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Abstract: Aiming at the problem that the traditional health management system cannot effectively integrate the data, which leads to the low efficiency of data processing and the effect of data traffic management, a smart health management system based on WEBGIS is designed. Based on the traditional system, the dynamic health data acquisition hardware module is designed. According to the weekly similarity characteristics of health data flow, the data traffic flow in different time periods is predicted and the data traffic is controlled. The WEBGIS technology is used to deal with the traffic in networks, and the effective management of the network traffic is realised. In this paper, we used this to manage health data traffic. Simulation results show that the designed management system can effectively reduce the data congestion and improve the efficiency of health data traffic management.

Keywords: WEBGIS technology; smart health; health transportation; management system; system design.

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1 Introduction

With the rapid growth of China's health development, the continuous growth of hospitalisation scale and the popularisation of internet advanced technology in all aspects of daily life, the traditional health management mode has been difficult to meet the needs of social and economic development. How to use internet technology to improve the efficiency of health management has become the goal and focus of the government. Therefore, 'internet plus health management' came into being. Taking the management of health traffic congestion as an example, traffic congestion has become one of the important restrictive factors for the economic and social development and the improvement of people's living standards in some cities of China. The effective supply of health road traffic resources and the daily travel demand of citizens are increasingly unbalanced. How to effectively solve the problem of health traffic congestion with advanced internet technology is imminent. In recent years, China's healthcare process has been accelerated, and internet technology has been widely used. It has become a general trend to apply advanced mobile internet technology to health management and reform the traditional health management mode that does not adapt to social development and improve the quality of health management. As one of the important links of health management, the problem of health traffic congestion is becoming increasingly prominent. With the development of economy and social progress, the wealth of residents is growing day by day. IoT have become the standard configuration for more and more families. With it, more and more sensors, more and more cars are parked in the parking lot, and residents are wasting more and more time data congestion, storage problems and other issues have become the current health data management problems faced by many large and medium-sized cities in China, and with the increase of travel time caused by data traffic delay, the increase of travel cost caused by no-load loss of vehicles, air pollution, etc.

The main contribution of the work is as follows:

1 Internet plus health management has innovating the management mode of health traffic congestion in China, integrating the development of advanced technology of mobile internet with health traffic congestion management, and forming a new mode of health traffic congestion management which is based on the 'internet plus health management' as the way to realise and infrastructure.

2 It promotes the health development more comprehensively and effectively, and embodies our government. Internet plus health management will also become a new driving force and new engine for health data traffic congestion management innovation.

Organisation of the paper is as follows: related work is discussed in Section 2. Section 3 has implementation details. Result is evaluated in Section 4. Conclusion is stated in Section 5 of the paper.

2 Related work

With the rapid development of information technology, the internet of things, cloud computing and other emerging technologies are applied to all aspects of health management, and the construction of smart health is gradually promoted in China. The construction of smart health not only improves the efficiency of health management, but also improves the life experience of health residents [1]. The internet of things and internet technology are used to connect the infrastructure used in health management, and information and communication technology are used to connect and integrate various health management systems and service departments, so as to form intelligent health life, improve the utilisation rate of health management resources, save energy and cost in traditional health management, and reduce the negative impact on the environment, to achieve the fine and dynamic management of the health, and improve the effectiveness of health management and improve the quality of life of citizens. With the rapid development of economy, the use of health motor vehicles is increasing in multiples. The increasing demand for transportation services brings great pressure to the management of health transportation system. The traditional health data management system needs to obtain data from different data sources when carrying out traffic management in network. The difference of data standards seriously affects the processing efficiency of the management system. In addition, each module of the traditional traffic management system is independent of each other, which cannot achieve effective data and function integration, and is prone to data disconnection problem [2].

WEBGIS is based on the traditional GIS technology, using the convenience of network connectivity and the sharing of data interconnection to realise the function expansion of traditional GIS technology. WEBGIS can seamlessly integrate with other information services in the web at any time. It can establish flexible GIS applications, make maximum use of network resources, and provide personalised services. This paper will study and design the intelligent health traffic management system based on WEBGIS, and verify the feasibility of the system in the actual health management.

