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Title

Deep reinforcement learning based integrated guidance and control for a longitudinal missile system

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Abstract

In general, missile guidance and control systems are developed by employing various methods such as nonlinear control and optimal control. They consist of guidance and control, and many studies have been conducted individually. Even though their performance is satisfactory, many research groups have been studying the method for integrating the guidance and control of the missile system because it is not trivial to design guidance and steering separately. In this paper, we propose an integrated method for the longitudinal missile guidance and control based on deep reinforcement learning (DRL). The DRL has been solving many problems that could not be solved in the past, and lots of related studies are being conducted. Among the various DRL methods developed so far, this study develops the missile guidance and control system using soft-actor-critic(SAC). Therefore, the input for the SAC-based method is composed of the target and missile information, and the output is determined as fin deflection for the missile. In order to ensure convergence to the optimal policy of the SAC, the input and the output are normalized between -1.0 and +1.0. The output is utilized by the fin control input of the missile by multiplying an appropriate scale factor. The overall method is designed and trained using Pytorch and Gym environment. To validate the performance of the proposed method, numerous numerical simulations are conducted, and the results are analyzed.