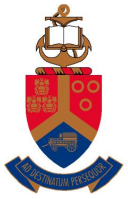

UNIVERSITEIT VAN PRETORIA
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YUNIBESITHI YA PRETORIA

COS 710: Artificial Intelligence
Assignment 3: Genetic Algorithms
Due Date: 6 May 2019

This assignment involves studying and comparing the use of a GA using a direct representation to a GA using an indirect representation in solving a discrete optimization problem. A GA employing a direct representation and a GA employing an direct representation must be implemented and the performance of both algorithms compared in solving ONE of the following discrete optimization problems:

- The Travelling Salesman Problem - This problem involves determining the minimum cost route for a salesman to visit different customers, without a customer being revisited and returning to the depot at which the journey commenced from. You can solve the symmetric or asymmetric version of the problem. Use a minimum of 10 problem instances from the TSPLIB benchmark set which can be accessed at https://www.iwr.uni-heidelberg.de/groups/comopt/software/TSPLIB95/.
- Examination Timetabling Problem - This problem involves allocating an examination to a timetable period so as to meet the hard constraints of the problem and minimize the soft constraints. The benchmark set that you will use is for the examination timetabling track of the second International Timetabling Competition http://www.cs.qub.ac.uk/itc2007/. Use a minimum of 10 problem instances which can be accessed from the assignment folder.

Implementation should be in Java or C++. Follow the same format for the report as for the previous two assignments. The report must include:

- A brief description of the chosen problem and problem instances that were used for the study.

- A description of the GA using a direct representation and the GA using an indirect representation in terms of the following:
  - A description of the chromosomes.
  - Define the fitness function used
  - The selection method used
  - Describe the genetic operators used
- Tables presenting the best, average and standard deviation of the objective value of both the GAs for each problem instance in the set of benchmark problems for the chosen domain over the number of runs performed. A sufficient number of runs must be performed to test the statistical significance of the results.
- A discussion comparing the performance of both GAs in solving the chosen problem. The appropriate statistical tests must be conducted to determine the statistical significance of the results which must be explained as part of the discussion.

Total:40