3 Hardware design of intelligent health data management system based on WEBGIS

The hardware part of smart health data management system is mainly composed of dynamic traffic data acquisition module and static traffic data acquisition module. After collecting real-time traffic information in the health, the two hardware modules transmit the real-time traffic information to the central server of the system through LAN. The

server and the upper computer of the system analyse and process it to realise the management of data traffic. This paper mainly designs the dynamic traffic data acquisition module. The static traffic data acquisition module uses the hardware part of the traditional traffic management system. The following is the design of the dynamic traffic data acquisition module.

The dynamic data acquisition module is composed of geomagnetic data collector and data receiver. The data collector uses the IoT devices embedded in it to detect passing vehicles at fixed distance intervals or according to the actual management requirements. Different direction magnetoresistance sensor is used in IoT devices. When the vehicle passes by, the iron nickel alloy film on the sensor will change its resistivity in the changed magnetic field. The change of magnetoresistance of the iron nickel alloy film can be measured by the output voltage of the bridge connected to it. After the IoT device analyses the geomagnetic disturbance signal generated by the vehicle passing by, it is processed and analysed by the main control chip S3C2440A of the dynamic data acquisition module [3]. S3C2440A chip has the ability of low power consumption and high speed parallel processing. The real-time data processing frequency can reach 400MHz. After the main control chip S3C2440A of dynamic data acquisition module analyses and processes the received data detection signal, the RF chip CC2420 receives and transmits the processed data to the system data receiver. After receiving the signal, the traffic information data receiver exchanges data between the data receiver and the system central server by TDMA communication mode.

TDMA communication mode can ensure that the central processor of traffic management system can timely analyse the data collected by hardware part, so as to avoid causing greater management pressure and improve the efficiency of health data management [4]. The traffic information data receiver sends the traffic data packet with time to the central server at time, and the central server receives the data packet sent by the data receiver at time, and stamps the time stamp of time. In the process of data transmission and communication, the time difference between the data receiver and the central server can be the sum of the absolute time difference of communication between them and the data packet transmission time, thus realising the time synchronisation under TDMA communication.

On the basis of the hardware part of the data management system designed above, the software part of the system is designed by using WEBGIS technology to realise the health data management in the smart health.

3.1 Data traffic signal control

Because the traffic flow data changes periodically, we can use the weekly similarity characteristics of traffic flow data, and use the method of weighting the historical data and modifying the time series prediction model to make short-term traffic flow prediction. Taking working days as an example, if only the historical data of the last five working days are used, the short-term traffic flow prediction can be realised according to the following steps [5].

The traffic flow prediction function is constructed as follows:

$$Q_d^w(t,n) = \sum_{k=1}^{5} w_k \left[(1+\eta_k) q_k^{w^*}(t,n) \right] \tag{1}$$

In equation (1), $Q_d^w(t,n)$ represents the predicted traffic flow at n hours after time t on the d day of week w; w_k represents the weight of week k; η_k represents the correction coefficient of week k; $q_k^{w^*}(t,n)$ is the historical traffic flow of week w^*, day k and time t [6]. The weight is obtained by comparing the real-time traffic flow data before the current time of the forecast day with the corresponding traffic flow data before the current time of the historical working day. That is, the closer the data of five working days is to the data before the current time of the forecast day, the greater the weight is. The calculation formula is as follows [7].

$$w_k = \frac{\theta_k}{\sum_{k=1}^{5} \theta_k} \tag{2}$$

In equation (2), θ_k is the anti-random interference factor. The anti-random interference factor can avoid reducing the weight of historical data and affecting the prediction accuracy due to large data error. Using the predicted traffic flow data and using the principle of fuzzy eclectic planning to control the traffic signal, the traffic flow changes can be predicted in advance, and the congestion of urban traffic main roads can be reduced.

