

Research Article

Research and Development on Food Nutrition Statistical Analysis Software System

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Abstract: Designing and developing a set of food nutrition component statistical analysis software can realize the automation of nutrition calculation, improve the nutrition professional's working efficiency and achieve the informatization of the nutrition propaganda and education. In the software development process, the software engineering method and database technology are used to calculate the human daily nutritional intake and the intelligent system is used to evaluate the user's health condition. The experiment can show that the system can correctly evaluate the human health condition and offer the reasonable suggestion, thus exploring a new road to solve the complex nutrition computational problem with information engineering.

Keywords: Food nutrition, software development, statistical analysis system

INTRODUCTION

Along with the wide application of various automated analytical instrument in the medical professional field and the widespread penetration of electronic computer technology to the medical department, the food nutritional statistical and analysis has entered into a new era with the main feature of automation, information and network. Although the statistical and analysis automation of medical nutrition is only a dream at present, the nutritional statistical and analysis system (referred to as NSAS, the same as below) composed by the network and information computer system has entered into a booming period and the arrival of computer statistical analysis instead of the computer has become an indisputable fact (Pereira *et al.*, 2009). The computer automation statistical analysis system can deal with the rapid-growth statistical data, it can fully play the advantages of high-speed computing calculation and accurate statistical data, ease the contradiction between the high speed determined by the automatic test instrument and computer system and manual report result and the low efficiency, thus making a great contribution to provide a large amount of data for the nutrition statistical analysis. Recently, some companies have begun to develop some systems as NSAS.

Currently, the statistical analysis of scientific data is basically dependent on the computer, the reform of such kind of data processing means quietly rose at the late eighties in the country and there are various statistical analysis software's and procedures compiled by each research unit. As times go on, the majority of statistical software's are gradually eliminated due to the

backward algorithm, poor data format specification, disorder output format and lack of integrity (Margolis *et al.*, 2011). In recent days, large-scale statistical analysis systems or software's are accepted by the majority of research workers, especially the researchers in the statistical community, such as SAS, SPSS, BMDP, GLIM, STATA and EGRET. However, this software's are some common statistical analysis software's, which cannot be well adapted by the professional statistical analysis format in food industry (Church and Krines, 2008). Therefore, the set of nutrition statistical analysis software was developed. Although there are many aspects in the system to be improved, it is hoped that the system can explore a new path for the development of medical field informatization (Koroušić Seljak *et al.*, 2013).

The aim of the study is to design a software system which could finish complicated nutrition statistics calculation online. This is a new attempt in exploring informational means for nutrition statistic analysis.

SYSTEM DESIGN AND FUNCTIONAL MODULE

Function of food nutrition statistical and analysis system: Data acquisition Data acquisition collects the individual (needing to investigate the nutrition status)'s food intake amount within a certain time and type-in the collected data into the database. Vladislav *et al.* (2011) the section requires the people to participate and the system needs to provide the entry personnel operation interface.

Data query The material needed to be queried in the section can be divided into three categories: the first

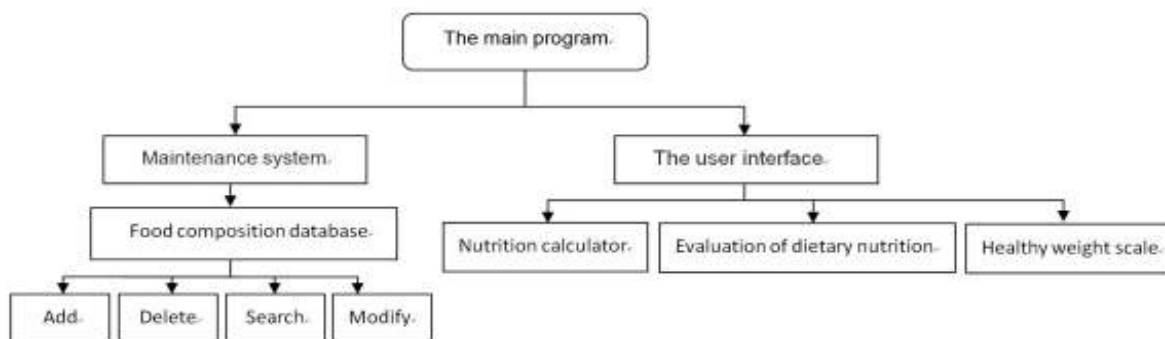


Fig. 1: System data flow diagram

one is providing the enter data for the professional to review and audit the reasonableness of each group of data; the second one is querying the nutrition composition content in each food; the third one is querying the result after the software statistical analysis for the expert to offer the reasonable evaluation on the nutrition health condition of test subject (Ouyang, 2013).

Data calculation Nutrition professional calculation is the fundamental basis for the nutrition expert to evaluate the nutrition status, the function requires calculating the entry original data according to the professional formula on the nutrition, obtaining the classified intake amount of each nutrition element and providing the various display modes and printing function.

