ISSN: 2472-3703 DOI: 10.6911/WSRJ.201908_5(8).0003

Study of WeChat Platform-Based Shortest Path Waiting System

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Abstract

With the rapid development of the internet, mobile medical care also develops rapidly, but the "three long and one short" problems in the hospital is still unsolved. We present a system of rational planning of walking route for patients based on WeChat platform. We firstly introduce the intelligent guidance and the considering the spatial distance among different departments, the shortest path waiting system is designed by using the backtracking method. The simulation results of the shortest path algorithm in this paper show that the algorithm can effectively plan the clinic route to save time while providing convenience for patients.

Keywords

Shortest path algorithm; Backtracking; Smart leading examining; WeChat platform.

1. INTRODUCTION

"Medical care is expensive and difficult" has always been the aspiration of people, because community medical institutions have no obvious advantage over hospitals in terms of fees, so patients tend to seek medical treatment in large hospitals. It is precisely because most patients choose big hospitals for medical treatment that large hospitals are now overcrowded, medical resources are tight, and patients' problems need to be solved urgently. With the development of mobile Internet and the popularization of mobile terminal, mobile medical service is developing rapidly as a new product in the information age. Mobile medical service is generally divided into app-based mobile medical service and WeChat public account based mobile medical service. WeChat has strongly promoted the development of mobile medicine based on WeChat public platform due to its strong flexibility and obvious portability. With the improvement of people's living standards, people's needs for medical resources are also increasing. Due to the large number of visits, manual guidance has become increasingly unable to meet the needs of patients. The rapid development of WeChat public platform has contributed to the emergence of intelligent guidance.

In this paper, neural network algorithm and big data analysis and other methods are used to diagnose diseases for patients according to their diseases, and to provide reasonable examination and outpatient service, saving a lot of time for patients and medical resources for hospitals. As China's aging population worsens, there are more middle-aged and elderly patients seeking medical treatment in hospitals, and the inconvenience of walking is obviously a very big problem. In order to solve this problem, this paper designed the shortest path medical consultation system based on WeChat public platform, which only considers the spatial distance and ignores other factors, such as walking time, to provide convenience for the elderly or people with walking difficulties.

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2. THE WECHAT PUBLIC PLATFORM

With the rapid development of Internet technology, the transformation of intelligent terminal and the development of various application software, people's social way is changing constantly. Compared with traditional media such as newspaper, radio and television, the emerging media that use the Internet to spread information quickly occupy a dominant position in social life, because of its efficient and convenient characteristics. In this context, WeChat public platform came into being. Users can use the public account platform to carry out we-media activities, that is, one-to-many media activities.

WeChat public platform is a we-media platform, which is an important part of WeChat system. Through this platform, individuals or enterprises can create a public account of WeChat, which can send five categories messages such as texts, pictures, voices, videos and text-images.

According to different usage requirements, there are also different types of WeChat platform in application, including service number, subscription number and enterprise number. Users can improve WeChat platform by developing WeChat server, database, and web server.

The function of WeChat public platform is realized through data interaction among WeChat user client, website server and WeChat public account server. Each data interaction is sent by the user to request a message. WeChat public platform provides a message interface to guide data interaction. If the WeChat public number is connected to the message interface, when the user sends a message request to the public number, WeChat server will send the request to the website server through HTTP (Hyper Text Transfer Protocol), and the website server will respond according to the set rules, and reply to the specified operation or message.

WeChat platform is widely used in various fields. According to statistics, the total number of WeChat public accounts of various brands has exceeded 8 million. At present, the operating bodies of various parties around WeChat public platform have begun to take shape. The continuous upgrading and innovation of the functions of the public platform, as well as the continuous growth of the number of users, will bring more possibilities to the operation of WeChat platform.

3. INTELLIGENT DIAGNOSTIC SYSTEM

3.1. Definition of Intelligent Guidance

All this time, medical problems have always been one of the most concerned livelihood issues. With the increasing demand for medical resources and the increasing number of people going to hospitals for medical treatment, the existing manual guidance system cannot fully meet the needs of patients. In recent years, with the rapid development of mobile Internet and information technology, it has become an important research direction that apply mobile Internet and various information technologies to medical services so as to solve the existing problems in medical services.

