AI ASSIGNMENT 02 REPORT (TASK 1)

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AI_CS 18

- **Crossover (Recombination):**

- Crossover is a genetic operator that combines genetic material from two parents to create one or more offspring. In this code, crossover is implemented as follows:
- During each generation, two parents are selected from the top-performing individuals based on their fitness scores.
- A random crossover point is chosen to split one parent's genes (squares) and combine them with the other parent's genes.
- The resulting child individual is formed by combining the genes from the two parents at the chosen crossover point.
- This process is repeated until a new population of the same size as the original population is created.

- **Mutation:**

- Mutation is a genetic operator that introduces random changes to an individual's genes. In this code, mutation is implemented as follows:
- After the crossover operation, for each child in the new population, there's a chance (controlled by the mutation_rate) that a random square within the individual is mutated.

- If mutation occurs, a random square within the individual is replaced with a new randomly generated blurred square.

- **Selection:**

- Selection is the process of choosing which individuals from the current population will be parents for the next generation. In this code, selection is implemented as follows:
- Fitness scores are calculated for each individual in the population to determine how well they approximate the target (input) image.
- The top-performing individuals are selected based on their fitness scores to become parents for the next generation.
- In this code, the top 50% of the population with the highest fitness scores are selected to be parents. This is a form of elitist selection, ensuring that the best individuals are carried forward.

These three components—crossover, mutation, and selection—are fundamental to the operation of a genetic algorithm. They work together to evolve a population of individuals over multiple generations, with the goal of improving the quality of solutions in each generation.

Git repository : https://github.com/Akanksha-Yadav/21051196_AI/tree/main