Study on Path Optimization Method of Urban Traffic Flow Guidance System Based on Internet of Things

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Abstract: This paper analyzes the existing traffic guidance systems and conducts a detailed explanation of things based on traffic flow guidance system and describes its characteristics and advantages and disadvantages. After a comparison between them, this paper designs the optimal way and introduces its features detailly. On this basis, this paper studies the structure and composition traffic information system, including the service application platform designed to induce traffic information systems and traffic information collection system and vehicle location system to provide basic information on traffic flow guidance system design. This paper analyzes the general method of route optimization to build a theoretical model based route optimization and this lay a foundation for things urban traffic guidance system path optimization.

Introduction

Traffic flow guidance by providing traffic information, route guidance, driver assistance and other means to limit and guide, blocking transport stream, which aims to facilitate travel and ease traffic congestion. Traffic flow guidance system has gone from a static to a dynamic system of the system development process. Static is a geographic information system of route guidance, is now the most common GPS navigation system. Dynamic traffic flow guidance system consists of three parts: the traffic information center, communications systems and automotive induction unit, now common form of radio traffic and road traffic -induced electronic screen. Currently, in the world, traffic guidance systems have received a great deal of attention to R & D personnel and users greatly welcomed [1]. Some of our large cities, but also have established traffic flow guidance broadcasting system, which consists of a vehicle detection device to transmit information on the road to the traffic control center, released to radio in the form of post-processing to the driver, the effect is very limited. Research focus at this stage is to choose relevant fields into account how fast the optimal path and macro reasonable. This article aims to introduce the realization of automotive systems and command centers in the form of networking traffic flow guidance system is connected, in connection with the sharing of information prerequisite to vehicle detection equipment and data acquisition camera lens upload information center, information center unified treatment, depending on the road conditions for different vehicles, released between information platform, automotive equipment and information platform via a network connection, you can update real-time road information in a timely manner to make the most reasonable path selection.

The Composition of the Traffic Flow Guidance System Structure

The Traffic Information Collection System. Making traffic flow traffic information must be collected and treated before induction, collect traffic information integrated traffic information is the basis and prerequisite information center is a necessary condition for data analysis and processing. Traffic information collection technology is mainly achieved through the traffic control system, traffic flow monitoring device must be set in the control area. It should be noted that the traffic information collection accuracy and speed of information transfer is closely related to the effect of information processing.
Traffic Flow Information Processing Systems. Things is through radio frequency identification (RFID), infrared sensors, global positioning systems, laser scanners and other information sensing device, according to the agreed protocol, to any article connected to the Internet, information exchange and communication in order to achieve intelligent identify, locate, track, monitor and manage a network of concepts. "The concept of Things" is based on the "Internet" concept on the extension and expansion of its clients any goods and goods between the conduct of a network for information exchange and communication concept. It has equipment of ordinary objects, autonomous terminal interconnected and intelligent three important universal service features. Ideal for traffic flow guidance in the process of information processing [2].

Vehicle Positioning Systems. VPS function is to determine the exact position of the vehicle in the road network, the study uses GPS positioning subsystem and DR positioning subsystem. Its main function is to initially locate the vehicle, providing an initial value for the map matching matching module. Throughout the system, the system is based on the user to organize the use of functional modules vehicle navigation systems encountered.

The Introduction of Path Optimization

Route optimization is an important part of traffic guidance systems, current research scholars on this subject to its practical application optimization method has a more mature conclusion. Through the urban transport network, traffic flow analysis of the survey, the establishment of a basic network optimization model to predict the minimum cost, to make reasonable traffic assignment.

The Principle of Route Optimization. A complete trip travel time to consider the impact of choice and the choice affects the way the impact of the path. For travelers, the general is both the travel route selected on the basis of consideration of transportation and travel time. More developed urban traffic network, high complexity of the road network, often multiple viable path between origin and destination. Travelers generally based on their travel requirements, travel preferences and degree of traffic information to determine their own possession driving route. Due to the diversity of choice overall, in terms of individual travel path becomes more complicated. Network traffic flow studies are all travelers' route choice behavior of the overall performance, so how travelers choose will have a significant impact on the entire system.

The traditional route optimization model system because of the road network leading to the huge complexity of the calculation process, the calculation results with access to a larger reality, therefore, reasonable to optimize network structure, automatically abandon some sections, can improve search efficiency, simplify the calculation process. Meanwhile, for the optimization models and algorithms to select, depending on the traffic conditions, select the appropriate structural model the actual situation.

