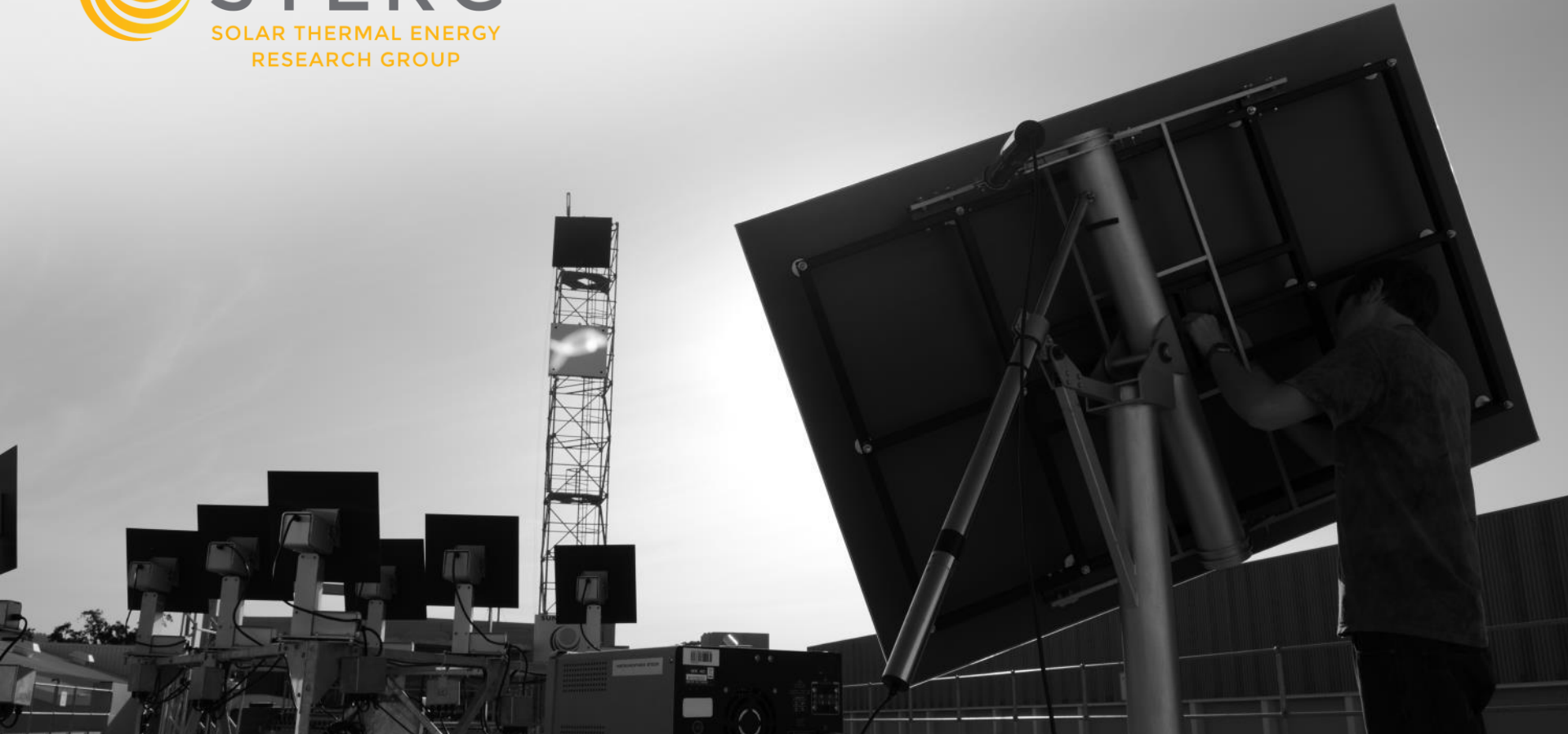STERG

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Obstacle avoidance with a Multicopter in a dynamic 2D environment

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Overview

Obstacle Avoidance

- Background (why it's needed)
- Algorithms used
- Algorithms explained
- Conclusion
- Questions

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Background – Why it's needed

Obstacle Avoidance

- Effective and efficient inspections – High plant safety

- Routine inspections – Lower maintenance costs

- But, inspections require time and labour

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Background – Why it's needed

Obstacle Avoidance

- Fully automated inspection
  - increase the efficiency
  - reduce the operating and maintenance cost
  - improve the safety and work conditions

Background

Obstacle Avoidance

- For system to be automated – have to be able to fly autonomously

- Broadly classified under
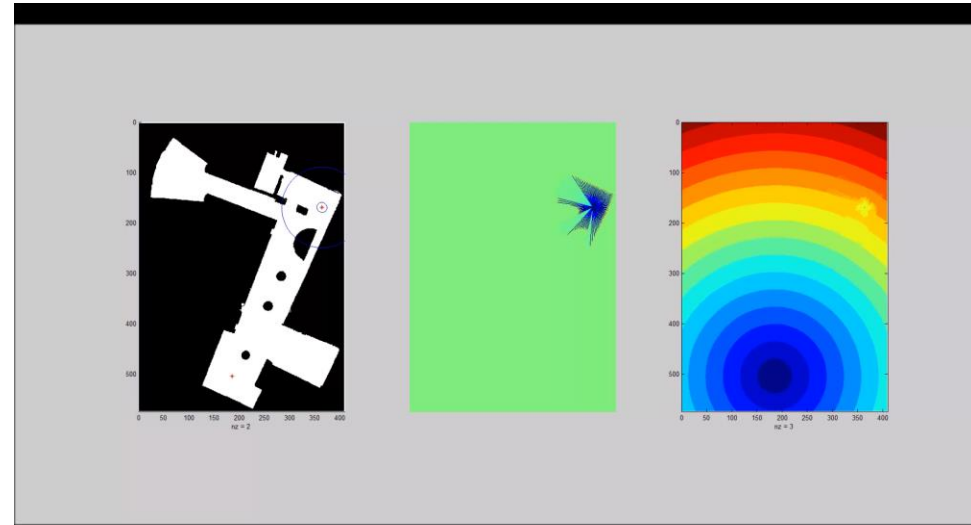 - Global and Local path planning

