Health Management Information System Based On Regression Analysis

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Abstract. With the improvement of living standard, people’s demand for health is increasing. However, the rapid pace of urban life makes it difficult for most people to stop and pay close attention to their bodies. Even after the hospital examination, it is difficult to achieve stable follow-up and health judgment. On the basis of regression analysis of data, an open source mobile terminal Android platform is used to design a health management information system (APP), which can realize the information sharing between residents and hospitals. The system allows people to know their physical condition instantly, and hospitals can track and advise users.

1. Introduction

With the continuous improvement of living standards and the rapid pace of society, health problems become a steady burden for the country and individuals. Health management information system is a software for comprehensive management of health data of individuals and people. The purpose is to share the health information of patients and healthy people with hospitals, so that patients and healthy people can have better health, and effectively reduce medical expenditure [1-2].

Most of the traditional health management information systems are based on the web page form of B/S architecture. It is not very convenient for users to view and understand their health information anytime and anywhere, which not only affects the user experience, but also lacks flexibility and practicability, and cannot achieve a good real-time communication between users and hospitals.

Nowadays, with the maturity of communication technology, mobile terminal is no longer limited to the terminal of communication network, but has become the terminal of Internet. Therefore, the application software and demand service of mobile terminal have a huge development space. The health management information system app based on regression analysis proposed in this paper is exactly based on Android system, adopting technologies such as separation of cloud storage and mobile client, introducing information sharing to realize seamless interaction between system server and client, and providing intelligent software for health information management [3-4].
2. System function
The health management information system based on regression analysis can automatically collect, control and process the data submitted by users, and then generate relevant health prompts through the judgment of hospital doctors. It mainly includes four modules: user login module, daily work module, statistical analysis module and quality control module.

For example, the incidence of hypertension is affected by the following five aspects: triglycerides, serum high-density lipoprotein, serum low-density lipoprotein, systolic blood pressure and diastolic blood pressure. Then when the user uploads the above five aspects of data, the system calculates the possibility of the disease through a specific algorithm. The system also classifies the incidence possibility into three levels: no hypertension, hypertension level 1, hypertension Level 2 and hypertension Level 3, and matches the symptoms with the doctor's suggestions one by one, and then sends them to the user, so as to effectively improve the people's healthy life of early treatment and early prevention.

This system takes android as the platform, uses web services, Java and other technologies to realize the function of information sharing between users and hospitals.

3. System implementation

3.1. User login
After the Android client is started, the user is required to input the account and password. Because the software interacts with the cloud, when clicking the login button on the Internet, the system will automatically detect the account and password and send them to the cloud for encryption. If login fails, users will be given feedback of login failure; otherwise, users will be given feedback of login success.

3.2. Routine
After logging into the system, the hospital operator and user can see two different interfaces respectively. As shown in Figure 1, the hospital operator interface has four functions: "Analysis of data", "UserInfo", "Routine test" and "Suggest". On the user interface, there are four functions: "Upload data", "Health status", "Routine test" and "Doctor's advice".

Figure 1. Hospital Operators’ Interface
In the concrete implementation, we need to encapsulate the service address, namespace, method name and parameter value of the calling web service. Generate soap request information and call specific methods to get the return result. Some codes are as follows:

```java
SoapObject jiemian = new SoapObject(nameSpace, methodName);
setProperties(jiemian);
envelope.bodyOut = jiemian;
Envelope.dotNet = true;
Envelope.setOutputSoapObject(jiemian);
```

During the data reading process, the access to MySQL database is applied. Some codes are as follows:

```java
public class sqlconn {
    public static void fetchdata(Connection conn) // Function to read data
    {
        try
        {
            Statement statement = conn.createStatement(); // Using statement to execute SQL statement
            String sql = "select * from emp"; // Querying the contents of table emp with SQL
            ResultSet rs = statement.executeQuery(sql); // Used to return results
            System.out.println("name" + "\t" + "pathogeny " + " physician-in-charge
" + "upload date ");
            String date = null;
            while(rs.next()){
                job = rs.getString("job");
                System.out.println(id + "\t" + job + "\t" + date);
            }
            rs.close();
        }catch(SQLException e){
            e.printStackTrace();
        }catch (Exception e) {
            e.printStackTrace();
        }finally{
            System.out.println("Read data successfully!"+"\n");
        }
    }
}
```

3.3. Prediction of hypertension
This system can monitor and predict hypertension. Hypertension is one of the most common chronic diseases. If this disease is not found and treated in time, it will easily cause cardiovascular and cerebrovascular diseases, with great harm [5].

There is a standard classification of blood pressure level in literature [1]. The classification is as follows: (1) normal blood pressure, systolic blood pressure < 120 mmHg and diastolic blood pressure < 80 mmHg; (2) normal high value, systolic blood pressure 120 ~ 139 mmHg and / or diastolic blood pressure 80 ~ 89 mmHg; (3) grade 1 hypertension (mild), systolic blood pressure 140 ~ 159 mmHg and / or diastolic blood pressure 90 ~ 99 mmHg; (4) grade 2 hypertension (moderate), systolic blood pressure 160 ~ 179 MmHg and / or diastolic blood pressure 100-109 mmHg; (5) grade 3 hypertension (severe), systolic blood pressure ≥ 180 mmHg and / or diastolic blood pressure ≥ 110 mmHg; (6) simple systolic hypertension, systolic blood pressure ≥ 140 mmHg, diastolic blood pressure < 90 mmHg.
According to the cardiovascular risk factors affecting the risk level of hypertension analyzed in literature [1], the following laboratory examination attributes are mainly concerned: triglyceride (TG), serum high-density lipoprotein (HDL), serum low-density lipoprotein (LDL), systolic blood pressure (sys), diastolic blood pressure (DLA).

