COLLECTING AND SHARING FOOD LABEL INFORMATION BY UTILIZING MOBILE PHONE PLATFORM AND OPEN DATABASE

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ABSTRACT

We are developing an open database to share food labeling information and an application to show nutritional intake amounts on mobile phones for dietary self-management. One of the benefits is to reduce the risk of such lifestyle related diseases. This system has two features. First, food labeling information is shared in a database. Users can read the barcodes of food with barcode reader on their mobile phone and invoke a nutrient information search to a backend database. If the record exists, it is directly downloaded to the user's mobile phone. If such information is unavailable, users are asked to input it by label to share it with other users through the databases. Second, users can record consumed nutrients on mobile phones that will show a graphical representation of caloric intake, e.g., graphs and color-coded number symbols. Users can check their daily intake amounts in real time.

1. INTRODUCTION

Food labeling has been an important part of public health policy in order to promote awareness of nutritional intake, and is expected to directly or indirectly decrease the health risk of illnesses such as obesity, diabetes and coronary heart disease, that usually correlate with dietary imbalance [1]. However, some research indicates that people seldom pay attention to the labels or are unable to read the nutrient information correctly. Japan was among the countries in which this was observed.

After analyzing several dietary management programs and nutritional Web site services in Japan, it was found that most of the services provide nutritional information for raw foods or predefined recipes, which is largely ineffective because currently many people don't cook for themselves. It was also found that that these services are usually provided through desktop computers [2] rather than mobile devices, and graphical representations of nutrient intake are seldom used, especially by the Web-based services. Yoshimoto has developed a related Web-based system, but its focus was different from that of our application, which is not intended to be a training system to improve one's diet [3].

It is important to have accurate nutritional information to be able to intelligently manage our dietary needs, so developed an open database to share food label information and an application to show intake amounts on mobile phones to support dietary self-management.

2. SYSTEM

2.1. User operation

In this article, it is argued that due to the limited space on food labels, a better practice for giving consumers access to the information would be to enable the downloading of nutritional information to users' handheld devices. The authors provide a preliminary model by utilizing a barcode reader, a function that comes with almost every new mobile phone in Japan, in a way that enables users to read food container barcodes and invoke a nutrients information search to the back-end database. If the record exists, the information is downloaded to the mobile phone directly, and the user can check her/his daily intake amounts in real time. If the record doesn't exist, the user is asked to input the nutrient information provided by the label, and the information will be shared with other users through the database.

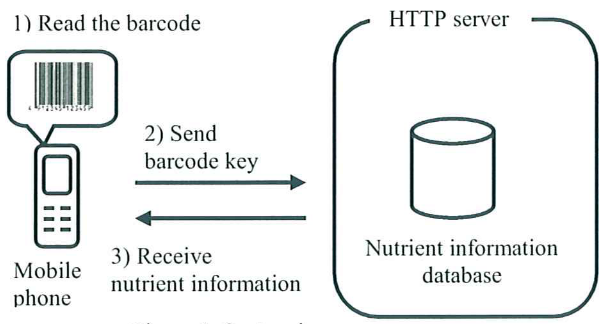

Figure 1: System image

Users' daily intake amounts can be checked in Dietary Reference Intakes for the Japanese [4]. The system requests that each user initially to input personal attributes including his or her sex, age, whether she is pregnant or not (for women), and usual amount of exercise?

2.2. Function

This application includes two functions on mobile phone: one for inputting a user's nutrient intakes and one for viewing personal archives.

2.2.1. Input page

In the Input pages, a user uses the barcode reader on his or her mobile phone. The packaged foods in Japan have "JAN codes" that show the country, maker and item number on each product. Items input include the JAN code (input by the system automatically), the item name, Calories, Protein, Fat, Carbohydrates, Sodium (Na)

NaCl deduced from the Sodium content (Fig.2.a). Japanese packaged foods have either Sodium or NaCl deduced from Na content displayed, so the system shows both. The formula for calculating NaCl content from Na content is NaCl = 2.54 * Na.

2.2.2. View pages

There are four view pages that show a user's current dietary condition.

