COMP250: Artificial Intelligence

9: Navigation

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Pathfinding

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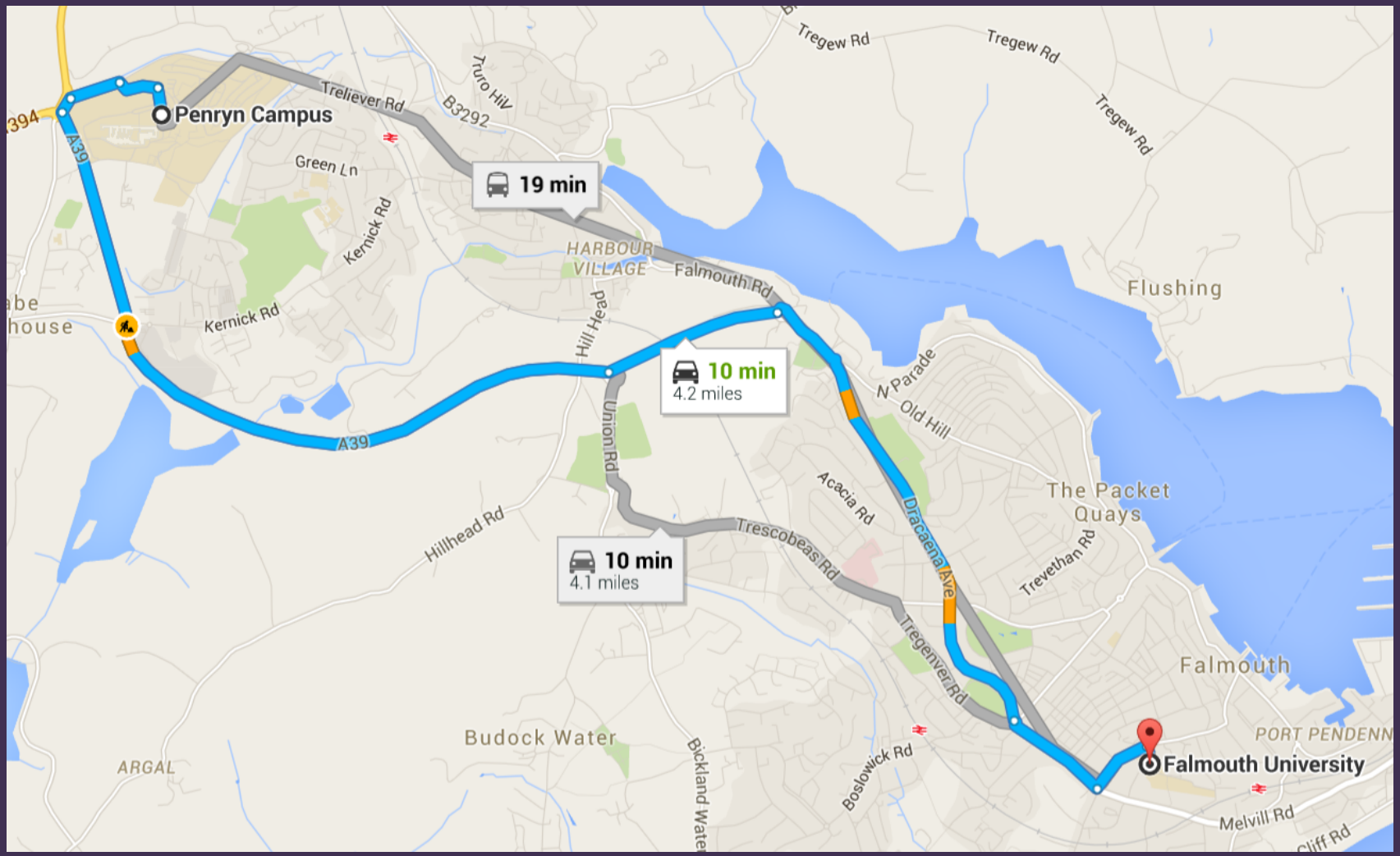
  - "Shortest" in terms of edge lengths — could be distance, time, fuel cost, ...

