mission was limited to the Suppression of Enemy Air Defenses (SEAD), and the role of manned and unmanned aerial vehicles was derived through this. These concepts are implemented in simulators for training and learned through reinforcement learning algorithms, and the learned artificial intelligence model can derive the mission points and optimal paths of each agent to perform SEAD missions based on multiple agents. The learning model was simulated by being mounted in a verification environment built on AirSim, and the simulator includes UAVs and manned aircraft performing SEAD missions, and surface-to-air missiles.

The future battlefield environment will be more complex than the current battlefield environment, and weapons systems are expected to become increasingly unmanned. Essential technology for making good use of these weapons systems is the autonomy of each weapon system, and this study directly secured technologies necessary for the UAV's Mission Planning. The expected effect of this study is to reduce the workload of manned aircraft and increase the success rate of missions by planning autonomous tasks based on complex battlefield situations. Only the SEAD mission was considered, but in future studies, more diverse situations and scenarios will be considered.

References

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