The Early Warning Method of Drug Adverse Reaction Monitoring Based on Data Mining Algorithm Was Studied

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Abstract. With the continuous progress of modern society, human rights are becoming more and more perfect, especially the medical system, because of the inevitability of development, at this stage has achieved a lot of proud results, but this can not meet the modern people's pursuit of health. Because the use of resources in the industrial society has led to the emergence of many viruses that have not been seen many, so now more and more kinds of drugs, we are considering more and more things, one of which is about adverse reactions to drugs. Therefore, this paper is based on this data mining algorithm to monitor adverse drug reactions early warning method. Based on the security of the user's personal privacy data, this paper proceeds to monitor the drug reaction in real time as the way, adopts the data mining algorithm as the main intelligent means used, compares it by consulting the domestic and foreign literature, and experiments with sandbox simulation as a modeling method, and finally results in the experimental results. The results show that if we can monitor drug reactions in real time, we can monitor adverse reactions early.

Keywords: Data Mining Algorithms, Adverse Drug Reactions, Monitoring Early Warning, Research Programs

1. Introduction
Since ancient times, people have an eternal pursuit of life. In ancient times, Shennong tasted all kinds of herbs to cure diseases and save people. Later, Sun Simiao and Hua Tuo promoted the development of China's medical system step by step. Later, through Li Shizhen's hand, he compiled the medical canon "compendium of Materia Medica". These are the wisdom crystallization of the ancients. Now due to the development of science and the rapid development of medicine, western medicine is generally used for treatment Because of the importance of artemisinin, we began to explore ancient prescriptions, in order to verify, we need to observe the adverse reactions of drugs to adjust, which is the purpose of this study.

Adverse drug reactions: refers to the occurrence of qualified adverse drug reactions which have nothing to do with the purpose of drug use or unexpected under the normal usage and dosage. Adverse drug reaction monitoring refers to the process of discovering, reporting, evaluating and controlling
adverse drug reactions\cite{1}. Opening ADR monitoring is an important part of drug supervision and management, which is of great significance to ensure the safety of public drug use, an important measure to implement scientific supervision, and an important measure to safeguard the vital interests of the people and benefit the people's livelihood\cite{2-3}. Monitoring activities can not only prevent the occurrence, spread and recurrence of serious drug injury events, but also improve the rational use of drugs, which can provide scientific basis for revaluation of listed drugs \cite{4}. At the same time, it provides the basis for the selection, rectification and elimination of drugs, promotes the research and development of new drugs, and further promotes the development of clinical pharmacy and drug epidemiology research \cite{5}. The implementation of national ADR reporting system and ADR monitoring work not only benefits the country and the people, but also ensures the safety of drug use by the masses, which is a good thing for the benefit of mankind \cite{6}. In recent years, as an important part of hospital construction, hospital information construction has attracted more and more attention. Some management software has been used in hundreds of hospitals across the country, such as "No.1 Military Health Service"\cite{7}. It can be stable, comprehensive information and unified data structure. It provides a reliable operation platform for the hospital, and computer system is used to monitor large-scale adverse drug reactions in the region or in the region\cite{8}.

Traditional adverse drug reactions are determined by preclinical research and phase I, II, III clinical trials, and drug-related or unrelated adverse events are collected to achieve the cost duration of the whole process, which is not applicable to emergencies \cite{9}. In addition, the test-based adverse reaction identification method limits the number of drug combinations to be collected. According to the limited types, it is aimed at long-term toxicity and special population. It is difficult to identify the complex clinical environment of adverse drug reactions under public emergencies in clinical combined medication \cite{10}. So now we use data mining algorithm to monitor adverse drug reactions.

2. The Data Mining Algorithm
Big data objects have the complexity of data spatial distribution state, such as data spatial distribution of different sizes, inconsistent distribution and other data objects of the same shape and different density distribution patterns, by calculating the distribution density of data objects in data space, determine the density attraction point (extreme point) and data object density attraction point density, so as to achieve the effective aggregation of clusters of different sizes, shapes and densities, in order to achieve effective mining and analysis of large amounts of data.