3.2 Emergency traffic disposal using WEBGIS technology

When there is a traffic accident on the road, when the system receives or detects the accident, it uses the vehicle GPS and the hardware module of the management system to locate the location of the accident. When using GPS for vehicle positioning, if t_g^j is the GPS time when the positioning satellite transmits the signal; t^j is the satellite clock time when the positioning satellite transmits the signal; T_g is the GPS time when the signal receiver receives the satellite transmitting signal; T is the receiver time when the signal receiver receives the satellite transmitting signal, then the transmission time of the GPS satellite signal can be calculated according to the following equation (3) [8–10]:

$$\tau^j = T_g - t_g^j \tag{3}$$

In the actual measurement process, because the GPS time of satellite cannot be measured, the following formula is used instead of the above formula:

$$\tau^j = T - t^j \tag{4}$$

According to the deviation between GPS satellite clock time and receiver time, the above formula can be converted into the following form [11]:

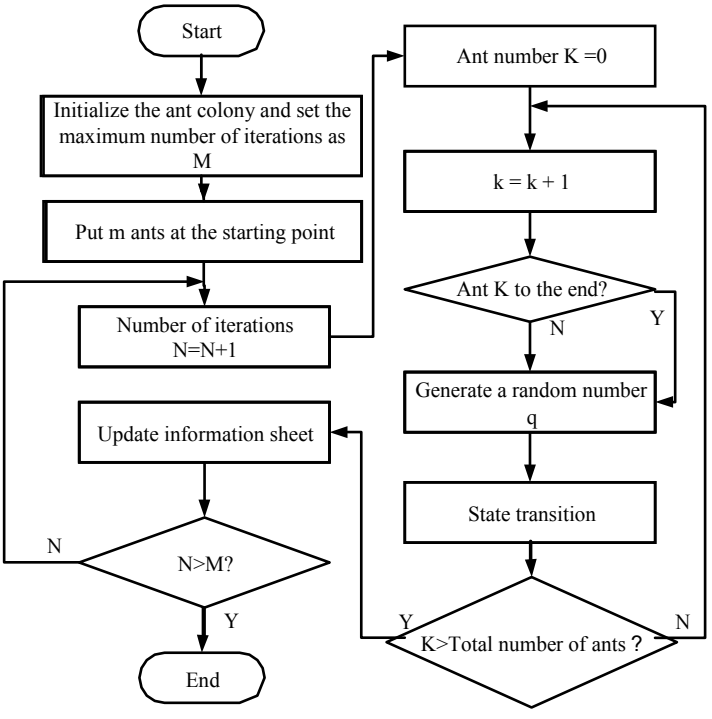
$$\begin{cases} \tau^j = \left(T_g - t_g^j\right) + \Delta t - \Delta t^j \\ \Delta t = T - T_g \\ \Delta t^j = t^j - t_g^j \end{cases} \tag{5}$$

In equation (5), Δt is the deviation between GPS satellite clock time and receiver satellite clock time; Δt^j is the deviation between receiver clock time and satellite clock

time [12,13]. The distance between the satellite and the signal receiver can be roughly obtained by multiplying the above-mentioned time with the speed of light, and the three-dimensional space coordinate system can be established according to the geometric relationship between the receiver and the satellite. In the space three-dimensional coordinate system, the location of the actual traffic accident is obtained by calculation.

After determining the actual location of the data congestion, a traffic network map with the congestion location as the centre and the distance between the congestion location and the data is rescued as the radius is established by using WEBGIS technology [14,15]. The system designed in this paper selects map services in ArcGIS Server to provide rescue Map Service. Using this service, the traffic management system combines the real-time traffic data collected by the system to plan the best rescue route, so as to improve the emergency handling efficiency of health traffic. In this paper, ant colony algorithm is used to plan the optimal emergency disposal route. Figure 1 shows the planning process of ant colony algorithm [16,17].

Figure 1 Emergency disposal path planning based on ant colony algorithm



The state transition rules of ant colony algorithm in the Figure 1 are as follows [18]:

$$S = \begin{cases} \arg\max\left\{\left[\tau_{it}(t)\right]^{\alpha}\left[\eta_{td}(t)\right]^{\beta}\right\}, q \le q_0 \\ w, q > q_0 \end{cases} \tag{6}$$

In equation (6), S is the set of the next position in the ant's path; w is a random value; q_0 is a constant; q is a random value on the interval [0,1]; α determines the ant's path

of advance; β judges whether the direction of ants is correct; $\tau_{it}(t)$ is the residual amount; $[\eta_{td}(t)]^{\beta}$ is the degree of inspiration. According to the above process, call the shortest path as the result of algorithm planning. The rescue team goes to the accident location according to the path planned by the system. The traffic management system can speed up the progress of the disposal team and improve the disposal efficiency by controlling the flashing time of traffic signals. Through the above process, the design of intelligent city traffic management system based on WEBGIS is completed. The performance of the management system will be tested through experiments [19–21].

