A Traveling Salesman Solution For The Capitals of All African Nations

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Abstract

A Traveling Salesman Problem is the task of finding the shortest round trip path a traveling salesperson can take to visit each vertex of a given graph. They are usually implemented using a genetic algorithm. Our salesperson happens to be traveling to the capitals of every country in Africa that is a recognized member of the United Nations.

The Problem 1

- 1. Algeria Algiers
- Angola Luanda Benin Porto-Novo
- Botswana Gaborone
- Burkina Faso Ouagadougou
- Burundi Bujumbura
- Cameroon Yaounde Cape Verde Praia
- Central African Republic -Bangui
- 10. Chad N'Djamena
- 11. Comoros Moroni12. Congo, Republic of the -Brazzaville
- 13. Congo, Democratic Republic of the Kinshasa
- 14. Cote d'Ivoire Yamoussoukro15. Djibouti Djibouti
- 16. Egypt Cairo

- 17. Equatorial Guinea Malabo
- 18. Eritrea Asmara 19. Ethiopia Addis Ababa 20. Gabon Libreville
- The Gambia Banjul
- Ghana Accra Guinea Conakry
- Guinea-Bissau Bissau

- Kenya Nairobi Lesotho Maseru Liberia Monrovia
- Libya Tripoli
- Madagascar Antananarivo
- Malawi Lilongwe Mali - Bamako
- Mauritania Nouakchott Mauritius Port Louis Morocco Rabat

- Mozambique Maputo

- 36. Namibia Windhoek
- Niger Niamey
- Nigeria Abuja
- 39. Rwanda Kigali Senegal - Dakar
- Seychelles Victoria
- Sierra Leone Freetown
- Somalia Mogadishu South Africa - Pretoria
- Sudan Khartoum
- Swaziland Mbabane Tanzania - Dar es Salaam
- Togo Lome
- Tunisia Tunis
- Uganda Kampala
- Zambia Lusaka 52. Zimbabwe - Harare



Figure 1: Capitals of African Nations

2 Overview

The remainder of this article is organized as follows. Section gives account of previous work. Our new and exciting results are described in Section . Finally, Section gives the conclusions.

3 Programs

The TSP was solved using the Python 2.6 programming language.

I leveraged software written by John Montgomery [?]

The results were then visualized using Google maps mapping API.

Two methods were used a hillclimb and

4 Solution

$$yDis = (lat2 - lat1) * Nautical Miles Per Latitude$$

$$xDis = (\cos(lat1 - \frac{\pi}{180}) + \cos(lat2 - \frac{\pi}{180})) * (lon2 - lon1) * \frac{Nautical Miles Per Longitude}{2}$$

$$tDistance = \sqrt{yDis^2 + xDis^2} * Milesper Nautical Miles$$

$$(3)$$

$$(4)$$

Final Order:

1.	Congo, Republic of the - Brazzaville	19.	Madagascar - Antana- narivo		Sierra Leone - Freetown Liberia - Monrovia
2.	Congo, Democratic Re-	20.	Mauritius - Port Louis	40.	Cote d'Ivoire - Yamous-
	public of the - Kinshasa	21.	Seychelles - Victoria		soukro
3.	Angola - Luanda	22.	Somalia - Mogadishu	41.	Mali - Bamako
4.	Namibia - Windhoek	23.	Ethiopia - Addis Ababa	42.	Burkina Faso - Oua-
5.	Botswana - Gaborone	24.	Djibouti - Djibouti		gadougou
6.	South Africa - Pretoria	25.	Eritrea - Asmara	43.	Niger - Niamey
7.	Lesotho - Maseru	26.	Sudan - Khartoum	44.	Ghana - Accra
8.	Swaziland - Mbabane	27.	Egypt - Cairo	45.	Togo - Lome
9.	Mozambique - Maputo	28.	Libya - Tripoli	46.	Benin - Porto-Novo
10.	Zimbabwe - Harare	29.	Tunisia - Tunis	47.	Nigeria - Abuja
11.	Zambia - Lusaka	30.	Algeria - Algiers	48.	Chad - N'Djamena
12.	Malawi - Lilongwe	31.	Morocco - Rabat	49.	Central African Republic
13.	Burundi - Bujumbura	32.	Mauritania - Nouakchott		- Bangui
14.	Rwanda - Kigali	33.	Cape Verde - Praia	50.	Cameroon - Yaounde
15.	Uganda - Kampala	34.	Senegal - Dakar	51.	Equatorial Guinea - Mal-
16.	Kenya - Nairobi	35.	The Gambia - Banjul		abo
17.	Tanzania - Dar es Salaam	36.	Guinea-Bissau - Bissau	52 .	Gabon - Libreville
18.	Comoros - Moroni	37.	Guinea - Conakry		

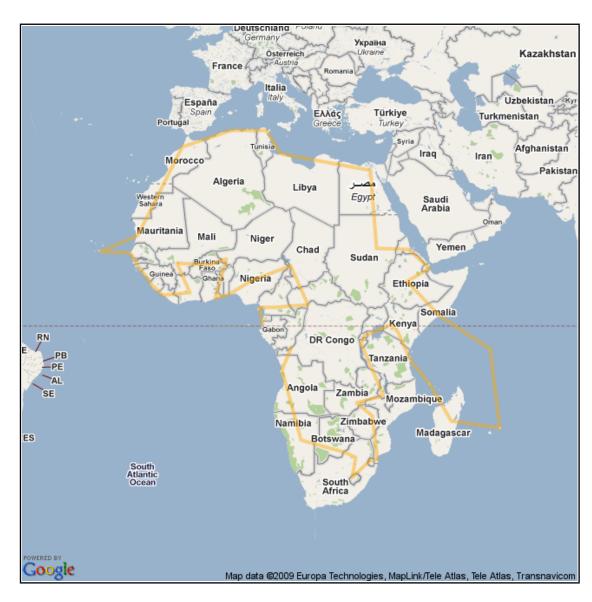


Figure 2: Final Path Through Africa

In this section we describe the results.

5 Runtime

We worked hard, and achieved very little.

6 Analysis

References

- [1] Montgomery, John Tackling The Travelling Salesman Problemhttp://www.psychicorigami.com/category/tsp/, 2007
- [2] Mead, C. A.; Truhlar, D. G. J. Chem. Phys. 1983, 78, 6344.