Analyzing Optimal Road Trip Planning using Genetic Algorithm with Google Maps

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Abstract – The accurate and reliable trip generation Forecasting Model is the most basic and important part of the traffic forecasting model. This project focuses on the genetic algorithm which has an excellent Global search capability with trip generation forecasting model in order to achieve the purpose of improving the accuracy of prediction. One of the hardest parts of planning a road trip is deciding where to stop along the way. Since the geographical area of the country is huge, it is difficult to make a plan that favours and appeals everyone who wants to travel. The proposed algorithm must satisfy reasonable path constraints that meet the drivers' preferences as well as alternative path constraints that limit the joint failure probability for candidate paths. system.

Index Terms – Optimal road trip, genetic algorithm, traffic forecasting, trip generation.

1. INTRODUCTION

Planning a trip involves research on tourist places to visit, how to get to each place and to work out the sequence in which to visit them given the number of places and the duration of the trip. The Traveling Salesman Problem (TSP) algorithm is typically used to find the minimum distance to travel given a list of places to visit. One drawback of the algorithm is that while it aims to minimize the distance traveled given the number of stops, there are real-world constraints such as: 1) the operating hours of such places, and 2) the duration of stay at each place which is not taken into account.

The main contribution of the proposed system is that it takes into account these two constraints by determining the travel time between places by, 1) using the latitudinal and longitudinal coordinates of places to calculate the straight-line surface distance (spherical distance) between them, and 2) constructing a Look-Up Table (LUT) consisting of the travel distance and travel time between places using the Google Maps Directions API. To the best of our knowledge, there is yet to have any trip planning system that takes into consideration these two constraints. Furthermore, the proposed system is aimed at offline sequencing without having to store maps or routes in the system.

1.1. Existing techniques of road trip planning

Currently, employing a monumental task to find the true distance between the identified landmarks. That is similar using the Google Maps API. So use a Python script to calculate the distance and time driven for all the routes between the landmarks. Now with the landmark-landmark distances, next step was to approach the task as a traveling person. The task was to order the list of landmarks and visit them in order such that the total distance traveled between them is as small as possible. The existing system makes it especially difficult to find a route that backtracks as little as possible.

1.2 Disadvantages of existing system

- Finding the route that backtracks little as possible, which is especially difficult.
- High cost, Low yield investment
- Time-consuming

1.3 Introduction on Genetic Algorithm for search*:*

Biological evolution motivated as analogy to the introduction of learning methods. Genetic algorithms generate successor hypotheses by repeatedly mutating and recombining parts of the best currently known hypotheses, rather than search from general-to-specific or from simple-to-complex,. At each step, current population which is collection of hypothesis, is updated. This is done by replacing some fraction with offspring of the most fit current hypotheses.

Problem is to identify the best hypothesis among a search a space of candidate hypotheses. The best hypothesis is defined as the one that optimizes a predefined numerical measure, called fitness. For example: Error function.

1.3.1 Basic Structure of genetic algorithm:

Iteratively updating a pool of hypotheses (population)

For each iteration:

- fitness function is used for the evaluation of hypothesis
- by selecting the most fit individuals a new population is generated

- some are carried forward, others are used for creating new offspring individuals

2. PROPOSED ARCHITECHTURE

If the fact that absolutely best route cannot be created between all the capitals, then we can turn to smarter techniques such as genetic algorithms to find a solution that's good enough for our purposes.

Genetic algorithms give a number of random solutions and continually randomize with these solutions always trying something slightly different and new from the current solutions and keeping the best ones until they can't find a better solution anymore. This is done instead of the existing system where it is required to look at every possible solution

2.1 Detailed description of the modules:

There are four modules designed in this proposed architecture. Namely,

- Design User Interface
- Selecting the locations
- Data Set
- Finding best location

