

Special Optimisation

Mhlasakululeka Mvubu

1. The order of location in the optimal tour is as follows:

- 115 St Andrew's Drive, Durban North, KwaZulu-Natal, South Africa \Rightarrow 9 Margaret Street, Ixopo, KwaZulu-Natal, South Africa \Rightarrow 67 Boshoff Street, Pietermaritzburg, KwaZulu-Natal, South Africa \Rightarrow 16 Poort Road, Ladysmith, KwaZulu-Natal, South Africa \Rightarrow 166 Kerk Street, Vryheid, KwaZulu-Natal, South Africa \Rightarrow 4 Paul Avenue, Fairview, Empangeni, KwaZulu-Natal, South Africa \Rightarrow 115 St Andrew's Drive, Durban North, KwaZulu-Natal, South Africa. The map showing the optimal route tour is shown in Figure 1

2. The expected travel time and distance are 10h 37 min , 891 km, respectively.

I. FEEDBACK BASED ON QUESTIONER

This was a very interesting task and I've enjoyed the challenge of having a deep insight about the problem and task of trying to conceptualize the problem to a point where I realized the appropriate approach for this task was *travelling salesman problem (tsp)* [dorigo1997ant].

Initially the challenging part I've experienced was to find an alternative Google Maps API keys in order to write a python script for web scraping, extracting the distance matrix between the selected locations. However, there were some billing on it. Which made me to took a decision by getting the distances between the locations directly from Google Map. I had also to properly search about **travelling salesman problem** in order to get better conceptual understanding and its associated build up python packages.

Table I
COMPARING THE SIMULATED RESULTS WITH GOOGLE MAPS

Travelled Salesman Method	891 km	10h 37 min
Simulation from Google Maps	892 km	10h 38 min

Table I represent the simulated results using travelling salesman approach and compared with Google Maps and Speed Rout. We note that the tsp approach is closely to the results simulated by google maps (using the simulated optimal tour), which gives an indication that tsp seems to the better method in addressing this type of special optimisation problem.

Lastly I've enjoyed the task and throughout the process of this technical assessment I've learnt a lot with regards to this special optimization task.

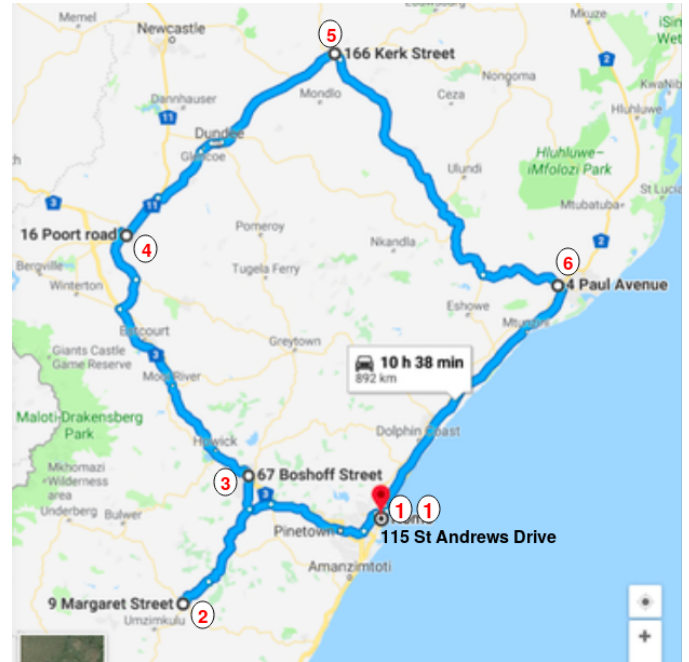


Figure 1. The optimal route mape simulated by travelling salesman method

Kindly see the proper documentation of the code on the following github url address :

<https://github.com/Mhlasakululeka/Spacial-Optimisation>

REFERENCES

- [1] Dorigo, Marco and Gambardella, Luca Maria. *Ant colonies for the travelling salesman problem*. Biosystems, Elsevier, 1997.