ASSESSED

G52AIM Lab 4 – Local Search in Memetic Algorithms

1 REPORT [50 MARKS]

These questions are designed to test your knowledge and intuition. We are only looking for short 1 or 2-line answers. You may include drawings of the search landscape to illustrate your explanations.

Question 1

How does a Memetic Algorithm differ compared to all metaheuristics implemented in previous labs? (We are looking for the characteristic of the search method, not the termination criterion). **[5 marks]**

Question 2

How does a Memetic Algorithm differ from a standard Genetic Algorithm? **[5 marks]**

Question 3

Relating to tournament selection for parent selection, what would be the effect, with specific reference to the chosen parents, of setting the tournament size equal to the population size for **both** parents? **[10 marks]**

Question 4

Relating to population replacement, why might it be a **bad** idea to replace the population with the `population_size` best solutions? You should think about the evolutionary process and what the advantages might be of keeping some solutions in the population that are not good with respect to their objective values. **[10 marks]**

Question 5

Memetic algorithms contain some form of local search within the evolutionary process. There are no strict guidelines for where local search should be applied however. In this question, you are to investigate the effects of applying local search in two locations.

Q5A:

List the two locations in the memetic algorithm where you are going to apply local search, for example: 1. Before crossover, and 2. Before parent selection. **[0 marks]**

Q5B:

Without running any experiments, hypothesise which of your configurations will perform statistically significantly better than your other configuration. **[5 marks]**

Q5C:

Perform a suitable statistical test to evaluate your hypothesis from 5.1 on the results obtained by running your MA implementation with local search in the respective locations using the below configuration: **[15 marks]**

- MAX-SAT instance #1 (there is no need to evaluate across multiple instances!)
- Population size: 8
- Max. generations: 75
- Crossover: Uniform crossover
- Mutation: Bit mutation with mutation rate = 1 / chromosome_length
- Local search heuristic: Davis's Bit accepting IE moves
- Total runs: 30

For each variation, you should change the name given to the memetic algorithm in its `toString()` method to uniquely identify it when the results are saved. You will be able to find the results for each variant in a separate CSV file located in either your workspace (if running from within your IDE) or where you are running the Java program.

In your answer, remember to state which statistical test was used, any parameters to the statistical test, the outcome of the test, and the conclusion you have drawn!

2 SUBMISSION

Deadline: Tuesday 06/03/2018 – 15:00

You should submit a single PDF file called **[username]-lab04-report.pdf** to Moodle under CW4b.