Travelling Salesman Problem on Real Map

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Abstract- In general the main problem is to find the optimum route for travelling among number of routes called as Travelling Salesman Problem. The main aim of travelling salesman problem is to find shortest route among the number of locations. Most of the existing system use branch and bound method, neural network, fuzzy system. But the existing system uses either training data or they are slow. In solving this problem, Genetic algorithm provide better solution to this as it does not use training data. Also the memetic algorithm uses advance method to genetic algorithm i.e. it uses local search method for finding the best shortest route. For comparison to them we are also using decision tree algorithm which gives worst solution as it uses training data. By taking the advantages of both, we propose travelling salesman problem which has more accuracy than the previous system.

Keywords- Genetic Algorithm, Memetic Algorithm, Decision Tree Algorithm, Route.

I. INTRODUCTION

The Travelling Salesman Problem presents a salesman who has to travel between many numbers of cities. The order of visit each city is not decided, but he need to visit each city during trip and return to start city. The cities or location are connected to other cities or location by airplanes, railways or by road. Path between cities or locations have weight assigned to it. The cost of link describes the difficulty to traverse this edge on the graph and may be given; for example, by the cost of an airplane ticket or train ticket, or due to the length of the edge, or time required to perform complete the traversal. The salesman needs to keep travelling cost and travelling distance as low as possible. So, for finding shortest distance between all the cities or locations, the proposed solution is called as Travelling Salesman Problem.

The travelling salesman problem permits a salesman to form the tour of any number of cities, or locations. Then from all available routes he select available shortest route, visit each city exactly once and return to the start city i.e. the origin point or starting point from where he starts traversing. If there is n number of cities, then it needs to generate n! Path. This increases the problem exponential rather than polynomial. There are many algorithms as a solution that offers fast running time but still yields near optimal solution.

The travelling salesman problem is a traditional problem in computer science. The way of stating the problem is that, there is list of cities which we to visit and pairwise distance between them. The task is to find the possible shortest path which visit each city exactly once and return to the start city i.e. origin city. A naive solution solves the problem in O (n!) time (where n is the size of the list), simply by checking all possible routes, and selecting the shortest one.

II. LITERATURE SURVEY

Archit Rastogi: A Proposed Solution to Travelling Salesman Problem using Branch and Bound, March 2013.Branch and Bound algorithm breaks a problem into number of sub problem. This is a process for solving each sub problem where each sub problem may have more than one possible solution, where the solution obtain for one sub-problem may affect the possible solutions of sub problem that are generated later.

Mohammad Saraei: Solving of Travelling Salesman Problem using Fiery Algorithm with Greedy Approach, July 2015.By calculating the results, it can be seen that fiery algorithm with greedy approach provides a better tour length when comparing with standard fiery algorithm, genetics and particle swarm optimization. In fiery algorithm if we maximize the number of locations algorithm performance intensively decreases in finding optimal intensity; but according to analysis when the algorithm is repeated we can obtain better result but this can be attended with large tie increase of getting optimal tour.

III. PROPOSED SYSTEM

In the travelling salesman problem on real map, we use three types of algorithm in special way. i.e. we obtain a solution using three algorithms. For getting valid solution it is required to select each location exactly once. If a given path contains a repeated or missing out location then it may provide wrong result or the system may misbehave, it doesn't provide valid solution. In Genetic algorithm we use special type of mutation and crossover. At first mutation strategy does the exchange among the route itself, it does not add or remove the location form the route. One crossover method which is responsible for producing a valid route is ordered crossover. In this project we called locations as cities and routes are called as tours. In the crossover method, we first select a subset from

the first parent, and then add it to offspring. If we found any missing values in it then it is added to the offspring from the second parent the sequence in which they are found.

The Second algorithm is the Mutation algorithm; we can say it as the advance version of Genetic algorithm. This algorithm has been proven to be very effective in finding near-optimum solutions to hard combinatorial optimization problems. In this paper, the fitness calculated for several instances of the traveling salesman problem are found to show why Memetic algorithm are well-suited for finding near-optimum tours for the TSP. This technique uses solution obtain from the genetic algorithm as the input then apply local search technique to it.

1. Genetic Algorithm: Genetic algorithm attempt to incorporate ideas of natural evolution An initial population is created consisting of randomly generated rules. Depending on the survival of the fittest a new population is generated which consist of the fittest rules in the current population as well as offspring of these rules. We can generate Offspring by applying the genetic operators such as crossover and mutation. According to J.S.Kim et. al.Genetic algorithms are adaptive search techniques that can find the global optimal solution from an initial population of sample solutions by manipulating and generating recursively a new population of generation. Genetic algorithm provides operators such as reproduction, crossover, mutation which are develop by using natural solution. In genetic algorithm initially the initial population is generated. For each generation select good solution to find new population create new solution from parent check the solution for the fitness if sufficient quality is not reached and minimum number of iterations are not completed then replace the old population with the new one. This creates random initial pool. Following operation are performed on the replaced solution.

