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Smart Device: A Smarter Way to find the Packed Food Quality

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ABSTRACT:Sensors are used in monitoring food nutrients. This is done according to contamination and degradation level present in food quality because of variation in surrounding condition like temperature, humidity that effect human adversely. A multi-sensory system is implemented to remove flaws from existing system in food industries and product safety is implemented. The data is collected via sensors and the algorithm processed on micro-controllers is displayed on the screen of Mobile Application for the user, with proper log file created with the integrated GUI that is integrated with the Bluetooth to send the real time sensor that is transferred over a range. Estimation of food and nutrient intake, that is defined by the proper standard of values that has been fixed by the food health organization so as to identify potential nutritional inadequacies.

KEYWORDS: Temperature and Humidity Sensor, Controller, Bluetooth, GUI Window

I. INTRODUCTION

To ensure packed food safety it should be monitored at every stage of supply chain. It serves the purpose of preventive consumer health protection by maintaining the required standard needed in food whether in terms of ingredients, storage environment, preservatives etc. Main objective is to provide good quality of the packed food product and to find out the actual expire date of the packed food product Recent developments in sensor technology as well as the development of the Internet Smart Card facilitates makes it easy for the packed foods to be maintained in its specified conditions. But during the transport and storage in some shops, the conditions mentioned on the packed food are not maintained. A commonly used Time-Temperature- Indicator (TTI) monitors the exposure of the packed food to the surrounding temperature and humidity.

The primary goal of a packed food and nutrition monitoring and surveillance strategy is to provide the basis for a packed food and nutrition related action program through the collection of relevant data that are regular, informative, coordinated, timely, reliable, effective and efficient. Customer can get the packed food information from the mobile app. The information of the packed food is whether the packed food is safe to consume or not. The mobile app displays: (i) Outstanding: If the quality of the packed food is maintained as per the conditions mentioned on its packet. (ii)Average: If the quality of the packed food is slightly varied as the conditions mentioned on its packet has slightly deviated. (iii) Bad: If the quality of the packed food has completely changed because of high change in mentioned condition on its packet.

II. RELATED WORK

The current bulk transit systems and local perishable food distribution logistics, both suffer from significant fuel inefficiency along with foodwastage due to quality degradation in the distribution pipeline. A mechanism that exploits automated electric vehicles (AEVs) in future smart cities and regions to provide both people transport and fresh food distribution that minimizes empty miles of the vehicles (and thus enhances transport efficiency) while meeting the constraints on passenger transit time and food freshness. We devise an optimization framework and show how it can be solved using genetic algorithms in order to handle dynamic demands for passenger transport/products, uncertain supply delays, and variations in product availability[1]. Performance evaluations with extensive simulations show that flexibly deciding the AEV routes improves the transportation efficiency by _24-78% whereas improves the delivery quality by _2 times compared to the typical fixed routes/schedules used both by regular passenger bus services and by local

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distribution operations. The major disadvantage is the no proper maintenance of packed food during the transportation. Temperature and Humidity is also not maintained properly.

Food fraud is a collective term used to encompass the deliberate and intentional substitution, addition, tampering, or misrepresentation of food, food ingredients, or food packaging; or false or misleading statements made about a product for economic gain the Global Food Safety Initiative (GFSI) has continued work on a Food Fraud Think Tank to consider if, or how, food fraud fits into their benchmarking[2]. More generally, the International Standards Organization (ISO) has a technical committee on Fraud Countermeasures and Controls that includes food in "material goods." The international focus on fraud complements the U.S. focus on adulteration.The major disadvantage is that Food fraud may be economically motivated; the public's health is at risk. These threats are potentially more risky than other types of food risks.

Food fraud is a collective term used to encompass the deliberate and intentional substitution, addition, tampering, or misrepresentation of food, food ingredients, or food packaging; or false or misleading statements made about a product, for economic gain. Food fraud is a broader term than either the economically motivated adulteration (EMA) defined by the Food and Drug Administration (FDA) or the more specific general concept of food counterfeiting[3]. Food fraud may not include "adulteration" or "misbranding," as defined in the Food, Drug, and Cosmetic Act (FD&C Act), when it involves acts such as tax-avoidance and smuggling. The economic motivation behind food fraud is distinctly different from those for food safety, food defense, and food quality. The cause of an event might be food fraud, but if a public health threat becomes involved, the effect is an adulterated product and a food safety incident. All of this is under the umbrella of food protection, which encompasses food fraud, food quality, food safety, and food defense. The major disadvantage is that false or misleading statements made about a product, for economic gain.

