MULTI-AGENT PATHFINDING

EXTENDING MULTI-LABEL A* TO SOLVE MULTI-AGENT PATHFINDING WITH WAYPOINTS

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BACKGROUND 1

MAPFW: Finding a path for agents along a set of waypoints, while avoiding collisions.

Potential Use: Train shunting and service.

Aim: Extend existing MLA* algorithm to solve MAPFW problems.

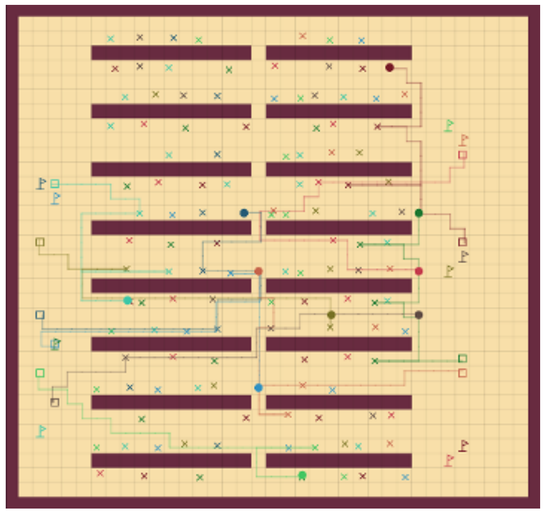
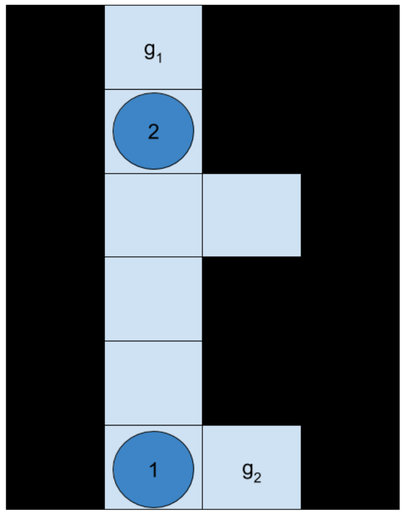


Image of MAPF instance in progress from *mapfw.nl*.



Example of a MAPF instance which is *not well-formed*, where agents can block each other.

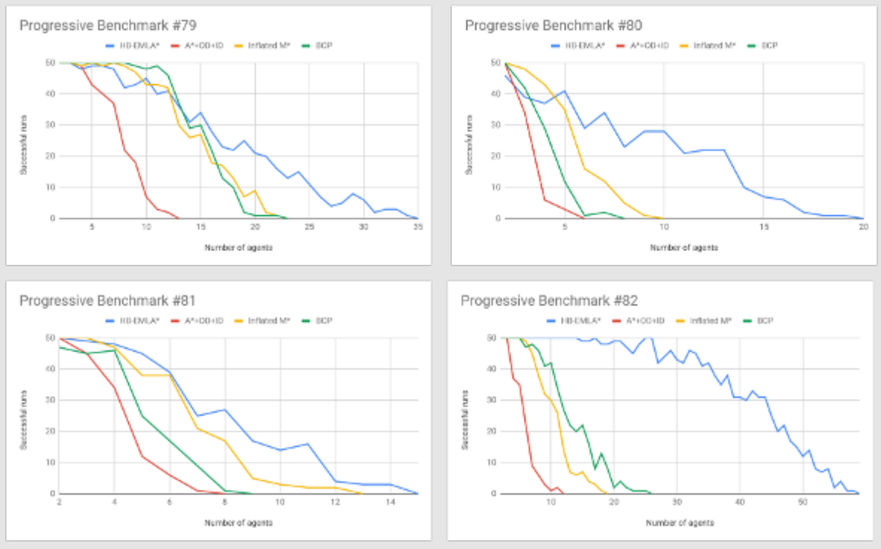
CONCLUSIONS 4

- EMLA* performs faster, and can handle more agents than other algorithms.
- The solution quality is 30% worse on average than optimal algorithms.
- EMLA* performs poorly on not well-formed instances.
- The Nearest Waypoint heuristic is an effective way for agents to pick waypoints, compared to other heuristics.

RESEARCH QUESTIONS 2

- How effective is Extended MLA* (EMLA*) at solving MAPFW?
- Under what conditions does EMLA* outperform other (optimal) MAPFW algorithms?
- How does Heuristic-Based EMLA* perform with different heuristics?

RESULTS 3



Performance of HB-EMLA* on benchmarks with an increasing number of agents from *mapfw.nl*, as compared to the MAPFW algorithms A*+OD+ID, Inflated M*, and BCP.

FUTURE WORK 5

- New conflict resolution methods, like dynamic agent planning.
- Solving not well-formed instances.
- Optimizations to reduce search space.
- Better heuristics to improve searching the graph.
- Finding new ways to order agent waypoints, such as a TSP solver.