

EPSRC CDT in Distributed Algorithms

PhD Project:

Algorithms and Decision-Making Processes in Distributed Attacker-Defender Games

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Project Description

The project will consider a few missions from the air combat domain and map these to simpler/abstracted 'canonical' problems; these will form the focus for the early research. Ideally, the research will yield methods/algorithms that can be usefully mapped across to illustratively complex air-combat situations; later research will then focus on investigating these within a suitable configured game-derived simulation.

Further, the solution of these problems in a complex, uncertain and dynamic situation in real-time is a challenging computational task. For problems of representative complexity, this will therefore likely require an application of distributed/decentralised high-performance computing methods.

Computational games provide a powerful abstract framework to model and analyse interactive processes with uncontrollable adversaries or a nature. Abstract representation can reveal the weaknesses in existing strategies and allow to develop new strategies with a mathematical guarantee. For many Attacker-Defender games it can be computationally hard or even undecidable to check the existence of a winning strategy. Various restrictions on the objectives and player's moves/actions can significantly change the computational complexity of the problems. It creates the scope for research on the design of algorithms to verify the existence of the winning strategies or to design new strategies.

The project will focus on developing Theoretical Computer Science techniques to overcome computational constraints by developing approximation algorithms, applying machine learning techniques and solving strategic optimisation and combinatorial problems on different discrete arenas and geometric environments.

Go to the [EPSRC CDT In Distributed Algorithms](#) website.