



# Autonomous Navigation

+ ME5751-Robotics Motion Planning

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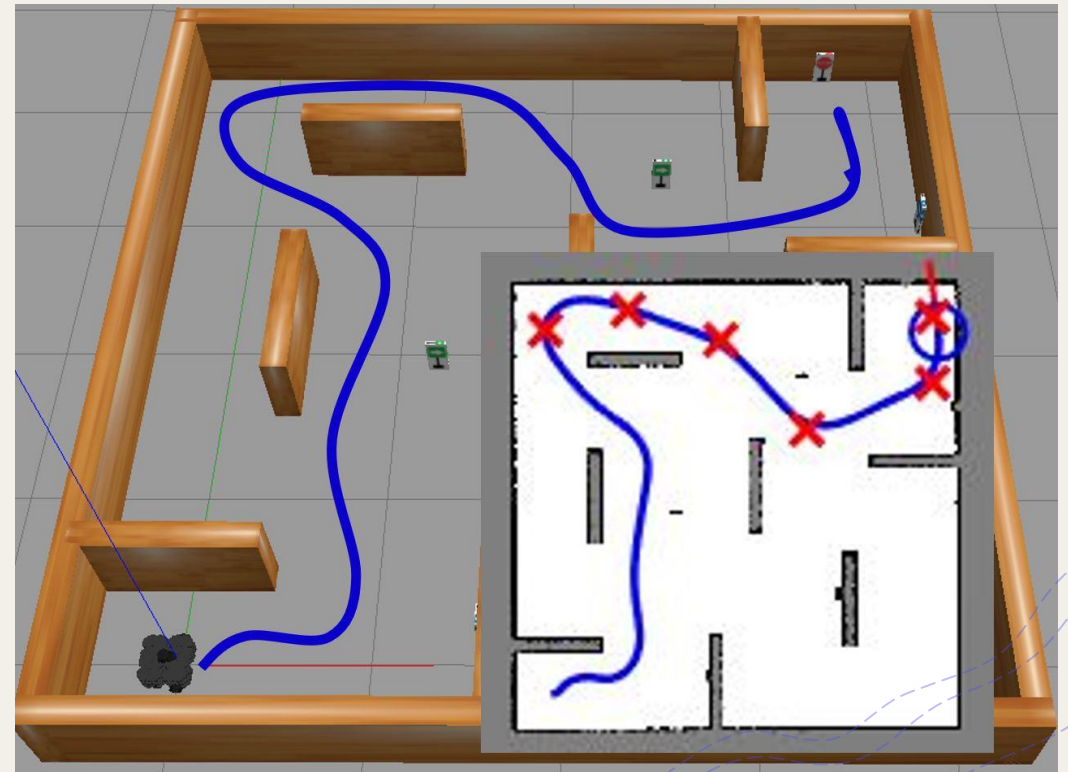
# AGENDA

(required topic to cover)