Applications of pathfinding



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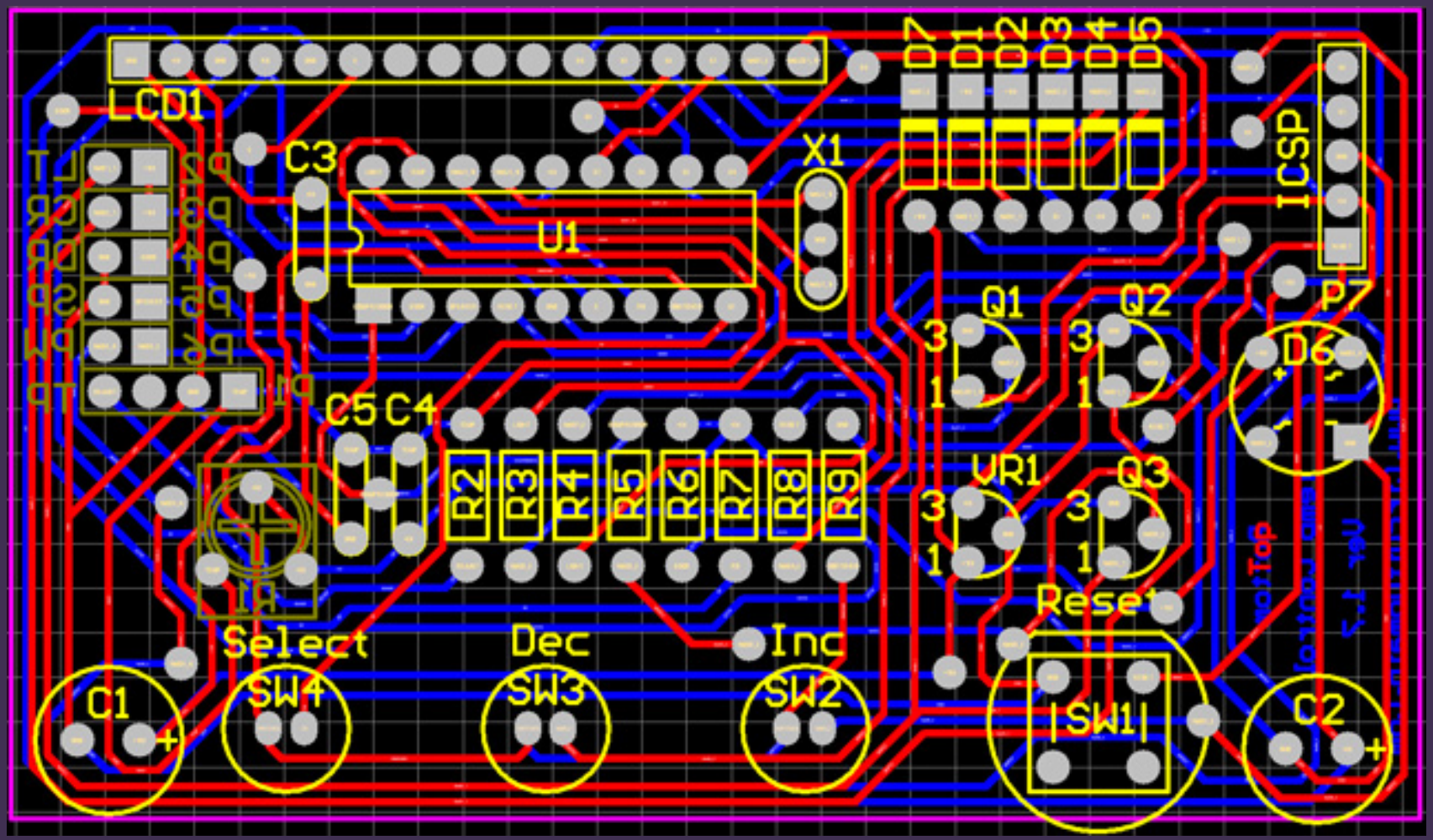

