The Design of Smart RFID Tag System for Food Poisoning Index Monitoring

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Abstract. Factors most affecting the health risks in the world are food poisoning such as food contamination is a disease. While there are many factors affecting food poisoning typically changes in temperature and humidity, and monitoring temperature and humidity variability during transport and storage is very important. So we for the consumer to prevent food borne illness and food poisoning index monitoring system are proposed. Proposed system consists of RFID tag, temperature and humidity sensor, sensor interface, reader, and server. In order to verify the effectiveness of the proposed system, we performed experiments on the tofu. Proposed system measures the temperature and humidity using the smart RFID tag. The measured information can be calculated according to food poisoning index with four grade, interest, caution, warning, risk. The proposed system confirms usefulness through experiments.

Keywords: Food poisoning index monitoring system, Smart RFID Tag, Temperature sensor, Humidity sensor, Sensor interface.

1 Introduction

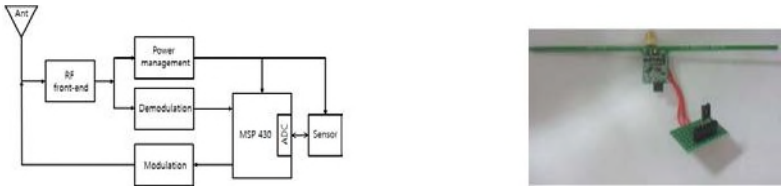
According to WHO, the human health harm factors that is occurred most often in the world is the disease which is caused by the contaminated food as food poisoning. A food contamination can occur in the production process, but also a large part caused by the careless food handling because of improper temperature or humidity when a food is transporting and storing [1]. Therefore, we know in advance the prevention of food poisoning and disease of consumers to the corruption of food poisoning index monitoring system is needed. There are many factors affecting food poisoning, typically changes in temperature and humidity is an important factor. So the monitoring system of temperature and humidity variability during transport and storage is very important [2].

In this paper, we propose the monitoring system of food poisoning index in order to ensure the food poisoning that can occur during the transportation and storage of food. Proposed system consists of RFID tag, temperature and humidity sensor, sensor

interface, reader, and server. The proposed system is measured temperature and humidity of surrounding environment during the transportation and storage of food. In order to verify the effectiveness of the proposed system, we performed experiments on the tofu. Proposed system measures the temperature and humidity using the smart RFID tag. The measured information can be calculated according to food poisoning index with four grade, interest, caution, warning, risk. The proposed system confirms usefulness through experiments.

2 The proposed system

2.1 The manufactured sensor tags



(a) The block diagram (b) The manufactured smart RFID tag

Fig. 1 Smart RFID tag system

The block diagram of the smart RFID tag system is shown figure 1 (a). The tag is consisted of 900 MHz antenna, RF front-end, power management, demodulation, modulation, MSP 430, and sensors. Power management supplies power to each of the parts. The power is collected from the RF energy. Demodulation transmits data converted RF data signal using ASK to MSP430. And modulation transmits digital signal of MSP430 to reader using the backscatter method. MSP430 checks reader activity and data management. Sensors convert temperature and humidity data to voltage. The manufactured smart sensor tag is passive type tag worked by RF signal power. Figure 1 (b) is manufactured smart RFID tag [3].

2.2 The monitoring system

Reader using the monitoring system is speedway revolution UHF RFID reader by IMPINJ. Table 1 is specification of reader [4].

Tab. 1 Specification of reader

Contents	Range
Interface Protocol	EPC global UHF Class 1 Gen 2 / ISO 18000-6C
RF Frequency	900Mhz ~ 930Mhz
RF Range	10cm ~ 10m
Transmit Power	+10.0 ~ 30.0 dBm

Power Consumption	24V

Food poisoning index is expressed possibility of food decomposition, which is based on temperature condition that affects growth of microorganisms as regards food decomposition with consideration of humidity condition, as a percentage, and is shown figure 2 provided by the Food and Drug Administration and the Meteorological Administration of Korea.

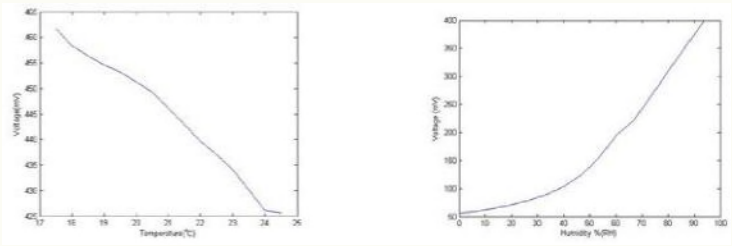
Fig. 2 The food poisoning index according to the temperature and humidity

As in figure 2, food poisoning index can be divided 4 steps, interest(green), caution(yellow), warning(orange), risk(red). Consumers apply the temperature and humidity information that is measured from sensor tag to figure 2, can check the status of the food [5].

3 Experiment

In this paper, we experiment using tofu. Figure 3 is experimental picture and test program and display food poisoning index. Through the experiment, we measured the output of temperature and humidity sensor. The result graph is figure 4.

Fig. 3 Experimental picture and test program



(a) Temperature sensor (b) Humidity sensor

Fig. 4 Output graph

In figure 4, we confirmed that voltage is almost linearly changed in accordance with temperature and humidity. The temperature and humidity data measured from sensor tag is calculated suitable for food poisoning index. The calculated food poisoning index is displayed 4 degree. And we could check the status of food.

In this experiment, we measured food poisoning index according to the surrounding environment and changing time. The quality status of tofu was confirmed through smell of tofu

4 Conclusion

The human health harm factor that is occurred most often in the world is the disease which is caused by the contaminated food as food poisoning. In this paper, we proposed the monitoring system of food poisoning index in order to ensure the food poisoning that could occur during the transportation and storage of food. The proposed system was measured temperature and humidity of surrounding environment during the transportation and storage of food using the smart RFID tags. The measured information was calculated suitable for food poisoning index. The calculated food poisoning index was displayed 4 degree such as interest, caution, warning, risk, but the grade crush on peripheral factors also cannot be better monitored. The proposed system was confirmed the usefulness through experiment. Consumer was checked food poisoning index, and supplied safety food. So consumer was trusted the food quality.

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