- +Introduction
- +Detailed methods
- +Performance analysis
- +Discussion

# Introduction:

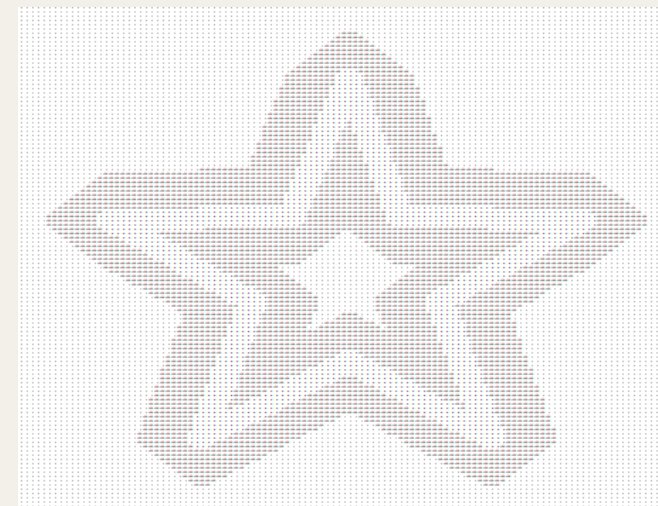
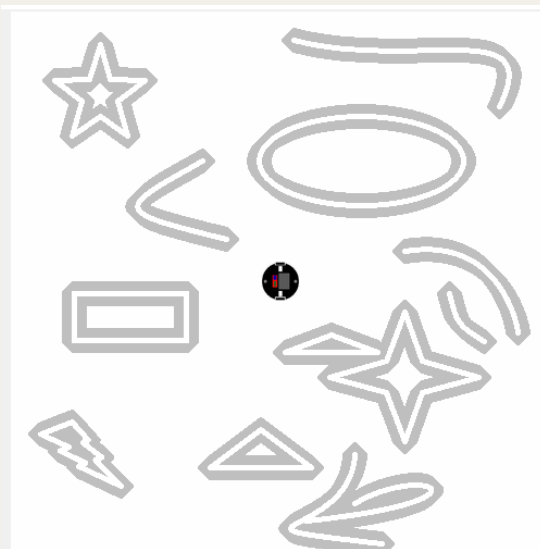
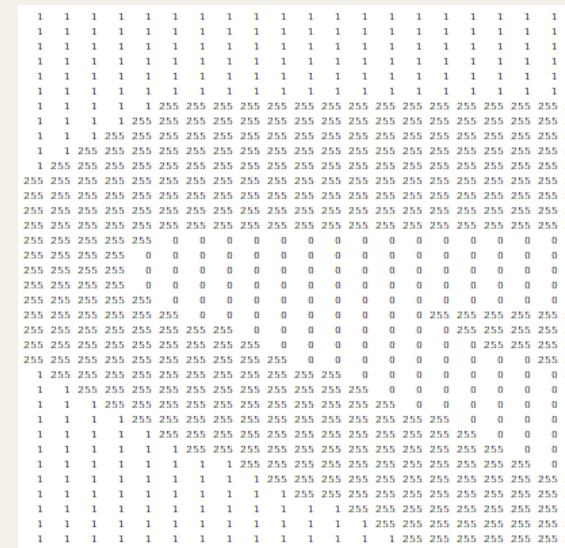
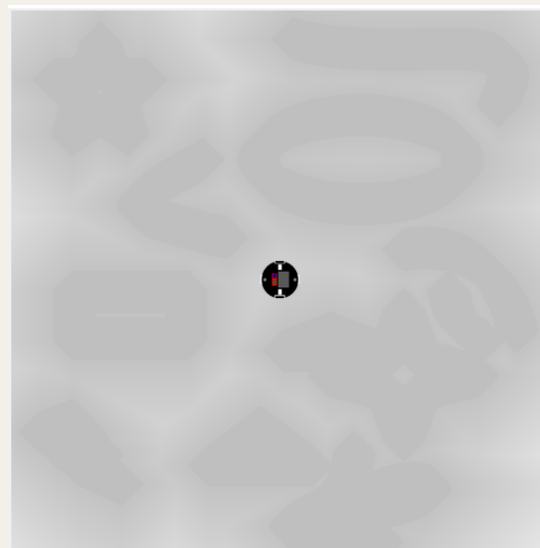
- +Process the given map
- +Plan a path
- +Navigate to the goal!



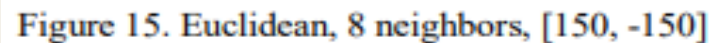
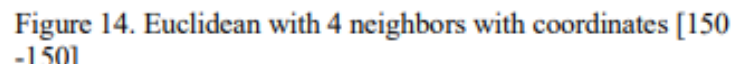


# Detailed methods

Potential map - "At least you should have the inflation layer done"

