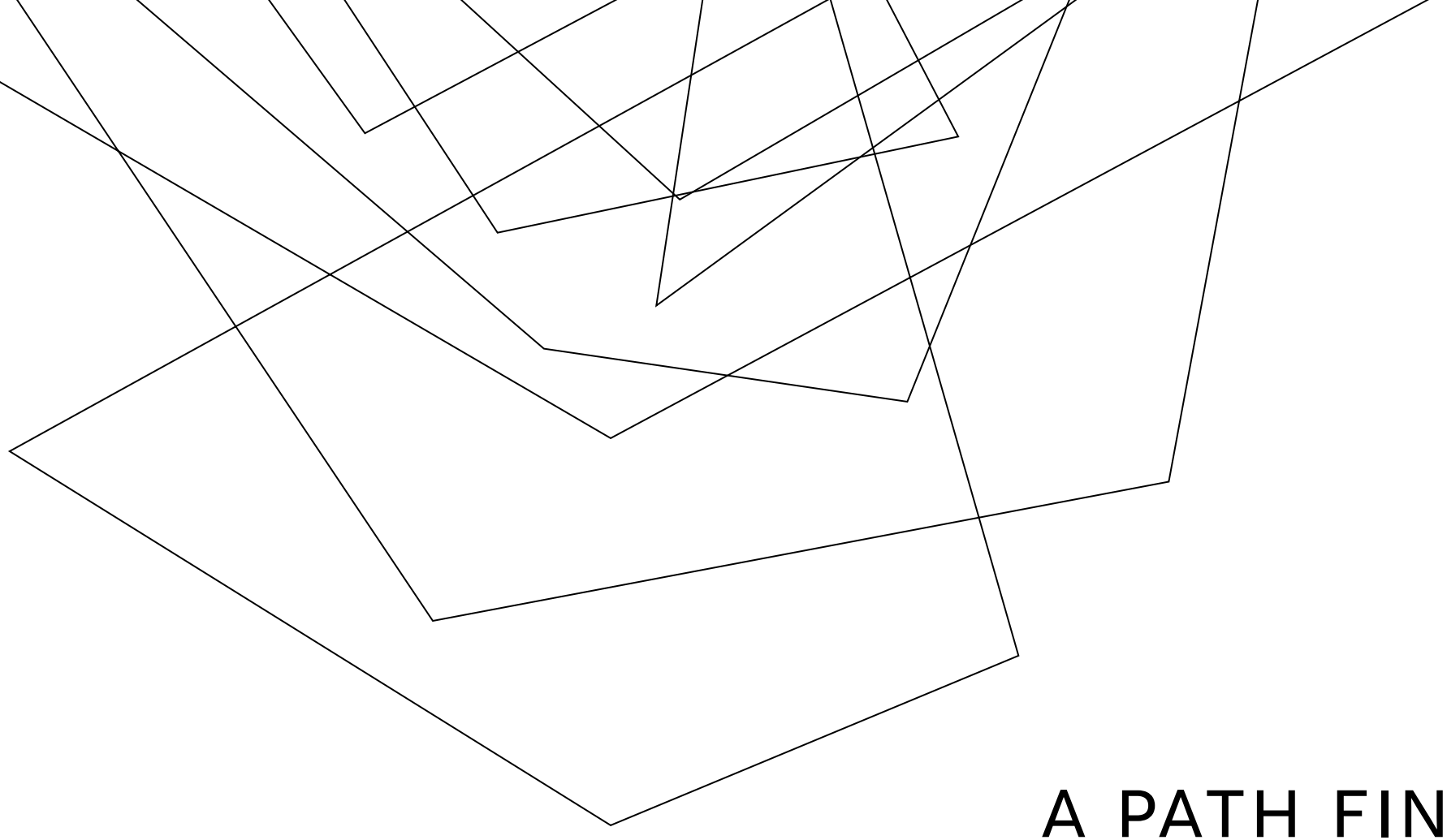

A PATH FINDING SYSTEM DONE BY

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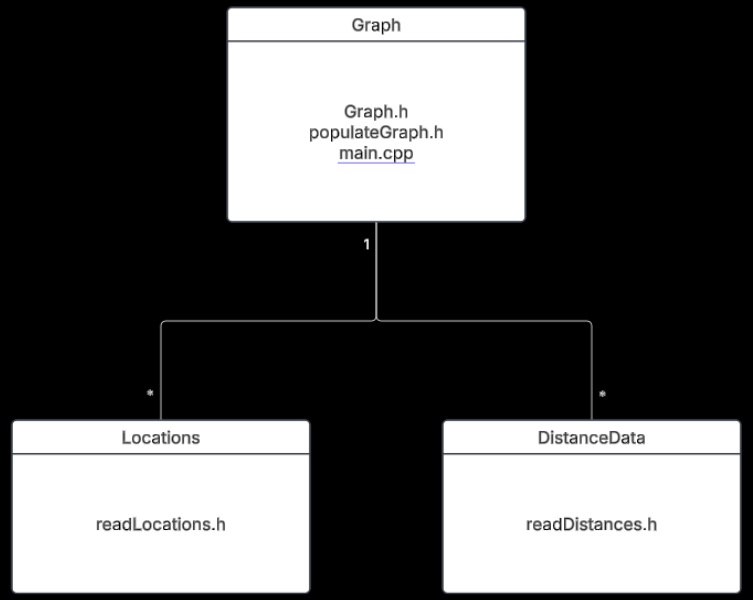
CLASS DIAGRAM

Our program has only 1 class, Graph and 2 structs location and DistanceData, making it's class diagram very simple



READING THE DATASET

We parse the CSV files line by line

