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.

1 The Problem

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

4 Solution

$$yDis = (lat2 - lat1) * NauticalMilesPerLatitude \tag{1}$$

$$xDis = (\cos(lat1 - \frac{\pi}{180}) + \cos(lat2 - \frac{\pi}{180})) * (lon2 - lon1) * \frac{NauticalMilesPerLongitude}{2} \tag{2}$$

$$tDistance = \sqrt{yDis^2 + xDis^2} * MilesperNauticalMiles \tag{3}$$

$$\tag{4}$$

In this section we describe the results.

5 Runtime

We worked hard, and achieved very little.

Figure 2: Final Path Through Africa

6 Analysis

References

[1] Montgomery, John *Tackling The Travelling Salesman Problem*http://www.psychicorigami.com/category/tsp/ , **2007**

[2] Mead, C. A.; Truhlar, D. G. *J. Chem. Phys.* **1983**, *78*, 6344.