Solving Traveling Salesman Problem By Using Improved Ant

Genetic Algorithms are adaptive heuristic search algorithms which tends to mimic the evolutionary concept of natural selection and genetics. Based on Charles Darwin's evolutionary principals of "survival of the fittest", GA's use techniques such as Selection, Crossover and Mutation that are inspired by natural evolution. Genetic Algorithms express an insightful utilization of a random search, driven to solve optimization problems. GA's have been used effectively in solving a variety of problems like Telecommunication Routing, Robotics, Computer Gaming, and Trip/Traffic Routing. Travelling salesman Problem is one such problem. Travelling Salesman Problem is such that, given a collection of cities and the cost to travel between each pair of cities, what would be the shortest route to visit all of the cities and return to the starting city. In the typical form, the travel costs are equal such that traveling from city A to city B costs just the same as it would to travel from City B to City A. The travelling salesman problem is known to be a NP-Hard Problem. The purpose of this study is to explore the various solutions proposed to handle the well-known NPComplete problem of the Travelling Salesman Problem using a genetic algorithm and selecting one of them to implement and validate the results proposed in the paper. After briefly exploring various papers, the paper "Enhanced Travelling Salesman Problem Solving by Genetic Algorithm Technique (TSPGA)" by Buthainah Fahran Al- Dulaimi and Hamza A. Ali was selected. The idea behind the study was to implement the paper and validate the results to check how close they are to the initial findings reported. The further enhancement includes the study of the paper "Hybrid Genetic Algorithm for Travelling Salesman Problem with sorted population". The approach mentioned in this paper has been implemented over the previous papers implementation and the findings are compared.

The Traveling Salesman ProblemA Computational StudyPrinceton University Press

The Traveling Salesman Problem (TSP) is widely considered one of the most intensively studied problems in computational mathematics and operations research. Since its inception, it has become the poster child for computational complexity research. A number of problems have been transformed to a TSP problem and its application base now extends into scheduling, manufacturing, routing, and logistics. With the advent of high-performance computing and advanced meta-heuristics such as GPU programming and swarm-based algorithms, the TSP problem is positioned firmly as the go-to problem for the development of the next generation of high-performance intelligent heuristics. This book looks to leverage some of these new paradigms for both students and researchers in this field.

"This book is devoted to the famous traveling salesman problem (TSP), which is the task of finding a route of shortest possible length through a given set of cities. The TSP attracts interest from several scientific communities and from numerous application areas. First the theoretical prerequisites are summarized. Then the emphasis shifts to computational solutions for practical TSP applications. Detailed computational experiments are used to show how to find good or acceptable routes for large problem instances in reasonable time. In total, this book meets a tremendous professional need for effective algorithms; it is the most comprehensive and up-to-date survey available on heuristic approaches to TSP solving."--PUBLISHER'S WEBSITE.

This book is a collection of current research in the application of evolutionary algorithms and other optimal algorithms to solving the TSP problem. It brings together researchers with applications in Artificial Immune Systems, Genetic Algorithms, Neural Networks and Differential Evolution Algorithm. Hybrid systems, like Fuzzy Maps, Chaotic Maps and Parallelized TSP are also presented. Most importantly, this book presents both theoretical as well as practical applications of TSP, which will be a vital tool for researchers and graduate entry students in the field of applied Mathematics, Computing Science and Engineering.

What is the shortest possible route for a traveling salesman seeking to visit each city on a list exactly once and return to his city of origin? It sounds simple enough, yet the traveling salesman problem is one of the most intensely studied puzzles in applied mathematics—and it has defied solution to this day. In this book, William Cook takes readers on a mathematical excursion, picking up the salesman's trail in the 1800s when Irish mathematician W. R. Hamilton first defined the problem, and venturing to the furthest limits of today's state-of-the-art attempts to solve it. He also explores its many important applications, from genome sequencing and designing computer processors to arranging music and hunting for planets. In Pursuit of the Traveling Salesman travels to the very threshold of our understanding about the nature of complexity, and challenges you yourself to discover the solution to this captivating mathematical problem.

This thesis reports on methods for solving traveling salesman problems with time-window constraints. Two types of windows are considered: hard time windows, which are inviolable, and soft time windows, which are violable at a cost. For both cases, we develop several heuristic procedures, including some that are based on Stewart's effective heuristics for the traveling salesman problem without time-window constraints. In addition, we develop exact algorithms for each case, which are based on the state-space relaxation dynamic programming method of Christofides, Mingozzi, and Toth. Computational experience is reported for all the heuristics and algorithms we develop. Keywords: Heuristic, Algorithm, Time Window, Hard Time Window, Soft Time Window, Slack, Branch and Bound, Nearest Neighbor, Penalty Cost, Traveling Salesman Problem, and State-Space Relaxation.

