INTEGRATION OF RFID AND 4G SYSTEMS FOR NEARLY EXPIRED FOOD NOTIFICATION

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Abstract— Today, people are provided with abundant basic necessities in advanced countries, but the other problem is: waste of food. Even though recent studies show that some expired food is still edible[1],it is still better to consume the food before it expires.Now a day, people are very busy for their work in industrial society. Therefore, many people like purchasing a lot of food in the markets to stock up and cook for 1 week, even 1 month. That can be a good idea for busy modern people because they might not have enough free time to buy fresh food everyday. Nevertheless, people could hardly keep track the expiration date on every single item. Chances are: the food might already expire whenever they want to cook or eat it. Thus, this research presents a design of RFID-based Nearly Expired Food Notification System with 4G Systems and real-time SMS messages, the system is able to record food information in the Database. Also, it can send a SMS messages to users' cellphone or show food information on the monitors to notify people which food is about to expire. Not only can people eat or cook fresh food, but also they will rarely waste expired food.

Keywords: RFID, RFID-based Nearly Expired Food Notification System, 4G Systems and real-time SMS messages.

I. INTRODUCTION

The technology and science have got developed rapidly in recent years, so people can get many information on the Internet, and many Information Technologies integrate Internet to work and process as well. One of the popular technologies is RFID. Also, the cost of RFID has been cheap little by little since RFID technology was heavily used in many different fields, which involve Daily Life and food management.

On the other hand, according to the article, "GLOBAL FOOD LOSSES AND FOOD WASTE"by Jenny Gustavsson、Christel Cederberg and Ulf Sonesson, 1.3 billion tons food being around one third of all food production is wasted or lost every year in all over the world [2].The 1.3 billion tons food includes expired food.In addition, a questionnaire has been surveyed by an environmental organizations called Friends of the Earth (HK)[3].That is about 156 million expired food items are thrown away every year in Hong Kong [4], and an average of 1.8 expired foods are thrown away each month by everyone.

As a matter of fact, there are not usually few food in People's home, yet it is difficult for people to check expiration date of food everyday, for most of people are very busy.This circumstance may make food be wasted.Especially, every so often people are used to buy some food that is not eaten or cooked right away.For instance, consumers go to markets to buy some pork.Although they do not originally want to order other food, they might buy few discount food at same time if they see the advertisement of discount items and special price.

Consequently, the discount food might be forgotten after a while. Next time the food may often past the expiration date when people want to cook it, hence how to use RFID technology to reduce food wastage and save time will be vital issues.

II. RFID-BASED NEARLY EXPIRED FOOD NOTIFICATION SYSTEM DESIGN

The RFID-based Nearly Expired Food Notification System has combined RFID、SMS platform、4G video services and Database, See Fig 1.

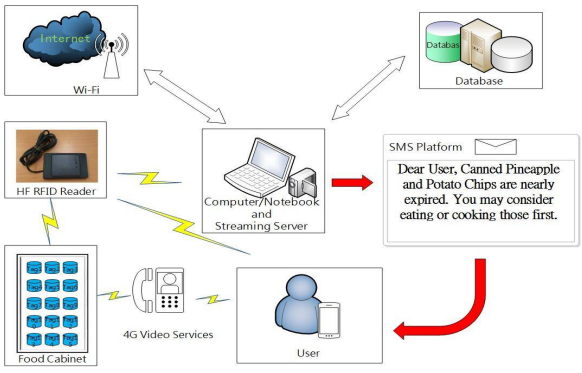


Fig 1. System Structure Drawing of RFID-based Nearly Expired Food Notification System

We build this system and place RFID Reader in front of food cupboard or refrigerator.People are very easy to use RFID Reader to scan any food that is labelled RFID Tag.The goal is to record food purchase and expiration date in the Database, See

Fig 2.When users want to inspect any food information, they just need to scan the tag of food with RFID Reader, the food information will be displayed on the Monitor.In addition, this system will check all food shelf life and send SMS message to inform user a day or two days in advance which one nearly expired food is .Thus, people can know that they may have to eat that one first.

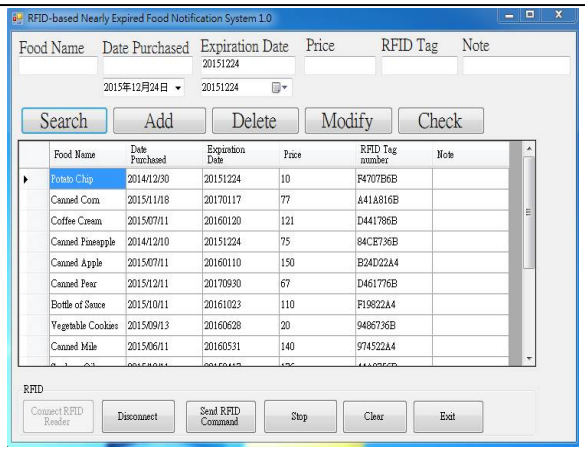


Fig 2. The interface of RFID-based Nearly Expired Food Notification System

III. RFID API DESIGN

Every kind of RFID Reader has its own communications protocol, and most of protocol commands are different.There are two way to design RFID middleware .The first one is using .dll file of Original Dealer to connect RFID to Computer.Even though this method is easier than another way, the functions in the program might be limited every once in a while, so we choose another method to design RFID middleware.At the beginning of this study we selected SerialPort of Visual Basic express 2010 and RFID communications protocol to design RFID API.If SerialPort receives correct RFID protocol command, **See Fig 3,** then the data will be replied by RFID Reader.In addition, RFID Tag number will be caught after the data is processed and edited .By the time the data is encoded, RFID Tag numbers will have been caught and used in the RFID middleware.

