SHORTEST PATH FINDING ALGORITHM TO PREVENT STREET HARASSMENT

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Presentation of the team

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https://github.com/sneusar/ST0245-002

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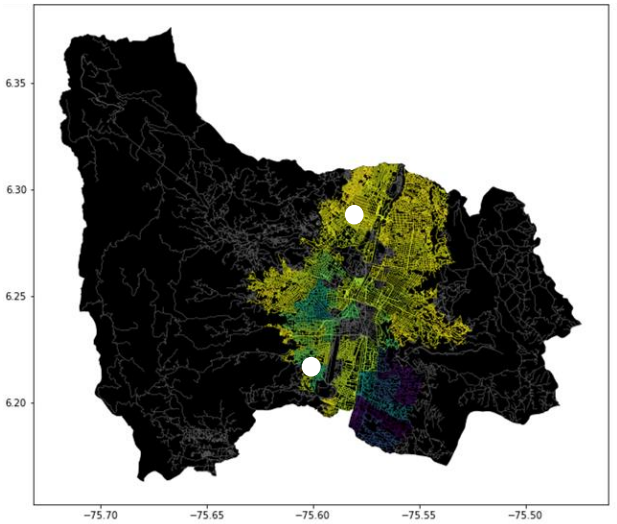
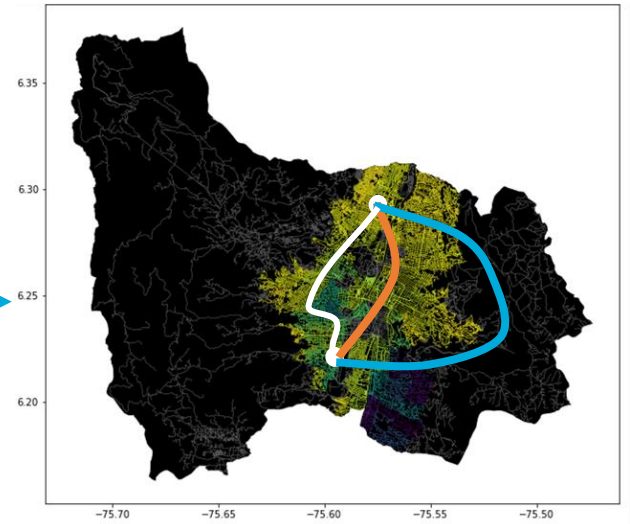
Problem Statement



Shortest path algorithm



Streets of Medellín, Origin and Destination

Three paths that reduce both the risk of harassment and distance

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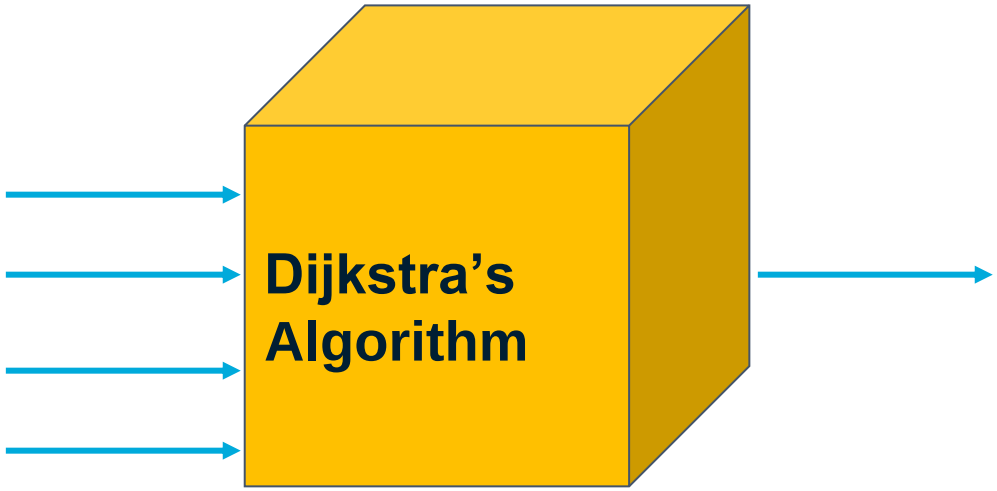
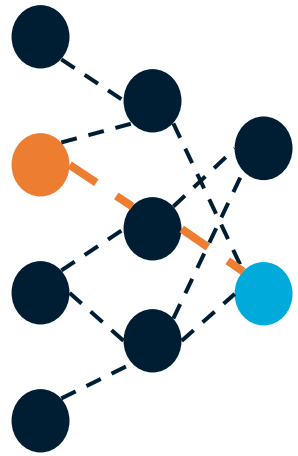
Solution Algorithm