And stream that line to get the desired locations and distances

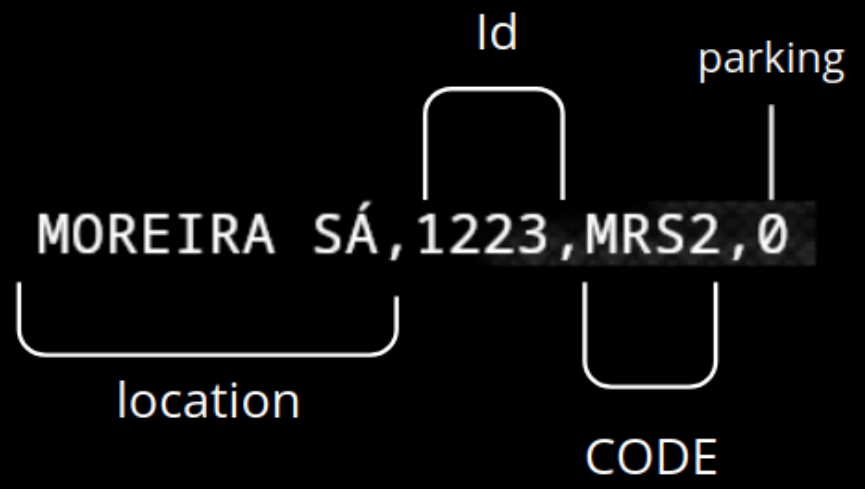
And save variables of these structs into vectors

```
struct DistanceData {
    std::string CODE1;
    std::string CODE2;
    int Driving;
    int Walking;
};
```

```
struct location {
    std::string location;
    int Id;
    std::string CODE;
    bool parking;
};
```

Still on Parsing...

