06.09.2018

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Travelling Salesman Problem

Biologically Inspired Computing

# Introduction

The travelling salesman problem is an optimization problem about finding the shortest route between cities around the world. I will in this report implement various optimization methods and test performance on time and result.

# Tools

I program the methods using python 3.6. The data used comes from “European\_citites.CSV”.

# Exhaustive search

## Questions

1. Question: What is the shortest route and what is the distance?

Answer: Implementing exhaustive search for 10 cities yielded following route:

*The shortest route using exhaustive search:*

*Barcelona Belgrade Istanbul Bucharest Budapest Berlin Copenhagen Hamburg Brussels Dublin Barcelona*

*The total distance is 7486.31km*

*Code execution: 3.715876340866089s*

1. Question: How long did it take the program to find it?

Answer: The code used about 3.7s when finding optimal route for 10 cities

1. Question: How long would you expect it take with all 24 cities?

Since it does not matter what the starting point is as long as the sequence of cities is the same. One can therefore do permutations

|  |  |  |  |
| --- | --- | --- | --- |
| Number of cities | Distance(km) | Time(s) | Permutations |
| 6 | 5018.81 | 0.00203 | 120 |
| 7 | 5487.89 | 0.00697 | 720 |
| 8 | 6667.49 | 0.04188 | 5040 |
| 9 | 6678.55 | 0.36299 | 40320 |
| 10 | 7486.31 | 3.54444 | 362880 |
| 11 | 8339.36 | 39.1216 | 3628800 |

Time = sek/perm \*antall permuteringer

Sek/permut \* 24!