AQA Computer Science A-Level

4.3.6 Optimisation algorithm

Concise Notes

Specification:

4.3.6.1 Dijkstra’s shortest path algorithm

Understand and be able to trace Dijkstra’s shortest path algorithm

Be aware of applications of shortest path algorithm

Optimisation Algorithms

- Find the best possible solution to the problem posed
- The only optimisation algorithm that you must be aware of is Dijkstra's (pronounced dyke-struh's) algorithm

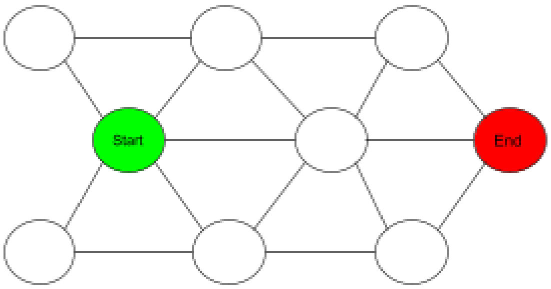
Dijkstra's Algorithm

- Finds the shortest path from a starting node to every other node in a network
- Is similar to the breadth-first search algorithm, but keeps track of visited nodes with a priority queue rather than a standard queue
- These points may be modelled as nodes in a weighted graph
- Used in satellite navigation systems to find the shortest route between locations
- Used in routers to send packets via the fastest route through a network

Dijkstra's Algorithm Overview:

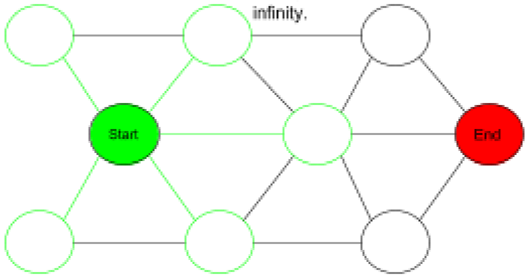
Step 1

Select Start and End nodes



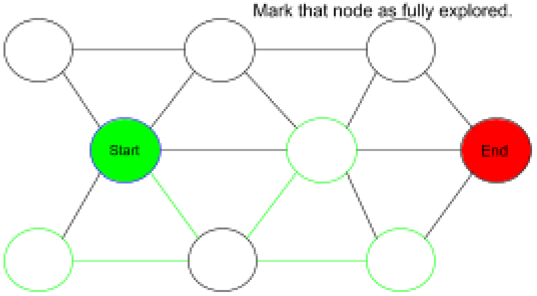
Step 2

Make note of the distances of the nodes from the start position. At this point, only the nodes connected to start will have a value, the others will have a distance of infinity.



Step 3

Note the start node as fully explored. Choose the node closest to the start node, and update the table to reflect the shortest distance from A to each node. Mark that node as fully explored.



Step 4

Repeat step 3, always selecting the node the shortest distance from A which hasn't been fully explored. Continue until each node has been fully explored (and hence each edge).