An overview of item-level radio frequency identification (RFID) tagging in the apparel supply chain. It explains the evolution of RFID technology and details key benefits when utilized by retailers, distribution and logistics providers, and manufacturers[4]. When used throughout the apparel supply chain, item-level RFID provides an intelligence-rich environment that enables businesses to better transport goods, predict demand, efficiently promote stock, avoid write-downs and markdowns, and ultimately drive revenue and profit margins.The major disadvantage of this paper is that it is not Fully Secure.

Food fraud, or the act of defrauding buyers of food or ingredients for economic gain—whether they be consumers or food manufacturers, retailers, and importers—has vexed the food industry throughout history. Some of the earliest reported cases of food fraud, dating back thousands of years, involved olive oil, tea, wine, and spices. These products continue to be associated with fraud, along with some other foods. Although the vast majority of fraud incidents do not pose a public health risk, some cases have resulted in actual or potential public health risks. Perhaps the most high-profile case has involved the addition of melamine to high-protein feed and milk-based products to artificially inflate protein values in products that may have been diluted[5]. The major disadvantage of this paper is that false or misleading statements made about a product, for economic gain.

Food fraud which has been so widely and variously reported over recent months and years. Its purposes are to set current experience into an historical context and to illustrate the tension between the science of deception and the science of detection[6]. Approach: This is a desk study of published literature and historical documentation, together with interviews with those professionally concerned with detection and enforcement. The major disadvantage of this paper is that meat processors have the technology to incorporate so much added water into cured meat products that more than half of what appears to be meat can be added water. Consumers will not know unless they are told.

Seafood is any form of sea life regarded as food by humans. Seafood prominently includes fish and shellfish. Shellfish include various species of mollusks, crustaceans, and echinoderms. Historically, sea mammals such as whales and dolphins have been consumed as food, though that happens to a lesser extent in modern times[8]. Edible sea plants, such as some seaweed and microalgae are widely eaten as seafood around the world, especially in Asia.The major disadvantages of this paper are that current electronic screening system targets higher risk of products. FDA fails to provide proper import of seafood, due to which animal drug residues in aquaculture products.

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III.PROPOSED SYSTEM

The system design process builds up general device building design. In this process the requirements that are listed must be used to create the architecture of the device. The requirements must be fulfilled and must meet with the expected output. The designing process is the critical step as all the small requirements must be met. Designing helps to proceed with the further steps as a clear idea of how the device must be designed and what all functions the device must possess.

A. System Architecture:

The architectural configuration procedure is concerned with building up a fundamental\ basic system for device. Technology explores the different systems used in packed food monitoring and food nutrients. This is done according to contamination and degradation level present in packed food quality because of variation in surrounding condition like temperature, humidity. A multi-sensory system is implemented to remove flaws from existing system in food industries and product safety is implemented. The data is collected via sensors and the algorithm processed on micro-controllers is displayed on the screen of mobile Application for the user.

B. The working of the device is as follows:

Implementation is done through temperature and humidity sensor. Sensors are connected with Microcontroller for detecting data and value of sensor will be stored in EEPROM of controller. The data will be stored in EEPROM of Microcontroller in every 1 hour and compared with the standard authorized data of that product.

Different kinds of sensors are used (temperature and humidity sensors) to measure the surrounding effects on packed food and its storage conditions. After integrating all the sensor information with the controller, the calibrations of sensor information are done to make them more accurate. Sensor data will be sent wirelessly via Bluetooth to the customer's mobile app. The app then retrieves all the data and estimates whether the packed food product quality is good to be consumed or not. The GUI window displays a pop up box which has the calculated result in it.

