PATH FINDING WITH A*

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INTRODUCTION

Path finding:

- Applications:

GPS

Logistics

Gaming

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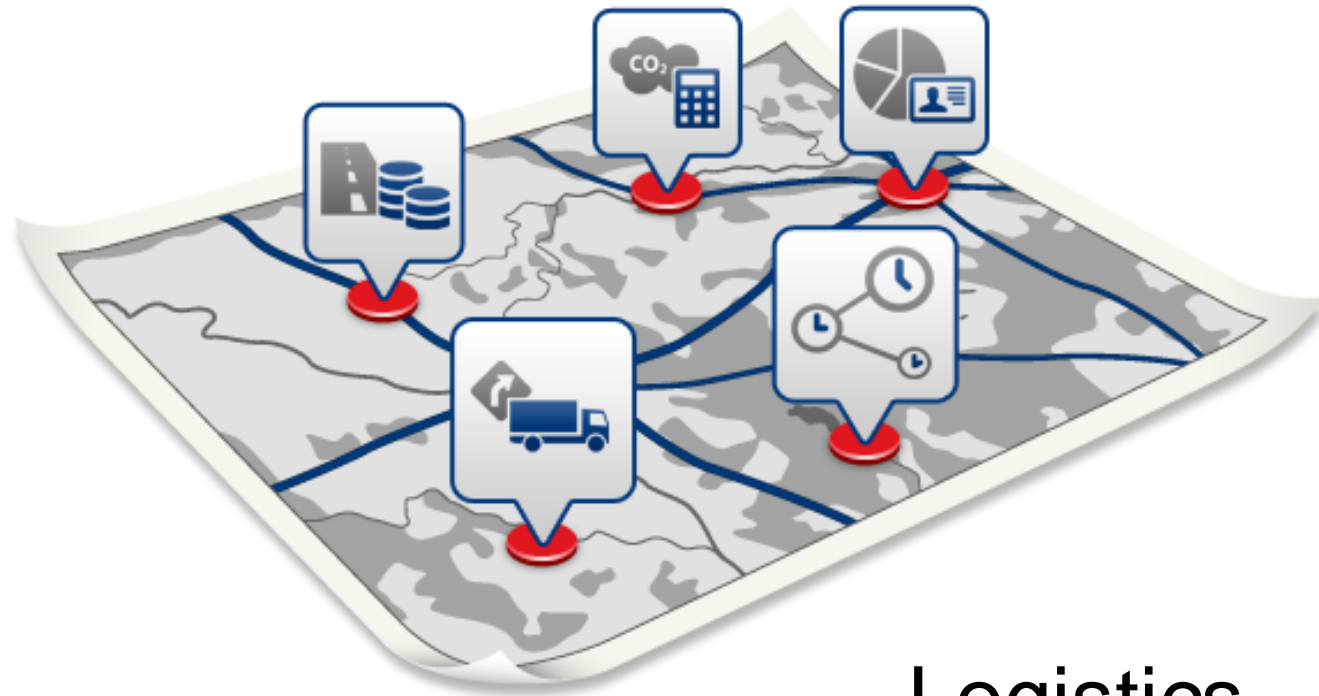