

Meta-agent CBS using low level meta-agent cbs

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# Introduction

With the constant improvement and use of robotics in the modern world, the need for multi-agent pathfinding (MAPF) becomes ever more apparent. A MAPF problem consists of a map and multiple agents, each with their own start and goal states. The task of a MAPF solver is to move every agent through the map, to their goal state without colliding with other agents. Work done on MAPF solvers can try to find the minimum sum of cost of the instance or the focus can be on finding a sufficient solution for all agents within some time bound.

This project focuses on finding optimal solutions to MAPF instances while trying to minimize computation time. Particularly, it will try to improve the performance of conflict-based search (CBS) when there are agents whose paths collide many times (also known as highly dependant agents). The strategy is to calculate (separately) the solution for the highly dependant agents, then calculate the rest of the solution to the MAPF instance, treating the pre-calculated solution as one agent. This technique is known as meta-agent conflict-based search (MA-CBS).

MA-CBS is a two-level algorithm, as it is derived from the two leveled CBS. At the top-level search, a constraint tree (CT) with nodes containing the time and location constraints for each agent. For every constraint tree node at the top level, a low-level search finds the optimal single agent paths based on the constraints in the node. If collisions still exist after the