The idea behind TSP was conceived by Austrian mathematician Karl Menger in mid 1930s who invited the research community to consider a problem from the everyday life from a mathematical point of view. A traveling salesman has to visit exactly once each one of a list of m cities and then return to the home city. He knows the cost of traveling from any city i to any other city j. Thus, which is the tour of least possible cost the salesman can take? In this book the problem of finding algorithmic technique leading to good/optimal solutions for TSP (or for some other strictly related problems) is considered. TSP is a very attractive problem for the research community because it arises as a natural subproblem in many applications concerning the every day life. Indeed, each application, in which an optimal ordering of a number of items has to be chosen in a way that the total cost of a solution is determined by adding up the costs arising from two successively items, can be modelled as a TSP instance. Thus, studying TSP can never be considered as an abstract research with no real importance.

The Traveling Salesman Problem (TSP) has already been solved in the semi-optimal manners using the numbers of different methods. Among them, genetic algorithms (GA) are pre-dominating. This paper presents a new approach to solve this problem using the Simplified Bi-directional Associative Memory (sBAM), a type of Artificial Neural Network. To get a comparative idea of its performance, the same problem has been solved using a genetic algorithm. In this paper, performance has been analyzed of a TSP by Genetic Algorithm (GA) and sBAM. Finally we proved that sBAM provide real time highly faster nearly optimal solutions than the genetic algorithm.

One of the simplest, but still NP-hard, routing problems is the Traveling Salesman Problem (TSP). In the TSP, one is given a set of cities and a way of measuring the distance between cities. One has to find the shortest tour that visits all cities exactly once and returns back to the starting city. In state-of-the-art algorithms, they all assume that a complete graph is given as an input. However, for very large graphs, generating all edges in a complete graph, which corresponds to finding shortest paths for all city pairs, could be time-consuming. This is definitely a major obstacle for some real-life applications, especially when the tour needs to be generated in real-time. The objective, in this thesis, is to find a near-optimal TSP tour with a reduced set of edges in the complete graph. In particular, the following problems are investigated: which subset of edges can be produced in a shorter time comparing to the time for generating the complete graph? Is there a subset of edges in the complete graph that results in a better near-optimal tour than other sets? With a non-complete graph, which improvement algorithms work better? In this thesis, we study six algorithms to generate subsets of edges in a complete graph. To evaluate the proposed algorithms, extensive experiments are conducted with the well-known TSP data in a TSP library. In these experiments, we evaluate these algorithms in terms of tour quality, time and scalability.

This thesis presents an evolutionary algorithm (EA) to efficiently solve large instances of the time dependent travelling salesman problem (TDTSP). In this approach, the path the salesman must follow is structured as an ordered list of cities. The path may optionally have two kinds of constraints. Precedence constraints specify that a specific city must be visited before another specific city. "Time windows" specify the time at which specific cities must be visited. This work demonstrate that EAs are more effective than traditional methods, such as linear or dynamic programming, for solving general TDTSPs of up to 50 cities. This thesis also describes an improved dynamic programming heuristic that produces better solutions in less CPU time on TDTSPs of up to 400 cities.

A brilliant treatment of a knotty problem in computing. This volume contains chapters written by reputable researchers and provides the state of the art in theory and algorithms for the traveling salesman problem (TSP). The book covers all important areas of study on TSP, including polyhedral theory for symmetric and asymmetric TSP, branch and bound, and branch and cut algorithms, probabilistic aspects of TSP, and includes a thorough computational analysis of heuristic and metaheuristic algorithms.

This book presents novel and original metaheuristics developed to solve the cost-balanced traveling salesman problem. This problem was taken into account for the Metaheuristics Competition proposed in MESS 2018, Metaheuristics Summer School, and the top 4 methodologies ranked are included in the book, together with a brief introduction to the traveling salesman problem and all its variants. The book is aimed particularly at all researchers in metaheuristics and combinatorial optimization areas. Key uses are metaheuristics; complex problem solving; combinatorial optimization; traveling salesman problem.

The Traveling Salesman Problem is central to the area of Combinatorial Optimization, and it is through this problem that many of the most important developments in the area have been made. This book focuses on essential ideas; through them it illustrates all the concepts and techniques of combinatorial optimization concisely but comprehensively. The extensive reference list and numerous exercises direct the reader towards related fields, and give results. Each of the twelve chapters in this volume is concerned with a specific aspect of the Traveling Salesman Problem, and is written by an authority on that aspect. It is hoped, that the book will serve as a state-of-the-art survey of the Traveling Salesman problem which will encourage further investigations, and that it will also be useful for its comprehensive coverage of the techniques of combinatorial optimization.

This book presents the latest findings on one of the most intensely investigated subjects in computational mathematics--the traveling salesman problem. It sounds simple enough: given a set of cities and the cost of travel between each pair of them, the problem challenges you to find the cheapest route by which to visit all the cities and return home to where you began. Though seemingly modest, this exercise has inspired studies by mathematicians, chemists, and physicists. Teachers use it in the classroom. It has practical applications in genetics, telecommunications, and neuroscience. The authors of this book are the same pioneers who for nearly two decades have led the investigation into the traveling salesman problem. They have derived solutions to almost eighty-six thousand cities, yet a general solution to the problem has yet to be discovered. Here they describe the method and computer code they used to solve a broad range of large-scale problems, and along the way they demonstrate the interplay of applied mathematics with increasingly powerful computing platforms. They also give the fascinating history of the problem--how it developed, and why it continues to intrigue us.