Selection: In each generation the available population is selected. To create a new generation the selection based on the fitness value and fitness function.

Mutation: Randomly selected bits in a solution are inverted to get the better solution.

Crossover: Substring from the pair of solution is swapped to form a new pair of solution.

The process of generating a new population based on prior population continues until a population evolves where it satisfies the fitness threshold.

The genetic algorithm uses the following steps:

a) Generate a population, The Genetic algorithm randomly forms values of the changing cells between the lower and upper bounds and create a set of chromosomes. This initial set of chromosomes is called the population.

b) Create a new generation, in the new generation, the chromosomes which have smaller fitness function have a greater chance of surviving to the next generation. The two techniques Crossover and mutation are used to generate chromosomes for the next generation.

c) Stopping conditions, at each generation, the best value of the fitness function in the generation is recorded, and the algorithm repeats step b. If there is no any improvement in the best fitness value is observed after many consecutive generations then genetic algorithm terminates.

Genetic Algorithm:

Begin
INITIALIZE population with random candidate solutions;
EVALUATE each candidate;
Repeat
SELECT parents;
RECOMBINE pairs of parents;
MUTATE the resulting children;
EVALUATE children;
SELECT individuals for the next generation
Until TERMINATION-CONDITION is satisfied
End

2. Memetic Algorithm: For Improving the relatively poor performance of genetic algorithms on travelling salesman problem has been one of the major kinds of uncertainty for researchers. For improving performance, many strategies are available. The first and surely the most important approach is to use special designed genetic operators i.e. recombination and mutation that properly profitable from special features of search space. The second approach is using a construction of heuristic to develop initial population of genetic algorithm regardless of simply using random heuristic to generate initial population. The third approach is to use improvement heuristics or local searches for getting locally optimize solutions. All this strategies are used in proposed memetic algorithm.

Memetic Algorithm

1. Encode solution space

2. {(a) set pop size, maxgen, gen=0;
　　{(b) set cross rate, maturate;
3. initialize population
4. while (gen < gensize)
　　{(a) Apply generic GA
　　{(b) Apply local search
5. end while
6. Apply final local search to best chromosome

IV. RESULT AND DISCUSSION

In the project give number of location or places as an input to the system. After this apply genetic algorithm, memetic algorithm, or decision tree algorithm. According to selected algorithm, it generates the number of routes having the shortest route on the top of list. It also has display on map link. After clicking on link it display the map of particular route. It also contain options for travelling by train, by bus, walk. This application also displays the directions for route. It provides the facility sharing the route to other person.

The comparison among all three algorithm i.e. Genetic Algorithm, Memetic Algorithm, Decision Tree Algorithm. This table shows the comparison among algorithm by taking distance as a measure. By this comparison analyzed that among these three algorithm Genetic and Memetic Algorithm gives best shortest distance. Sometimes Memetic Algorithm gives best result than Genetic Algorithm.

IV. APPLICATION

Vehicle Routing: Suppose that in a city n number of mail boxes have to be send everyday within a certain period of time, say one hour. The problem is to perform the given work with minimum number of vehicles in minimum time.

School Bus Routing Problem: The aim of this problem is to get a bus loading pattern so that the number of paths is minimized. The total distance covered by all buses is kept low.

Mission Planning Problem: The goal is to determine a shortest path for army men to fulfill the aim of the mission in the minimum possible time.

Crew Scheduling Problem: An application for deposit carrying between different branch banks is reported by Svestka & Huckfeldt (1973). Here, deposits need to be picked up at branch banks and returned to the central office by a crew of messengers. The problem is to determine the routes having a total minimum distance.

V. CONCLUSION AND FUTURE SCOPE

The TSP can be solved using the Genetic algorithms, Memetic Algorithm which provides optimal solution. In genetic algorithm, find the shortest route by calculating fitness value using mutation and crossover. A Memetic Algorithm is a search technique used to find the solutions of optimization problems. Memetic Algorithms use techniques inspired by natural selection such as mutation, selection, and crossover with the addition of local search.

The current application developed is according to the requirement that has been provided by the organization. As perspective to the future enhancement, the application can be further expanded in accordance with the changing scenario in the web-based applications that required frequent changes in the changing environment and expansion of the organization. In this project, basic genetic algorithm is used to solve the Travelling Salesman Problem. In future it will also use as an android application.

VI. ACKNOWLEDGMENT

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