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- Open it in PyCharm

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  - Often implemented with a **priority queue**

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- ... but is not the most efficient algorithm for doing so

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  - Heuristics are often used to prioritise search, i.e. explore the most promising options first

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- Different $h(x)$ can lead to different paths (if there are multiple "shortest" paths)

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  - Repeat until there are no more points that can be removed

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Navigation meshes

Pathfinding in videogames

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- A* works on any **graph**
- But what if the game world is not a graph? E.g. complex 3D environments

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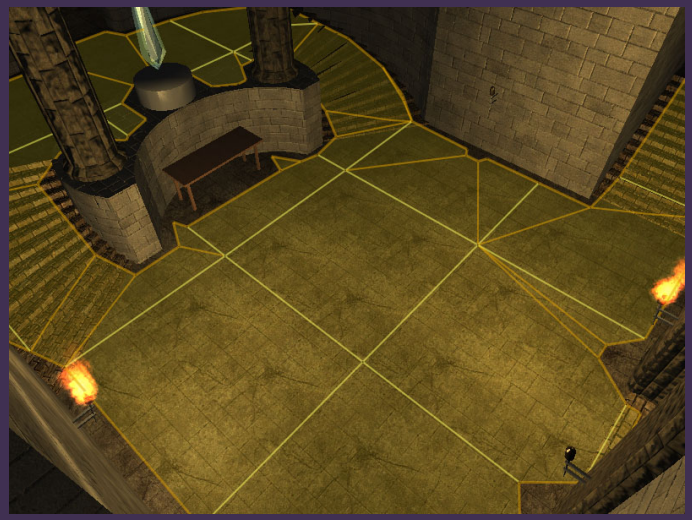

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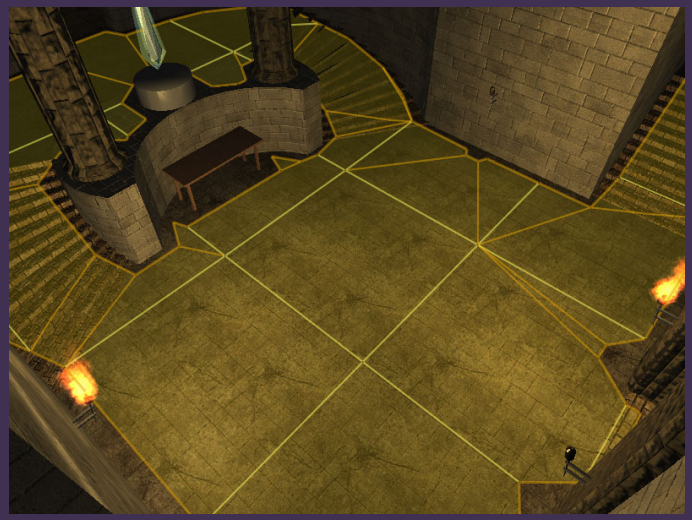

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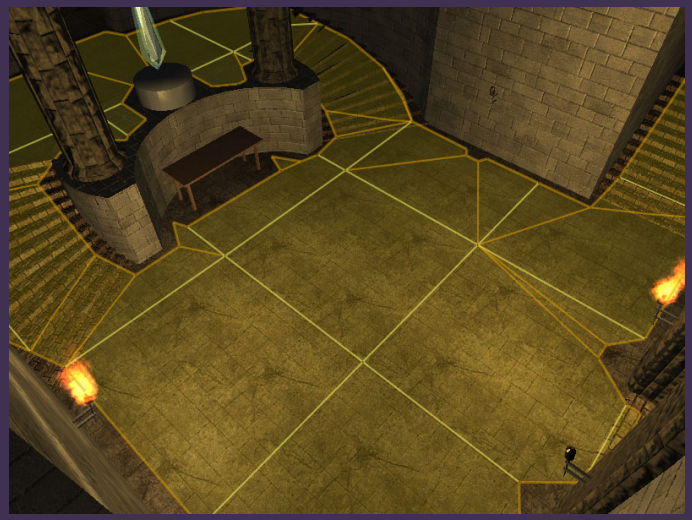

