COMP702: Classical Artificial Intelligence

7: Navigation

Paper Club

For next week's session:
Nathan R. Sturtevant, Devon Sigurdson, Bjorn Taylor, Tim Gibson. Pathfinding and Abstraction with Dynamic Terrain Costs. Proceedings of AIIDE Conference, 2019.
(PDF link on LearningSpace)

FALMOUTH UNIVERSITY

Pathfinding

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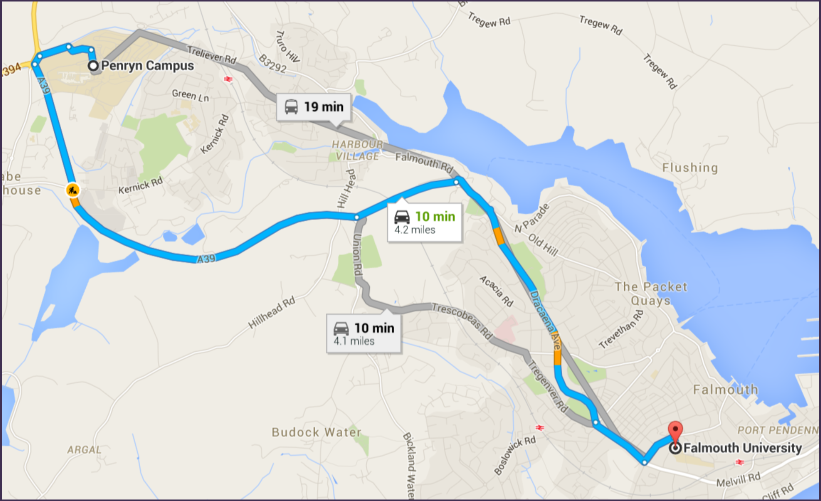
  - "Shortest" in terms of edge lengths — could be distance, time, fuel cost, ...

Applications of pathfinding



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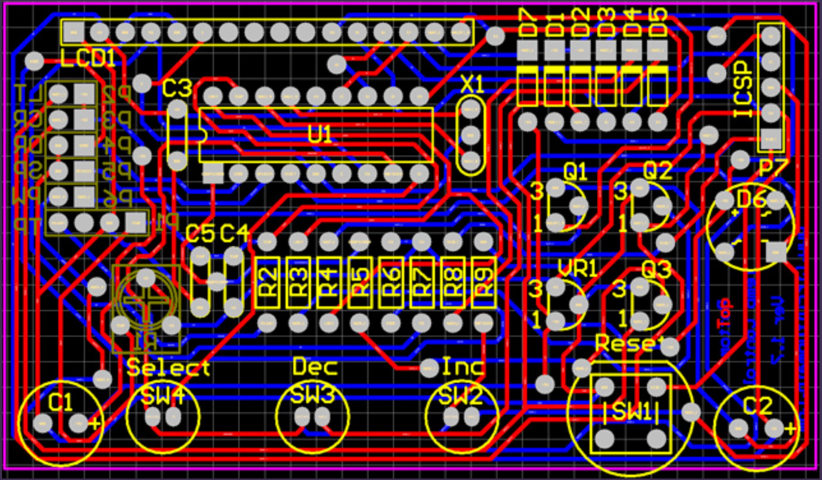

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    - Often implemented with a **priority queue**

Greedy search

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- **Is** guaranteed to find the shortest path
- ... 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

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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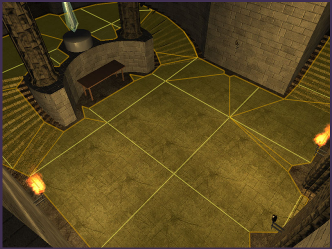

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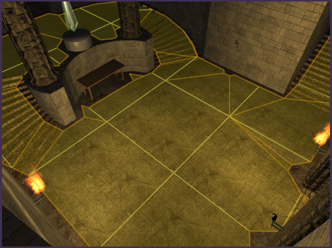