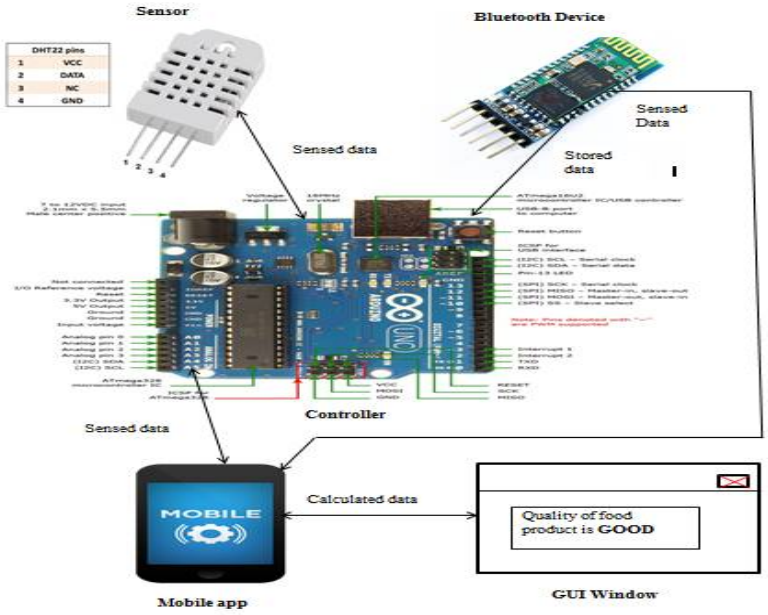

Fig. 1: Detailed architectural design

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Description of the Proposed System:

A. Arduino UNO: It is a Controller that uses ATmega328. Atmega consists of 14 digital input/output pins, 6 analog inputs, a USB connection, a power jack and a reset button. It is used for calculation of temperature and humidity value of the food product.

B. Temperature and Humidity Sensor: This uses 3-5V power, max 2.5Ma current use during conversion (while requesting data). It is Good for 0-100% humidity readings with 2-5% accuracy. It is also Good for -40 to 80°C temperature readings ±0.5°C accuracy. It is used to sense the temperature and humidity values of the packed food product.

C. Bluetooth Module: Bluetooth Module used is HC-05. It Works through UART Communication Technology. The Power Supply for this is +3.3VDC 50Ma. The Bluetooth Protocol used is Bluetooth specification v2.0+EDR. It is a Wireless module. It is used to transfer the data from the smart device to the customer's mobile app.

D. Mobile App: It is an Android Mobile App Used for displaying the sensor data as well as for display about product condition.

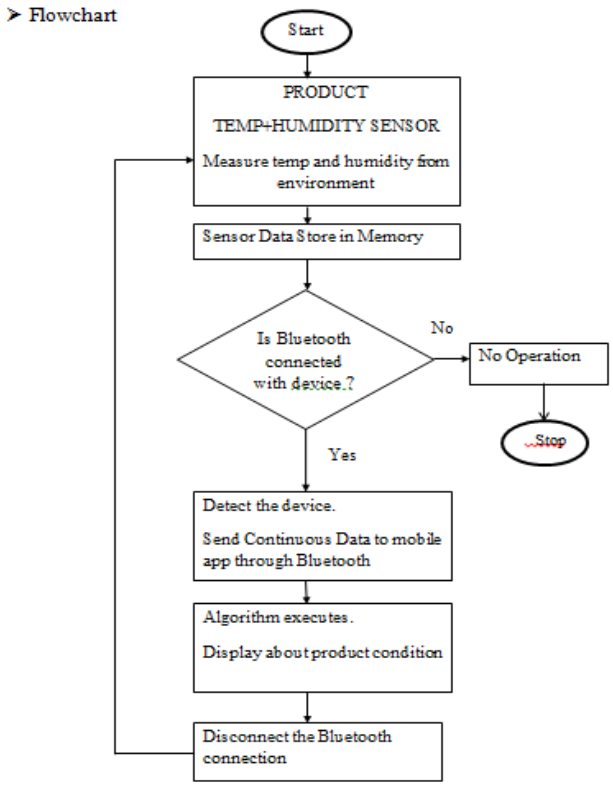

Fig. 2: Flow Chart

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IV. SIMULATION RESULTS

The simulation studies involvein the implementation of a device in which temperature and humidity is defined first as floating data types.Then the temperature and humidity of the packed food that is sensed from sensor is taken as input.The average temperature is calculated as defined in the code.The range condition is defined to display the quality of the packed food.If the average temperature is below 30, then the quality of the packed food is termed as outstanding.If the average temperature is between 30 and 37, then the quality of the packed food is termed as average.If the average temperature is above 37, then the quality of the packed food is termed as bad.