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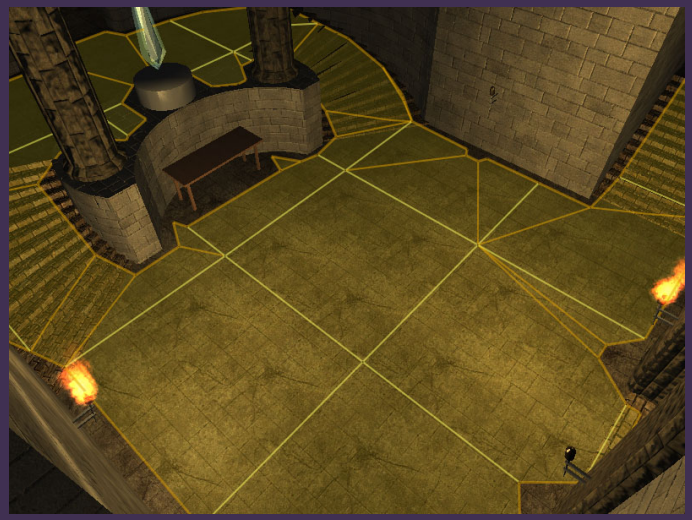

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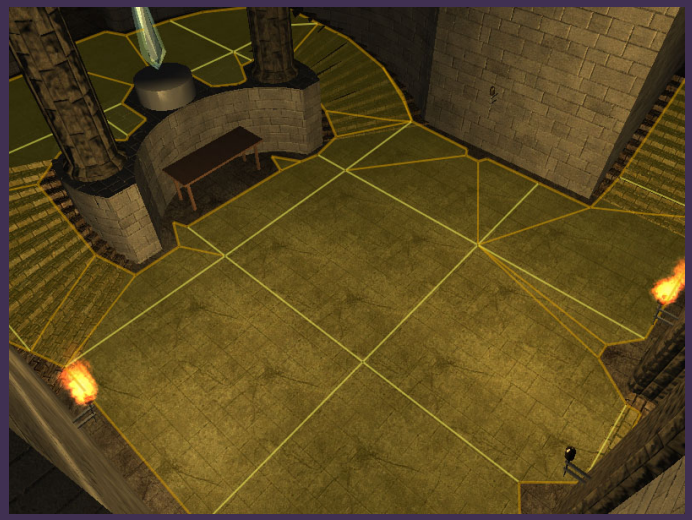

