

Assignment: Graphs and Algorithms

Background:

For general understanding: [https://en.wikipedia.org/wiki/Node_\(computer_science\)](https://en.wikipedia.org/wiki/Node_(computer_science))

OSPF - Computer Network (3sem bog) chap 5.2 (se Moodle)

A-star example of coding:

- <https://www.codeproject.com/Articles/15307/A-algorithm-implementation-in-C>
- <https://github.com/valantonini/AStar>

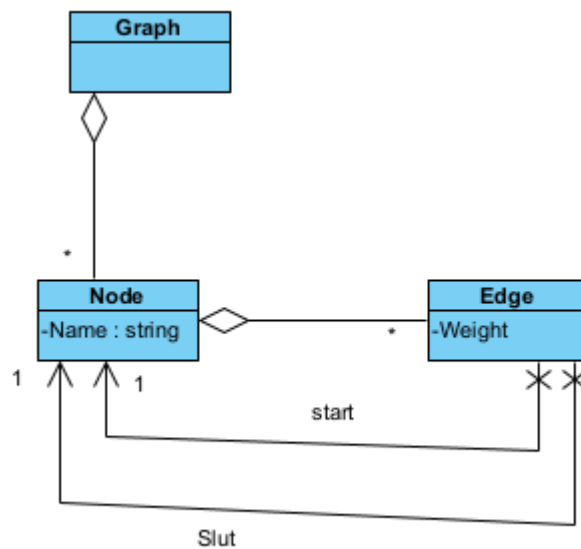
C# implementation of A-star: <https://pele-easj.dk/2024e-ASWC/exercises/Astar.cs>

Part 1: design and implement a data structure to hold a graph

You can define a structure yourself that can support:

Graph ----> * Node -----> * Link

Or possible implement following DCD:



part 2: insert values in the specific graph

Make a graph i.e. with these values:

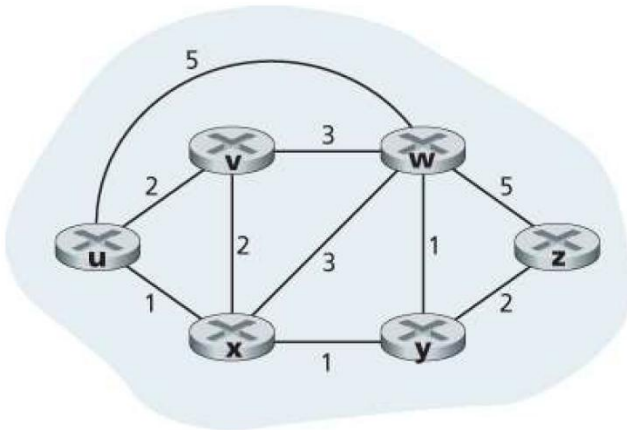


Figure 5.3 Abstract graph model of a computer network

Part 3: Design and implement a class to handle OSPF algorithm 'OSPFAlg'

Create a class OSPFAlg that takes a graph object in the constructor.

Create a method DoOSPF(Node startNode) that finds the shortest paths from the start node to all the other nodes (calculates OSPF – or spans a minimal spanning tree).

Use the algorithm from the note or from wikipedia https://en.wikipedia.org/wiki/Dijkstra%27s_algorithm

Part 4: Design and implement a class to handle AStar-algorithm 'AstarAlg'

The easiest thing is to make a specialization of the Node class, e.g. AStarNode, which contains a position (x,y)

Also make a class Heuristica that can estimate the distance from a node to a specific end node

Create a class AstarAlg that takes a graph object in the constructor.

Create a method DoAStar(Node startNode, Node EndNode), which finds the shortest paths from the start node to the end node.

Use Wikipedia if necessary https://en.wikipedia.org/wiki/A*_search_algorithm or this implementation [AStar.cs](#)