SC

Assignment - 3

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1. Demonstrate the schema theorem by applying it to a genetic algorithm for optimizing a simple binary-encoded function.

Ans:

The schema theorem is a fundamental concept in genetic algorithms. It states that short, low-order schemata with above-average fitness and to increase their representation in subsequent generations.

1. Define a simple Binary-Encoded fitness function:

Create a fitness function that evaluates the binary strings your GA will be optimize.

2. Initialize the population:

Start with a population of random binary strings.

Define the size of your population & length of each binary string.

3. Schema Analysis:

Identify schemas with the binary strings, such as fixed positions with specific values.

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4. Apply Genetic operations.

- selection : choose individuals for reproduction based on fitness
- crossover: perform crossover between pairs of selected individuals to produce offspring. preserving certain schemas.
- mutation: Mutate some bits in offspring to introduce diversity. affecting schema survival.

5. Schema theorem Application:

use the schema theorem to predict the survival of certain schemas across generation will evolve based on fitness of & crossover / mutation rates.

6. Run & observe:

Execute your genetic algorithm for a set number of generations observing how different schemas propagate or diminish over time plot or tabulate these results for clarity.

7. Conclusion:

Discuss how well the schema theorem predicts schema survival & overall behaviour of GA in optimizing function.