EFFECTIVE FOOD TRACKER MONITORING AND CONTROL SYSTEM FOR FOOD SAFETY

RANU, DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING, GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
VILLAGE KABLANA, JHAJJAR 124104
M. D. UNIVERSITY, ROHTAK, HARYANA (INDIA)
LALINA GOYAT, **RISHU BHATIA**, DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING, GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
VILLAGE KABLANA, JHAJJAR 124104
M. D. UNIVERSITY, ROHTAK, HARYANA (INDIA)

Abstract
There are quality monitoring technologies that are used to keep an eye on the standards and safety aspects of the food. Despite the fact that monitoring the food in the current day is relatively tough to perform in order to reduce the amount of food that is wasted and to preserve public health, monitoring the food is still important. The creation of an internet of things that would be based on the intelligent food monitoring system is one of these proposals. It does so by using a temperature sensor as well as a light sensor, and the data collected pertains to the temperature as well as the moisture content of food items. The information is then sent further by the system to the data gathering programme, which is ultimately responsible for determining the quality of the food.

Keywords: Food quality, IOT (internet of things), gas sensors.

INTRODUCTION

The integrity of the food supply chain must to be scrutinized at each and every level by uploading of the essential criteria for food, such as those for ingredients, storage conditions, etc.

Monitoring and control strategies may make use of a wide number of microcontroller types to accommodate a broad spectrum of environmental circumstances. Due to the fact that these methods allow us to warn persons at every stage of the supply chain, food spoilage and contamination are reduced to the fullest degree that is practically possible.

Radio identification tags are used in packaging to identify and communicate information about fluctuations in temperature and humidity as well as information about colour changes that imply a decline in the quality of food goods. These tags may also transfer information about changes in colour that indicate a reduction in the quality of food products. The carrying out and analyzing of routine activities with the purpose of identifying shifts in the nutritional or health status of the population via monitoring the population's overall condition.

PROBLEM DEFINITION

The food that people eat in this day and age has repercussions for everyone on our world. Not only does this apply to fast food, but also to pre-packaged meals, vegetables, and other things that we use on a daily basis. This is owing to the inferior quality of all of these things, in addition to the temperature at which they were kept.

Both the moisture content and the gas content are subject to change over time. Each kind of food calls for a certain environment in terms of its temperature, humidity, and level of light. In order to ensure that food is safe to eat, the whole supply chain should be carefully inspected.

Since 1976, governments, the Codex Alimentarius Commission, as well as other relevant organizations, as well as the general population, have had access to information on the levels and trends of food contaminants, as well as their contribution to overall human exposure, and their significance with regard to both public health and trade thanks to the Global Environment Monitoring System- Food Contamination Monitoring and Assessment Programme, also known as GEMS/FOOD. This information includes levels and trends of food contaminants, as well as their contribution to overall human exposure.

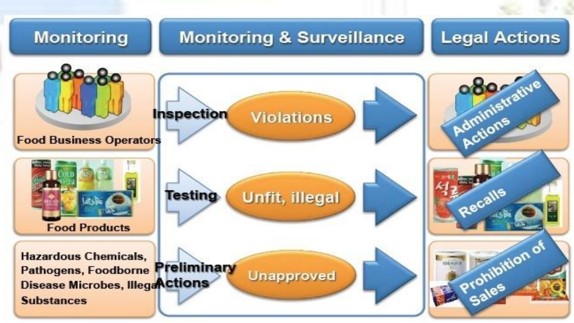

Fig 1: Phases of monitoring system

In Estimates of food and nutrient intakes are created by making use of the relevant standards of values that have been established by the food health organization. This is done in order to detect possible dietary deficiencies as well as dangerous eating behaviors. This tackles a number of challenges that are unique to monitoring warehouses, as it is

critical that the monitoring be carried out correctly at each level.
It is important for it to keep an eye on matters such as food and nutritional health. A monitoring strategy requires both initial baseline data as well as continuing data collection for it to be able to examine trends.
The information must be analyzed and disseminated in an appropriate manner.

PURPOSE OF MONITORING SYSTEM

A key goal of a strategy for food and nutrition monitoring and surveillance is to build the foundation for a comprehensive food and nutritional-related action plan. This is accomplished by acquiring necessary data that is timely, accurate, informative, coordinated, regular, and frequently disseminated. Predictability is an essential component of such a system because it allows decision-makers to anticipate the types of information that will be provided at the proper times and to make suitable preparations as a result.

