A Multi-step and Eligibility Trace Approach to Incremental Dual Heuristic Programming for Flight Control

W. Chan * and E. van Kampen †
Delft University of Technology, P.O. Box 5058, 2600GB Delft, The Netherlands

Incremental Dual Heuristic Programming (IDHP) is a succesor to the Dual Heuristic Programming (DHP) algorithm that uses an incremental system model, this algorithm showed promising flight control performance and tolerance of faults in simulation experiments. This paper studies the potential for extending IDHP through augmenting the computation of agent updates and returns, more specifically, by using eligibility trace updates and multi-step temporal difference error. This results in the IDHP(λ) and MIDHP(λ) algorithms, which are compared against IDHP in several simulated flight control scenarios with faults introduced mid-flight. The results demonstrate that the proposed algorithms have improved flight control performance and fault tolerance in terms of tracking errors when controlling a nominal aircraft and an aircraft with faults introduced.

Nomenclature

(Nomenclature entries should have the units identified)

*MSc. Student, Faculty of Aerospace Engineering, Control and Simulation Division, Delft University of Technology.
†Associate Professor, Faculty of Aerospace Engineering, Control and Simulation Division, Delft University of Technology.