2.1. Dynamic neighborhood radius
Dynamic neighborhood radius adaptive density up to distance is defined as:

$$R_{+i} = R \frac{A_i}{A_{i+1}} \quad (1)$$

In the upper model, $R$ is the reach distance of the initial density, and $A_i$ and $A_{i+1}$ represent the density values of the two cluster density attraction points that have been determined.

2.2. Data point density
The formula can be expressed as:

$$\text{density} \left( x_i \right) = \sum_{j=1}^{n} \frac{d(x_i + x_j)^2}{2\sigma^2} \quad (2)$$

In the upper version, the right Gaussian function represents the effect of each data point on the X-point;

2.3. Density up to distance
It refers to any data object $x$ in the data cluster space, and the distance between the data $R$, with a data as the center, the data distance as the radius of the circular area, corresponding to the data object's
reach density distance field.

\[ R = \text{coefR} \times \text{mean}(D) \]  

(3)

In the upper version, coefR refers to the adjustment factor of distance, the coefficient value is greater than 0 and less than 1; mean(D) refers to the average distance of all data objects, and D is the object collection of data.

3. Experiment

3.1. Modeling

The results show that the suitable temperature range of the monitoring robot is 20 to 50 degrees C. When the operating temperature exceeds 40 degrees C, the temperature increases by 10 degrees C each time, and the robot life is reduced to 1/2 of the original. If the temperature continues to rise, it may cause the heat to get out of control. Therefore, it is very important to establish precise heat for effective modeling and management of robot groups. The thermal model of the common robot is divided into the uniform parameter thermal model and the distribution parameter thermal model numerical thermal model. The uniform parameter thermal model assumes that the internal heat production of the robot is uniform and treats the entire robot or an area inside the robot as a uniform heat source. Its thermal production calculations are usually based on the fact that the robots of Bernardi et al. are uniform in the thermal model and have a heat rate

\[ q \sim \frac{1}{V} \left( u_{oc} - U \right) + T \frac{\partial u_{oc}}{\partial t} \]  

(4)

Where q is the heat generated by the robot, I is the charge and discharge current, V is the volume of the heat region generated by the robot; UOC is the open voltage, u is the robot operator T is the robot temperature; UOC/\partial t is the robot open voltage temperature effect factor. On the basis of this model, many researchers have studied the thermal production of robots to explain their formation, aggregation, conduction and flow, as well as to simulate, predict and manage the thermal behavior of modules. Some foreign research teams, etc. to 35a.h square lithium manganese robot as the object, the robot charge and discharge on the thermal characteristics of modeling, simulation and experiments with the increase of current, the temperature rise of the robot rapidly increased in order to improve the performance of the robot, through the discharge of heat generated.

GUMUSSU and others have established a three-dimensional CFD model of Panasonic's 18650b lithium robot, and studied the thermal generation and twirl exchange of heat in the robot's natural state of twirl, assuming that the robot is an even heat source. Zhang Caiping and other false calculations using average capacitance proposed an improved thermal model, and applied to the motor to optimize the fast charging strategy, so that the charging time is reduced by 50%. The uniform parameters ignore the temperature distribution inside the robot, and mathematical thermal models are often used for small-scale electrical computational low-rate charge and discharge conditions and practical engineering. According to the thermal model of the distribution parameters, the internal heat production of the robot is uneven, according to the relationship between the internal current density and temperature of the robot, the temperature cloth of the robot is calculated. The method of calculating the heat rate Q and current density according to the current density is shown in formula (2), and formula (3).

\[ Q-J(\varphi_c - U + T \frac{\partial u_{oc}}{\partial t} \text{plus} \sigma_{eff} \varphi_e \text{e} + k_{eff} \varphi_e \text{e} + k_{eff} \text{eff} c_{e} \cdot \varphi_e \text{e}) \]  

(5)

\[ Jk(c_s,max - c_{s, surf}) \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times \exp \left( \frac{0.5F}{RT} \eta \right) - \exp \left( \frac{0.5F}{RT} \eta \right) \]  

(6)

