Task Re-Allocation for Unmanned Aerial Vehicles

Introduction

Unmanned Aerial Vehicles (UAVs), commonly known as drones, are being seen as the most promising type of autonomous vehicles in the context of Intelligent Transportation System (ITS) technology. A key enabling factor for the current development of ITS technology based on autonomous vehicles is the task allocation architecture. This approach allows tasks to be efficiently assigned to robots of a Multi-Agent System (MAS), taking into account both the robots' capabilities and service requirements. There are different types of algorithms that are employed in state-of-the-art drone-based ITSs, including auction (market)-based approaches, game-theory-based algorithms, optimization-based algorithms, and Machine Learning (ML) techniques. In this context, task re-allocation may be needed due to dynamic events (e.g., removal of one task from the task set, failure of one UAV, unexpected arise of a high priority task, adverse weather conditions, etc.) affecting the execution of the originally assigned task set. The objective of this thesis is to design a task re-assignment algorithm that can dynamically re-allocate tasks to a fleet of UAVs while minimizing the impact of such a re-allocation on the execution efficiency (e.g., the total makespan) of the process.

Expected Outcome of Thesis

The expected outcome of the thesis is defined as follows:

- → Design of a task re-allocation algorithm that can efficiently re-allocate tasks to a fleet of drones that is executing an already assigned task set.
- → Validation of the proposed approach by means of simulation results with a well-defined scenario including dynamic events that trigger task re-allocation.

A Few References from the Literature

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