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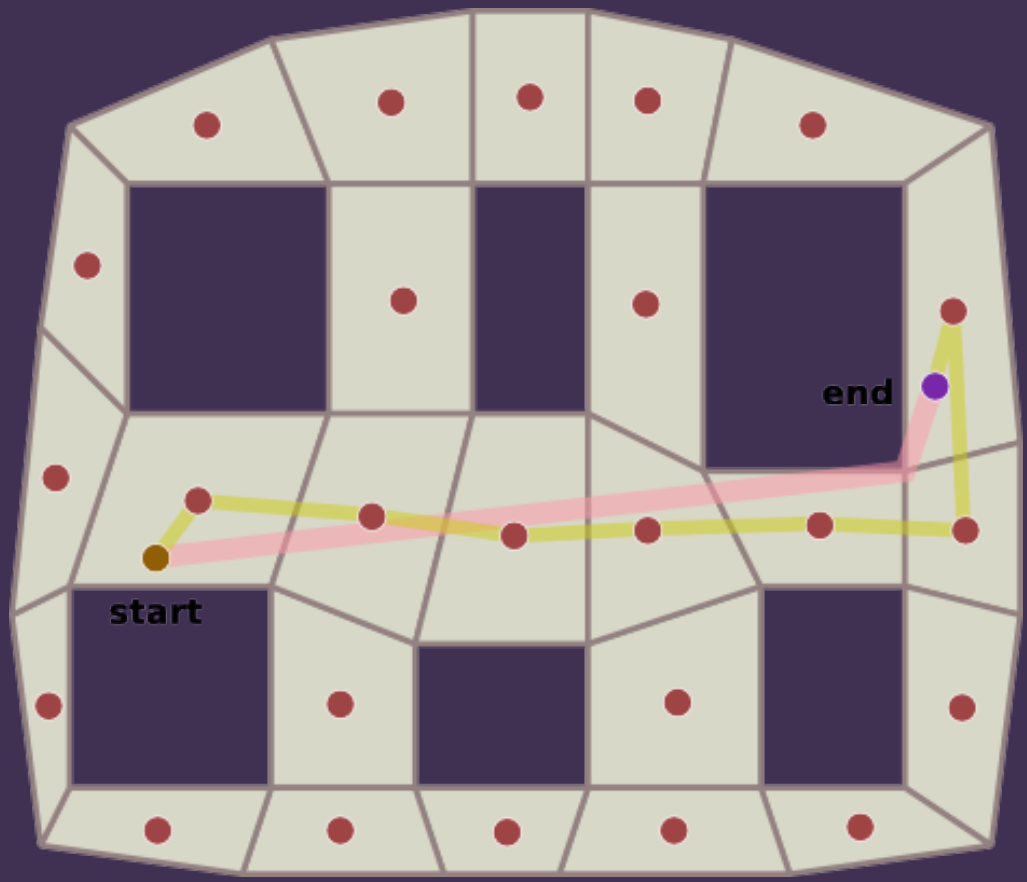
  - Generate graph from polygons

Meshes to graphs



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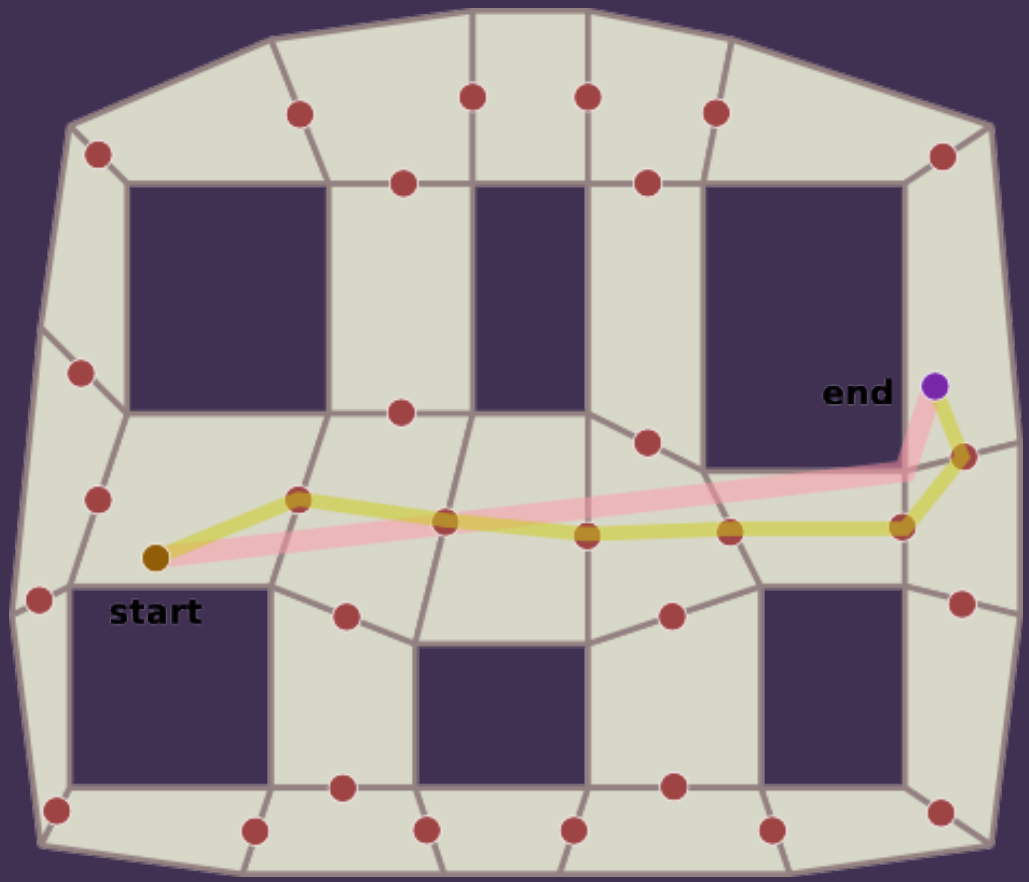

