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Title: Evaluation of a Model of Expert Decision Making in Air Traffic Control

Abstract:

Experts are capable of performing complex tasks using relatively simple strategies that are adapted to fit the constraints of the problem at hand. The resolution of conflicts between aircraft, for example, is regarded as a very complex optimisation problem, yet air traffic controllers are able to perform the task using a small set of simple strategies. Much of the expertise of the air traffic controller lies in the ability to select the appropriate strategy for the problem. In this project, we are developing a model of expert decision making for the air traffic control conflict resolution task. This is part of a broader project that is developing a new approach for simulating the tasks that a human operator performs, and the workload that the human experiences while carrying out those tasks.

We model expert decision making as a serial search process in a hierarchical tree, in which the selection of a decision option for further evaluation is constrained by the situation. In this

paper, we will present an analysis of the behaviour of an initial version of this model. The key aim of this analysis is to compare the model's behaviour against the behaviour of expert controllers under varying scenario complexity. The analysis relies on both data from our model simulation runs and recordings of the activities of 14 air traffic Controllers. It is based on the frequencies of different intervention classes in four different static aircraft scenarios of varying complexity.

This paper is structured as follows: We will first present a functional overview of our conflict resolution model, including its underlying operational concepts. Both the aims and the general methodology underlying the analysis of the model will then be described. Results will be presented, identifying both the behavioural similarities and discrepancies between the model and human air traffic controllers. There is close agreement between the model and the humans in the selection of aircraft for intervention, although the humans are more variable than the model. Human controllers are also more variable in the solutions that they generate, and have a tendency to prefer vertical solutions, unlike the model which has a preference for lateral solutions. The results suggest that the modelling approach that we are taking has promise, and that it is possible to simulate expert decision making in complex dynamic tasks using relatively simple models of the decision process.