IJCSN International Journal of Computer Science and Network, Volume 4, Issue 1, February 2015
ISSN (Online) : 2277-5420 www.IJCSN.org
Impact Factor: 0.417

A Survey on Generating Driving Routes for Real Time Traffic Congestion Analysis

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Abstract - Vehicle navigation technologies have been around for some time. Even big companies like Google have developed their map service. However, we are trying to develop a navigation system that is better than the ones available in the sense that it provides the user with the most optimum route to his destination, rather than the most shortest route. In this paper, we explore and review various existing technologies, techniques and work being done on the same. This paper, focuses on optimum route guidance considering both static as well as dynamic parameters like traffic density, and traffic clearance rate. To realize optimum route guidance system, Real Time Traffic Congestion Analysis i.e. RTTCA is proposed using A* algorithm based on real time traffic information.

Keywords - *A* algorithm, shortest route, navigation system*

1. Introduction

A route guidance system is a routing system that provides instructions to drivers based upon "optimum" route solutions. A dynamic route guidance (DRG) system would route drivers using the current traffic conditions such as congestion and road works. This system can provide actual routing advice to the driver in light of the real-time traffic conditions and incidents of the traffic network. Based on the A* algorithm, it implemented in the route guidance system for find out different paths and process is analyzed. A* algorithm can handle the traffic density and traffic clearance rate.

This proposed work, it presents and analyses an efficient solution to the vehicle routing problem based on real-time dynamic information. This approach consists of solving a sequence of optimization problems, where we take into account different parameter like traffic density, real time data and traffic clearance rate. Based on the detailed analyses of characteristic of the optimum path and real-time limitation of traditional algorithm, in this A* algorithm is proposed to overcome this problem. The main work is to realize optimum route guidance system based on real time traffic congestion analysis.

Such a system would be particularly useful when accidents or road works occurred on roads. Also, the system is highly beneficial to the motorist when driving in unfamiliar areas. A DRG system using model would act as the driver's assistant and try to reduce his tension. Thus, the traditional methods ignore the presence of vagueness and ambiguity in drivers' perception, making them difficult to be valid mathematical models.

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2. Related Work

Caixia Li, Sreenatha Gopalarao Anavatti, and Tapabrata Ray introduced analytical hierarchy process (AHP) using a fuzzy inference technique based on the traffic information for dynamic route guidance system. It considers two parameter cost and traffic density. This paper reduces complexity and timing delays as compare to traditional methods. In this paper, Rule-based fuzzy systems are based on fuzzy theory, with expert knowledge represented explicitly using a set of fuzzy if-then rules [1].

T.Shanmuga priya, Mr.N.Kamalraj suggested the capabilities of Enhanced dijkstra algorithm as a comprehensive tool for decision-making improved by integration of the. In this paper, of Balanced Path Routing technique is used where the data is sending from source node to the alternate node and then pass to other node and then to next node and then to the final node to reach the destination. Cuts between the nodes are

prevented and the shortest route path from source to destination is given by this technique [7].

N. Pushpalatha, Dr.B.Anuradha gives the Dijkstra's algorithm for the estimation of shortest path. This paper proposes a Dijkstra's algorithm which uses the connectivity of information, the estimated distance information among the sensor nodes and find out the Shortest Path Position Estimation between Source nodes and Destination nodes in Wireless Sensor Networks which gives Low Cost [5].

ZOU Liang,*, XU Jianmin, ZHU Lingxiang gives the Application of Genetic Algorithm in Dynamic Route Guidance System. This proposes the biggest obstacle between the genetic algorithm and dynamic route guidance that is the initial generation of genetic algorithm by applying A* algorithm[1].

Shan Hu a, Jiansheng Wu a, Ling Xu b detects the real-time information of the traffic congestion on the road and a method based on real-time video analysis was presented. This proposed method finds out proper and detect the place of traffic congestion on the basis of real time video analysis [6].

JIN Sheng, WANG Dianhai, WANG Liming the traffic conditions are monitored at the off-ramp using occupancy rates and also monitors the performance index for the surface street vehicles, and then the control signal split and cycle length are optimized for the surface street vehicles assuming that the off-ramp queue is shorter than the minimum allowable length[3].