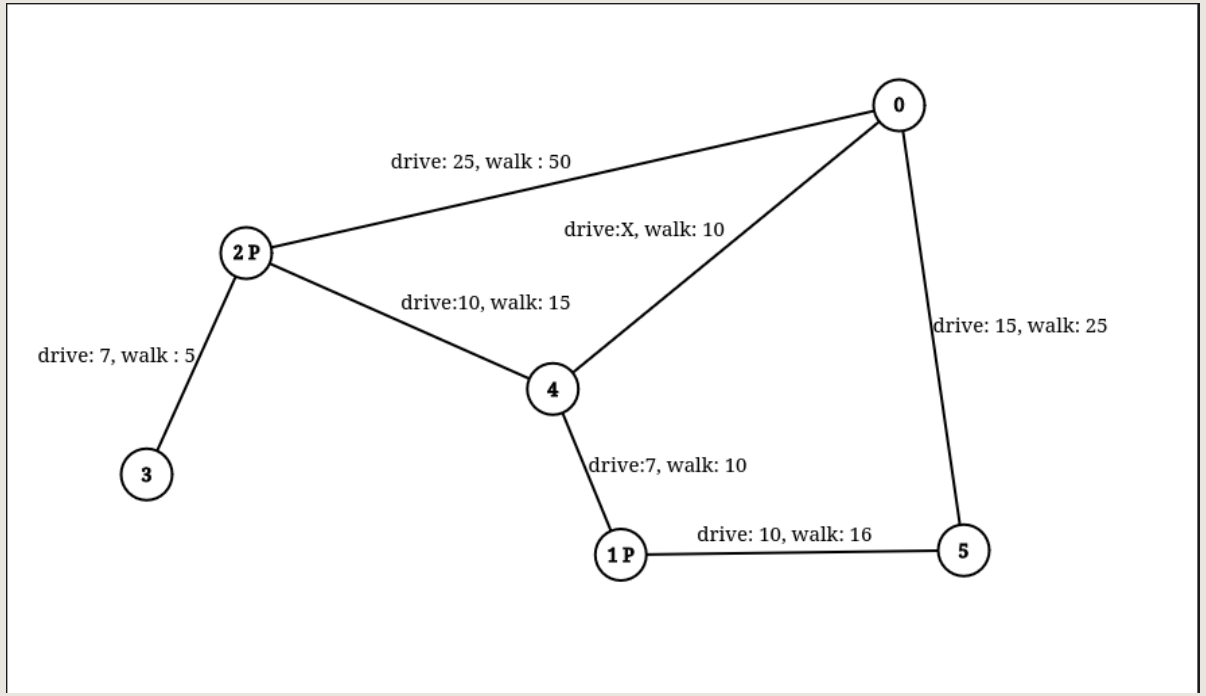
```
while(std::getline(file, line)) {
    std::stringstream stream(line);
    location row;

    std::getline(stream, row.location, ',');
    stream >> row.Id;
    stream.ignore();
    std::getline(stream, row.CODE, ',');
    stream >> row.parking;

    data.push_back(row);
}
```



GRAPH

Our nodes are the location Id's, and
have a parking attribute

Our edges are double weighted, having both driving and walking weights



Changes made to Graph.h

On the Vertex class:

- Changed addEdge to create a double weighted edge
- Added parking attribute
- Created getParking() and setParking() methods

On the Edge class:

- Changed constructor to handle 2 weights
- Added second weight attribute
- Changed getWeight() method, to return a pair of weights

On Graph class:

- Changed addEdge function and addBidirectionalEdge to construct double weighted edges

Implemented Functionalities

Independent Route Planning

Determines the best route between a source and destination

Restricted Route Planning

Determines the best route between a source and destination whilst excluding specific nodes or edges from the graph

Environmentally-Friendly Route Planning

Determines the best route between a source and destination, combining driving and walking

Algorithms used : Dijkstra,
We simply apply it 1 or more times

APPROACH

Independent Route Planning

We just do a normal dijkstra get the best path, remove the edges of this path from the graph and get the best path again for the alternative route (if available)