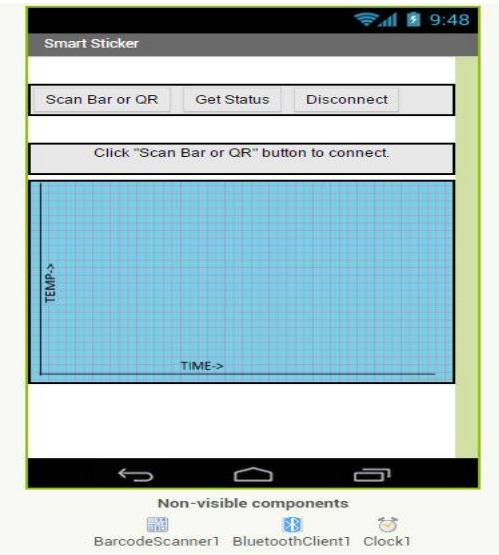

Fig.3. GUI window

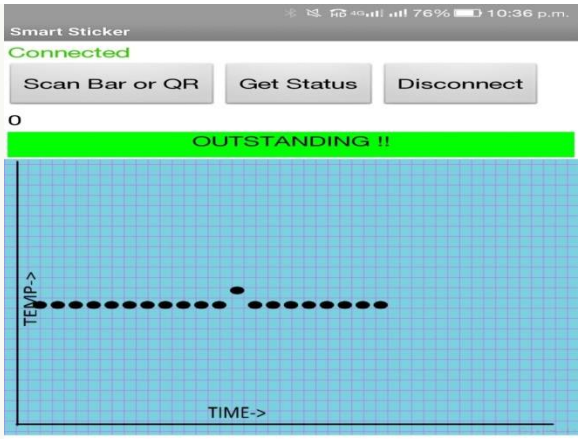

Fig. 4. FAQ Displaying Outstanding

Customer can get the packed food information from the mobile app. The information of the packed food is whether the packed food is safe to consume or not. The mobile app displays: (Fig.4.) Outstanding: If the quality of the packed food is maintained as per the conditions mentioned on its packet.

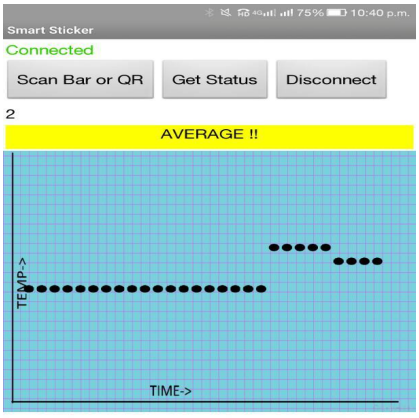

Fig.5.FAQ Displaying Average

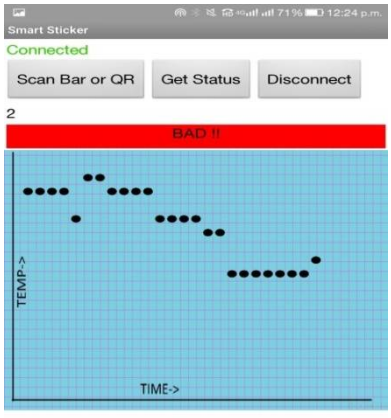

Fig.6. FAQ Displaying Bad

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(Fig.5.)Average: If the quality of the packed food is slightly varied as the conditions mentioned on its packet has slightly deviated. (Fig.6.) Bad: If the quality of the packed food has completely changed because of high change in mentioned condition on its packet.

V. CONCLUSION AND FUTURE WORK

The quality of packed food is monitored time to time. The temperature and humidity of the packed food is monitored regularly. The sensed data of the packed food is stored periodically. The quality of the packed food is calculated through mobile app and it displays as either outstanding, average or bad. User can receive the actual status of the packed food by mobile app. Seeing the status displayed in the mobile app user can analyze whether to buy the particular packed food or not. This helps in minimization of food poisoning, typhoid and other diseases that are caused due to consumption of low quality packed food. The device can be converted into sticker and stuck on packed food through which customer can get to know about the packed food quality. The conversion can be done through VLSI technology. VLSI technology is a company which design and manufacture custom and semi-custom Integrated circuits (ICs). This helps to minimize the size of the device into sticker format. The stickers can then be stuck on the packed food for the customers to get to know about the quality of that product through app. Each sticker on the packed food has different QR code (Quadratic Residue code or Quick Response code) or a BAR code, that is used for scanning. From this scanned results, the app displays the quality of the packed food.

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