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The study on the algorithm of the medical diagnostic decision support system under the mobile platform

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ABSTRACT

The Mobile platform usually refers to provide reference for design, hardware chipset and upper communication protocols and support complete platform software and development tools. Downstream vendors can be designed according to the need in a short time and make the corresponding mobile products. Application developers can don't need to care about the platform hardware related content, and for the type of mobile devices, mobile platform of supporting software and the corresponding development tools have a systematic understanding. Medical professionals dealing with patients is the key to decision making. In the diagnosis of the patient's condition, adjust the treatment plan and monitoring the changing condition when making decisions. In recent decades, people have developed a series of methods and tools to assist clinicians to decide. Generally speaking, the tools and methods is not to replace their jobs, but people used to assist and support. As information and communication technology in the field of health care organization's infrastructure has become increasingly important, doctors, healthcare professionals and other associated with health care personnel aware of these calculation methods and techniques to support the importance of the decision making process.

KEYWORDS

Mobile platform; Medical diagnostic decision support system; Algorithm.



INTRODUCTION

Android was announced by Google on November 5, 2007, the early developed by Google, after the Open Handset Alliance (the Open Handset Alliance) development. Android is open source Software platform based on the Linux kernel and the mobile phone operating system, it USES Software Stack (Software Stack J architecture. The platform was the composition by the operating system, middleware, user interface and application Software. It is for mobile terminals to build open and complete mobile platform software system. The top of the Android platform is the application layer, including a variety of applications. Such as calls, text messages, developed by the company, specific provisions of the ministry in Java programming; The second is the application framework layer, the layer is the core of the company issued the API framework, developers can use these API framework to develop their own applications; The third layer includes a function Library (Library) and Android RunTime, the Android with C/C + + Library is for the use of various components of the Android system, these functions through the Android Application Framework (Application Framework) provided to developers. Android Runtime includes the Virtual Machine (Virtual Machine) and the Core Library (Core Library). The Dalvik virtual machine is a kind of "Register" type (Register) -based Java virtual machine, variables are stored in a Register, the virtual machine instruction is relatively reduced, while the core library provides most of the available in the Java programming language core library functions; Bottom is based on the Linux kernel, is developed by C language, provides only basic functionality. Mobile platform application development refers to the mobile operating system in Java, c + + development language such as software development in order to realize the function of the mobile platform extension.

THE FRAMEWORK OF THE MEDICAL DIAGNOSTIC DECISION SUPPORT SYSTEM UNDER THE MOBILE PLATFORM

According to the needs of each patient, the medical decision is making including diagnosis, prediction and treatment. In the whole medical system, the decision runs through the whole health care system in patients with different stages. Different period have different degree of decisions. On the one hand, when faced with a life-threatening situation need to make a quick decision. On the other hand, for chronic diseases such as diabetes and high blood pressure, there needs to be more relaxed time scales to determine drug configuration. Time factor will affect the use of diagnostic decision support technology. When the time factor is very important, can't choose the normal decision-making support system. Diagnosis, prediction and treatment decisions are involving specific patients. In the policy, management level and resources also need to make decisions. A country's health service agencies can to a life-threatening situation and development of expensive new drug? What are the consequences of a closed society hospital? Should elderly, delirious patients to provide what level of monitoring service? For these decisions, decision support technology plays a very important role.

Reasoning of another kind of expression is the causal relationship between contains event, or an event caused by the occurrence of another event. For example, high blood pressure is caused by heart disease. Causal beliefs are expressed as a connection of conditional statements; each connection is defined as the form of probability. These causal beliefs associated digital network called Bayesian networks and causal probability. These methods are very popular, because they can put the uncertainty of medical knowledge express in an effective manner. Nodes represent variables and directed line segment between the nodes represent the causal relations, said state probability distribution of each arc deviation, the relationship between the nodes by conditional probability tables, said reasoning model based on Bayesian theory. For medical decision-making, Bayesian networks can be easily integrated with decision theory, resulting in a model, the selection of optimal treatment or in the presence of uncertainty in development model of health maintenance.