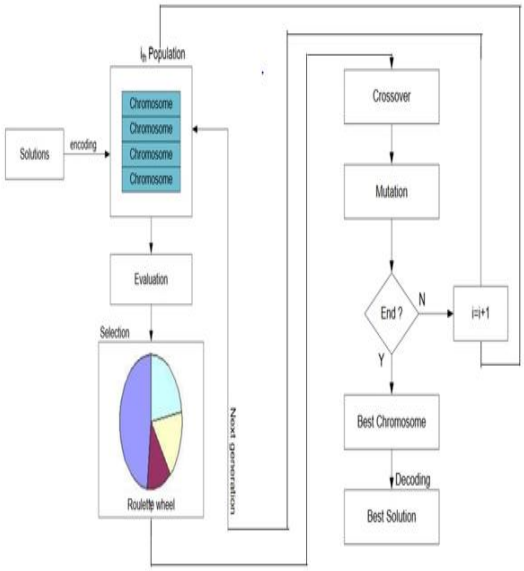

Figure 1.Proposed Architecture

2.1.1 Designing user interface:

The user interface is the application where the user is allowed to enter the locations The project uses Google maps API for taking source and destination locations The user can enter all the locations which are called waypoints to be visited before reaching the destination.

Figure 2.Map Objects

To create a GUI using Google Maps the following step are followed:

The steps are: importing data, parsing data, and updating the web page.

A graphical user interface i.e. GUI, is a display that shows all of the relevant data and controls of a system to the user. Google Maps is a popular maps tool that Google has made its Google Maps software open to developers by releasing an API so that web developers can create their own Google Maps websites that fit their needs. The API is written for JavaScript programming of websites.

Google Maps can be a useful tool in plotting data on a map.

- The first step in using outside data is to import it into your Javascript code as an object. One common form of holding data is the use of a JSON file. A JSON file can contain a database of information in an external file that can be imported into Javascript.
- Parsing is done using a function in jQuery
- The map objects are called and updated using js on function everytime the webpage is called.

2.1.2 Finding the Dataset:

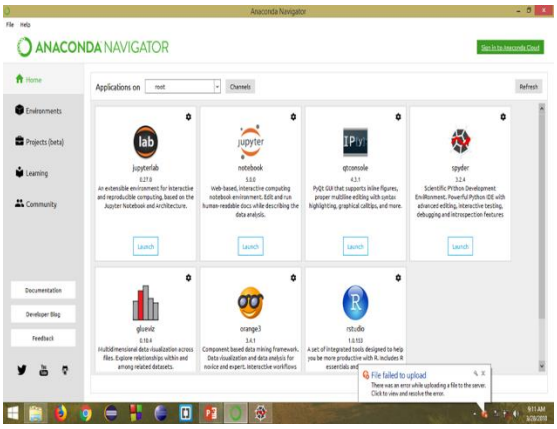

Figure 3.Using Anaconda Navigator to find the Data sets

The data set contains all the locations in the maps. It contains many-to-many relations among the locations to show the possible directions. The data set is used by the Anaconda Navigator to show the optimal path on the maps.

2.1.3 Finding best location:

Genetic algorithm is implemented using Python programming. The code uses the algorithm to minimize the backtracking and optimize the path to be followed to visit all the way-points.

Steps followed in the genetic algorithm is as follows:

- Determine the number of chromosomes, generation, and mutation rate and crossover rate value.
- Generate chromosomes of the given population, and a random value for the initialization of the genes
- Process steps 4-7 until number of generations is met
- Evaluation of fitness value of chromosomes by calculating objective function
- Chromosomes selection
- Crossover
- Mutation
- Solution (Best Chromosomes)

After implementation, the result is obtained on the map.

Figure 4.Implemented result on maps

3. ADVANTAGES OF PROPOSED ARCHITECTURE

- Time efficientCost efficient
- Find a route that's good enough for our purposes.
- Ease of Best Route Application
- Logistic Applications
- Call Taxi Applications

4. CONCLUSION

The proposed algorithm helps satisfy path constraints reasonably that meet the drivers' preferences. It also gives alternative path constraints that limit the joint failure probability for candidate paths.

Instead of looking at every possible solution, exhaustively, using genetic algorithms can help to start with start with a handful of random solutions and continually tinkers with these solutions always trying something slightly different from the current solutions and keeping the best ones until they can't find a better solution anymore. This proposed algorithm for road trip planning is thereby an optimal and time efficient solution.

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