The Intelligent Guidance system which combines modern network and information technology, uses neural network algorithms and big data analysis method, according to the long-term health condition and the specific symptoms of the patients, compare the patient’s symptoms with many medical cases of database, provide patients with a more accurate and detailed the diagnosis results, can recommend appropriate doctor or relevant inspection items, and provide patients with a variety of medical scheme. It can also accurately locate the location of patients, provide specific distribution of hospital departments, and plan the treatment route for patients, that fundamentally solve the problems of patients not knowing the hospital department setting, repeatedly queuing in the wrong department, and not knowing the treatment process. It not only improves the work efficiency of hospital guidance, but also has

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important practical significance and practical value for promoting the development of hospital informatization.

Intelligent guidance system combines information and network technology to provide people with an efficient way of life. It is not only a component of hospital information system, but also an important embodiment of modern medical system's transformation to informatization. Compared with manual guidance, the intelligent guidance system, which provides services to patients with mobile intelligent terminals, can more conveniently and efficiently complete the guidance. The intelligent system can handle a large number of diagnostic services at the same time, improve service quality, promote harmonious and stable doctor-patient relationship, make reasonable allocation and full use of limited medical resources, and effectively improve the quality of medical services and management level of the hospital.

3.2. Intelligent Guidance Implementation Method

Nowadays, there are many ways to realize intelligent medical guidance. [1] Proposed a semantically based medical resource balancing recommendation algorithm, which integrates semantic ontology with stable matching algorithm, and USES reasoning principle to select doctors with different user satisfaction, which greatly alleviates the problem of medical resource centralization. [2] Constructed and designed an intelligent medical guidance system by using sparse matrix and jaccard similarity coefficient and combining with medical database, which can overcome the minute needle flow of hospitals and relieve the pressure of guidance. [3] Used the web crawler to form the guidance training data, and at the same time used the combination model of attention and text convolution to improve the accuracy of guidance. [4] Proposed a medical guidance system using rough set and rule analysis to recommend clinical examination methods based on patients' physical data. [5] proposed an improved reliability prediction algorithm of AHP, reconstructed the disease symptom table from the data provided by the general database of disease knowledge of China, and improved reliability prediction algorithm of AHP and improved tf-idf algorithm greatly improved the accuracy and reliability of the calculation results of the diagnostic guidance system. In addition, naive bayesian classifier or polynomial bayesian classification model with good effect in medical diagnosis can be used to quickly diagnose the possible diseases of patients according to the database technology and patients' description of the disease.

3.3. Prediction of Future Intelligent Guidance

Intelligent leading examining at present is mainly based on keyword with some kind of disease patients medical explain the core word similarity matching, to select the similarity of the highest department as the cause of patients [6], patients' self-reported illness ability level also has influence to the condition judgment, intelligent leading examining more can't consider the factor of the ill, from various angles such as the patients age, health, diet and other factors. Therefore, natural language processing technologies involved in intelligent guidance should be vigorously developed to achieve semantic analysis and ambiguity elimination at the text, lexical, syntactic, lexical and textual levels, so as to improve the accuracy of language conversion, enhance the ability of natural language understanding, make the dialogue process smoother and improve the accuracy of guidance.

Nowadays, artificial intelligence has become one of the key points in the development planning of strategic emerging industries. In the future, intelligent diagnosis should be vigorously integrated with artificial intelligence identification. Through "man-machine combination", the data and information of the machine can be connected with people's thinking and knowledge, so as to make the intelligent diagnosis more accurate and maximize the resources of the hospital.

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4. OPTIMAL WAITING BASED ON THE SHORTEST TREATMENT PATH

4.1. Problem Description

"Difficulty in seeing a doctor" has long been a persistent disease in China's medical system, and this "difficulty" began from the first step to enter the hospital. The number of outpatient clinics in large hospitals is increasing day by day, and the building is crowded during the peak period of visiting, showing the phenomenon of "three lengths and two shortcomings". That is, the waiting time for registration, payment and taking medicine is long, but the time for doctor's inquiry and examination is short. The voice of patients lamenting "difficult to see a doctor" is endless, so it is urgent to put forward effective solutions to some specific problems and outstanding contradictions.