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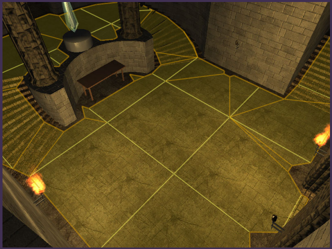

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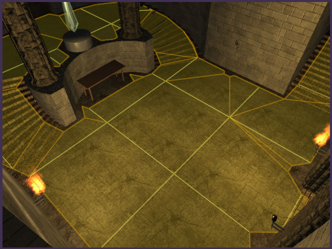

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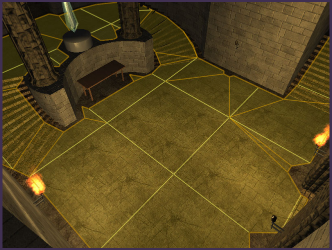

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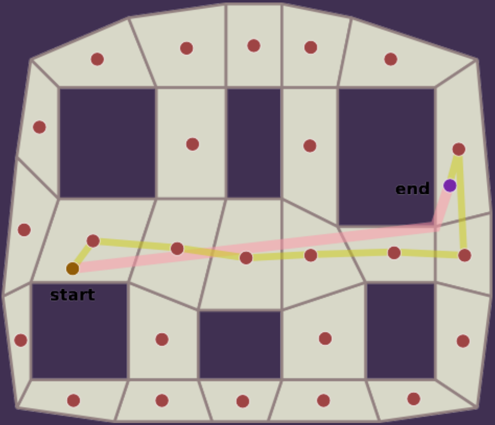
  - Generate graph from polygons

Meshes to graphs



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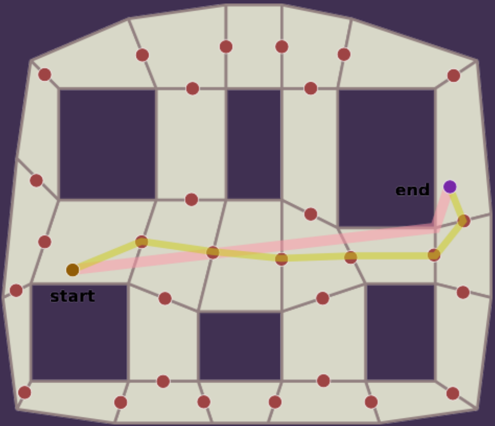

Centres of edges

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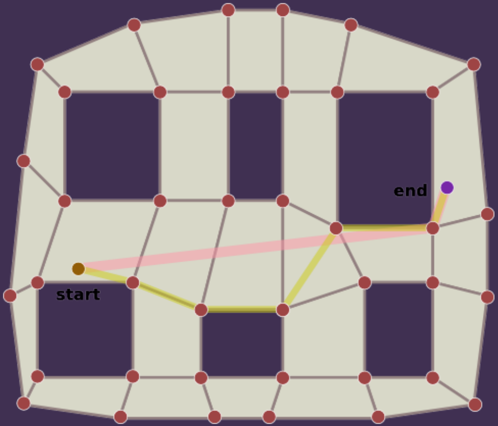
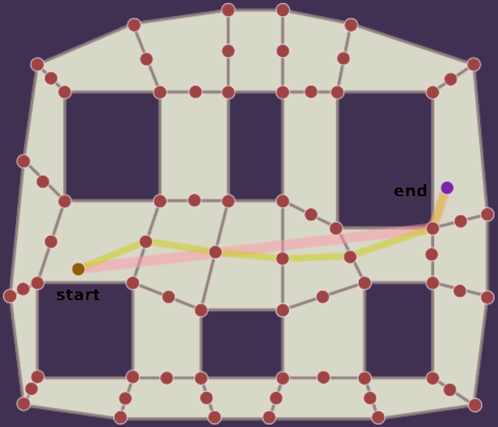


Vertices of polygons

Meshes to graphs



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)