PROGRAMMING II: REPORT PROJECT 2

INTRODUCTION

This project is elaborated with the aim of practicing all the exposed theoretical content about C and getting more comfortable with it. Nevertheless, this project is not only focused on practicing content but also seeing its impact. The delivery has been proposed in a realistic, useful, and enjoyable approach. Besides that, while doing this project we will have to organize our time and work, so the result of the code is the best possible. That is why communication and understanding between partners is crucial.

OBJECTIVES

- Create functions and structures.
- Use recursion, trees, DFS, BFS… (dynamic memory).
- Calls between functions and themselves.
- Understand each purpose of each function.
- Have a readable and understandable code.
- Use comments to improve the readability of the code (could be for ourselves or anyone else).

MANAGEMENT

For producing this code, first we analyse all the script (pdf) and the different .h files. Then we start coding. We tried to do almost everything together, so we could study and learn while practising. Nevertheless, on some occasions we decide to work separately so that we could be more productive. Then we put everything in common with the intention to understand all the parts of the project and to include or change any function in case the other thought differently or had a better way to code it.
Besides, in any case that some of us were doubtful about how to proceed, the other would try to help and arrive together to a solution.
If that was not the case, then we asked the different professors that were at our reach.

DAILY ACTIVITY (DIARY)

Day 08/05/2023:

The previous day from the first class session for the project, we saw that the project was already uploaded, so we decided to look at it so that we could use the first session to comment our interpretation of the different processes defined and required for the delivery. At the end, we couldn't completely understand how to proceed. If the delivery was divided in a tree section, path searching based on a matrix… we could not arrive to a conclusion if it was better to perform the search of the ideal path while discovering new cities or if it was advantageous to first looked for all the cities that should be visited and then create the path.

Day 09/05/2023:

On the first day of the project, we ask some questions to the teachers:

- What was the meaning in the “small.h”, the struct for CityRegistery() has some missing names and what was supposed to mean -1.

With that, we discovered that -1 will be our key point, because it determines that that person has been adopted or that it can not go further on searching.
From that, we could start developing our functions. We knew what the output should be, so we diced to start explaining what should be done in each function and what they will call and return. Then we develop with the AddList() and delete function, as we had previously worked with it the last semester.

Day 10/05/2023:

The next day, we decided to meet with the intention to do most of the project. After doing trees with BFS and DFS (using the powers in class and other resources) we decided to develop the most challenging function which was the one that has the objective to find the lowest cost path possible. We thought and tried different algorithms, but we decided to go with Dijkstra algorithm. Even thought, this algorithm we thought it will work slower with bigger data (thinking of medium and large files), it was true that it will always returns the most economical path to take.
For being able to succeed in getting the algorithm correctly, we try and found some relevant information on the internet.
Besides, while we were coding the print functions (partial and total road map) we thought it will be easier to change the struct RoadMap from each .h file. So instead of using integer city ID, we had an array call path that contain each city in the road. So, instead of having in the RoadMap struct as elements the cities, we had the different routes. At the end the functions worked better.

At the end we had some doubts, whether what we had done was correct. Like changing the .h files and making it in our own way, so we decided to contact our teacher by email.

Day 11/05/2023:

This day we only talk about the different doubts solved by the teacher.

Day 16/05/2023:

During this day, we have just tried to improve our code. We change to better the print functions and ask if we need to try and create our own matrices and registers for medium and large files.
In this class, we discover how to work with conditional compiling.

Day 20/05/2023:

During this day after being able to have our own medium and large .h files completed, we tried to find some other ways to compile the project correctly. As the one discovered before, required changing the code.

Day 23/05/2023:

Today we have finished the report and we had had some doubts in our discoveries about running conditioned to the file chosen. So, as it was after the class' hours, we send an email.

Day 24/05/2023:

This was our last day changing things. Just adding some more comments and consider what the teacher recommended us after talking by email.

RESULTS AND PROBLEMS

PROBLEMS:

- Being careful about possible spelling mistakes of some keywords between our code and the .h files.
- Being able to correctly compile the code (working well in the terminal).
- Interpreting the possible output or return of some functions.
- Getting confused about the objective and content (to add) in some functions.
- Being confused of which was the best method to analyse the optimal path.

RESULTS

Small.h:

```
[Running] cd "c:\Users\sara0\Desktop\uni\programming II\C\Project
2\" && gcc copy_project2.c -o copy_project2 &&
"c:\Users\sara0\Desktop\uni\programming II\C\Project 2\"copy_project2

BFS -> Names:
Maria and Jordi (Barcelona)->
Louise and Paul (Paris)->
Eva and Albert (Zurich)->
Anna and Kazimierz (Varsovia)->
Agnese and Leonardo (Rome)->
Madalena and Lourenço (Lisbon)->
Amber and Finn (Amsterdam)->

Partial road map:
Barcelona=>Madrid=>Paris=> 180
Paris=>Berlin=>Viena=>Zurich=> 150
Zurich=>Viena=>Varsovia=> 140
Varsovia=>Viena=>Zurich=>Rome=> 210
Rome=>Madrid=>Barcelona=>Lisbon=> 260
Lisbon=>Paris=>Berlin=>Viena=>Amsterdam=> 280

Total Road Map:
Barcelona=>Madrid=>Paris=>Berlin=>Viena=>Zurich=>Viena=>Varsovia=>Viena
=>Zurich=>Rome=>Madrid=>Barcelona=>Lisbon=>Paris=>Berlin=>Viena=>Amster
dam=>

Total cost: 1220
```

```
DFS -> Names:
Maria and Jordi (Barcelona)->
Louise and Paul (Paris)->
Anna and Kazimierz (Varsovia)->
Agnese and Leonardo (Rome)->
Eva and Albert (Zurich)->
Madalena and Lourenço (Lisbon)->
Amber and Finn (Amsterdam)->

Partial road map:
Barcelona=>Madrid=>Paris=> 180
Paris=>Berlin=>Varsovia=> 170
Varsovia=>Viena=>Zurich=>Rome=> 210
Rome=>Zurich=> 70
Zurich=>Viena=>Berlin=>Paris=>Lisbon=> 270
Lisbon=>Paris=>Berlin=>Viena=>Amsterdam=> 280

Total Road Map:
Barcelona=>Madrid=>Paris=>Berlin=>Varsovia=>Viena=>Zurich=>Rome=>Zurich
=>Viena=>Berlin=>Paris=>Lisbon=>Paris=>Berlin=>Viena=>Amsterdam=>

Total cost: 1180
```