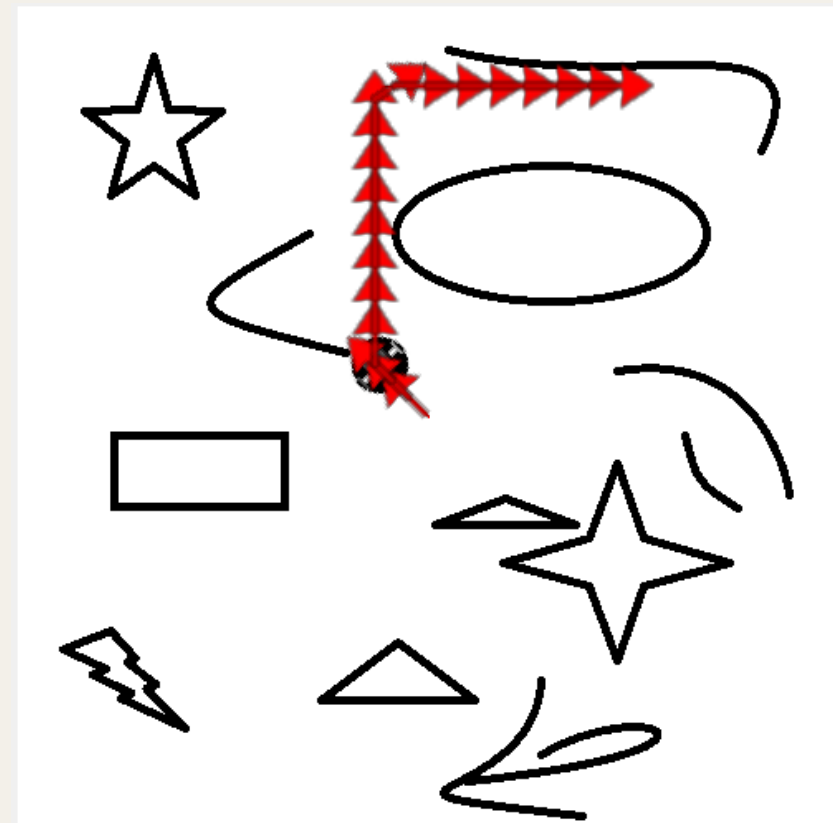
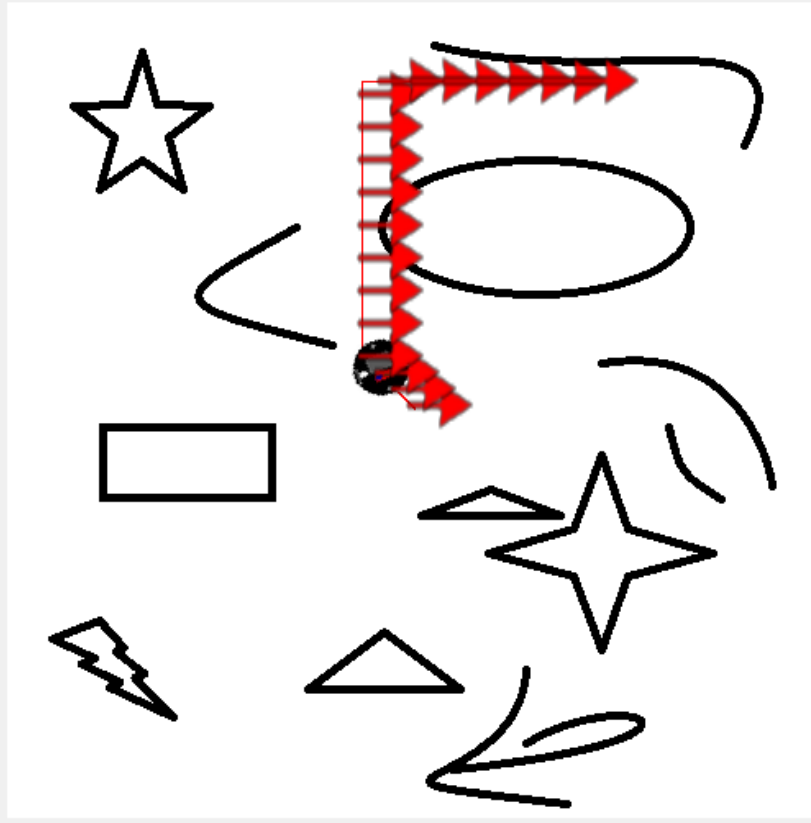
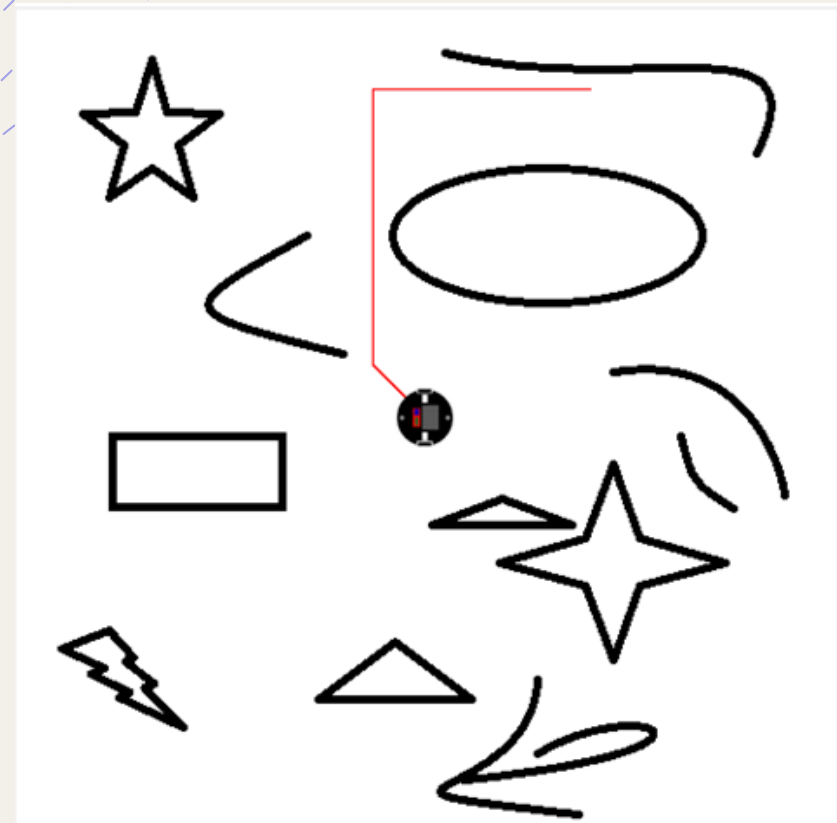


