Comparison of the Genetic algorithm and Simulated Annealing for solving TSP problems

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***Abstract*—Simulated Annealing and Genetic Algorithms are two very famous algorithms for solving combinatorial optimization problems. In this paper, each algorithm is applied to a specific instance of a TSP problem to elucidate what are some of the pros and cons from using either approach.**

I. Introduction

Problem solving is hard. It is said that one of the main reasons of why it is hard is because we do not know where to even begin. It is a very creative intense process getting from point A to point B and figuring out how to get there is a very interesting challenge, for we have to take into consideration all the possible data and information about the world as much as possible. We have to review all the information provided, work out relationships within these data and to find the way to connect the goal and with the current information about the problem.

According to Dr.Michalewicsz from his remarkable *How to Solve it* book, a problem gets complicated because of some of the following reasons:

- There are so many possible solutions that the *search space* makes exhaustive search unfeasible.
- The *evaluation function* changes from time to time, requiring not a single solution but a set of them
- Finding a single non-optimal solution is already difficult as it is.

So when given the task of solving a problem, we have to take into consideration the **search space** of the problem, the **function to evaluate** the quality of a solution and more important what is the **model** of the problem.

II. Traveling Salesman Problem

The TSP [1] is very useful model when learning algorithms for problem solving since it involves a very simple concept: a salesman has to visit certain number of cities exactly once time and then return home using the shortest path possible.

The search space of a TSP is the all the possible path that there are to solve the unconstrained problem and its evaluation function would be the total distance traveled by the traveling salesman from start to finish.

References

[1] H. Kopka and P. W. Daly, *A Guide to LaTeX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.

[1]Other forms of models are the satisfiability problem (SAT) and non-linear programming (NLP)