EcoPioneer



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VRP Project Report

Computational Intelligence for Optimization

1. Project definition

The goal of this project is to optimize the vehicle routes of the vehicles in the fleet, to visit every location while minimizing the overall distance travelled. Our problem is a classic VRP with multiple vehicles, based on data from [google developers](https://developers.google.com/optimization/routing/vrp#create_the_data).

The **fitness function** we’ll be optimizing through minimization is the total distance travelled. The **search space** consists of all the combinations of locations visited by vehicle. You can find the project repository [here](https://github.com/MafaldaPaco/cifo).

1. Implementation
   1. Representation
   2. Fitness Function
   3. Evolution

We adapted the *evolve* function to better suit our needs. We altered the way we applied elitism - elitism tends to improve the fitness of the generations, by saving the best value and, therefore, guaranteeing that the fitness will never decrease through the generations. With the goal of avoiding local optimums, we altered our elitism implementation to save not only the best individual, but an *x* number of elites. The intuition behind this is that while the first elite might be the best at a certain stage of the evolution, it might lock the development to a local optimum. With more options, we hope to get a higher chance at the best fitness available.

With this goal in mind, we also implemented a plateau tolerance, that will change our parameters after *n* generations without improvement. This technique was suggested by a student who farms, and uses this graftingtechnique on his plants. Grafting combines two plants to get the characteristics of both of them. When the plateau threshold is reached, we update the values on our crossover and mutation rate. Explicar se aumentamos ou diminuimos os valores e porquê (testar).

* 1. Selection
  2. Crossover
  3. Mutation

1. Tuning
2. Results
3. Conclusion

References

Vanneschi, L., Silva, S. (2023). Particle Swarm Optimization. In: Lectures on Intelligent Systems. Natural Computing Series. Springer, Cham. https://doi.org/10.1007/978-3-031-17922-8\_4