TU Delft

An interactive version of this poster can be found at https://mapfm-poster.jdonszelmann.nl

Matching in Multi-Agent Pathfinding using M*

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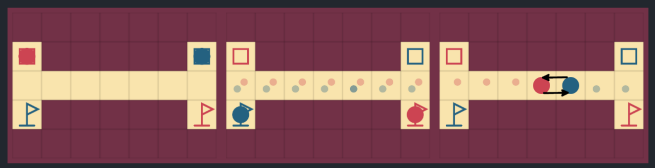
1. Multi-agent pathfinding



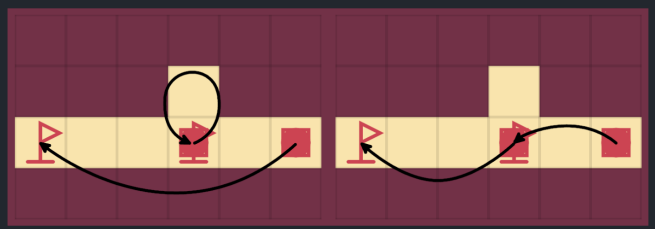
A start state | A goal state | An illegal action

Multi-agent pathfinding (MAPF) is finding collision-free paths for multiple agents.

2. Matching in MAPF

A trivial matching | A more complex matching

Grouping agents in MAPF into teams gives MAPFM, MAPF with matching. Agents travel to one their team's goals. An assignment from agents to goals is called a matching.



A possible matching | Another, shorter, matching

3. M*

- A complete and optimal algorithm to solve MAPF instances.
- Derived from A*.
- Plan agents independently when possible.

4. Research Questions

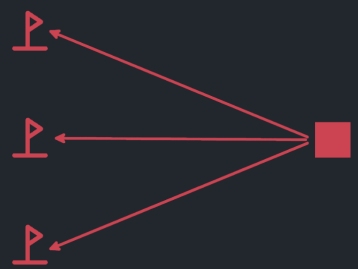
- How can M* be adapted to also solve MAPFM problems?
- Do existing improvements of MAPF M* also improve performance when solving MAPFM problems?
- How does M* compare to other MAPF algorithms adapted to solve MAPFM?

Two techniques were developed to add matching to M*.

5. Prematching

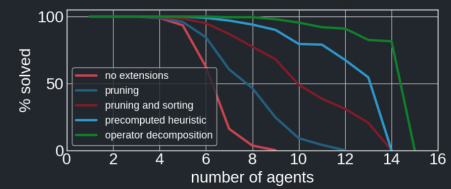
Agents search a path to only one of their goals at a time. All possible assignments of agents to goals are searched separately.

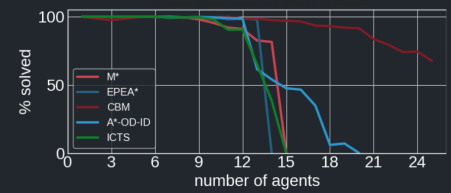
6. Inmatching



Inmatching searches all matchings at the same time in a single slower search process.

7. Results





Graphs display percentage solved in 2 minutes out of 200 20x20 maps, 25% filled with obstacles. Agents are split over 3 teams. All maps are guaranteed to be solvable.

8. Conclusion

- Prematching is generally preferable to Inmatching.
- Several extensions to M* and to prematching can improve the performance of M*.
- The performance of M* is comparable to that of other A* derived algorithms.

Paper

Complete explanations, results and conclusions can be found at https://mapfm-poster.jdonszelmann.nl/paper.pdf.