In this paper, the laboratory examination attribute values of hypertension in the hospital are obtained for analysis. Here, only part of the data are taken for explanation, as shown in Figure 2.

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
|     |     | TG | HDL | LDL |
| ws | e | 157 | 100 | 1.97 | 0.94 | 2.66 |
| 54 | 103 | 69 | 1.1 | 1.86 | 1.30 |
| 927 | 144 | 80 | 2.12 | 1.07 | 2.80 |
| 4 | 152 | 90 | 2.15 | 1.02 | 1.67 |
| 10 | 119 | 64 | 0.76 | 1.7 | 3.09 |
| 9 | 113 | 78 | 0.69 | 1.66 | 2.83 |
| 90 | 89 | 69 | 1.43 | 1.22 | 2.31 |
| 475 | 94 | 52 | 0.64 | 1.02 | 2.21 |
| 789 | 141 | 50 | 1.63 | 1.3 | 3.48 |
| 468 | 103 | 62 | 0.53 | 2.56 | 2.82 |
| 2 | 143 | 87 | 1.49 | 1.61 | 3.87 |
| 18 | 111 | 64 | 0.92 | 2.17 | 4.98 |
| 99 | 90 | 61 | 1.75 | 1.42 | 2.02 |
| 564 | 119 | 79 | 1.04 | 1.21 | 2.9 |
| 128 | 120 | 81 | 0.61 | 1.13 | 3.16 |
| 421 | 147 | 72 | 0.71 | 1.22 | 2.57 |
| 156 | 120 | 70 | 0.62 | 1.08 | 2.4 |
| 480 | 129 | 70 | 1.52 | 1.06 | 2.96 |
| 254 | 121 | 53 | 1.36 | 1.25 | 2.3 |
| 645 | 110 | 66 | 0.67 | 1.53 | 4.2 |
| 666 | 113 | 73 | 0.45 | 1.44 | 2.06 |
| 502 | 115 | 66 | 0.99 | 1.93 | 2.39 |
| 546 | 108 | 84 | 1.11 | 1.84 | 5.19 |
| 357 | 108 | 69 | 0.95 | 1.25 | 2.56 |
| 75 | 107 | 103 | 2.14 | 0.96 | 2.77 |
| 41 | 119 | 78 | 0.8 | 1.12 | 2.47 |
| 54 | 111 | 72 | 1.03 | 0.94 | 2.64 |
| 913 | 112 | 71 | 1.08 | 1.22 | 3.21 |
| 813 | 103 | 68 | 0.68 | 1.8 | 2.88 |
| 365 | 121 | 50 | 2.42 | 1.02 | 3.26 |

Figure 2. Partial Data on Factors Affecting Hypertension

Regression analysis can be used to deal with the data of influencing factors of hypertension, and calculate the relationship between systolic blood pressure and serum triglyceride. The calculation method of other factors is similar to it.

1. Calculate the value of $\bar{x}$, $\bar{y}$, $l_{xx}$, $l_{yy}$, $l_{xy}$, where X is TG and Y is SYS.

\[
\bar{x} = 1.25, \bar{y} = 123.23, \sum x = 37.62,
\sum y = 3697, \sum x^2 = 56.69, \sum y^2 = 465653
\sum xy = 4893.28
\] (1)

\[
l_{xx} = \sum x^2 - (\sum x)^2 / n = 56.69 - 37.62^2 / 30 = 9.51
\]

\[
l_{yy} = \sum y^2 - (\sum y)^2 / n = 465653 - (465653 / 30) = 450131.23
\]

\[
l_{xy} = \sum xy - (\sum y * \sum x / n) = 4893.28 - (37.62 * 3697 / 30) = 257.24
\]

2. Calculate the regression coefficient b and intercept a.

\[
b = \frac{l_{xy}}{l_{xx}} = \frac{257.24}{9.51} = 27.05
\] (2)

\[
a = \bar{y} - b\bar{x} = 123.23 - 27.05 * 1.25 = 89.42
\]
3. List regression equations.

\[ \hat{Y} = a + bX = 89.42 + 27.05X \]  \hspace{1cm} (3)

4. Draw regression equation chart, as shown in Figure 3.

Figure 3 shows the relationship between systolic blood pressure and serum triglyceride. The abscissa is serum triglyceride and the ordinate is systolic blood pressure. It can be seen that systolic blood pressure and serum triglyceride are basically linear. It can be seen from the figure that with the increase of serum triglyceride, the systolic pressure also increases, so serum triglyceride has an impact on the incidence of hypertension.

![Figure 3. Relationship Between Systolic Blood Pressure and Serum Triglycerides](image)

By calculating the relationship between examination attributes, we know that the influence of examination attributes on hypertension tends to be consistent. The higher the combination of all factors, the greater the possibility of suffering from hypertension. According to the possibility of different factor gradients, the system makes a comprehensive judgment, infers the grade of hypertension, matches the symptoms with the doctor's orders, and then transmits them to the client. At the same time of information sharing, the health goal of early medical treatment and early prevention should be achieved.

4. Conclusion

This system is mainly for information sharing between users and hospitals. Compared with the traditional mode, it is more conducive to information synchronization and interaction. The health management system based on regression analysis has a relatively large development and promotion space in the future, which is conducive to people's healthy life.

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