- Virtual Force Field

- D* Lite

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Algorithms explained

Obstacle Avoidance   Virtual Force Field (VFF)

- Global path planning with local collision avoidance
- Goal position – Attractive force
- Obstacles – Repulsive force
- Can be compared to a marble on a floor
- Local minima – Problem
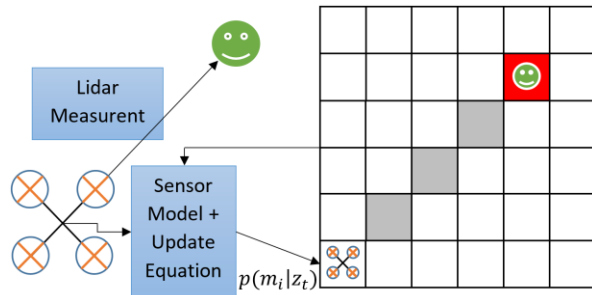
Algorithms explained

Obstacle Avoidance   D* Lite

- Global path planning algorithm
- Plan from end to start – therefore less computationally intensive when re-planning
- Further enhance speed – add virtual force field
- D* Lite basically pulls the quadcopter to the end position
- Local minima?

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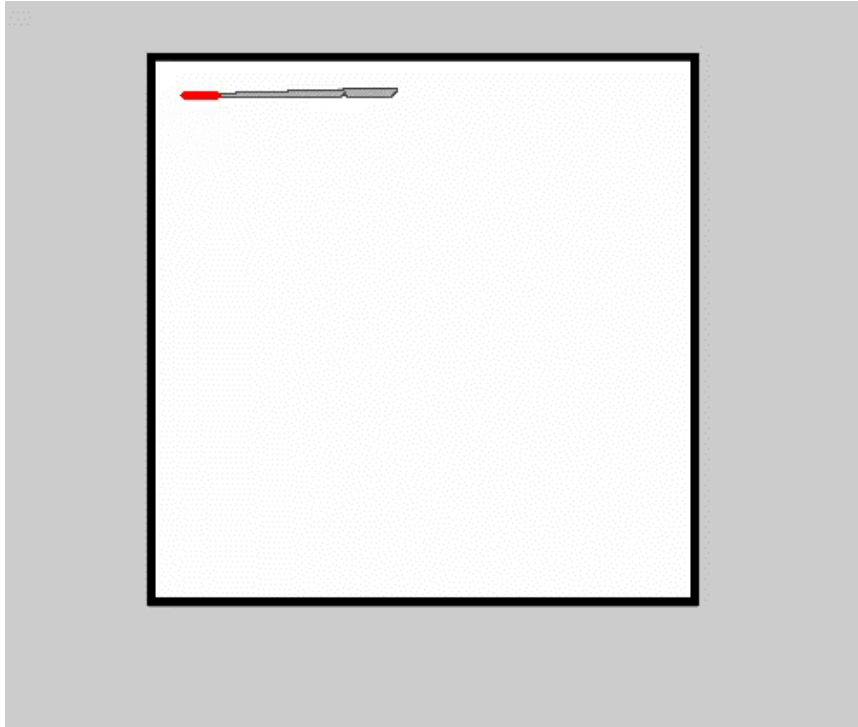UNIVERSITY
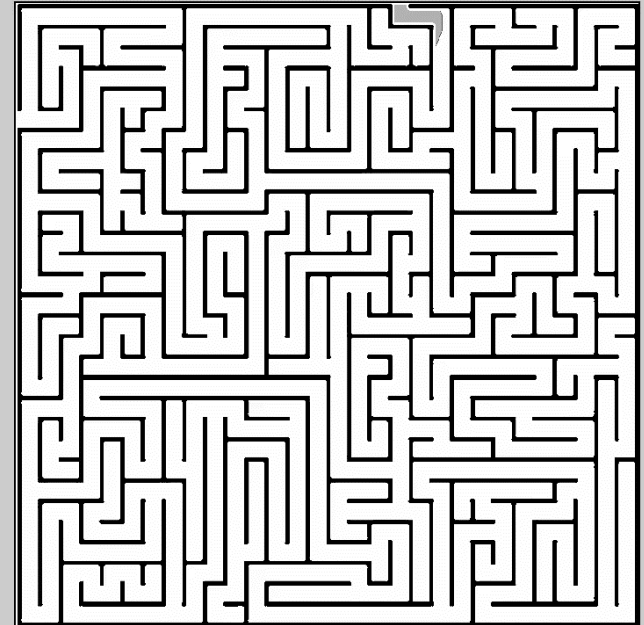
Conclusion

Obstacle Avoidance

- High algorithm speeds were obtained
  - Global path (100x100 map) < 0.3 s
  - Path recalculation is faster as some data can be re-used
  - At each position it takes less than 4 ms to check if the next position is suitable with VFF
- Code was successfully tested with a multicopter simulator
- We also successfully field-tested our algorithms with virtual obstacles to check if everything works correctly
- Sensor is already tested and works perfectly, just have to mount and do final tests

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Questions

Obstacle Avoidance

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