4 Simulation experiment

In this paper, the intelligent health traffic management system based on WEBGIS is studied, and WEBGIS technology is used to effectively improve the application and processing efficiency of traffic management mode in different periods of health traffic, and relieve the traffic pressure of the health. In order to verify whether the traffic management system designed above can be applied in practice, this section will carry out experimental verification.

4.1 Experimental content

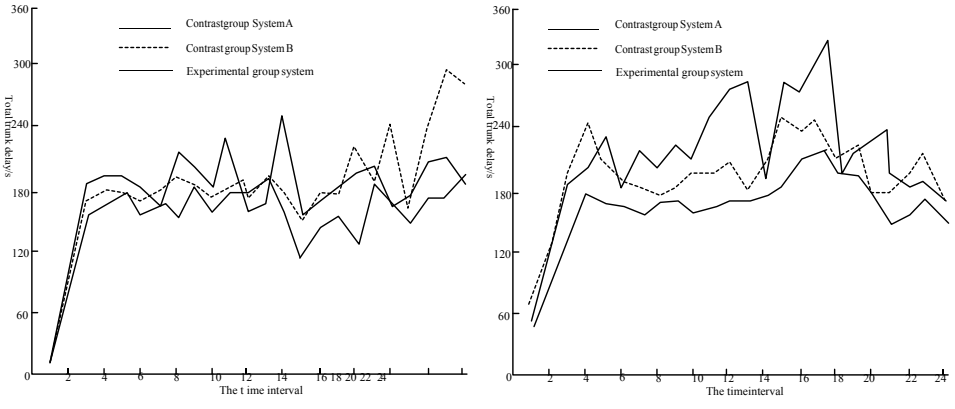
This experiment from two angles, using the WEBGIS based smart health traffic management system and two traditional traffic management system contrast form, intuitively and effectively test the effectiveness and feasibility of the traffic management system designed in this paper. Taking the traffic management system based on GIS as the comparison group A, the traffic management system based on visual inspection as the contrast group B, the intelligent health traffic management system based on WEBGIS designed in this paper is taken as the experimental group.

The comparison index of the comparative experiment is the average delay and average parking times of health roads under the guidance of different management systems. The experiment is carried out in the simulation software. The corresponding management schemes of the three traffic management systems are transformed into corresponding control parameters, which are respectively input into three identical computer platforms as input data. Set 15 min as the time interval for data output, and the simulation time is 24 h. Record, process and analyse the experimental data, compare the health traffic situation under the control of the three systems, and draw the conclusion of this experiment.

4.2 Experimental results and analysis

Figure 2(a) and (b) respectively show the comparison chart of 15 min average total delay in north to south and south to north directions of health traffic trunk lines under the management of three systems, and analyse the relationship between the curves in the Figure 2.

Figure 2 Comparison of total delay in north south direction of trunk line: (a) North to south road trunk line total delay and (b) total delay in north-south trunk road



It can be seen from Figure 2(a) and (b) that, compared with the control group system A, the comparison group system B and the experimental group traffic management system can reduce the delay of trunk line vehicles, and the improvement effect for the south to north direction is better than that for the north to south direction. Compared with system A, the maximum improvement rate of average total delay for 5 min from north to south in comparison group B is 16.78%; that for 15 min from south to north is 39.27%; for two way trunk line, the maximum value is 21.32%. Compared with the control group A, the maximum improvement rate of the average total delay of the traffic management system in the experimental group is 24.21% for the 5 min north to south trunk line, 43.92% for the 15 min south to north direction, and 34.11% for the 15 min two way trunk line. Compared with the control group A system and the control group B system, the experimental group traffic management system gets the least average delay and the best traffic timing management effect.

The average benefit comparison of the three data management systems is shown in the Table 1.

