Prof. R. Wattenhofer

BA/MA/SA:

Multi-Agent Pathfinding and Crowd Simulation

Pathfinding for single agents on a graph is a well studied problem. Dijkstra's algorithm provided a solid foundation in 1959 and since then several more specialized adaptations have been conceived, such as the A* algorithm for grids and hierarchical pathfinding using the ability to preprocess maps.

The applications for *multi-agent* pathfinding have grown numerous in the recent decades. Movies such as Lord of the Rings want to display huge armies clashing, but without paying an actor for each combatant. Real-time strategy games incorporate larger and larger amounts of units and players expect predictable and efficient unit movement. Finally, building safety researchers can predict the movement and behaviour of human crowds during an emergency evacuation through simulation.

This topic allows for a wide range of different models: a simpler model might consider the environment a grid, in which every node can only be occupied by one agent and agents can move only in 4 directions. Such a model allows for easy reasoning and is more conducive to a theoretically focused thesis. At the other end of the spectrum, modeling the environment as a 2-dimensional plane with polygonal obstacles and agents as circles could be explored in a more practical work through simulations focusing on realism. You are welcome to bring in your own approaches to this topic!
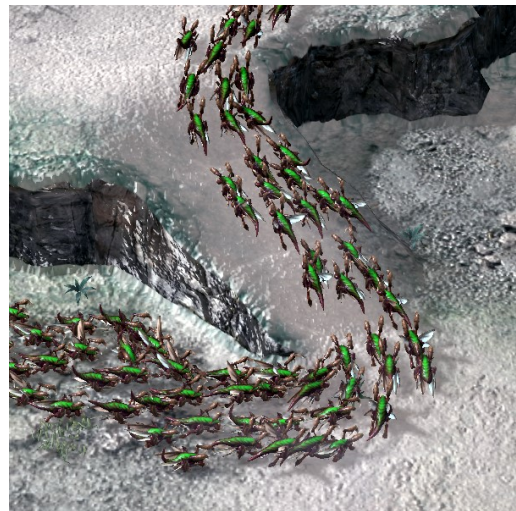
During your thesis, you will meet on a weekly basis with your advisor(s), to discuss progress and open questions.

Pros: Good theory skills and/or good programming skills, being able to work independently on this topic.

Interested? Please contact us for more details!

Contact

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