

Licenciatura em Engenharia Informática MDISC 2023/2024

**Report Summary**

*Analysing the algorithm and results*

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Dijkstra's algorithm(Method):

# methodToReplaceSize:

The method methodToReplaceSize counts non-null elements in a list of SignalPoint objects. It initializes a counter and iterates through the list, incrementing the counter for each non-null element. The loop continues until it encounters a null or goes out of the list bounds, which triggers an IndexOutOfBoundsException. When this exception occurs, the method returns the count of non-null elements. If the loop exits normally, it returns -1, although this scenario is unlikely due to the infinite loop structure.

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Descrição gerada automaticamente

# methodToReplaceSizeRoute:

This method does the same as methodToReplaceSize but uses a list of Rout instead of SignalPoint.

Uma imagem com texto, captura de ecrã, software, ecrã

Descrição gerada automaticamente

# methodToReplaceIndexOf:

The methodToReplaceIndexOf function finds the index of a given SignalPoint object within a list of SignalPoint objects by comparing their names. It first determines the list size, iterates through the list, and returns the index of the matching object if found, otherwise, it returns -1.

Uma imagem com texto, captura de ecrã, software, Tipo de letra

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# importNamesFromCSV:

The importNamesFromCSV function reads a CSV file specified by filePath, converts each line into a SignalPoint object, and stores them in a list. It then returns this list of SignalPoint objects.

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Descrição gerada automaticamente

# importRouteFromCSV:

The importRouteFromCSV function reads data from a CSV file and creates Route objects based on the information. It uses a list of SignalPoint objects to determine the route connections. Finally, it returns the list of created Route objects.

Uma imagem com texto, captura de ecrã, software

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# findShortestPath:

The findShortestPath function calculates the shortest path between a source and a target SignalPoint. It uses Dijkstra's algorithm to efficiently find the path. It iterates through points, updating distances and predecessors until the shortest path to all points is determined. Then, it reconstructs the path from the source to the target and returns it as a list of Route objects representing the shortest route. If no path is found, it returns an empty list.

Uma imagem com texto, captura de ecrã

Descrição gerada automaticamente

Uma imagem com texto, captura de ecrã, Tipo de letra

Descrição gerada automaticamente

Uma imagem com texto, captura de ecrã, Tipo de letra

Descrição gerada automaticamente

# constructRoute:

The constructRoute function creates a new route based on a list of SignalPoint objects and existing routes. It iterates through each pair of adjacent signal points and searches for a corresponding route in the list of routes. If a matching route is found, it creates a new route object using the distance and signal points of the found route and adds it to the list of new routes. Finally, it returns the list of new routes.

Uma imagem com texto, captura de ecrã, Tipo de letra

Descrição gerada automaticamente

# totalDistance:

The totalDistance function calculates the total distance of a list of routes. It iterates through each route in the list and adds its distance to a running total. Finally, it returns the total distance as an integer value.

Uma imagem com texto, captura de ecrã, Tipo de letra

Descrição gerada automaticamente

Input and Output Methods

# generateSubgraphCSV:

This method generates CSV content representing a subgraph.

It constructs CSV content by appending vertices, edges, and their costs to a StringBuilder object.

Uma imagem com texto, captura de ecrã, software, Tipo de letra

Descrição gerada automaticamente

# writeCSVToFile:

This method writes CSV content to a file.

It takes the CSV content and writes it to the specified file path.

Uma imagem com texto, captura de ecrã, Tipo de letra

Descrição gerada automaticamente

# generateAllSubgraphCSV:

The generateAllSubgraphCSV function creates CSV content representing a subgraph based on the provided shortest path. It iterates through each route in the shortest path, appending the names of the signal points to the CSV content. Finally, it returns the generated CSV content as a string.

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Descrição gerada automaticamente

# displayAllPath:

The displayAllPath method orchestrates the display of all paths. It first imports signal point names and routes from CSV files. Then, it iterates through each signal point, excluding the access point ("AP"). For each signal point, it finds the shortest path to the access point, generates CSV content representing the subgraph, and attempts to visualize the graph. Finally, it writes the CSV content to an output file.

Uma imagem com texto, captura de ecrã

Descrição gerada automaticamente

# displayOnePath:

The displayOnePath method finds and displays the shortest path from a specified signal point to the access point. It retrieves input data, imports signal point names and routes, finds the shortest path, prints the path details and total distance, generates a CSV file representing the subgraph, and visualizes both the input graph and the output subgraph. Any exceptions encountered are rethrown as a RuntimeException.

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Descrição gerada automaticamente

Results (Display One Graph)

# Console Result:

* Route, this is route of points that leads to an Assembly point
* Total Distance, this is the total distance to the Assembly point from a Point

The print below is the result for Escadas1:

Uma imagem com texto, captura de ecrã, Tipo de letra, preto

Descrição gerada automaticamente

# Normal graph and minimum spanning three

# Input Graph output Graph

# Uma imagem com file Descrição gerada automaticamenteUma imagem com diagrama, file Descrição gerada automaticamente

# CSV File Infomation export:

# 

Results (Display All Graphs)

# Console Result:

For this choice there isn’t any information displayed in the console.

# CSV File Information Export

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# One of the Graphs:

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