Centres of edges

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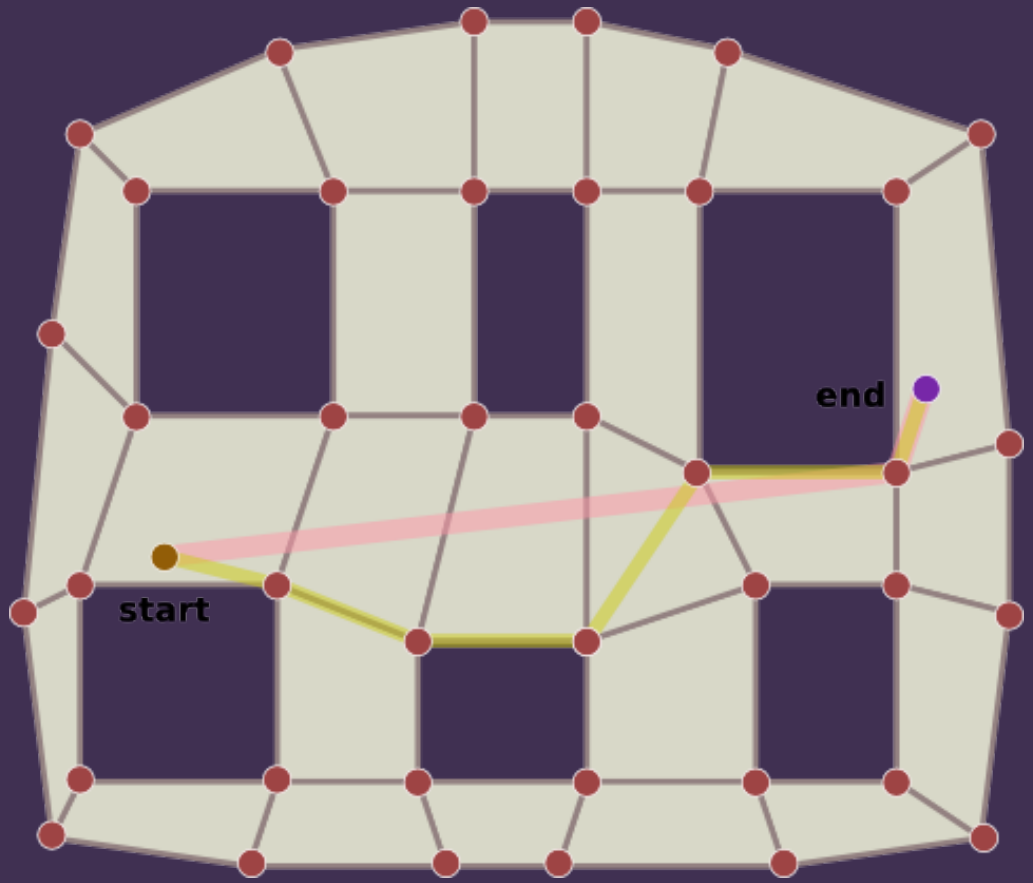

