



Design and Analysis of Algorithms (COM336)

1st Semester 2024/2025

Project # 3

Due Date: 04/01/2025

Dijkstra's algorithm

In this project you will use Dijkstra's algorithm to find route information between two cities chosen by the user. The user will be shown a route that results in the shortest path.

Maps. For this assignment we will be working with maps, or graphs whose vertices are points in the plane and are connected by edges whose weights are Euclidean distances. Think of the vertices as cities and the edges as roads connected to them. To represent a map in a file, we list the number of vertices and edges, then list the vertices (index followed by its x and y coordinates, price, and time), then list the edges (pairs of vertices. For example, represents the map below:

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Country1 1000 2400

Country 2 2800 3000

Country 3 2400 2500

Country 4 4000 0

Country 5 4500 3800

Country 6 6000 1500

Country 1 Country 2 500\$ 120 min

Country 1 Country 4 350\$ 90 min

Country 2 Country 3 750\$ 245 min

Country 2 Country 5 378\$ 110 min

Country 3 Country 5 1050\$ 320 min

Country 3 Country 4 459\$ 145 min

Country 3 Country 6 528\$ 186 min

Country 4 Country 6 630\$ 190 min

Country 5 Country 6 230\$ 85 min



Project Overview:

Objective: Develop a system to optimize air traffic routes between the world's capitals, minimizing travel time and costs using Dijkstra's algorithm.

Key Components

1. Data Collection:

- Gather data on all world capitals, including their geographical coordinates (Real Values).
- Collect information on existing flight routes, distances, and average travel times between these capitals.

2. Graph Representation:

- Represent the network of capitals as a graph where each capital is a node.
- Edges between nodes represent direct flight routes, weighted by factors like distance, travel time, or cost.

3. Dijkstra's Algorithm:

- Implement Dijkstra's algorithm to find the shortest path between any two capitals , Lowest price, or shortest travel time..
- The algorithm will consider the weights of the edges to determine the optimal route.

4. User Interface:

- Develop a user-friendly interface where users can input their starting and destination capitals.
- Display the optimal route, including total travel time, and estimated cost.

5. Additional Features:


- Options to prioritize different factors (e.g., shortest time, lowest cost).
- Visualization of the air traffic network on a world map.

Input: Countries of the world

Map: World Map

Output: Show the route on the map

Example for interface:



The interface consists of a world map on the left and a control panel on the right. The map shows various countries with labels such as United States, Canada, Mexico, Brazil, Russia, China, India, and Australia. The control panel on the right includes:

- Source:
- Target:
- Filter:
- Path: Run
- Distance:
- Cost:
- Time:

Notes:

1. You have to choose the country through mouse or keyboard.
2. The path should appear also on the map.
3. Your project should include at **least 50 countries with real data**.