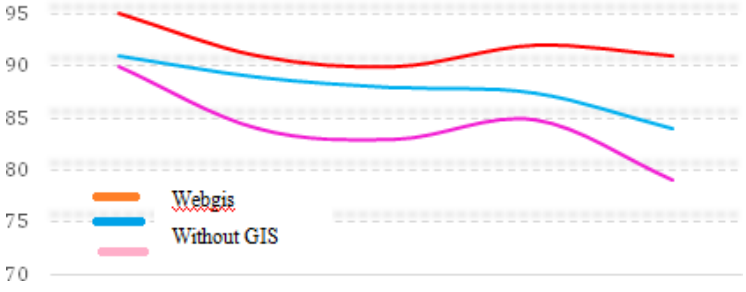
Table 1 Comparison of average benefits of three schemes in interval time

Direction	*Index*	*Control group A*	*Control group B*	*Experience group*
The main line is from north to south	Average delay/s	181.58	187.55	165.67
	Average parking times	6.46	6.59	5.88
The main line is from south to north	Average delay/s	232.84	213.04	192.26
	Average parking times	7.38	7.3	6.46
Trunk line overall	Average delay/s	414.41	400.60	357.93
	Average parking times	13.84	13.89	12.34
Access Rd	Average delay/s	48.23	47.35	41.14
	Average parking times	0.85	0.84	0.78

It can be seen from Table 1 that the traffic management system designed in this paper can effectively reduce the delay and parking times of trunk vehicles, and improve the overall traffic efficiency of the road network. Through the above experiments, the effectiveness of the intelligent health traffic management system based on WEBGIS is verified, which can be put into use after actual test.

Figure 3 represent that accuracy of data management using WEBGIS is higher when compared with data management without WEBGIS.

Figure 3 Accuracy of data transmission with and without WEBGIS (see online version for colours)



5 Traffic management strategy of smart health based on WEBGIS

First of all, change the concept of health traffic congestion management, and pay attention to the service function of the government in health traffic congestion management. The number of internet users in China ranks first in the world, and the internet has become an important part of people's life. We should make progress in the new wave of internet revolution, change the thinking of health traffic congestion management, build our health with new management mode, and improve the quality of health traffic service for citizens. The main function of the government is to provide comprehensive road traffic management and convenient services, which requires that the core management concept of the government is to better meet the needs of the general public and provide 7×24 h of service for public transportation. Therefore, we should establish a service-oriented government that conforms to the concept of "internet plus health management", emphasise the role of government in guiding and coordinating traffic congestion management, and gradually achieve the standardisation and harmony of health traffic congestion management.

Secondly, change the management mode of health traffic congestion and establish the information interconnection system of health traffic congestion management. Cloud computing, internet of things and big data processing technology, as another revolution in the field of mobile internet, are not only an innovation in the technical field, but also provide technical support for the innovation of health traffic congestion management mode, and put forward new requirements. The internet plus health management mode has enough knowledge and enthusiasm for the relevant government departments to create the new mode and mode of internet traffic. The new mode and characteristics of the health's traffic congestion management mode are required to be transformed and innovating, and a network platform health matching the social economic system should be constructed. Traffic congestion management mode, so as to meet the new demands of society,

enterprises and the public for health traffic services. The government should make use of advanced internet technology to promote the transformation of health traffic congestion management from 'sweat type' to 'intelligent type', provide accurate service with efficient means, and create a good health travel environment for the masses.

Finally, we should make a good plan for the management of traffic congestion under the 'internet plus health management' and strictly enforce it. The creation of a new traffic congestion management mode under the 'internet plus health management' is a systematic project, which includes the application of advanced technologies in mobile internet, the construction of talents in various departments of government, the reorientation of functions and the formulation of policies, and so on. Health internet plus information technology is the support. The government's active transformation and construction is the priority among priorities. Without the government's attention, organisation and promotion, the construction of traffic congestion mode under the 'internet + health management' will be lack of vitality and cannot be effectively implemented. Therefore, it is necessary to do a good job in the scientific planning of data congestion management under the new situation, establish a leadership responsibility system, clarify the work responsibilities, do their own job, do their best, grasp the construction and strictly implement.

6 Conclusion

In order to ensure the efficiency of health traffic management and improve the convenience of health residents, this paper designs a smart health traffic management system based on WEBGIS. Compared with two traditional management systems, it is proved that the system can effectively improve the efficiency of health traffic management and achieve better management effect. In the future research, it is necessary to consider the requirements of the communication distance and the use environment of the system hardware, and optimise the endurance of the hardware part of the system, and comprehensively improve the performance of the data management system.

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Conflict of interests

The authors declare that they have no competing interests in this section.

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