Dalvik virtual machine is Google for mobile devices an important part of Android platform. The virtual machine can run the Java platform applications, these applications are converted to compact Dalvik executable format. The format is suitable for the system memory and processor speed limited.

Most of the virtual Machine (including the Java virtual Machine), unlike the Dalvik virtual Machine, the former is the Stack Machine (Stack Machine), the Dalvik virtual Machine architecture is based on the register. Like CISC and RISC debate, the two ways of comparative advantage is constant topic of debate, and sometimes technology boundaries become blurred. In addition, the relative advantage of the two methods depends on the choice of interpretation/compile strategy^[4]. In general, and virtual machine based on stack must use instructions to load the data on the stack, or use the instruction to manipulate the data, so compared with register-based virtual machine, need to order more. DX tool is used to convert Java. Class files into. Multiple classes can be included in a single file. Dex file. Repeat, can be used for multiple strings and other constants in the transition to the class. Dex format output to reserve space. Java byte code can also be converted to alternative set of instructions, use the Dalvik VM. The Dex file is from the same in file size. The class files compressed into jars files smaller.

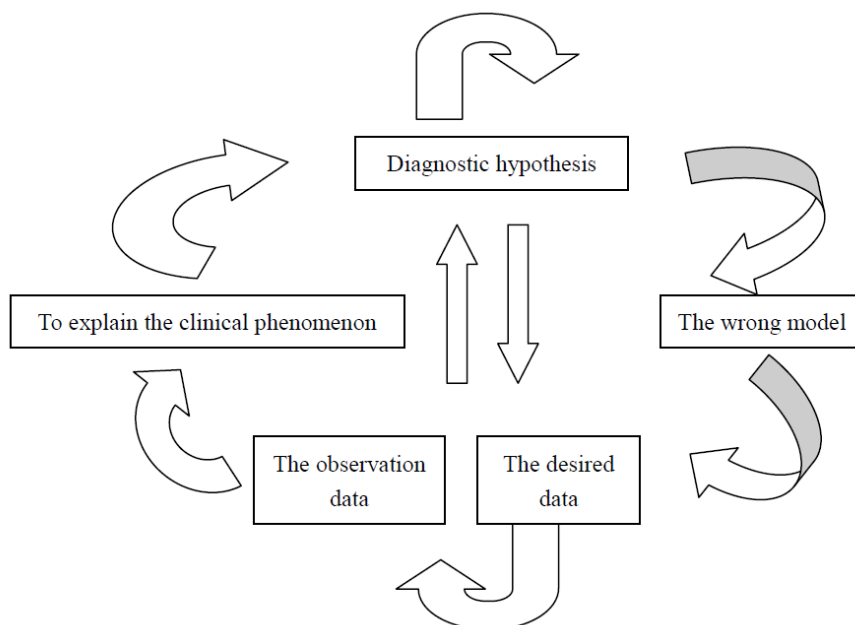


Figure 1: Diagnosis inference model

THE DESIGN OF THE MEDICAL DIAGNOSTIC DECISION SUPPORT SYSTEM UNDER THE MOBILE PLATFORM

The decision-making process can be divided into the following four stages.

The necessity of the first stage is given decision-making, explicitly pointed out that to solve the problem, and then focus on the knowledge gathered to solve the problem. Knowledge collection may include some important literature review, using evidence-based medicine experiment or and discuss relevant personage analysis.

The second stage involves creating a possible decision scheme collection, to solve the questions in the first stage. The decision set can be quite large, so let's first consider the most realistic solution. Particularly want to stress is that don't make decisions can also be thought of as a strategy.

Third stage includes by considering the results of the subsequent stage and potential response to evaluate every possible solution. The scope of assessment is including ethics, technology, cost, politics, and the long-term interests of patients and their families. Detailed scheme of each audit is a waste of time, however, in order to prevent the conditions change or the preferred scheme was proved to be wrong, it is necessary to make appropriate emergency plans. The last stage of the decision-making process is in each scheme selected practical implementation. To comprehensively consider the factors such as interest, success rate, risk and cost to choose the most appropriate scheme.