Restricted Route Planning

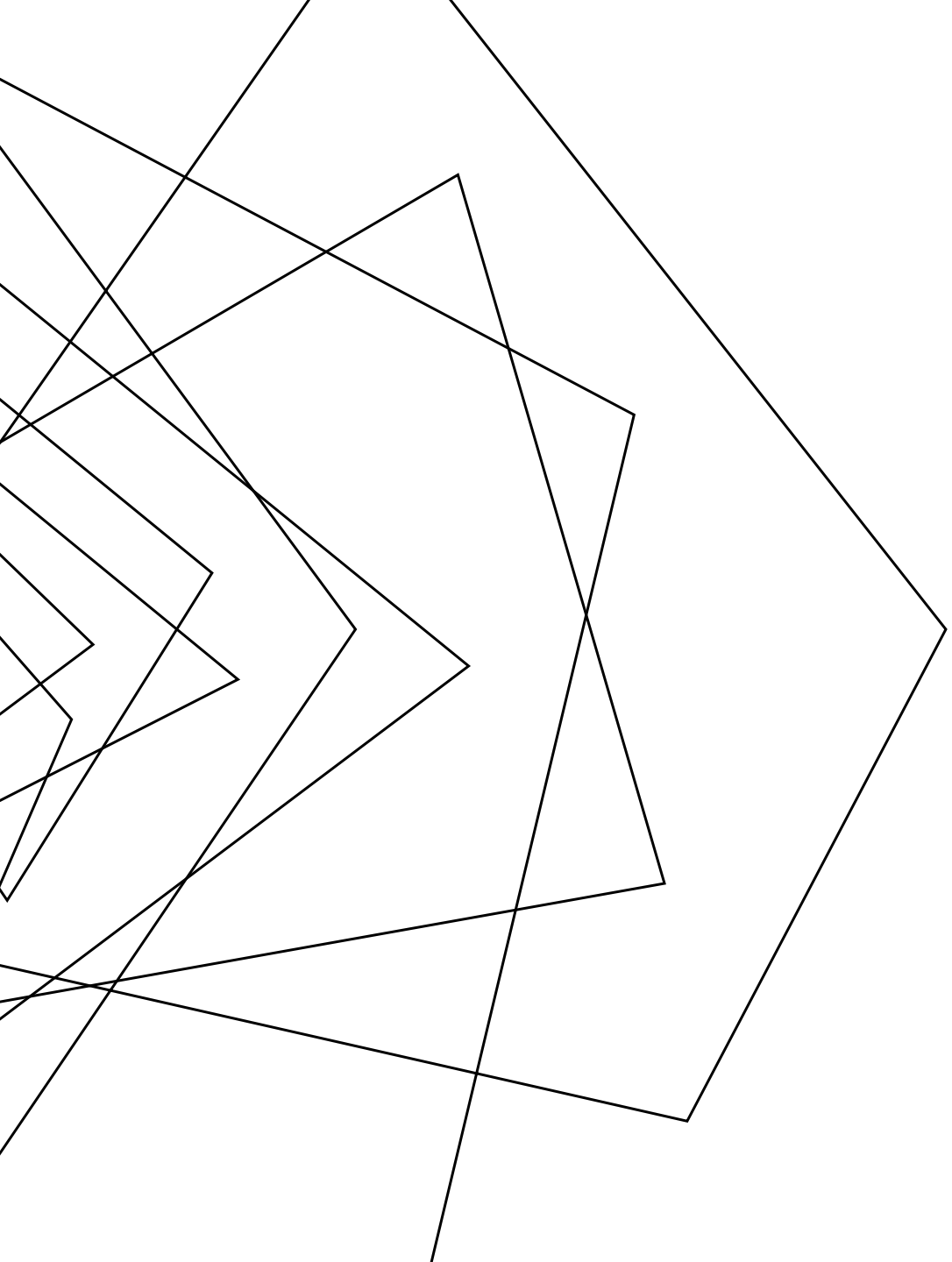
We simply don't initialize the nodes and/or edges that the user wants to avoid, when creating the graph. From there we just do a normal dijkstra and get the best path

Environmentally-Friendly Route Planning

We dijkstra (driving) from source to every node where there is parking, and from those nodes to the destination (walking) we store the total time (driving + walking) and choose the best paths

Algorithms


Dijkstra driving and Dijkstra walking
O((V + E) log V)
Driving and walking route
O(P * (V + E) log V)
where P is number of Parking nodes



USER INTERFACE

Users are offered a simple menu that allows them to input the data, manually or via a file, the result is printed in the cli and a text file is also generated with the result.

The user is prompted, step by step about the route.