By taking a look at a few of the examples that are provided below, we can understand why it is necessary to have a complete system for ensuring the quality and safety of food:

Even the bottled water that we drink today poses a health risk. Some high-end brands claim that they employed innovative processes to make the water alkaline, but there is some question as to whether or not these assertions are really accurate.
Because of the frequency with which they are consumed, fresh fruits and vegetables are susceptible to infection and will quickly get stale if they are not stored in an environment that is optimal for their preservation.

SYSTEM ARCHITECTURE

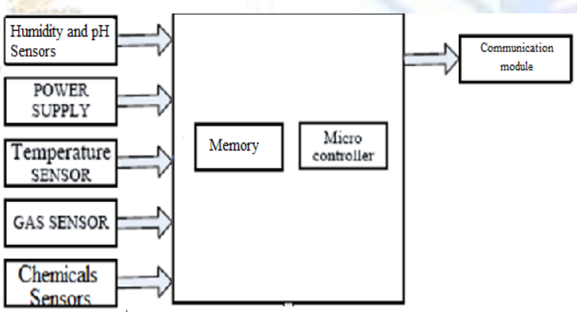

Fig 2: Diagram of food tracker

Internet of things architecture is equipped with integrated sensor, processor, and computer modules that provide alerts to the user or monitoring device. At this moment, we are in the process of integrating the sensor subsystem into our system:

Sensors Subsystem

Sensor for the intensity of the light: TSL2561 Sensor for the temperature and humidity: SHT10 Sensor for the pH: Processor MSFET3330 Subsystem:

Board for the Raspberry Pi 2

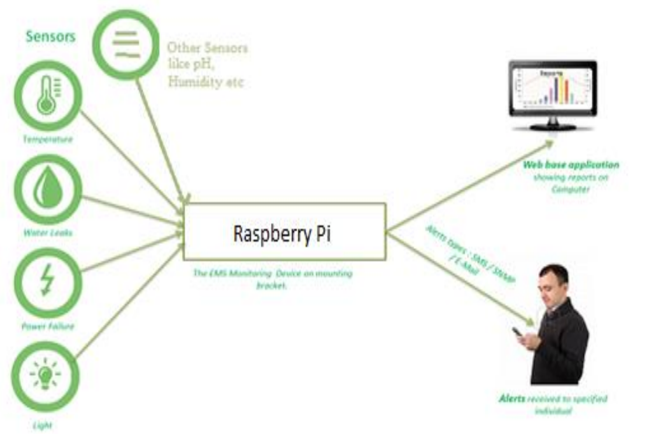

Fig 3: Food track architecture

We are in the process of developing a method that will reduce this deterioration and, to the extent that it is possible, avoid the contamination of food. We are doing this with the help of a Raspberry pi2 board.

We are examining, with the help of a wide range of sensors, how different surroundings influence food and the conditions under which it is stored.

Our implementation is split up into two different groups:

IMPLEMENTATION

1) Monitoring food in relation to environmental factors (temperature, light, humidity)

2) Food security

Fig 4: A consumer focused website that provides useful information

Sensors for temperature, humidity, and light are used in a manner that is congruent with the surrounding environment. An analog-to-digital converter (ADC) has been added to the light sensor so that a suitable value of luminous intensity and an adequate gas concentration in ppm may be obtained. Meat, for instance, is a source of methane gas, which, in order to ensure the food that we are using as an example is safe to consume, it is necessary to remove the gas.

Identified prior to a person cooking it and consuming it, my series sensor is being used in order to do this task.

This sensor data that has been saved is then communicated through Bluetooth, and an appropriate graphical user interface (GUI) is built. The nutritious content of food is enhanced to its full potential by the environment in which it was grown.

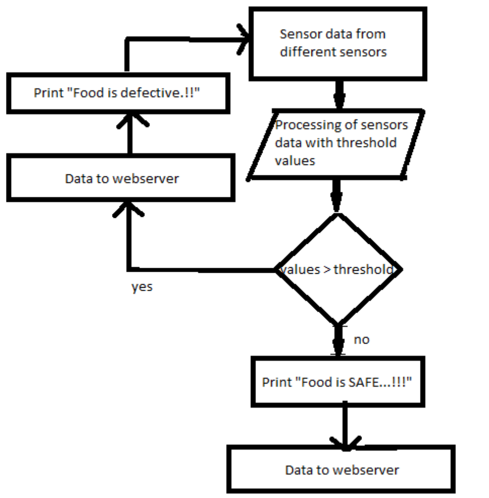

Fig 5: Diagram of workflow

A) Keeping an eye on the current condition of the environment:

a) Temperature and humidity: In the temperature range of 50–100 degrees Fahrenheit, which is when the majority of food is handled, the chemical handling process speeds up by 18 degrees Fahrenheit for every one percent increase in humidity.