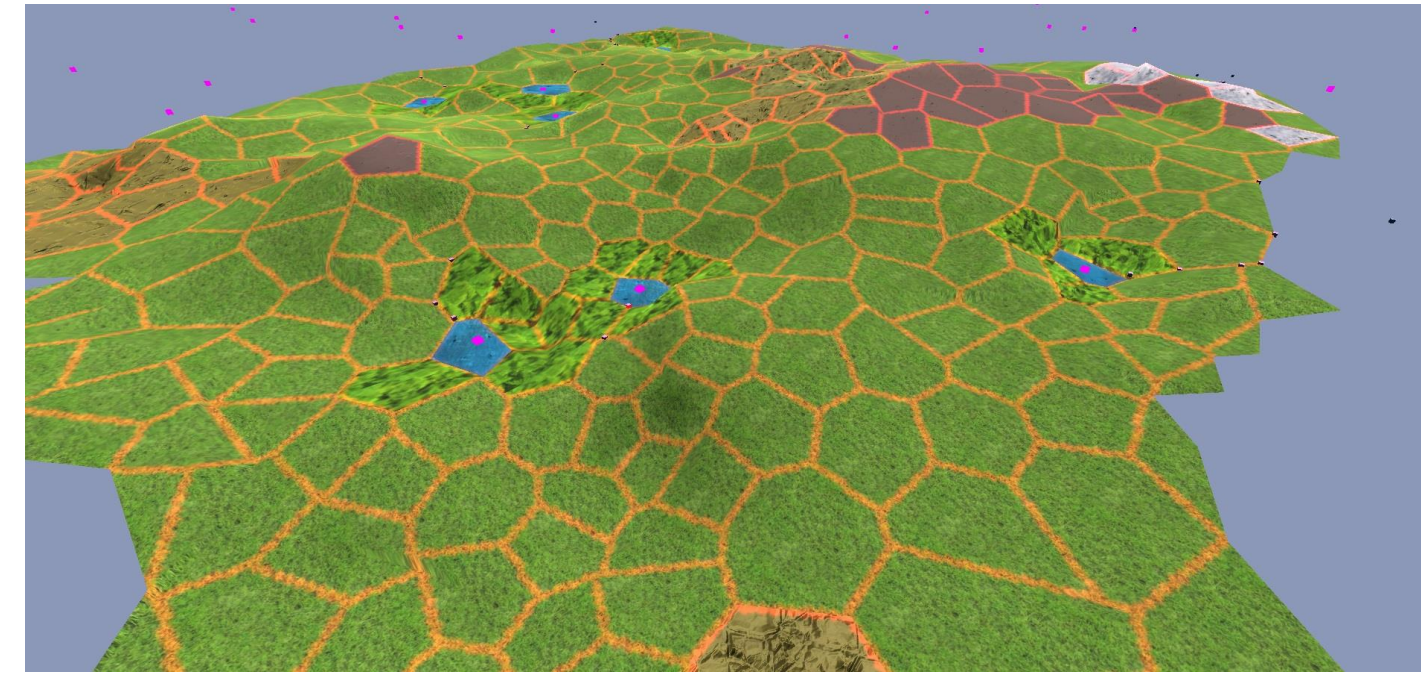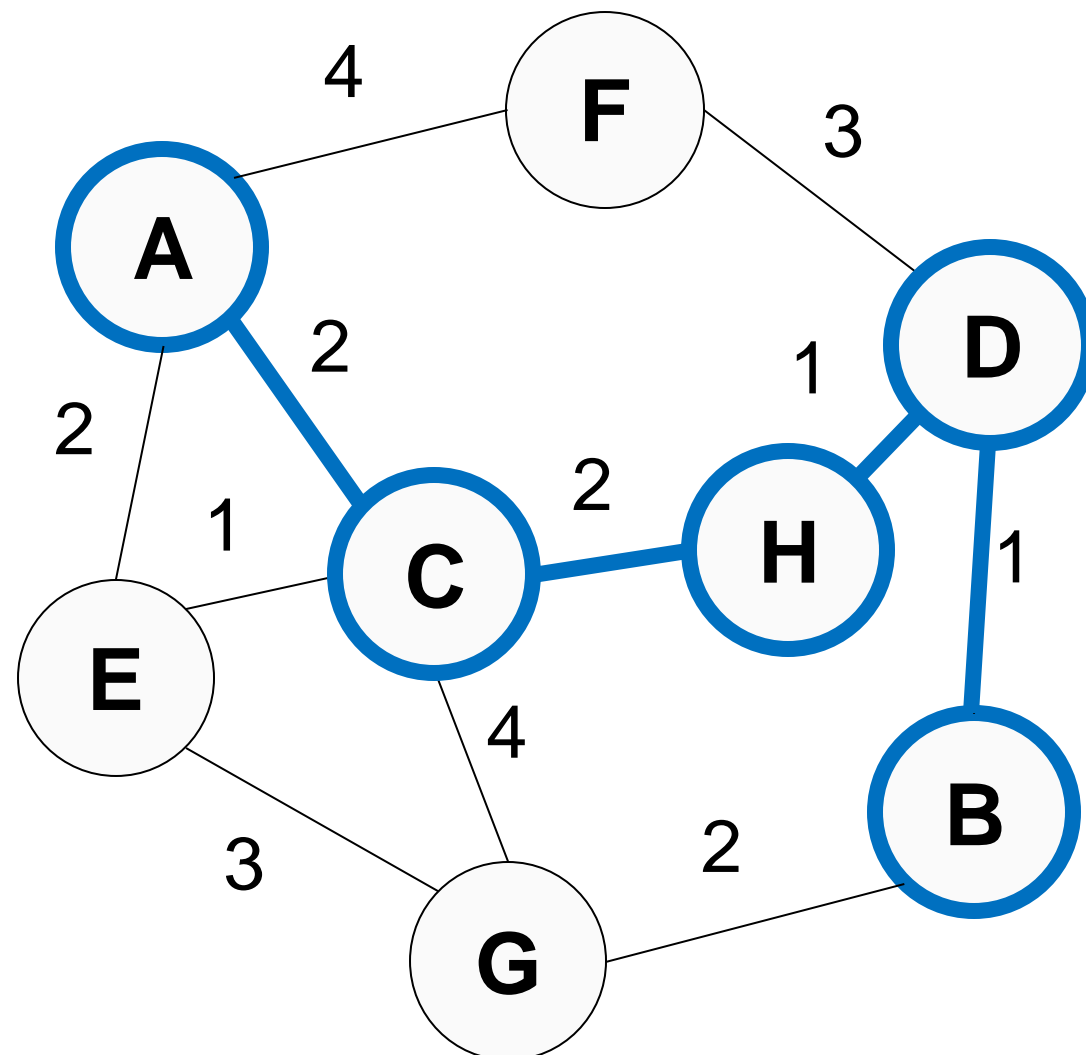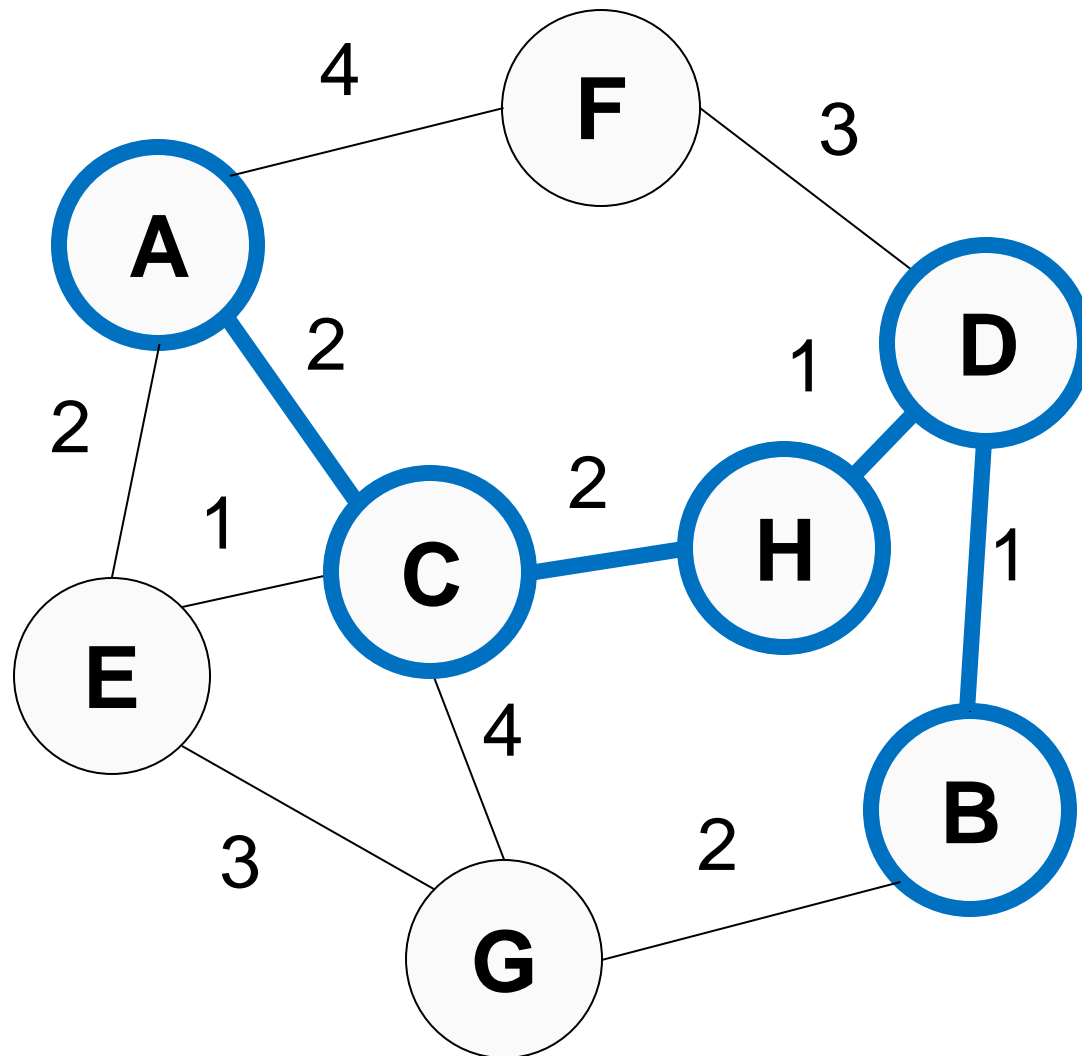
INTRODUCTION

