

Advancement in monitoring the Food Supply Chain Management using IOT

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Abstract

Food safety has become a significant issue in the decade. As a result, the government is focusing on providing safety for the welfare of the people. The rapid development in the field Internet of Things (IoT) will surely help the concerned authorities to focus on the same. In our venture we utilize distinctive advances for observing nutrition and to check the nourishment level of the food substance. This is implemented by checking the freshness of the ingredients that are utilized as a part of the food and furthermore it relies upon the contamination and degradation of the food due to various temperature conditions throughout the supply chain. We use different sensors to distinguish the state of the nourishment, through WASPMOTE sensor which gathers the information about the food and by utilizing raspberry pi unit an alert notification is sent to the food manufacturer as well as the consumer. As a result both are notified about the food contamination or degradation.

Keywords- Internet of Things, Survey, Nutrition Plan, WASMPOTE SENSOR, Food Supply Chain

I. INTRODUCTION

In the last few years, we have seen an increased interest in the internet of things (IoT). Everyone's talking about IoT. Mostly, you hear how connecting sensor-

enabled devices to the cloud can change everyday lives. That's true—there are some pretty cool connected consumer devices on the market. But the real value of the IoT lies in revolutionizing the way the world does business—and, in this case, the way food supply chains operate [1]. Food and agricultural products from production to consumption of the whole process involves the production, processing, packing, transportation, storage, shelf display and consumption, each link is likely to bring the unsafe factors [2]. Today almost everyone is getting affected by the food that they consume, it is not only about the junk and packed foods, the vegetables we consume do not offer quality since they are affected by temperature and moisture, condition during supply chain. Majority of consumers only pay attention to the information provided on the packaging, i.e. the amount of ingredients used and their nutritional value but they forget that they are blindly risking their health by ignoring the environmental conditions to which these packets are subjected. Food contamination can occur during production process as well as improper way of handling the food during transportation. In order to control the food before getting supplied to the consumer, the monitoring system measures the contamination level which occurs due to temperature and humidity variation. WASPMOTE is used to detect various environmental conditions. With these techniques the contamination and degradation of food is monitored and notification is sent to concerned authorities during supply chain. Steps can also be taken to prevent the food from further degradation by taking preventive measures during transportation. Manufacturer as well as the supplier can monitor the status of the food. It is an inevitable decision to retain the freshness of food substance during supply chain. There are many chances for the food to get spoiled due to temperature, humidity and other environment factors. IoT solutions provide promising potentials to address the traceability, visibility and controllability challenges for food safety. In Supply Chain management our focus is on different perspectives which include production, traceability, transportation and distribution. Technologies to be adapted for such an environment include radio frequency identification, wireless sensor networks, sensors related to temperature and humidity measurement and Cloud Computing. Related Work A paper on “Big Data Approach in an ICT Agriculture Project”, by Dennis A. Ludeña R. and LairizeArray, states that the novel nutrition based agriculture production and distribution system make usage of big data and IOT, which helps in generation a healthy food recommendation to the end user. Internet of Things (IoT) is included

along with Big Data approach to use its benefits like automation, and providing richer experience through virtualization to the end user. The other research on Using Food and Agriculture cloud to improve value of Food Chain focuses on challenges and solutions for cloud computing in supplying agricultural products. Based on different interviews of farmers the observed challenges are Insufficient information on consumption trends, production information and distribution information. Assumed solution for above challenges are as Sharing consumption trends, Sharing production information. These challenges can be overcome through continuous monitoring of the food throughout the supply chain which is both a way beneficiary to producer and the consumer. A paper on “Agricultural Production System based on IoT”, discusses on increasing demand of people requirements in technology. IOT based monitoring was suggested to analyze the crop environment since its development can be stopped because of various temperature and humidity conditions. IOT Layers the IoT makes possible a new collaboration between food producers, transportation and concerned authorities of the government. With IoT-based business solutions, authorities across the supply chain gain the real-time visibility and enable the automated, intelligent actions needed to ensure food is of the highest quality is delivered on time.