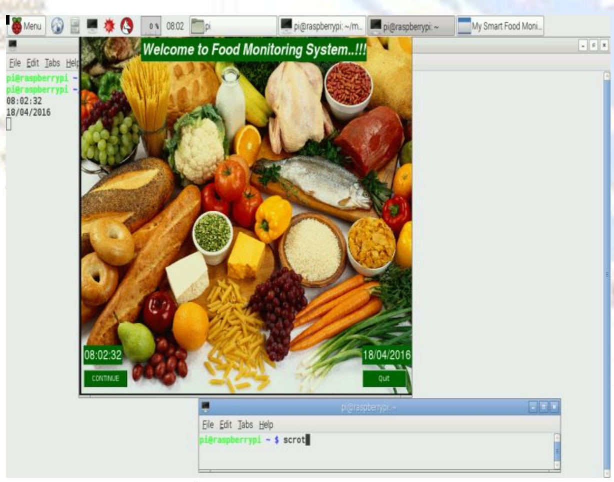

Fig 6: For EFFECTIVE FOOD TRACKER, a GUI was developed.

b) A sensor that detects light: Whether their ingredients are from natural or artificial sources, the vast majority of foods are exposed to light at some point throughout the process of their manufacture, packaging, storage, transport, or marketing. It is possible for foods to decay when they are exposed to light; this process is commonly referred to as photo degradation.

Fig 7: In this GUI, sensor values are shown.

Fig. 7 shows a graphical user interface that displays sensor information.

The first step in the process of light-induced alterations in food is often one of two steps: Light is absorbed by a product component that will then go on to experience a chemical reaction.

When one component of the diet is exposed to light, it triggers a reaction in another component of the diet.

Conditions of insufficient monitoring have an effect on the following nutrients:

A, B12, D, Folate, K, E, Pyridoxine, and Riboflavin are all examples of vitamins. Anthocyanin, carotenoid, chlorophyll, myoglobin, and haemoglobin are all examples of pigments. Tryptophan, phenylalanine, tyrosine, and histamine are all examples of amino acids. Phospholipids and unsaturated fatty acids are examples of fats.

B) The following are the kinds of food products that we keep an eye on:

a. Milk: Because milk is sensitive to light and there is a rising interest in the nutritional worth of foods, the packaging and handling practices of milk have come under closer examination. Milk is often displayed in retail locations using high levels of light, which may dramatically accelerate the process of photodegradation of the milk's components. As a consequence of this exposure, the addition of vitamin A, riboflavin, and vitamin C (ascorbic acid) may be lost, which may also create obvious changes in taste.

Milk kept in plastic containers for twenty-four hours and illuminated with fluorescent light showed a reduction of ninety percent in the amount of added vitamin A [32].

C) Securing food supplies:

Now that all of the numerous needs, requirements for food storage, and testing situations have been taken into account, we integrate our sensors with the board. After integrating our board with the computer or laptop and waiting for the device to run and recognize the operating system from the SD card, we start the Python programming process. Following the successful connection of our communication module, the alarm message is then sent over Bluetooth to either the supervisory unit or the user, based on the criteria that we have specified. In addition, we are building a log file for continually observed data along with a relevant website that outlines the acceptable constraints for a particular meal and the safety concerns associated with exceeding those limits.

WORKING OF THE PROPOSED SYSTEM

• Developed a strategy to reduce the risk of food spoilage and contamination while cutting down on waste.
• Board for the Raspberry Pi 2.
• All of the necessary setup has been completed with the help of the suitable software platform in order to make this design function in a real setting after all of this board analysis based on need has been completed.
• An assortment of sensors to monitor the ways in which the surrounding environment influences the food and how it is preserved.

CONCLUSION AND FUTURE WORK

The approaches that are presented in this body of work have, as their major objective, the preservation of the food material by making use of a variety of methods and evaluations, such as monitoring and safety.
We will proceed with care when using and creating more sensors that could be incorporated for the food business into the cold storage with the characteristics of a tiny testing unit in order to avoid damage to food items with appropriate monitoring analysis in accordance to environmental conditions. These sensors could be used to monitor temperature, humidity, and other factors that might affect the quality of the food.

When deciding whether or not to add additional dipping sensors in the future, we will be cautious to only do so after ensuring that the data logs from all of the dipping sensors have been appropriately included.

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