Vertices of polygons

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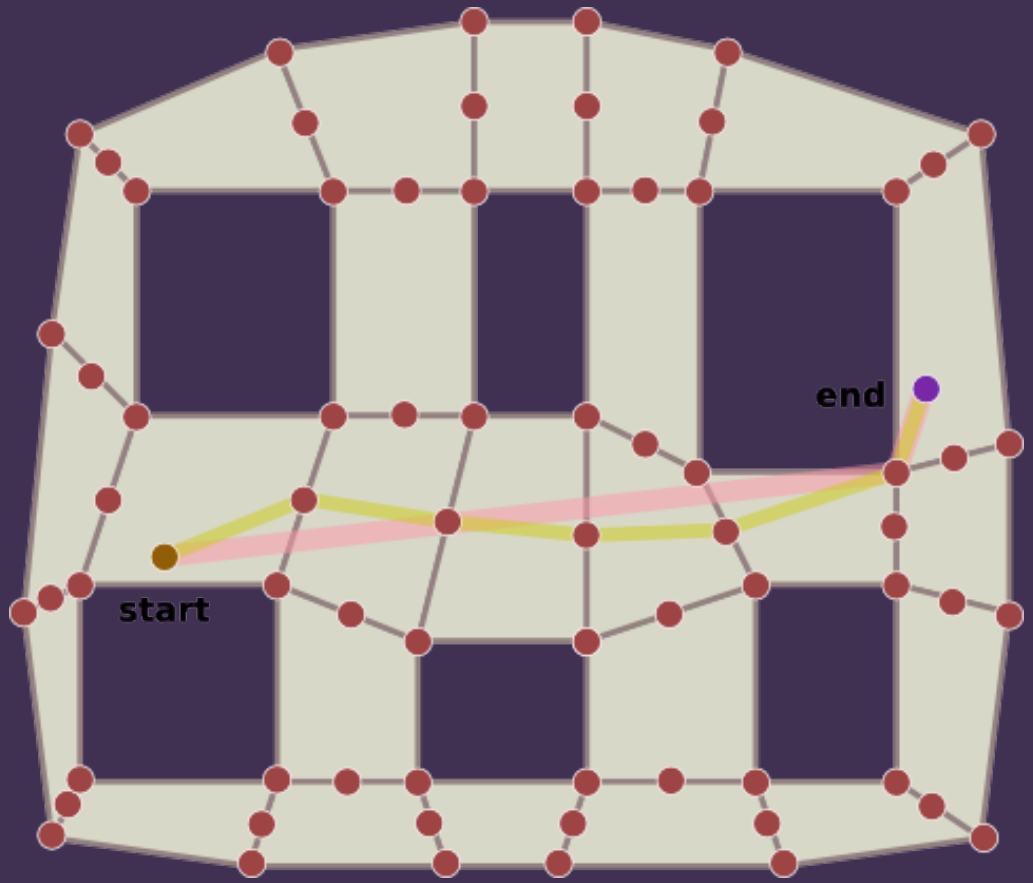

Hybrid approach: edges and vertices

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- **Dynamic environments**: may need to re-run pathfinder if environment changes (e.g. movable obstacles, destructible terrain)

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  - Pub crawls (`http://www.math.uwaterloo.ca/tsp/pubs/`)

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- Entire research field devoted to finding efficient **search algorithms** and **heuristics**

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MicroRTS

Getting started

- We now have **Java** in this room (thanks Paul!) but **Eclipse** needs to be installed per-user
- Download from `https://www.eclipse.org/downloads/`
- Run the installer
- Select **Eclipse IDE for Java Developers**
- Set the installation folder to somewhere on the `D:` drive, for example `D:\eclipse`
- Now go to `https://github.com/falmouth-games-academy/comp250-bot` and follow the instructions