AED 2223 - Group 12

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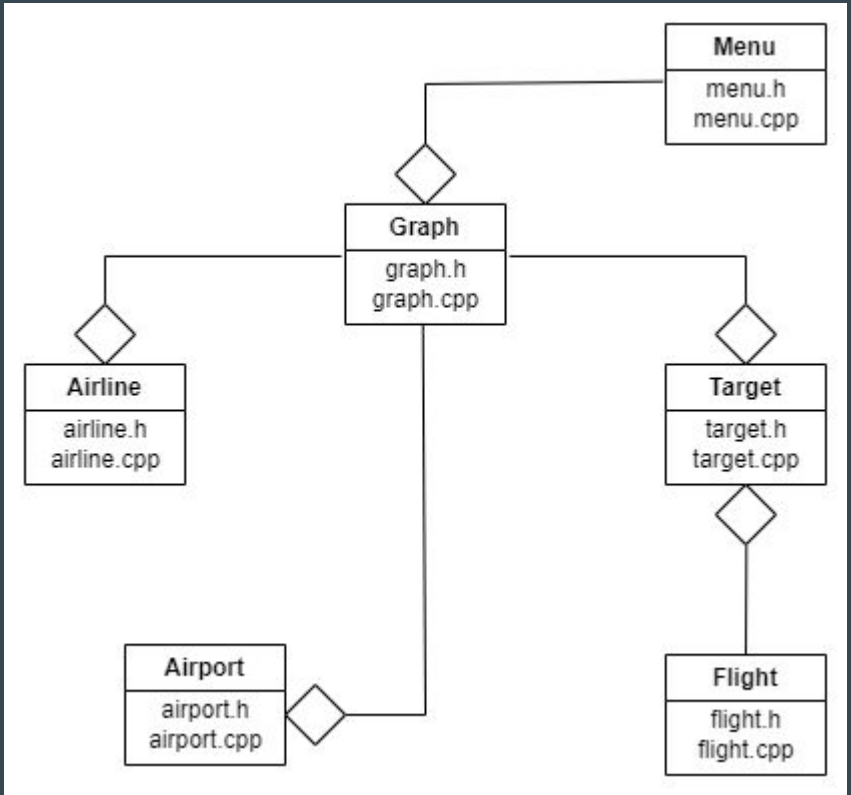
Class diagram



Dataset reading description

Firstly, we read the airports.csv to find all the cities that have a duplicate(another city with the same name) in another country

After that we began to store the values.

When reading the file airports.csv we created an unordered map with airport codes as keys and it's Airport object as value

When reading the file airlines.csv we created an unordered map with airport codes as keys and it's Airline object as value

When reading the file flights.csv we created an unic graph for flights

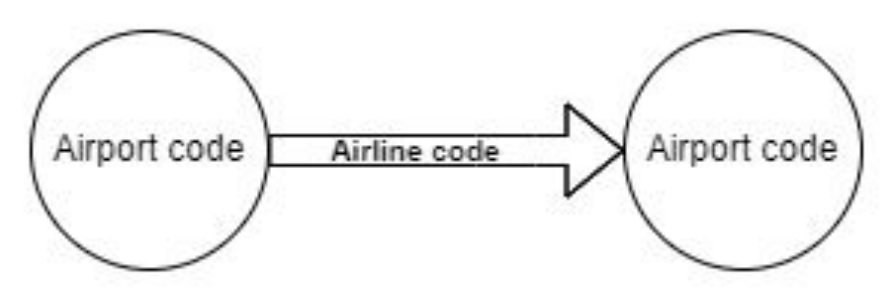
Graph description

This is how we created the graph:

Airport codes are Nodes

Flights are Edges

Airlines codes are labels for edges



Graph data

```
Global number of Airports: 3019
Global number of Airlines: 444
Global number of flights: 63832
```

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List of implemented features and it's associated algorithms

- Path with lowest flight number between city, airport, country or coordinates

  Complex: O(num1 * num2 * (V + E)) num1 - number of airports from, num2 - number of airports to
  Associated algorithms - BFS

- Path with fewest airline change between airports

  Complex: O(number of all airlines * (V + E))
  Associated algorithms - Mix of BFS and DFS