1. The mobility mode
2. The start and the destination
3. Locations to avoid
4. Segments to avoid
5. Locations to include

And receives the result printed and on a text file (output.txt)

```
Source:1
Destination:485
BestDrivingRoute:1,485(6)
AlternativeDrivingRoute:1,1045,485(7)
```

FUNCTIONALITIES TO HIGHLIGHT, WHAT WE ARE MOST PROUD OF

The overall simplicity of the program, and our solution, using almost only 1 algorithm for every route option possible

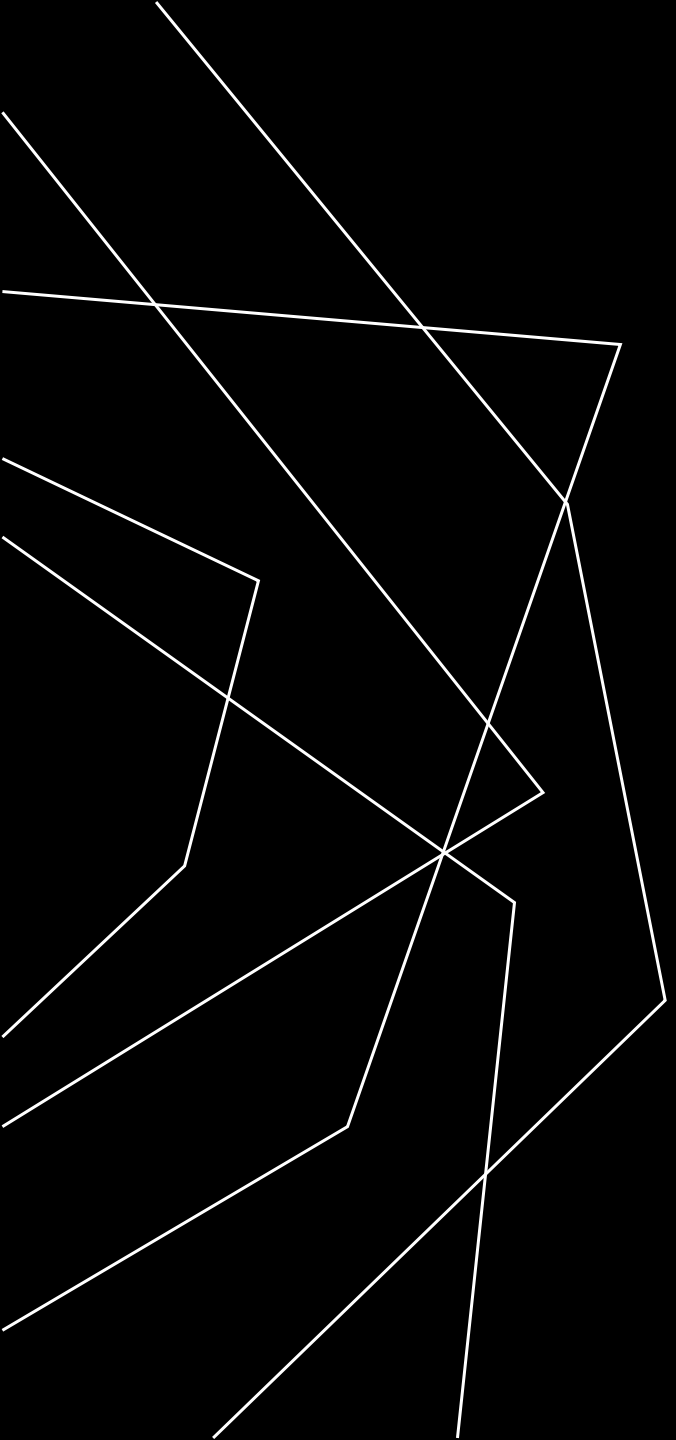
MAIN DIFFICULTIES AND PARTICIPATION FROM EACH ONE

Our main difficulties where:

- The final algorithm for the enviromental friendly route, and the approximate solution
- Some of the communication between the CLI and logic

We all ended up doing a little bit of everything and helping each other, but the main division of tasks was :

The CLI and Doxygen - André Pinho
Main Algorithms - André Gomes
The Graph, final Algorithm and PowerPoint – Carlos Coutinho



THANK YOU