The medium and liquid phase potentials are solid phase potential, the conductivity of solid particles, the constant rate quantity of electrochemical reactions, the conductivity of liquid phase ions, the maximum concentration of lithium ions inserted into solid phase for electrolyte concentration Max, and the solid surface F is \( \varphi_c \text{e} \text{the Faraday constant; } R \text{ is the gas constant and } \eta \text{ is the over-the-mark of the gas constant as an electrochemical reaction. This model can accurately reflect the temperature } \varphi_e \text{e} \sigma_{eff} k_{eff} \text{e} \text{eff} c_{e} \text{c}_{s, surf} \text{distribution within the robot to guide the robot's material selection and} \]
structural design. The application of finite factor method in the calculation of VK company 10a.h square robot group lithium robot simplifies the model, and analyzes the current density and temperature distribution at the current density and discharge rate of different robot structures (electrode aspect ratio, electrode aspect ratio, electrode aspect ratio), and infrared imaging experiments verify the correctness of the model. Some commercial and industrial software has also developed application packages for the robot thermal model, but due to the coupling of several complex partial equations, such software has computing power because of the high requirements for the robot management system, it is difficult to apply in the robot management system. As a result, some down-order distribution parameter thermal models are used for efficient calculation and thermal analysis management control. Based on computational fluid mechanics, Hu and so on put forward a state space model of lower-order method which can not only guarantee the small amount of computation, but also provide the calculation results of the state spatial model with a small amount of computation similar to that of the CFD model. Richardson and others put forward a new method to consider transient heat production, anthropomorphic thermal conduction and non-uniform versophological boundary by comparison with finite meta-calculation results, and obtained the conditions of low-order two-dimensional thermal model through comparison, to verify the effectiveness and accuracy of the model.

3.2. Data source
In order to carry out the experiment better, we need to collect some real patient information for the modeling process of the experiment, we need some real information is from a research institute in North China for nearly a decade of data, the experiment is all real and effective, conducive to our experiment.

4. Evaluation Results

4.1. The application of data mining in the monitoring of adverse drug reactions

| Drug Group 1 |  Euclid | Cosine classification | Data mining |
|--------------|---------|-----------------------|-------------|
| The accuracy of the training dataset | 72.31% | 76.21% | 92.41% |
| Check accuracy | 80.19% | 82.42% | 94.21% |
| Standard error | 0.1671 | 0.1412 | 0.0122 |

| Drug Group 2 |  Euclid | Cosine classification | Data mining |
|--------------|---------|-----------------------|-------------|
| The accuracy of the training dataset | 72.49% | 75.39%. | 92.17% |
| Check accuracy | 86.49% | 84.21%. | 95.41% |
| Standard error | 0.1361 | 0.1225 | 0.0203 |

From the data described in Table 1, Table 2, it can be known that, through the monitoring and analysis results of the two drug groups, according to all the above data, after different data pre-processing operation, Euclid's algorithm accuracy is the lowest, the data is modeled and processed when MATLAB is applied, while the calculation of optimal parameters is more satisfactory, but there are
still improvements can only be said to be poor, and linear regression combined in monitoring adverse drug reactions has been better monitoring the early warning effect and less error.

![Inflection point graph based on the prediction accuracy of the data mining algorithm](image)

So, we made six experiments to reduce the error and correct the error, as shown in the figure above.

4.2. Adverse drug reactions

Drugs act on the human body, in addition to play a therapeutic role, sometimes for various reasons and have nothing to do with the purpose of drug treatment and cause damage to the human body, which is called adverse drug reactions. Different degrees of adverse reactions can make people feel uncomfortable, worsen the disease, cause new diseases, and even die. The key now is to reduce the adverse effects. In real life, the incidence of adverse drug reactions is quite high, especially in the long-term use or large dose use, the situation is more serious, even serious adverse reactions. Strictly speaking, almost all drugs may cause adverse reactions under certain conditions. However, as long as the rational use of drugs, we can avoid or minimize the harm. Therefore, in the process of medication, we should closely observe the changes of the disease, timely find and deal with adverse reactions, and try to avoid adverse consequences.

5. Conclusions

Life is fragile, in modern life, because of the complexity and variety of diseases, we have been trying to improve the medical model, drug treatment as a vital part of the modern medical system, we must strictly control every aspect, so we should do our best to the best of the United States, so we try to use data mining to monitor and warn of adverse drug reactions. Above, is the point of view of this article, if there are differences, look forward to the right.

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