Group 2 Project Proposal

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Abstract: Group 2 proposes to study the convergence properties of simulated annealing, genetic algorithms, and ant-colony approaches towards finding optimal solutions for various travelling salesman problems. Code will be tested to find convergence rate, wall-clock time, and for solution space exploration. For future studies, we will consider looking at parallel and/or GPU solutions to accelerate algorithms.

0.1   Introduction

0.2   Simulated Annealing

Simulated annealing is a stochastic approach towards minimizing an energy function.

0.3   Genetic Algorithms

Unlike simulated annealing, genetic algorithms rely on a population approach to

0.4   Ant-Colony Approaches

0.5   Go with the Winner Approaches

Simulated annealing probabilistically convergences to the optimal solution at the rate of $(\frac{1}{n})$ where n is the number of independent runs. Using heuristic schemes such as the "Go with the Winner" [?], hereby referred to as GWW, one can improve this convergence rate to $O(log\frac{1}{n})$ and have recently found their way into molecular modeling applications [?]. In general terms, the GWW algorithm mirrors that of simulated annealing; however, each independent run is periodically reassessed to determine if one is converging upon a losing solution. Runs with no chance for success are immediately discarded while runs with the best chance of finding an optimal solution are replicated; thus, GWW generates an ensemble of independent runs filled with "winners".

0.6   Analysis

To assess the performance of our optimization schemes, we would