Medium.h:

```
BFS -> Names:
Maria and Jordi (Barcelona)->
Louise and Paul (Paris)->
Eva and Albert (Zurich)->
Anna and Kazimierz (Varsovia)->
Agnese and Leonardo (Rome)->
Madalena and Lourenço (Lisbon)->
Amber and Finn (Amsterdam)->

Partial road map:
Barcelona=>Lisbon=>Paris=> 186
Paris=>Zurich=> 66
Zurich=>Paris=>Viena=>Varsovia=> 434
Varsovia=>Viena=>Paris=>Lisbon=>Barcelona=>Madrid=>Rome=> 790
Rome=>Madrid=>Barcelona=>Lisbon=> 266
Lisbon=>Paris=>Zurich=>Amsterdam=> 302

Total Road Map:
Barcelona=>Lisbon=>Paris=>Zurich=>Paris=>Viena=>Varsovia=>Viena=>Paris=
>Lisbon=>Barcelona=>Madrid=>Rome=>Madrid=>Barcelona=>Lisbon=>Paris=>Zur
ich=>Amsterdam=>

Total cost: 2044
```

```
DFS -> Names:
Maria and Jordi (Barcelona)->
Louise and Paul (Paris)->
Anna and Kazimierz (Varsovia)->
Agnese and Leonardo (Rome)->
Eva and Albert (Zurich)->
Madalena and Lourenço (Lisbon)->
Amber and Finn (Amsterdam)->

Partial road map:
Barcelona=>Lisbon=>Paris=> 186
Paris=>Viena=>Varsovia=> 368
Varsovia=>Viena=>Paris=>Lisbon=>Barcelona=>Madrid=>Rome=> 790
Rome=>Madrid=>Barcelona=>Lisbon=>Paris=>Zurich=> 488
Zurich=>Paris=>Lisbon=> 222
Lisbon=>Paris=>Zurich=>Amsterdam=> 302

Total Road Map:
Barcelona=>Lisbon=>Paris=>Viena=>Varsovia=>Viena=>Paris=>Lisbon=>Barcel
ona=>Madrid=>Rome=>Madrid=>Barcelona=>Lisbon=>Paris=>Zurich=>Paris=>Lis
bon=>Paris=>Zurich=>Amsterdam=>

Total cost: 2356
```

Large.h:

```
BFS -> Names:
Maria and Jordi (Barcelona)->
Louise and Paul (Paris)->
Eva and Albert (Zurich)->
Anna and Kazimierz (Varsovia)->
Agnese and Leonardo (Rome)->
Madalena and Lourenço (Lisbon)->
Amber and Finn (Amsterdam)->

Partial road map:
Barcelona=>Lisbon=>Paris=> 183
Paris=>Lisbon=>Madrid=>Zurich=> 332
Zurich=>Tokyo=>Sydney=>Barcelona=>Sydney=>London=>Varsovia=> 424
Varsovia=>Paris=>Lisbon=>Madrid=>Rome=> 546
Rome=>Madrid=>Lisbon=> 217
Lisbon=>Madrid=>Rome=>Amsterdam=> 323

Total Road Map:
Barcelona=>Lisbon=>Paris=>Lisbon=>Madrid=>Zurich=>Tokyo=>Sydney=>Barcel
ona=>Sydney=>London=>Varsovia=>Paris=>Lisbon=>Madrid=>Rome=>Madrid=>Lis
bon=>Madrid=>Rome=>Amsterdam=>

Total cost: 2025
```

```
DFS -> Names:
Maria and Jordi (Barcelona)->
Louise and Paul (Paris)->
Anna and Kazimierz (Varsovia)->
Agnese and Leonardo (Rome)->
Eva and Albert (Zurich)->
Madalena and Lourenço (Lisbon)->
Amber and Finn (Amsterdam)->

Partial road map:
Barcelona=>Lisbon=>Paris=> 183
Paris=>Varsovia=> 160
Varsovia=>Paris=>Lisbon=>Madrid=>Rome=> 546
Rome=>Madrid=>Zurich=> 320
Zurich=>Madrid=>Lisbon=> 163
Lisbon=>Madrid=>Rome=>Amsterdam=> 323

Total Road Map:
Barcelona=>Lisbon=>Paris=>Varsovia=>Paris=>Lisbon=>Madrid=>Rome=>Madrid
=>Zurich=>Madrid=>Lisbon=>Madrid=>Rome=>Amsterdam=>

Total cost: 1695
```

CONCLUSION

While creating this code we have discovered how important and useful were the concepts that we have been working with during the semester (lists, queue, trees, recursion, dynamic memory, …). Besides, it has been entraining to work together to get the objective that the project required. Nevertheless, it has taken lots of hours and conversations to understand and develop the code together efficiently, so it has been very satisfactory to get positive feedback from our work.