ANSWER BOOKLET
LIVRET DE RÉPONSES
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Paper 3 Q4 practice 4/08/22

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Please write question numbers in the following format: / Veuillez numéroter les questions en utilisant la présentation suivante: / Sírvase escribir los números de las preguntas en el siguiente formato:

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There are various important decisions that need to ~~be~~ be made in genetic algorithms, which will ~~each~~ each impact the sucess of the genetic algorithm.

- Roulette ~~wh~~ wheel selection ~~refe~~ refers to the ~~selection~~ algorithm used to randomly select genetic sequences from the total population. In roulette wheel selection, each genetic ~~seq~~ sequence will be ~~weighted~~ weighted based on their relative fitness levels. Those with higher fitness will have a greater chance of being selected (sampled) from the population. A balance between ~~ex~~ exploration and exploitation must be ~~stru~~ ~~struck~~ struck, as relying purely on fitness levels to select genomes may lead to premature convergence, while the opposite may never ~~conv~~ converge
- ~~It~~ With cyclical crossover, two parents are combined, each parent preserving some of their genetic traits. This will accelerate the ~~search~~ genetic algorithm as new towns are explored.

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- population size refers to the number of tours to ~~be~~ be used in the mating pool. A longer population size may increase the time taken for the algorithm to execute, while a smaller size may lead to premature convergence, as not enough tours are explored. This would detract from its success.
- A purely random set of population routes would be sub-optimal, ~~as~~ ~~And~~ decreasing the chance of an optimal solution. While using a computer-generated heuristic in this sense would be very difficult to do (as it ~~cost~~ would require brute force), a human heuristic, such as manual tour mapping could prove to be successful. Combining this with a number of randomly generated tours could, therefore ~~be~~ provide a good ~~numb~~ amount of exploration vs. exploitation.

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- mutation rate refers ~~to~~ to the rate at which ~~the~~ offspring in the genetic algorithm are genetically changed to add randomness. The increase in exploration could be useful in preventing premature convergence, as new tours will be continually explored. Furthermore, simulated annealing is a technique that could be employed to increase the algorithms successfulness by gradually reducing the mutation rate ~~throughout~~ throughout the algorithm. This will increase the likelihood of success, as the algorithm will be able to ~~conc~~

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convergence as it becomes more mature.

- Finally, the stopping criteria can be adjusted to ensure the algorithm stops only when an optimal solution is reached. A stopping condition like one that is time-based will likely not be successful, as the algorithm may not yet be finished. Likewise, a stopping condition that is too long may lead to wasted computer resources, as the algorithm will have already converged. Ideally, a termination condition that recognizes when a plateau appears in the fitness landscape would be good in ensuring a successful genetic algorithm.

To conclude, variables like population size, initial population routes and mutation rate must be balanced for an appropriate level of exploration vs. exploitation in order to have a successful algorithm. Furthermore, a terminating condition that considers trends in the fitness landscape will also improve the successfulness of the genetic algorithm.