Data analysis is an important function in the software. After obtaining the calculation result, the calculation result shall be saved in the database for spare. With the contrast with the standard data, it can obtain the result, analyze different nutrition status from different result and it shall visually display in the forms of chart and text.

System module design: The system adopts the modular design program and it can be mainly divided into two modules of maintenance system and using system. Each independent part is controlled by the master module, wherein, the module in the using system mainly includes the nutrition calculator, dietary nutrition evaluation and healthy weight scale (Fig. 1).

- Nutrition calculator is the basic calculation statistical tool in the system. It can calculate the contained nutrition component in these foods through the food intake amount within a certain time and store the calculation result in the database and conduct the statistical analysis on the stored data. The calculated data includes the energy, protein, fat, carbohydrate, dietary fiber and various vitamins, trace elements and others in total of 28 (Peilong *et al.*, 2013). For example, if we want to analyze the nutrition status of the sampling

population in a region, firstly input the intake food variety and amount within a certain time and the system can automatically calculate the nutrients content according to the input and make the basic evaluation on the overall nutrition condition and conduct the statistical operations of sum, average, variance, chi-square test through NSAS statistical function according to the demand. The system gives full play to the advantages of high calculating speed and high calculation accuracy, thus simplifying the work of nutrition researcher.

- Dietary nutrition assessment module is used to analyze and evaluate different respondents' nutrition status. In the module, the database is classified according to the investigation group class and meal species. When applying, it can find the corresponding nutrition component and content according to the specific group, time, intake food class and amount and conduct the statistical analysis. The operator shall firstly select which special group the respondent belongs to, such as infant, children, pregnant women, nursing mother, adult and people with illness, then input the respondent's age, gender, height, weight and physical type and other basic conditions and the intake food class and amount within a certain time, the analysis system will calculate the corresponding nutrition component class and intake amount according to the input condition and make contrast with the national formulated standard intake amount and further make the reasonable evaluation on the respondent's nutrition condition. In addition to be used for the nutrition assessment on the patient in the hospital, the module can be used for the healthy person to make the nutrition assessment, such as infant and children, thus providing the objective basis for the dietitian and professional as the reference for the nutrition counseling guidance and treatment to help the respondent establish healthy diet structure and good eating habit.
- Healthy weight scale is a module to propose different nutrition improvement program according to different people's physical conditions by use of

computer's artificial intelligence technique. According to the inputted height, weight and other physiological conditions, it can make the analysis, judge the nutrition status and offer the improvement program. The module also has the nutrition catering function and the dietician can scientifically cater for the patient with the function. According to patient's nutrition status, the system will firstly analyze the needed nutrition component, offer the corresponding food variety table, then the dietician selects the food in the table, the system will conduct the real-time calculation on the difference between the intake amount of nutrition

component and needed nutrition component, then the dietician can formulate a reasonable diet for patient through increasing or decreasing the food variety or intake amount according to the difference. It can not only be used for the hospital to cater for the patient, but also in the school, restaurant, hotel and other catering industries.

SYSTEM TEST AND EXPERIMENT

The system function test adopts the remote access service procedure; user can open the browser at any

