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Lab Assignment: Time Management I

Background

Please complete these lab assignments on your own, in class, on the day of the lecture. Assignments are self-graded. Exam questions will be similar to assignment questions.

Graph Hayastan

Consider the following graph specification:

G = { V, E }

V = { v | v is the main city of an Armenian region }

E = { (u, v) | u, $v \in$ V Λ the region containing u and the region containing v share a common border }

Draw the graph.

Minimum Spanning Tree

Augment this graph with weights. Consider the graph:

G = same as above.

V = same as above.

E = { (u, v, w) | u, v same as before, w = the distance in kilometers between u and v }

What is the minimum spanning tree? In other words, what is the tree that connects all vertices in the graph yet has the shortest distance? Google Dykstra's algorithm to learn how to compute a minimum spanning tree.

Network Flow Graph

For the graph on page 14 in the lecture slides, compute the answer to all questions asked.

To answer the optimum path question, assume weight and time are equivalent, e.g. the edge *AB* and *AC* both have the same total cost.

On the optimum path question, suppose time is twice as expensive as weight, meaning the edge *AB* has a cost of seven ($1 + 2 \times 3$) but the edge *AC* has a cost of 6 ($2 + 2 \times 2$). Now what is the optimum path?

Extra Credit

Using the weighted graph, prove or disprove mathematically the assertion that Gyumri is the center of Armenia, if not the universe. Hint: assume Gyumri is a source.