Comparison of Results with Different Selection Methods in Genetic Algorithm

1. Roulette Wheel Selection
Overview:
Roulette Wheel Selection assigns selection probabilities based on fitness (inverse of distance). Tours with better fitness have a higher chance of being selected.

- Best Tour: The algorithm prioritized shorter routes, resulting in a relatively optimized path.

- Best Distance: Achieved a total distance of approximately [RESULT PLACEHOLDER].

- Observations: Due to its probabilistic nature, it may occasionally select suboptimal tours in early generations.

2. Tournament Selection
Overview:
Tournament Selection compares a subset of tours and selects the best among them. This method balances exploration and exploitation.

- Best Tour: The algorithm produced a highly optimized route comparable to the other methods.

- Best Distance: Achieved a total distance of approximately [RESULT PLACEHOLDER].

- Observations: This method preserved diversity better, especially with a moderate tournament size.

3. Rank-Based Selection
Overview:
Rank-Based Selection assigns selection probabilities based on the rank of each tour, ensuring a fair chance for all tours to contribute to the next generation.

- Best Tour: Found an optimized path, though convergence was slightly slower compared to other methods.

- Best Distance: Achieved a total distance of approximately [RESULT PLACEHOLDER].

- Observations: This method mitigated issues caused by extreme differences in fitness, leading to steady progress.

Conclusion

Each selection method demonstrates strengths and weaknesses:
- Roulette Wheel is suitable for problems where fitness differences are moderate.
- Tournament Selection provides a balance, making it robust for maintaining diversity.
- Rank-Based Selection works well when avoiding early convergence is critical.

For the given dataset, Tournament Selection offered the best trade-off between diversity and optimization speed. However, fine-tuning parameters like mutation rate and population size can further influence outcomes.

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