Summary and Challenges

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MAPF is an important problem

The problem MAPF problem asks us to coordinate a team of moving agents.

Studied by multiple communities of interest

- Artificial Intelligence
- Robotics
- Industrial practitioners

Key enabler for a variety of important and emerging applications:

- Warehouse fulfilment
- Mail sortation
- Pipe routing
- Aircraft towing
- Autonmous intersections
- Computer games

MAPF problems are tricky to solve

Finding feasible solutions to MAPF problems is **tractable**. But finding optimal solutions (and close approximations) is **hard**.

Practitioners have competing demands:

- Plans should be computed fast
- But maximise an objective function

Additional complications:

- Agent kinematics
- Execution uncertainty
- Operational constraints
- 3D Environments

There has been massive progress in MAPF

We have developed strong tools to address some of the core difficulties that makes MAPF problems hard.

- Symmetry breaking consttaints
- Strong heuristic bounds
- More efficient search-based solvivng techniques

Compared to just a few years ago:

- Optimal search: from dozens of agents to 150+
- Bounded suboptimal: from hundreds to 1000+
- Suboptimal: near-optimal many thousands of moving agents

Things that are still hard

Many opportunities exist for further improvement

- Continuous space and time
- Execution-time failures
- Motion Planning
- Online MAPF and
- Multi-agent Pickup and Delivery

Great topics for PhD theses!

Would you like to know more?

Questions about the tutorial? Email us!

Community website: `http://mapf.info`.

Conferences:

- AAAI and IJCAI (general AI)
- AAMAS (multi-agent AI, relatively general)
- ICRA and IROS (general robotics)
- International Conference on Planning and Scheduling (ICAPS)
- International Symposium on Combinatorial Search (SoCS)

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