Path finding:

- Problem domains transformed to graphs
- How to get from A to B as efficiently as possible
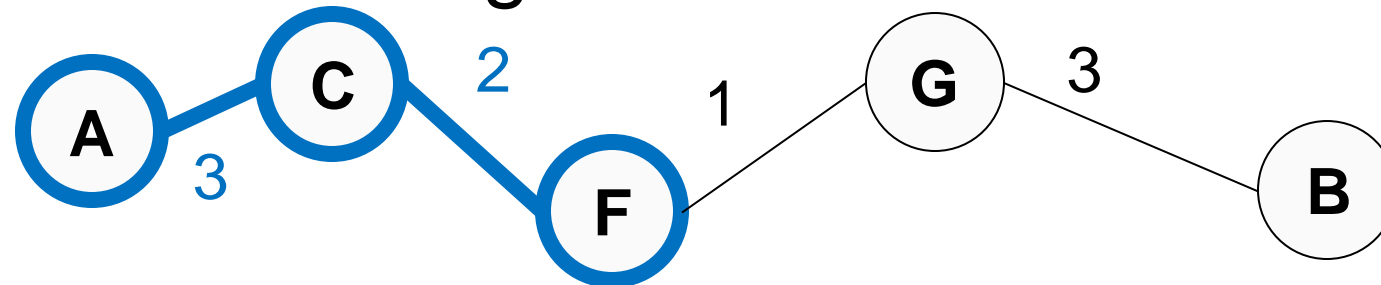- "efficiently" -- path with the smallest edge cost

A* ALGORITHM

- For path finding and graph traversal
  - Finding least-cost path between start and goal node

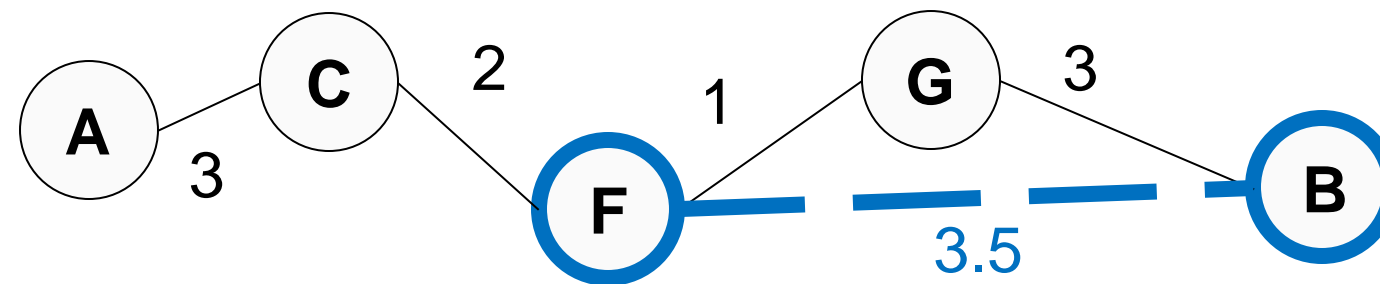- Informed search algorithm => uses heuristics

A* ALGORITHM

Path finding with the A* algorithm:

- $g(n)$: current least cost to get from node A to n

- $h(n)$: heuristic cost to get from node n to B (e.g. Euclidean distance)