Current or previous condition view (Fig.2.b): These pages show each nutrient on a transverse bar graph. Graph colors show the user's current dietary levels for each nutrient with green representing a level below 75%, orange indicating between 75% and 100%, and red meaning over 100%. The maximum value for each graph is the user's reference nutrient intakes based table of Dietary Reference Intakes for the Japanese. Balance view (Fig.2.c): The Balance view shows the difference between a user's actual nutrient intake and the reference intake for each nutrient. Blue numbers indicate that the user's intake is below the reference amount and red shows that the intake is over. If the user's reference is 2000 kcal and the actual intake is 1500 kcal, the balance is 500 kcal. The user can watch both the balance view and food label, and decide how much and what kinds of food to eat. Weekly view: This page shows sequential line graphs a one-week period, and shows one page per nutrient. List view (Fig.2.d): This view shows the item name and the input time in list form.

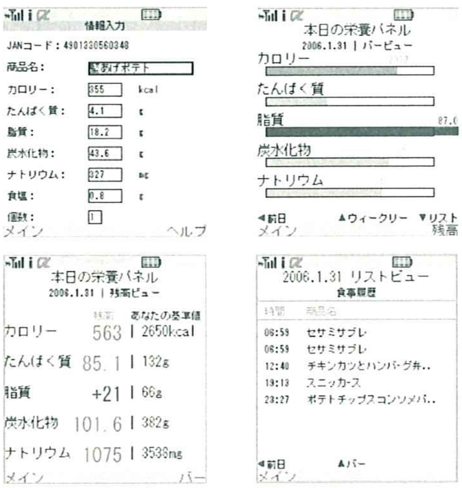

Figure 2: Application interface on mobile phone
a. Input page (upper left), b. Current condition view (upper right), c. Balance view (lower left), d. List view

2.3. Develop environment

This application was developed using Eclipse 2.1.1, Java 2 SDK Standard Edition v1.3.1_16, and the i appli Development Kit for Doja 3.5. Database was constructed Apache 2.048, MySQL4.1, and PHP 5.0.3. Doja 3.5 is a Java extended library for i appli (this is the development software for mobile phones supporting i-mode, which is provided by NTT DoCoMo), Doja 3.5 doesn't support floating point. Nutrients have very small numerical values, so the integral part and decimal part are stored separately after being input.

For sharing food label information, this application communicates with a database. This application first searches for nutrients in the mobile phone memory, then in the database. Saving previously input information in memory, can help lower communication charges.

3. EXPERIMENTS

We did preliminary experiments that examined the usability of the application and awareness about nutrients. Ten persons joined in the experiments; they are students of graduate school of information. In this experiment, people used the developed application on mobile phones, and ten items were shown to them. Users were polled before and after trying the system on mobile phone for the evaluation. After preliminary experiments, six persons reported that the Balance view is useful. Eight persons reported Inputting the nutrient information is useful. In the question "If you decide from a food label when to buy food, which do you use in deciding, information from the label or its application?" eight persons answer both.

Let us discuss the reason for the users' responses. The Balance view is a good function, because it shows color-coded number symbols for dietary intakes relative to dietary reference intakes for one day. Moreover, this is useful when users decide on their next meals. Users said they are more aware of nutrition when buying food. The ability to show a user's intake amounts in graphics and the balance numbers customized to her/his nutritional needs was especially convenient when making dietary decisions. However, most of the users felt discouraged when they had to input nutritional information manually most of the time, due to the rare amount of available data in the database during the preliminary stage. The reduction of the users' input effort will be the key to the system's future growth.

4. CONCLUSION

We developed an open database to share food labeling information and an application to show nutritional intake amounts on mobile phones for dietary self-management. An experiment was performed in which people used the application on mobile phones. The result of our experiment clearly shows that users need an easier input method and a lot of information about nutrients for their health. Recently, we see two-dimensional barcodes on products and on menus in restaurants, and IC tags are used mobile phones and cards. Both save much more information older one-dimensional barcodes, and can save user's time. We have developed a method that we hope will support users' attempts to improve their health.

5. REFERENCES

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[4] Ministry of Health, Labour, and Welfare, "Dietary Reference Intakes for the Japanese", http://www.nhlw.go.jp/houdou/2004/11/h1122-2.html, 2005.