Faculdade de Engenharia da Universidade do Porto

Mestrado Integrado em Engenharia Informática e Computação

Concepção e análise de algoritmos

Smart garbage collection

Assignment 4

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1 Abstract

The aim of this project is to allow a user to search containers in streets that are inserted by a user in an application command line interface. The user has two options: exact search, where it will be shown the number of containers that exist in that street, if that street exists, and approximate search where if the street that the user inserted doesn't exist, the program will present to user similar street names with the number of containers in each presented street.

2 Keywords

Smart, Garbage System, Graph Theory, Optimization, Routing, Path Finding, Streets, Strings, KMP matcher, edit Distance, String comparison

Conteúdo

3 Introduction

The purpose of this work is to add some features to the previous project, those related with street name searching. So we implemented two types of search: exact search and approximate search. Containers are in street corners, so our application always asks two street names to be inserted. To interact with this features we developed a sub-menu in main menu ("Search Containers"), where two options are given: exact search, and approximate search. the interaction in each option is described in paragraphs below.

Exact search

In this case, we start by asking the user to insert the name of the first street. When user input is finalized, we immediately check if the street exists or not. In affirmative case, the user inserts the second street name, otherwise the user return to the previous sub-menu, where user can start the process again or do an approximate search. When user finishes second street name input, we check if that street exists, if it doesn't the program returns to the previous menu, if it does and there is a container between those streets, the application displays the container id, type of garbage and it's filled percentage, if there isn't a container then a message is displayed saying that no container was found.

Approximate search

In this option, like the previous, we start by asking the user to insert the name of the first street, but when user ends input, even if that name doesn't exists, several similar names are displayed. The user is asked to chose one of the given options, then the process is repeated for the second street. Finally, if the selected streets have containers between them, similar information as the previous option is displayed.

4 The Algorithms

4.1 Exact search

For the exact search the KMP (Knuth-Morris-Pratt) Matcher algorithm was implemented, as we learned in lecture classes. The algorithm was implemented and then methods were created to obtain the existence or not of a container at the intersection of two streets selected by the user.

The user input is compared to all streets in the database, and if a true value is obtained, the street is added to a list of potential streets.

After completing this process for the two desired streets, all the existing containers are extracted in each one.

At the end, if a container is in the list of each of the two streets, it means that it is at the intersection of them, the ID of the container together with its type of garbage and the percentage of occupancy is shown.

4.2 Approximate search

For the exact research the algorithm "Edit Distance"was implemented, as we learned in theoretical classes.

The algorithm was implemented and then methods were created to suggest to the user several streets depending on their input, in order to obtain the street that the user intends to use in their search.

After completing this process for the two desired streets, all the existing containers are extracted in each one.

At the end, if a container is in the list of each of the two streets, it means that it is at the intersection of them, the ID of the container together with its type of garbage and the percentage of occupancy is shown.

5 Difficulties and conclusions

5.1 Difficulties

The biggest problem we found was to display the right streets when doing an approximate search, due to words like "Rua"or "Avenida"that most of the streets have, and big streets have several edges, so various options referring to the same street would be displayed. Thankfully all those challenges were overcome.

5.2 Conclusions

With this project we improved our understanding of the algorithms we learned in class. Besides, we feel that with this new knowledge we can improve future projects that require inputs from user and because of that be a better engineer.