4.2. Problem Analysis

In the patient group, the elderly who are inconvenient are not a minority. In addition, large hospitals, especially the third-level hospitals, have large building area and many clinics. There are many specialist clinics, specialist clinics and specialist clinics, which lead to long waiting time for patients. In practical application, the proposed path-based system model only considers the spatial distance, but does not consider the impact of distance on walking time. Therefore, it is more suitable for patients with abundant time conditions and higher requirements for route planning, such as elderly patients with limited physical strength, patients with leg injuries and movement constraints, and so on.

4.3. Overview of Algorithm

Suppose the hospital has M outpatient services, and the outpatient service $m, m = 1,2,\cdots M$, has N_m corresponding examinations. Currently, there are totally I patients in the hospital. Since the sufferings of the process can contain multiple performance (e.g. , initial diagnosis, examination and subsequent visit), we denote the treatment sequence of patient i as $y_i = [y_1, \cdots, y_p, \cdots, y_{P_i}]$, where y_p is the pth department, P_i is the total number of clinic department for patient i, $i = 1,2,\cdots, I$. Then, the shortest treatment path of the ith patient is:

$$s(y_i) = \min\left\{\sum_{p=1}^{p_i-1} dist(p, p+1)\right\} \tag{1}$$

$$s.t. \quad T_b(y_i, x_{m,0}) < \min_{x_{m,n\in X_i, n\neq 0}} T_b(y_i, x_{m,n}), \forall x_{m,0} \in X_i, if\ N_{i,m} \neq 0 \tag{2}$$

$$\max_{x_{m,n\in X_i, n\neq 0}} T_g(y_i, x_{m,n}) \leq T_b(y_i, x'_{m,0}), \forall x_{m,0} \in X_i, if\ N_{i,m} \neq 0 \tag{3}$$

Where $dist(p, p+1)$ indicates the shortest walking distance from the department p to $p+1$, $x_{m,n}$ is the examination n corresponding to outpatient service m, $n = 1,2,\cdots, N_m$, $x_{m,0}$ and $x'_{m,0}$ respectively represent the first diagnosis and subsequent visit for outpatient service m, $T_b(y_i, x_{m,0})$, $T_b(y_i, x_{m,n})$ and $T_b(y_i, x'_{m,0})$ respectively represent the initial moment of outpatient service m, examination n and subsequent visit for outpatient service m for patient i under the order y_i. X_i is the collection of all the treatments of patient i, and $N_{i,m}$ is the number of examinations of patient i corresponding to outpatient service m (if $x_{m,0}$

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does not belong to X_i, $N_{i,m} = 0$), $N_{i,m} = 0,1,\cdots,N_m, T_g(y_i, x_{m,n})$ represent the time when patient i obtain the results for the examination $x_{m,n}$ under the order y. Constraint (4-2) ensures that the patient performs the corresponding inspection $x_{m,n} \in X_i$ after the initial diagnosis $x_{m,0}$; Constraints (4-3) ensures that patient i has obtain all the corresponding examination results $x'_{m,n} \in X_i$ corresponding to out-patient m before subsequent visit $x'_{m,0}$.

To solve the visiting order decision problem (4-1) with constraints, we adopt the backtracking method which is an optimal search method. It firstly searches the whole state space with depth conditions to achieve the goal. When there is a node that can no longer move in the depth direction, it becomes a dead node. At this point, we move back to the nearest live node and make it as the current extended node. In this way, the backtracking method searches the state space recursively until it finds the required solution or when there are no active nodes in the solution space. Compared with the exhaustive method, the retrospective method searches the solution space in a depth-first way, and avoids invalid search with pruning function in the search process, thus its running time is shorter and running efficiency is higher.

5. SIMULATIONS

To prove the effectiveness of our proposed method, we compare it with the worst road condition in which the patients choose the longest path. Figure 1 presents the average distance that each patient travels in the hospital with the patients increasing. It can be shown that, in our method, the patient walk less than a half distance compared with the worst case method, because it makes each patient walk in the shortest path.