Streets of Medellín, Origin and Destination

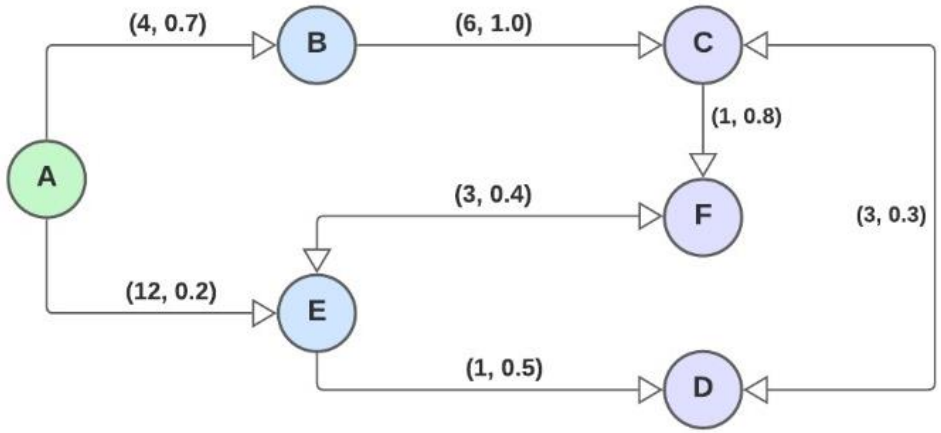




A path that reduces both distance and harassment

Explanation of the algorithm

Example execution: Origin: A, Destination: D



This dijkstra algorithm works with the average of length and harrasment risk.

As the algorithm stores the predecessor of the vertex, in other function we recollect all the predecessors to build the path, giving as result that the final path is: A -> E -> D.

The priority queue stores some values to choose the best posibility to traverse the graph. Those that remain are useless because we already found all posible routes in the graph, but as we push them after end that information will stay there.

Dictionaries

Vertex	Path	Cost
A	None	0
B	A	2.35
C	C	5.85
D	E	6.85
E	A	6.1
F	C	6.75

Priority queue

Information	1°	2°
From:	C	E
To:	D	F
Cost:	6.85	7.8

Dijkstra’s Algorithm to reduce both harassment risk and distance

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Complexity of the algorithm

	Time complexity	Complexity of memory
Dijkstra's Algorithm	O((V + E) log V)	O(V)

Time and memory complexity of Dijkstra's Algorithm. V is the number of vertices and E is the number of edges. This corresponds to the intersections and the streets in Medellín respectively.

First path minimizing d = $(d + r)/2$

Origin	Destination	Distance (meters)	Risk of harassment (between 0 and 1)
EAFIT University	National University	7744.230	0.691

Distance and risk of harassment for the path that minimizes d = $\frac{d+r}{2}$. Execution time of 0.077 seconds.

Second path minimizing d = $(d\text{^}r)*r$

Origin	Destination	Distance (meters)	Risk of harassment (between 0 and 1)
EAFIT University	National University	7906.476	0.368

Distance and risk of harassment for the path that minimizes d = $d^r * r$. Execution time of 0.176 seconds.