## + Path Planner – A\* Search



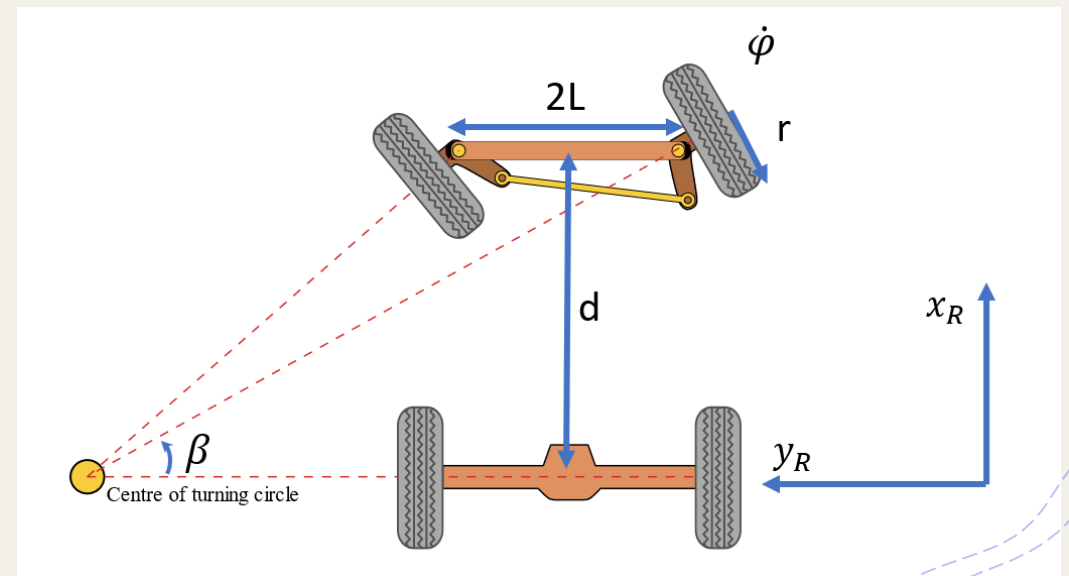
# Detailed methods

+ Navigate to the goal



# Detailed methods - Dynamics of a Truck

Car width  $2L = 16$ , car axle distance  $d = 20$ , wheel diameter  $r = 3$   
Front-right wheel steering angle  $\beta < 40^\circ$ , no wheel speed should be above 20rad/s (in your program, leave these parameters as constants)



# Performance analysis

- + Robot wheel speed and wheel angles control execution efficiency (smoothness of car traveling through the path)
- + Different heuristics, neighbor and  $\mu$  value combinations have different path output, different iteration numbers and different times generation
- + Higher number of iteration means longer wait time for path to generate
- + Different paths cause the tuning of robot navigation speed and angles to change.



# Discussion

- + Depending on the heuristics, neighbor and  $\mu$  combo the path will go thru a wall... the issue is easily fixed by adjusting  $\mu$  or changing heuristics.
- + The car moved slowly depending on the controller settings fine tuning is required depending on the path
- + It performs better or worse (path, time, speed, movement) depending on the set up of all the previously mentioned.

# References:

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