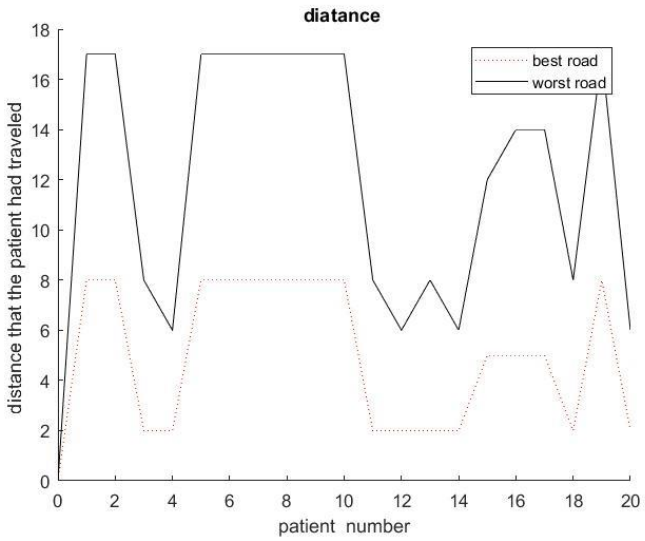

Figure 1. Patient travelling average distance

As the waiting time of patients' examination results can be too long, patients are unwilling to waste too much time. Therefore, the shortest journey is not simply the smallest sum of each journey. Since patients' decisions are only related to the length of the path, but not the time, patients' decisions are independent of each other.

Then the time of clinic of each patient is shown in figure 2. Figure 2(a) shows the average clinic time of each patient. Figure 2(b) shows the same as Figure 2 but with the double times distance than it. It can be seen that if the distance between the clinic is very short, the clinic time is independent with path choice, because walking time is only a small part of the total time.

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As the distance between the clinic time is being enlarged, the clinic time shows more effects by the distance.

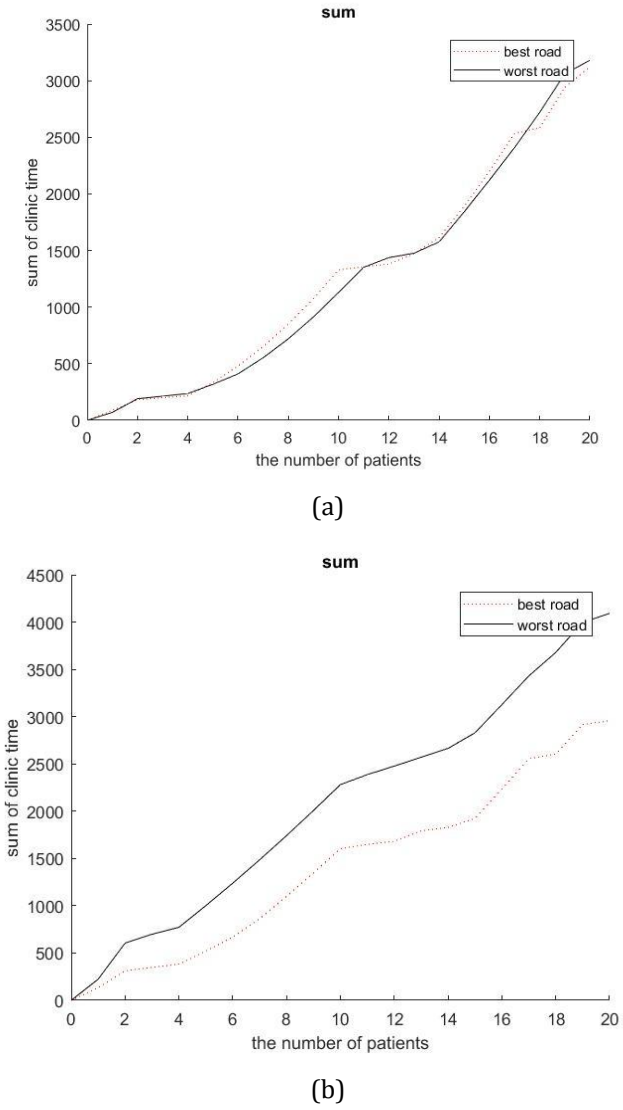

Figure 2. Average clinic time of each patient

6. CONCLUSIONS

Based on WeChat public platform, we designed the shortest path waiting system through backtracking method, including intelligent guidance and shortest path. This system saves a lot of time and provides convenience for patients, improves the quality of hospital treatment, and realizes reasonable allocation of limited resources.

ACKNOWLEDGEMENTS

This paper was supported by innovation and entrepreneurship training program for college students Changchun University of Science and Technology.

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