Third path minimizing d = $(d * 2\pi)+(r * 1000)$

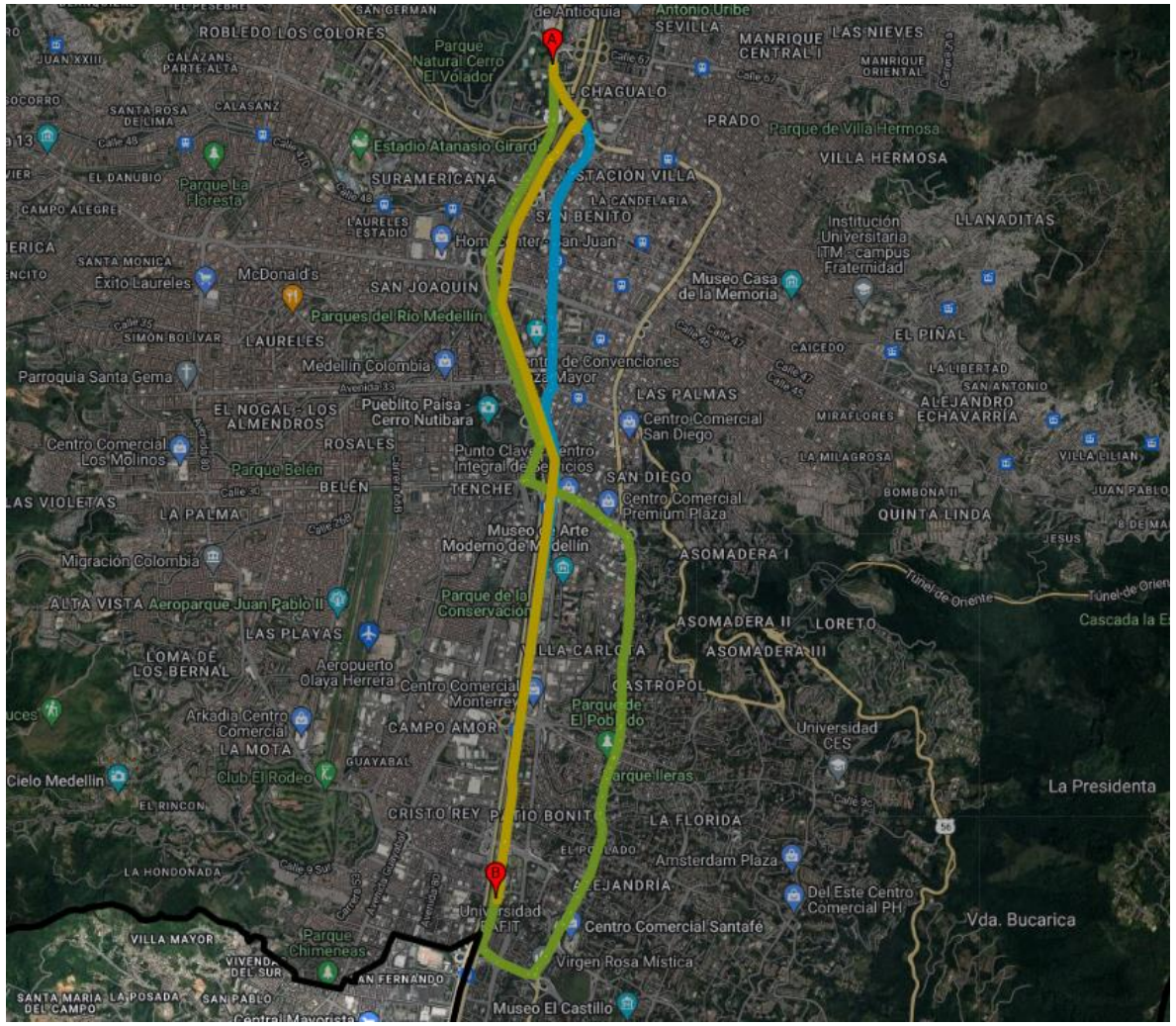
Origin	Destination	Distance (meters)	Risk of harassment (between 0 and 1)
EAFIT University	National University	7977.367	0.788

Distance and risk of harassment for the path that minimizes d = $(d * 2\pi) + (r * 1000)$.
Execution time of 0.121 seconds.

Visual comparison of the three paths

Three paths from Universidad EAFIT to Universidad Nacional.

- $v = \frac{d+r}{2}$
- $v = d^r * r$
- $v = (d * 2\pi) + (r * 1000)$



Future work directions

Databases

Record of users' origins and destinations.

Project 1

Design user interface

Statistics

Study demographics

Project 2

Predict better paths through ML

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THANK YOU!

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