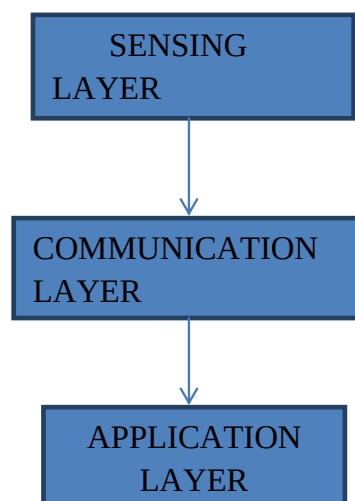


Figure.1 Food supply chains in the era of Internet-of-Things

The existing method implemented is based on above mentioned three layers (Fig1). Any temperature fluctuations can trigger and create alert to adjust the truck's refrigeration. If it fails, an alert can be sent to the food supplier, who can replace bad goods before they arrive at the customer's dock. As the result the customer receives quality goods on time and is never aware there was an issue. Plus, the sensor-enabled refrigeration system can send alerts to the manufacturer, pinpointing the exact part that broke down and facilitating faster replacement and fixes [9]. Food Supply Chain(FSC) is composed of 5 scenarios Produce, Store, Transport, Sell and Consume. A typical IoT solution for a FSC comprises: a series of field devices (WSN nodes, RFID readers/tags, user interface terminals, etc.), a backbone system (databases, servers, and many kinds of terminals connected by distributed computer networks, etc.); and a series of heterogeneous wired and wireless communication infrastructures (Wi-Fi, cellular, satellite, power line, Ethernet, etc.). Due to its ubiquitous connectivity, all physical entities of field devices and backbone equipment's can be distributed throughout the entire FSC. Large amount of data is extracted and fed into high level and directly usable information for decision support systems (DSS). The food supply chain traceability system model can be seen in Fig.1. A platform that comprise three layers: sensing layer, communication layer and application layer.

The sensing layer is designed to monitor the condition of ingredients used in the food and in the supply chain with different automatic identification and data capture technologies, based on cost effectiveness.

The communication layer is designed to allow various stakeholders to access supply chain information. We set up an IoT architecture based on Object Name Service (ONS), so information can be captured and stored on the Web. Currently, the system tracks by lot level, but it will be able to manage goods at the item level using unique identifiers, such as a Serialized Global Trade Item Number or Global Individual Asset Identifier. The application layer provides the functionalities that are built on top of an implementation of IoT; it will support applications and services that could be used by farmers, retailers, the government, analysts and consumers. It includes a database containing China's food safety regulations. Supply chain partners will be able to analyze data captured from the RFID tags and bar codes to determine product quality and shelf life. Consumers will be able to check product expiration dates, quality guarantee periods, test reports, electronic

pedigrees, product photos and videos, and customer evaluations. The revolution of IoT technologies have brought out great potentials to make today's food supply chain safer, more effective and more sustainable.

II. PROBLEM DEFINITION

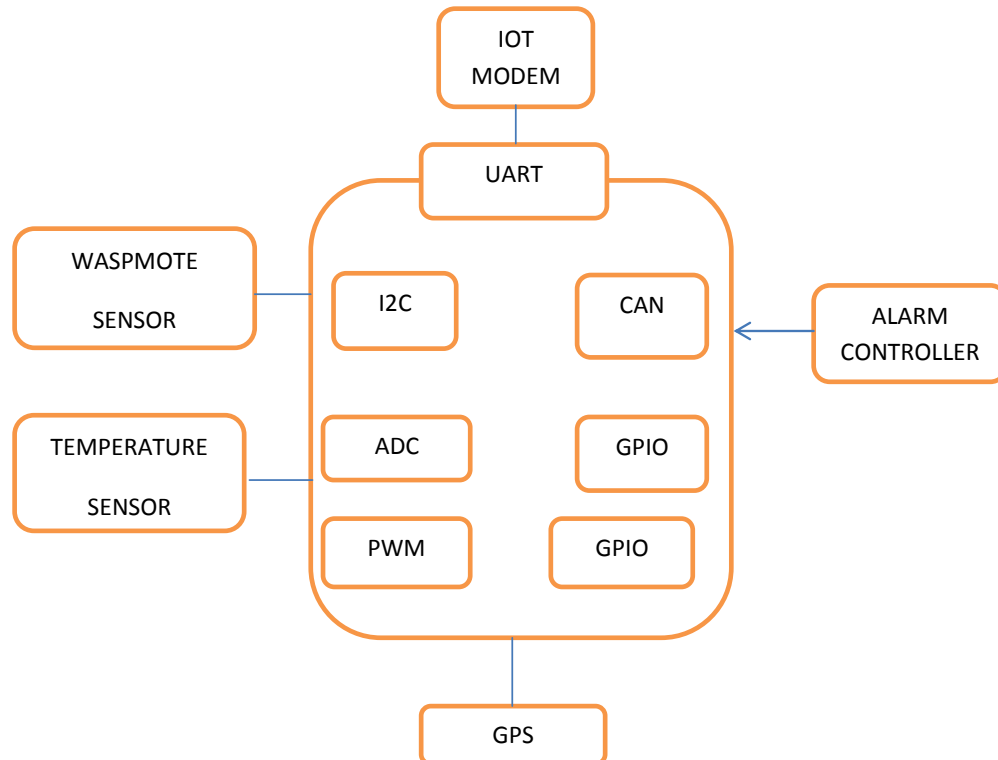
To enhance the food supply chain this framework will be beneficial to all the manufacturers and consumers. The main objectives are to ensure fresh and nutritious food as well as the ensured quantity has been supplied to concerned authorities who are supplying food items. As well as to measure the contamination level along with the expiry of food substance to be provided.

