COMP20003 Algorithms and Data Structures

Worksheet 10

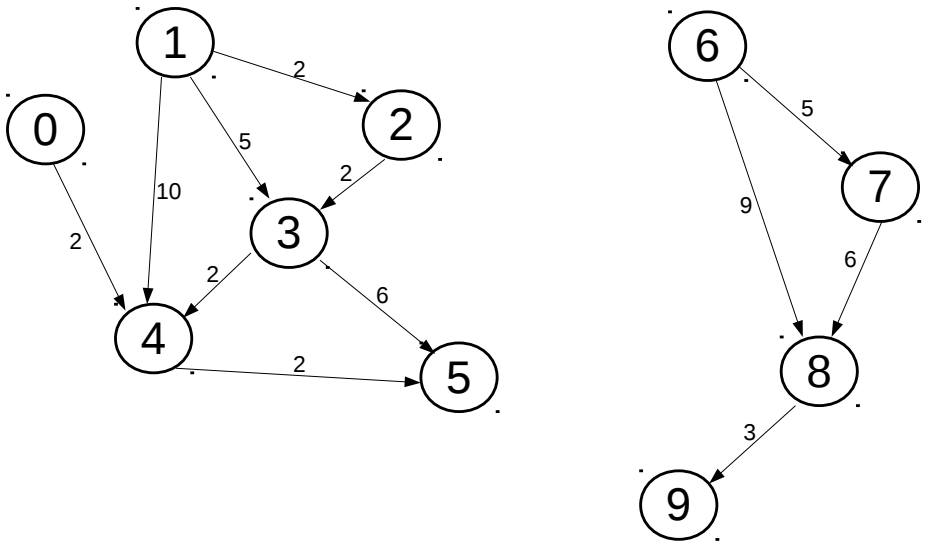
[week starting 10 of October]

Second (Spring) Semester 2016

Overview

The workshop for Week 11 will start with a tutorial on All pairs shortes paths, and optionally implement it.

Tutorial Questions



Question 11.1

1. Draw the matrix representation of the graph above.
2. Trace the operation of the Floyd-Warshall algorithm on this graph, to get the shortest paths between all pairs of vertices.
3. Does the order in which the vertices are examined affect the operation of the algorithm? Change the numbering of the vertices (but not the weights) as indicated below and retrace the algorithm. You should end up with the same result. Have any of the intermediate steps changed?

```
Old vertex number 3, rename to 5
Old vertex number 4, rename to 3
Old vertex number 5, rename to 4
Old vertex number 6, rename to 7
Old vertex number 7, rename to 9
Old vertex number 9, rename to 6
```

4. Does the Floyd-Warshall algorithm work on graphs where there are negative weights? justify your answer.

5. Given a sparse graph represented as an adjacency list, how would you approach the all pairs shortest paths problem? Does this differ from the approach you would take fo a dense graph represented as a matrix? Compare the computational complexity of the two approaches.

Programming exercises

Programming 11.1 You can use the laboratory time to implement the Floyd-Warshall algorithm, and test it on the graph you have just worked within the tutorial.

October 7, 2016