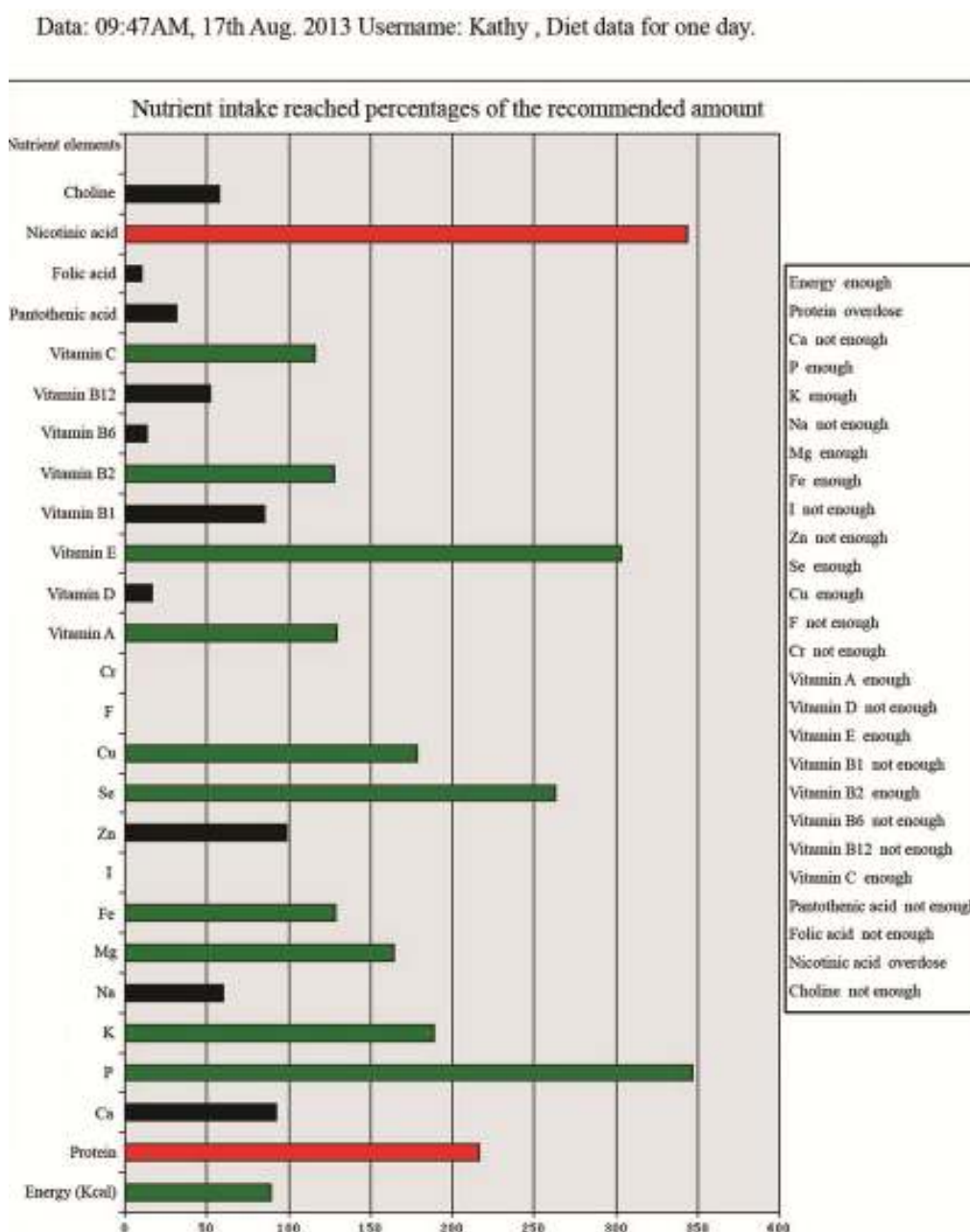


Fig. 2: Tester's nutrition status assessment result

Table 1: Foods amounts taken in by a tester for one day

No.	Foods	Amounts (g)
1	Milk	250
2	Bean curd	100
3	Steamed buns	250
4	Potato	100
5	Spinach	200
6	Mushroom	150
7	Cucumber	100
8	Apple	250
9	Hawthorn	60
10	Peanut	80
11	Egg	100
12	Chicken	150
13	Marbled beef	150
14	Shrimp	150
15	Sardines	100
16	Carbonated drinks	250

computer accessible to the Internet and log in to the system. It tests a day's recipe for a 30-year-old female. The tester's physical condition is as follows: height, 165 cm; weight: 53 kg; engage in the light physical labor; Data entry date: 2013-8-17. A day's recipe for the tester can be seen in Table 1.

After the analysis of the software, the obtained results can be shown in Fig. 2. The excessive nutrients are displayed in red, the normal in green and those below the standard in black. After the hand computation for 3 times, the obtained value in the software is in consistent with the calculation result.

CONCLUSION

Applying the system can analyze and test the diet nutrition condition for different population. The experiment can show that the calculated data in the system is true and reliable, which can provide the accurate reference data for the dietitian, clinical dietitian or the user. For the software adopts B/S structure, users do not need to install the software in the local computer and only opening the browser can enter into the website and calculate, thus improving the system's usability and convenience and exploring new method and thought for food nutrition statistical and analysis.

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REFERENCES

- Church, S. and C. Krines, 2008. Using nutritional data in the food industry. *Food Sci. Technol.*, 22(2): 23-25.
- Koroušić Seljak, B., V. Stibilj, L. Pograjc, N.F. Mis and E. Benedik, 2013. Food composition databases for effective quality nutritional care. *Food Chem.*, 140(3): 553-561.
- Margolis, D., W.H. Land Jr., R. Gottlieb and X. Qiao, 2011. A complex adaptive system using statistical learning theory as an inline preprocess for clinical survival analysis. *Procedia Comput. Sci.*, 6: 279-284.
- Ouyang, B., 2013. Theory of regression apple professional cooperation organization research. *Adv. J. Food Sci. Technol.*, 5(3): 328-331.
- Peilong, X., N. Na and L. Qing, 2013. Effects of low-ester pectin on wheat dough's physical properties detected by rheological method. *Adv. J. Food Sci. Technol.*, 5(8): 1011-1014.
- Pereira, A.C., S.R. Marco and M. Pedro, 2009. Quality control of food products using image analysis and multivariate statistical tools. *Ind. Eng. Chem. Res.*, 48(2): 988-998.
- Vladislav, V., R. Gitesh, M. Michael, M. Andrew, B. Carla and P. Steven, 2011. Development of mobile-accessible nutritional system to improve healthy food choices. *Res. J. Appl. Sci. Eng. Technol.*, 3(9): 1034-1047.