III. METHODOLOGY

- The proposing framework utilizes four segments WASPMOTE, GPS, Temperature sensor, Raspberry pi.
- GPS tracks the food during the supply chain.
- WASPMOTE identifies the food degradation level.
- Temperature sensor detects the temperature and moisture condition of the environment during transportation of food through various locations.
- RASPBERRY PI helps in integrating the information from above mentioned components and sends notification to the supplier and concerned authority of nutrition plan scheme.
- Data Analytics is playing a major role in providing suitable solutions from large datasets. It involves use of machine learning algorithms to develop prediction models that can enable decision making capabilities.

Think about the maker and purchaser framework, it worked with the assistance of web application framework to screen the nourishment status from moving one place to somewhere else. Here the unmistakable login page for maker and purchaser. Customer can know the sustenance status through alarm message by PH sensor. In view of the temperature, dampness and so forth. gives the alarm message to purchaser. The buyer can know whether the food decade.

BLOCK DIAGRAM



WASPMOTE SENSOR

WASPMOTE distinguishes and store natural examples amid the item's vehicle and know in this way whether it has been presented to high/low temperature or whether it has been tainted amid the trip or whether the holder is opened in an unapproved mold or considerably whether it has been dropped. It has to be integrated in a casing so that it is protected from environmental conditions such as light, dust, humidity or sudden changes in temperature.

GPS

GPS beacon CAL-Amp LMU-22600 can be gainful answer for the following of nourishment and refreshment. It doesn't require control source, battery. For resources that don't have a committed power source, a battery-fueled trailer tracker or individual gadget can be effortlessly joined.

TEMPERATURE SENSOR

Temperature sensors can be introduced in any compartment that should be observed for radical changes in temperature. This is particularly useful for nourishment administrations, as the stage can send you cautions if compartment temperatures achieve risky levels for sustenance. The sensor helps in understanding the environment and adjusts the controls accordingly.

Beneficiaries and the benefits

1. The producer is a food manufacturer who supplies goods to various geographical locations.
2. He can include product information on the web portal on his profile by providing credentials. Also he can modify his prior product data or transaction.
3. This all information is made available to different stakeholders who supply the food for consumption.
4. While the goods are transferred from one location to another the sensors monitor the contamination level. If it degrades an alert message is triggered to manufacturer and the consumer.
5. The consumer will be aware of contamination level and buy the product based on the efficient goods.
6. Therefore the manufacturer will produce and ensure quality goods to all his stakeholders.
7. Both the consumer and producer can sell and purchase product through web interface. To make it more efficient, same operation can be performed with Smartphone app.

IV. CONCLUSION

The proposed system ensures that the best quality of food for the consumer. It reduces the health risk of food poisoning which leads to sudden death of children. This architecture can be adapted for monitoring and analyzing the quality of meat and seafood products during supply chain as well as for nutritious plan adopted by various state governments in order to provide quality food to children.

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