The process is described as a unidirectional loop, but in some cases, it is also possible to access the stage in front of and behind according to the results of the phase correction of its details. For example, consider the other possibilities, found that the initial problem defined by mistake and need to be modified.

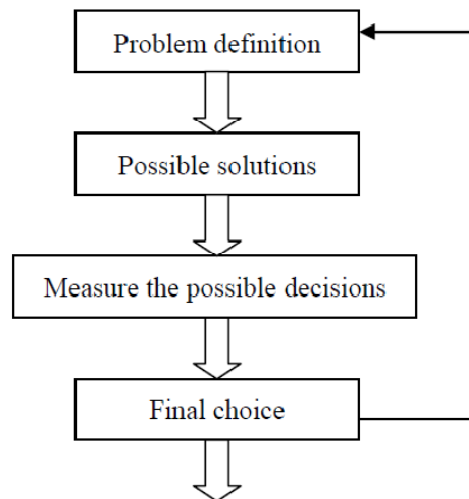


Figure 2: Decision process

THE MODELS OF THE MEDICAL DIAGNOSTIC DECISION SUPPORT SYSTEM UNDER THE MOBILE PLATFORM

Model contains qualitative and quantitative mathematical model, can predict the future state of patients, and based on the time of the state and have been through the description of the (system dynamics) to predict progress, to help decision makers. These models, including the system behavior, it allows the use of testing signal, so that the system is able to study a variety of problems to predict the state of the patients progress.

Qualitative model can be used in the mining time related behavior, by dividing the patients state trajectory are connected by a series of nodes, the connection between the nodes reflected the removed the restriction on the system. These models can be used to support patients' assessment and treatment scheme design. For diagnostic assessment, the causal mechanism of disease processes is pioneer node and the path to the important node (decision) defined. Relationship of therapy for the treatment plan, according to the survey condition the value of the corresponding therapy may formulate expected. This relates to a cost function, the practical value is defined as the cost of treatment, the cost efficiency and effectiveness for the treatment of patients. Quantitative model is generally in the form of differential and the additional equation to describe. When according to the features of individual patients to adjust the parameters of the model, the model can be run in different situations, such as all kinds of rules of drug treatment. Therefore, clinical users can learn the effect of the changes on the physiology major variable. This is another form of decision support.

Quantitative model of a typical example is the documents referred to in the human cardiovascular system. The model can predict venous blood pressure, cardiac output and peripheral resistance. However, it is important to note that when check the physiology of decision support system, the clinical doctors usually still prefer the use of a continuous variable symbol, such as flow, value-added or impairment, rather than a discrete values. In addition, they tend to replace the mathematical equations, and using qualitative or logical constraints to management variables and their temporal changes.

The mathematical model of qualitative also can become an active main part of the decision support system. A good example of this is for people with type 1 diabetes (night) to maintain normal

blood sugar during fasting, has been developed based on model predictive control. Controller uses a model to express the sugar metabolic system. It includes subcutaneous insulin absorption and intestinal absorption the model. Controller using Bayesian parameter estimation to determine the parameters in the model change over time. The model can predict the future more than 15 minutes of blood sugar. These predictions were used to fix into the dose of insulin pump, to achieve or maintain the desired blood sugar levels.

Database search: to test the large clinical database can properly find statistical evidence of diagnostic value. Sometimes, these arguments can create lay the foundation for the professional system. Clinical decision is the most direct method, however, in the case of the database in the past, statistics give a kind of entity or entities set of relative frequency (frequency theory method), it can estimate the prior probability. This kind of simple and direct solution of disadvantage is that the more arguments, the less they match in the database entries. This contrary to usually thinking, not the more evidence to diagnosis the greater the likelihood of matching. Moreover, it lacks a kind of measuring method of a single argument, so not sure which one argument influence the results of patients with greater.

