

# Homework 08

General comments:

- Do not forget to run some test cases.

## Problem 1 (5 points):

Modify the provided traveler salesman combinatorial algorithm to solve the slightly different problem. You are looking for the shortest route which goes through all cities, while it starts and ends in the same city (the first one), i.e. we need a close loop route.

Coordinates of the cities are provided in the '`cities_for_combinatorial_search.dat`' file: the first column of the data file corresponds to 'x' coordinates and the second one to 'y' coordinates. The coordinates of the city where the route begins and ends are in the first row.

Provide your answers to the following questions:

- What is the sequence of all cities in the shortest route?
- What is the total length of the best route?
- Provide the plot with the visible cities location and the shortest route.

## Problem 2 (10 points):

Implement the Metropolis algorithm to solve the above problem. A good way to obtain a new test route is to randomly swap two cities along the route. You need to choose the number of cycles and initial and final temperature ( $kT$ ). Provide the reasons for your choices.

As a test, compare this algorithm solution with the above combinatorial.

Now load the cities coordinates from the '`cities_for_metropolis_search.dat`' file. Find the shortest route for this set of cities.

- What is the sequence of all cities in the shortest route?
- What is the total length of the best route?
- Provide the plot with the visible cities location and the shortest route.