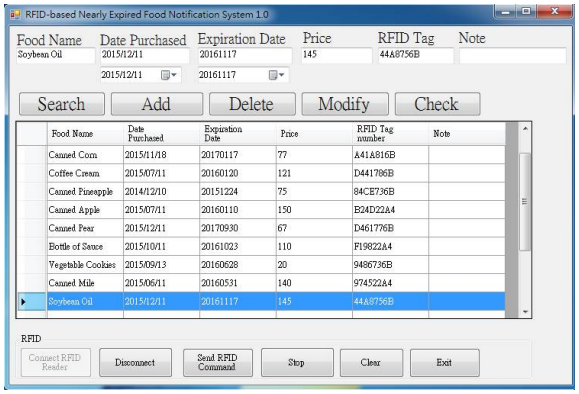


Fig 3. RFID API / Middleware

IV. RFID SPECIFICATIONS

There are two major types of RFID system being passive and active.The passive RFID falls into different frequency ranges, such as LF-125 kHz, HF-13.56MHz and UHF-915MHz…etc..Different RFID frequency ranges can be used in different applications.This research uses HF-RFID System for System Development.HF-RFID System is cheaper than UHF-RFID System, so it is appropriate to build in the home for RFID Nearly Expired Food Notification System because general users usually consider the cost before choosing a new system.

V. SYSTEM USER INTERFACE AND 4G VIDEO SERVICES

Although modern is proficiency in fundamental computer operation, we still consider designing a simple and friendly interface involving all functions. The intention is to ensure all users can use it easily. Users do not have to spend too much time to learn how to use the system.

In general quite a few people like to order some lower-priced food or ingredient, such as instant noodles and cans. People, however, do not remember how many cans or instant noodles they still have. In this case, user can turn on the 4G Video of cellphone to check their food cupboard at once, See Fig 4, and decide to buy discount food or not.



Fig 4. 4G Video Services

VI. RESULTS AND DISCUSSION

RFID can be applied in food management System, This study supports a complete RFID-based Nearly Expired Food Notification System. The system not only remind the users about all food information, it also includes a simple interface and full function. People can add、modify and delete food item quickly after scanning the RFID Tag. Besides, RFID-based Nearly Expired Food Notification System will send users a real-time SMS message to warn them which foods need to eat first because the foods are nearly expired. **See Fig 5**

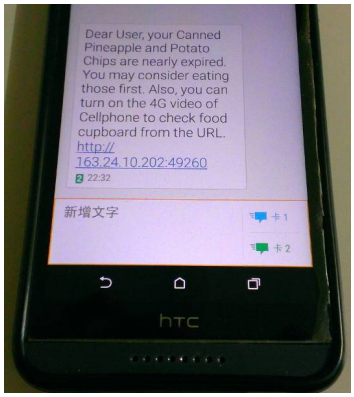
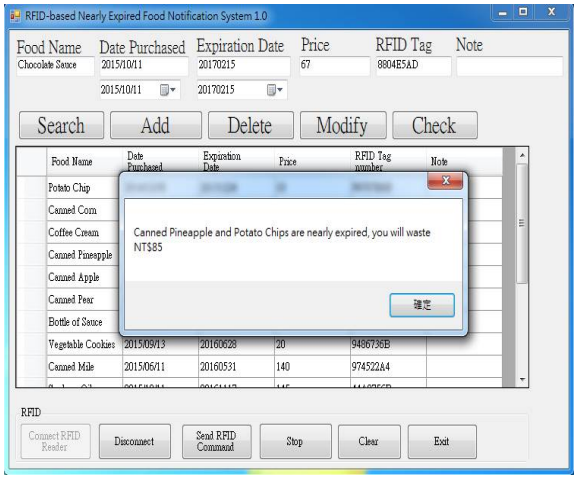


Fig 5. SMS Interface

People can set the system remind them how many day prior to expired. Sometimes, people do not feel that much if an expired food is thrown away. Consequently, the RFID-based Nearly Expired Food Notification System will also caution users how much money they already squander, **See Fig 6**.



See Fig 6. Waste Money Notification

This system can bring convenience to people who can manage the food easily in the home and decrease food wastage.

CONCLUSIONS

Modem people care very much about healthy diet. Also, people who do not have sufficient time to check the shelf life of food in the home often have the life style with “leave early and return late”. Now and then they might see the ingredient is expired when they want to cook lunch or dinner. In this situation, the food may be thrown away .Besides , sometimes people want to cook dinner or lunch, yet they just knew the ingredient that has already run out. Many people should have this kind of experience, hence the purpose of this research is to integrate HF RFID、4G Systems、SMS Platform and Database to build a Nearly Expired Food Notification System, which will automatically check every food and ingredient from the Database, and notify people which one is nearly expired food that they may eat first. Users can both avoid eating expired food, and know which food they need when going shopping.

To sum up, having this system at home can help users save a lot of time, bring with healthy diet for people, and last but not least: sustain quality of life.

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