Database search is one of the earliest uses of statistical methods. Due to the completion of human genome, people are interested in this way again. Has developed a method of query data (e.g., single nucleotide polymorphism), there are many of the world genetic database. Regression analysis can be used to interest in the relationship between the response variables and a set of interpretation model. This approach includes the model of regression coefficient adjustment (model parameters), until you get the most suitable data sets. This model improved the relative frequency of use, because the logistic regression, are obvious elements of evidence for the value of the regression coefficient is very important. In many clinical applications have such examples; gastroenterology field is a typical example.

Statistical pattern analysis is an important tool for decision support. In this way, data pattern recognition can be expressed as statistical problems, used to satisfy with the clinical findings and classify the results of exhaustive decision areas. To classify biological data, as well as the corresponding state of illness and disease treatment methods are classified. This method has been widely used in clinic, the rhythm of the heart of the analysis to the treatment of head injury. Want to distinguish between data model, you need the data difference analysis, including different class differences between measurements.

THE ALGORITHM DESIGN OF THE MOBILE PLATFORM MEDICAL DIAGNOSTIC DECISION SUPPORT SYSTEM MODEL OF

Pattern recognition problem can be divided into two stages. Pattern vector P is a data set over the line of dimensional vector. We define the pattern space Y_p is On behalf of All of the possible values of P . Pattern recognition problem can be seen as how to differentiate Y_p is As mutually exclusive and no missing area. In terms of ECG analysis, full waveform can be used to classify diagnostic value. A complex decision method may obtain in such a situation. Sometimes, however, research on the characteristics of the child inside the model, the simplified model of vector may be more appropriate. In arrhythmia analysis, for example, just need to have a R - R intervals of ECG data, so that you can use more simple decision equation. This may be a linear or nonlinear transformation process:

$$X = \tau P$$

Pattern vector P belongs to the pattern space Y_p , The feature vectors X belongs to the feature space YX . Because of the feature extraction function is to reduce the dimension of input vector, so some information will be lost. Can be achieved the classification of YX through a lot of statistical method, these methods include classification function (linear and polynomial), the core evaluation, k neighborhood, cluster analysis and Bayesian analysis.

Bayesian analysis is widely used in decision support system is one of the methods. In essence, it is a kind of estimate the parameters of the conditional probability density function method. Clinical manifestations of the prior probability of some diseases knowledge with each in the group of patients with disease clinical found that match the conditional probability. Classification problem become one of the choice of policy makers, when unknown prior probability, it can minimize the misclassification, conditions and minimize the maximum average loss function (also called minimum maximum principle). Bayes' rule is the misclassification minimizes the average ratio of the optimal decision rules. As a kind of mechanism is derived, when exist in patients with specific clinical findings, this method can calculate the probability of competition in the diagnosis.

Bayesian classification is not based on a case history in clinical database. Therefore, it is compared with other database search technology, its cost less time. Moreover, due to the fault of clinical reasoning classification can be quantified by mistake. However, the limitations of the method is the need to assume that disease states are complete and are mutually exclusive, in fact this assumption may not set up.

SUMMARY

Android as Google enterprise strategy important constituent, will further promote the "anywhere, anytime to provide information for everyone to achieve the goals of the enterprise. We found that a large number of global mobile phone users never use any Android based mobile communication devices, Google's goal is to make mobile communications is not dependent on the device or platform. For this purpose, Android will complement rather than replace Google has long been pursuing mobile development strategy: with mobile phone manufacturers And mobile operators around the world, a partnership, the development is both useful and attractive mobile services, And promote the products. This article will medical diagnostic decision support system for mobile platform development and design, and the necessity of the decision making process, decision support and the current some widely used methods and techniques were summarized. The concrete content includes review of the nature of the decision making process, according to the structure of decision support system for classification, and the mobile platform is given some decision support technology in clinical applications.

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