The Considerations of Route Guidance. The use of pure mathematics is difficult to solve complex transportation problems in the entire transport system, there are many uncertain factors and unexpected things, therefore, the following points should be considered in conjunction path optimization problem.

Global Optimization. If the distance between two points if three varying routes to travel, from the user's point of view to select the shortest distance from the road, so a lot of users will gather at the shortest distance down the road, resulting in a network of local roads congestion clogging; from the point of view of the overall network, the other two lines have not been fully utilized, can not give full play to the role of the network as a whole, in which case, the optimal path from the shortest path between two points is not the need to re-allocate the traffic flow. Global optimal load balancing in favor of the network, allowing users to take advantage of reasonable transportation network.

Travelers factor. Travelers are the main route guidance system, the choice of the route there are many special requirements, such as too many do not want to go the route intersections based on personal preference and some drivers, some drivers do not want to walk a lot to turn left the route, because straight and turn left, turn right easier than congestion, some drivers need to travel a fixed route, such as urban public transport. Therefore, when performing dynamic route guidance must take into account these special factors.
Traffic information factor. Dynamic route guidance inducing than static nature of the path lies in providing the latest induction regimen based on real-time traffic information gives walkers, so traffic must have real-time information, for the case of some communication delays can not be eliminated, and to adopt appropriate methods path to improve the search process, so that the route can induce timely and effective given Walker sent.

The Method of Path Optimization

The Expression Optimization of Road Network. Classic representation of the road network topology modeling, graph theory, said. Graph theory does not refer to a simple graphical sense, it uses a binary data structure diagram showing the relation is defined as:

\[
G = (N, A)
\]

\[
N = \{X | X \in data\ object\}
\]

\[
A = \{NA\}
\]

\[
NA = \{<X, Y | W(X, Y) \land (X, Y \in N)\}
\]

Where, N is the set of vertices; A relationship data; \( <x, y> \) said arc vertex x, y between; \( w (x, y) \) reflects the arc \( <x, y> \) information; NA vertex the relationship between the collection [3].

Have to figure graph theory and a directed graph of the points, if you define x as a starting point, y is the end, then the arc \((x, y)\) is the direction, in which case the graph is called a directed graph; If \((x, y)\) represents only one side of the arc, two vertices x, y is not between order, so at this time Pictured undirected graph.

Determine the Weights of the Road.

(1) Take the shortest travel time as the target. It can significantly reduce the travel time of the route is the most optimal path for most users expect, the congestion of the city, travelers weigh the pros and cons route distance has not the most important factor, especially in the rush hour, to than non-peak periods to spend 3-4 times as long to walk the same section of the road, so much has become a time-consuming the most significant route selection criteria.

(2) Take the shortest distance as the optimal target. The section of road length as the weight, which is a form of static road resistance, the weight of heavy road can be obtained directly, without a lot of information collection and calculation. As stated above, in the dense urban road network, the travel distance to travel the length of the fundamental starting point is not the route to consider when, therefore, this road lies right road network intensive, heavy traffic, or under circumstances such as urban centers applicability is relatively small, the reference value is low. In the network model is simple, fewer nodes and less alternative route, detour too far from the edge of the lot and other cities, such as intercity between distance factors can serve as an effective measure.

(3) Take the best quality roads as the optimal target. This factor is also resistance in the form of a static way, the road network in accordance lane road, slope, surface type and other indicators of a hierarchy, and then weighted according to each level of assessment methods derived comprehensive assessment of the value of this section, and select the optimal path without considering the length of time and distance, only choose between the integrated value of the highest sections of departure and destination. In this case the calculation results and the actual difference between the larger, so the systematic study in the use of this method [4].

Establish the Road Network model. Take the graph theory to express abstract urban roads, while you can set up a simple network model according to the road traffic volume to determine the actual weight [5].

Fig. 1 is an urban road network, during network abstraction, with the nodes in the network instead of to the intersection of said line sections. The actual road network topology modeling, not all follow the true status of the road painted, abstract for special sections to deal with, such as in the actual road network connecting the two sections of the Cross between the mouth turn more twisted road to its simplicity, can be approximately expressed as a linear or two segments just as shown in Fig. 2:
Conclusions

This paper analyzes the principle and the three path optimization factors of urban traffic flow guidance system based on internet of things. On the basis of graph theory, this paper conduct the expression of the road network optimization, empower its abstract values into a directed graph, and explore the way the weight determination method, and finally establish network model.

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