G. Tan, M. Bertier, and A.-M. Kermarrec it gives the problem of shortest-path geographic routing in a static sensor network. A reduced visibility graph is based on the construction of static sensor network which guide nodes to find out near-optimal paths in the network. The per-node protocol is used to expenses in terms of state information and message transmission which depend on complexity[4].

DAN Zhenggang, CAI Linning, ZHENG Li presents a multi-agent model system for the VRPTW which is based on the internal behavior of agents and coordination among the agents. The system shows a formal view of coordination using the traditional contract-net protocol (CNP). This improved method is based on a vehicle selection strategy and number of negotiations and the negotiation time are also reduced.[2]

3. Proposed System

In this work, Real Time Traffic Congestion Analysis i.e. RTTCA is proposed which uses A* algorithm for finding optimal solution based on real time traffic information for the shortest route to Destination. In this a dummy city model which monitored the routes of the city which is helpful for Real time Traffic congestion analysis. And all the information is stored in it.

For the detection of the traffic density on the routes which use the In-pavement sensor which shows us the congestion analysis of optimum route in real time system. Due to use of sensors Traffic density and traffic clearance rate Information is updated all the time and we get it on our vehicle so it will be easy to get another optimum route for the Real Time Traffic congestion Analysis.

This model should develop own Traffic Analysis Algorithm as optimum route generator.

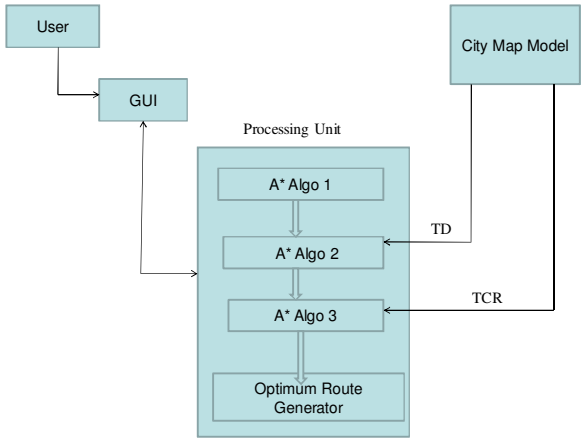

FIG 1: System Architecture

A. System Architecture

- There is a user who wants to use the Graphical user Interface. GUI provides the various navigational system and we monitor the optimum route guidance system.
- It is connected to the processing unit where algorithm 1 is applied for the real time data and algorithm 2 is applied for the traffic density which calculates the traffic density of the route.
- Then algorithm 3 is applied for the traffic clearance rate which calculates the timing required for traffic clearance.

- After applying all these algorithm here develop own algorithm for finding out optimum route for system is the optimum route generator. It gives the most optimum route and this processing unit is updated all the time.
- These real time parameters such as traffic density and traffic clearance rate get from the city map model which is the hardware part where sensors are used to show the congestion analysis of traffic.
- If congestion is monitored anywhere due to use of sensors which provide collective data and this data provides the congestion level on each route.

B. A* Algorithm

- A* is the algorithms that takes an input, evaluates a number of possible paths and gives the solution.
- A* algorithm is generally used for path finding and graph traversal.
- A* uses a best-first search and finds out the least-cost path from a given initial node to goal node.
- The A* algorithm combines features of uniform-cost search and pure heuristic search to effectively compute optimal solutions.

Table I: Comparisons of Algorithms

Dijkstra's algorithm	Dynamic time warping algorithm	A* algorithm
1. Used for path finding	1. Used to find out congestion	1. Used for graph traversal and path finding
2. For greedy approach to solve single source shortest problem	2. For computing global distance between two time series	2. For Pure heuristic estimate to effectively compute optimal solutions
3. Find out shortest path position	3. Find out optimal match between two given sequence	3. Find out least cost path

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4. Conclusions

We have referred several papers, describing several techniques to build various types of navigation systems. Our main concern is adopting an accurate algorithm that allots proper consideration to all static and dynamic parameters to develop our system, Hence, it is important to have a very strong algorithm. Amongst the ones that we reviewed viz. analytical hierarchy processing technique, and fuzzy inference model, we have chosen not to directly adopt one single algorithm but to adopt aspects from all, thus developing a new hybrid model of triple A* algorithm model that can be used to each parameter and gives very accurate results.

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