- Current cheapest path through n:

$$f(n) = g(n) + h(n)$$
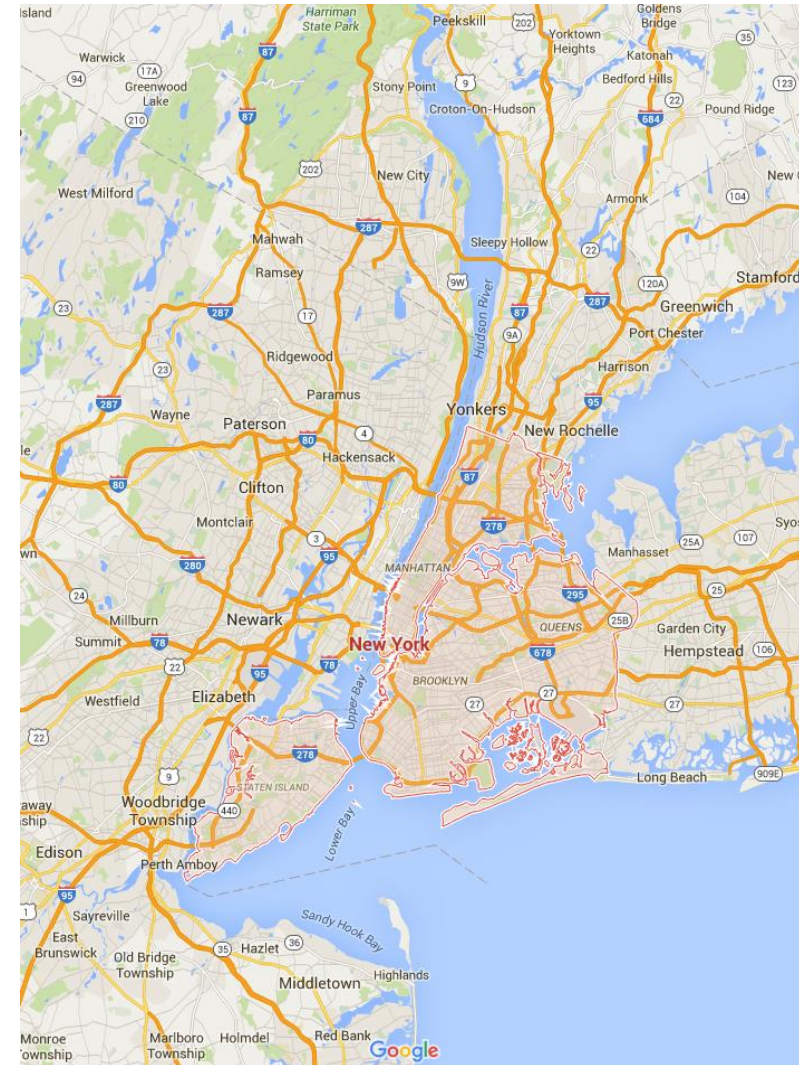
A* ALGORITHM

Path finding with A*:

- Expand non-visited neighbors of node with lowest f-value and check for potential cheaper paths along these neighbors

ASSIGNMENT

Assignment:

- Implement A* in Python
- Shortest path w.r.t. minimal distance / time in a NY street map
- Alternative heuristics

PROGRAMMING IN PYTHON

Python:

- High-level programming language
- Free & open-source
- 'Easy to read' code (Matlab-like)
- Popular in the field of ML & AI

Need to refresh your Python skills?

- Minerva:
  Documents/Practicals/0_Introduction/python_scripts.zip/Python_Basics.ipynb
- or https://developers.google.com/edu/python/

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GETTING STARTED

- Assignment on Minerva: Documents/Practicals/1_A-star_search/a-star.zip

- Edit a_star.py or make a new file (.py or .ipynb)

- You can use Jupyter Notebook, Pycharm, or anything you like

- To import, e.g. a method readGraph() from the file graph.py (that is in the same directory):

```
import graph
graph.readGraph(...)
```

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ASSIGNMENT

Assignment:

- Minerva: Documents/Practicals/1_A-star_search/a-star.zip

- In groups of 2
  - Choose groups on Minerva

- Send questions to
  - ai@lists.ugent.be

- Deadline
  - November 2rd, 2018 (23:59)

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