- Shortest path in distance between coordinates

  O(num1 * (V + E)) num1 - number of all airlines

*We only have one graph

*We can list all possibilities

*We can use specific airlines to search

*We have several sorting options

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List of implemented features and it's associated graphs

- Network diameter

  Complex: O(V * (V + E))

  Associated algorithms - BFS

- Articulation points

  Complex: O(V * (V + E))

  Associated algorithms - DFS

- List all possible destinations with an certain flight number from an specific airport

  Complex: O (V + E)
  Associated algorithms: BFS

Other features

1. Lock/Unlock airports or cities
2. List and count airlines and flights from an airport
3. List and count all airports an airline operates in
4. Global statistics(flight, airline and airports number)
5. Rank airports according to user choice
6. Statistics for country

User interface

```
|=============================================================================================|
|                   Path                        |                   Airports                  |
|===============================================|=============================================|
| Path with lowest flight number         [11] | Get information from specific Airport  [21] |
| Path with fewest airline change        [12] |                                             |
| Shortest path(distance) between points [13] |                                             |
| Change searching settings              [14] |                                             |
|                                               |                                             |
|===============================================|=============================================|
|                 Airlines                      |                   Network                   |
|===============================================|=============================================|
| Get Airline information                [31] | Get network info                       [41] |
|                                               | Get country statistics                 [42] |
|                                               |                                             |
|===============================================|=============================================|
|               Other operations                |
|===============================================|
|  Exit                                   [0] |
|===============================================|

Please choose an option:
```

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User interface

```
China
 |-----Beijing
        |-----Capital Intl: (PEK)

Spain
 |-----Madrid
        |-----Barajas: (MAD)

Canada
 |-----Toronto
        |-----Lester B Pearson Intl: (YYZ)

Germany
 |-----Frankfurt
        |-----Frankfurt Main: (FRA)
 |-----Munich
        |-----Franz Josef Strauss: (MUC)

Number of flights: 333
Number of Airports: 73
Number of countries: 18
Number of cities: 70
```

```
Different destinations:
Germany
|-----Frankfurt
      |------FRA

United States
|-----Miami
      |------MIA

Portugal
|-----Lisbon
      |------LIS

Brazil
|-----Sao Paulo
      |------GRU
|-----Rio De Janeiro
      |------GIG
|-----Brasilia
      |------BSB
|-----Campinas
      |------VCP
```

```
REC--(TAP)-->LIS--(RYR)-->OPO | 6134.32Km total distance | 1 airline changes
REC--(TAP)-->LIS--(RZO)-->OPO | 6134.32Km total distance | 1 airline changes
REC--(TAP)-->LIS--(TAP)-->OPO | 6134.32Km total distance | 0 airline changes
REC--(TAP)-->LIS--(USA)-->OPO | 6134.32Km total distance | 1 airline changes
REC--(CFG)-->FRA--(DLH)-->OPO | 9358Km total distance | 1 airline changes
REC--(CFG)-->FRA--(TAP)-->OPO | 9358Km total distance | 1 airline changes
REC--(CIX)-->GIG--(TAP)-->OPO | 9823.61Km total distance | 1 airline changes
REC--(TAM)-->GIG--(TAP)-->OPO | 9823.61Km total distance | 1 airline changes
REC--(ONE)-->GIG--(TAP)-->OPO | 9823.61Km total distance | 1 airline changes
REC--(AZU)-->GRU--(TAP)-->OPO | 10279.9Km total distance | 1 airline changes
REC--(CIX)-->GRU--(TAP)-->OPO | 10279.9Km total distance | 1 airline changes
REC--(TAM)-->GRU--(TAP)-->OPO | 10279.9Km total distance | 1 airline changes
REC--(ONE)-->GRU--(TAP)-->OPO | 10279.9Km total distance | 1 airline changes
```

Main difficulties and special features

Our main difficulty were analyzing data (receiving input of cities with the same name in different countries), understanding what was the expected result, and testing our results

A special feature was to search path with fewest airline changes between two airports

Also we created a way to lock and unlock airports and cities in case the user can't pass through there

Effort of each member of the group and hardest part

Ian Beltrão - 50%

Mansur Mustafin - 50%