Analysing the Quality of Fruits and Vegetables using IoT integrated with a Smart Phone Application

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ABSTRACT

India is the 1st largest producer of fruits & 2nd in vegetable production in the world. Now consumers are more conscious about quality and source of their foods. So Food safety is imperative to avoid food borne diseases and to ensure the public health. It is a major concern in order to prevent the food wastages and economic losses also. In the era of technology advancement everything requires monitoring & controlling. A new generation of mobile sensing approaches offers significant advantages over traditional platforms in terms of speed, control, low cost, ease of operation, data management, require minimal equipment and user involvement. Sensing technology with cellphones enables the development of powerful platforms for many applications including food safety analysis. To determine the quality of food materials non- destructively is a difficult task, numerous methods are available but most of the methods are in destructive form. In recent year's non-destructive methods of food quality evaluation have been developed. In this work, temperature sensor, humidity sensor, gas sensor and LCD display are used as hardware tools to measure the real time parameters of respective food. A specially developed application is used as software tool, which get the real time parameters from sensors, takes picture of that particular fruit/vegetable as inputs, then compare sensor inputs with the preloaded data and process image to provide the accurate grade of respective food. This IOT based analysis will be beneficial for consumers as well as the producers to get the uniform high quality fruits & vegetables.

Keywords : Android app, temperature sensor, gas sensor, Wi- Fi, Internet of Things, Arduino Uno.

I. INTRODUCTION

Now a day's food safety is defined as a public health priority and has been growing a concern among Indians over the last decades. It is the major concern in order to prevent the food wastage and economic losses also. The quality of the food needs to be analyzed and it must be prevented from decaying by the atmospheric factors. It is essential to develop a system that can help people to identify the freshness of food. Our proposed system may give the good quality analysis system. It is based on IOT with different sensors are used like temperature sensor, MQ3 sensor, humidity sensor and LCD display.

Through this sensors real time parameters are gathered and send this real time data by using Wi-Fi module to specially developed application. This application compares input data with preloaded data and also take picture of that particular fruit then process that image to provide the sufficient result. In this way we are analyzing food quality explained below.

II. METHODOLOGY BLOCK DIAGRAM

The working of proposed system. Different sensors are used to testing a food quality like, DTH11 sensor used to sense a food temperature and humidity levels. Normal temperature and humidity values of respected fruit or vegetable is stored send through Wi-Fi to android app, which compares input data with preloaded data of that food. The app also captures the image of respected food then process that image according to its color and outlook to specify the defected area of that food. The gas sensor is used to check the gas level of food it will alert food normal -or abnormal condition.
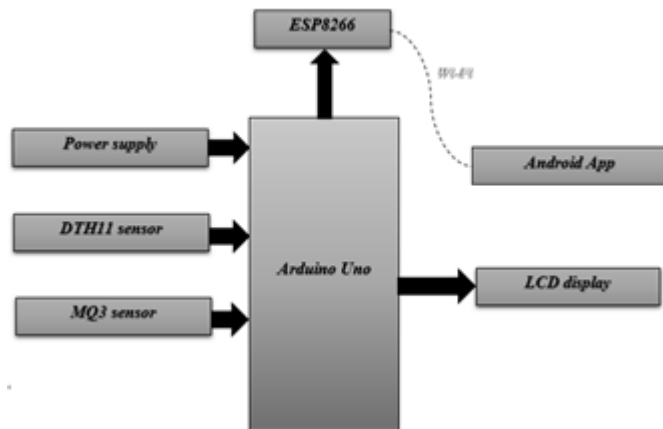
In this way we are checking food quality in a effective way to avoid food borne illness and buy a healthy food and make a human wealthy. Our proposed is designed to make a compact and handy to detect and alert the human to find unhealthy food. It is used in also take shop to buy a fresh food fruits and vegetables also.

HARDWARE COMPONENTS
Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328P.It is the most popular prototyping board. The board comes with built-in Arduino boot loader. It has 14 digital input/output pins (of which 6 have be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, a reset button, on-board UART, SPI and TWI interfaces, on-board resonator and holes for mounding pin headers. It contains everything needed to support the embedded controller. While programming the board, it can be connected to the PC using USB power. It has 32Kb flash memory, 1Kb EEPROM and 2Kb SRAM. The board can be connected to different Arduino shields for connectivity with Ethernet, Bluetooth, Wi-Fi or Cellular network and it can be connected to most of the IoT platforms.


LCD DISPLAY

A liquid crystal display (LCD) is a thin, flat electronic visual display that can uses the light modulating properties of the liquid crystal (LC). LC does not emitts light directly. It has low electrical power consumption enables to be used in battery-powered electronic equipment.

DTH11 SENSOR

DTH11 sensor is a temperature and humidity sensor. It consists of two main components – one is humidity sensing component and other is thermistor. The Thermistor is actually a variable resistor that changes

its resistance with change in temperature. The humidity sensor measures the humidity level and converts it findings into a corresponding electrical signal. The sensor can measure the temperature from 0℃ to 50℃ and humidity from 20% to 95% with an accuracy of ±1℃ and ±1%.
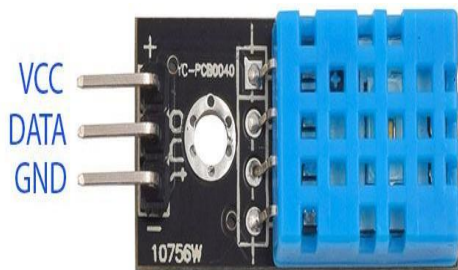
MQ3 SENSOR

The MQ3 sensor detects the emission of ethanol type of gases, where the sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. If the fruits/vegetables get spoiled, they emit the ethanol type of gases. The MQ3 sensor detects the concentration of such gases and output of this sensor is analog voltage, which is directly proportional to the concentration of the gas. It's conductivity increases as the concentration of ethanol gases increases. It has a high sensitivity and fast response time. The analog output is passed to the analog pin of Arduino which has inbuilt ADC that converts the analog to digital value.

ESP8266

The ESP8266 Wi-Fi module is a self-contained SOC with integrated TCP/IP protocol stack that can access to Wi-Fi network. It is capable of either hosting an

application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre- programmed with an AT command set firmware. The module comes available in two models ESP-01 and ESP-12. The ESP- 01 model is used in our proposed system. The ESP-01 has 8 pins available for use.
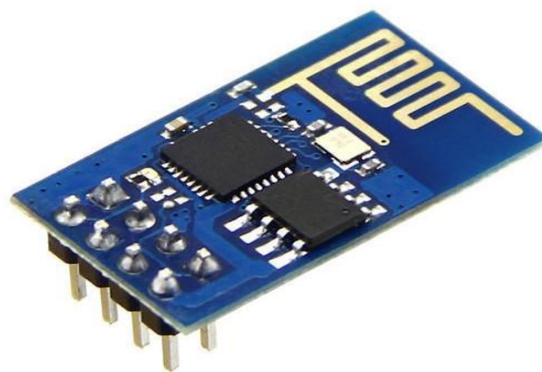
INTERNET OF THINGS (IOT):

The IoT describes the network of physical objects-"things"-that are embedded with sensors, software and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices ranges from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025.

Over the past few years, Iot has become one of the most important technologies of the 21st century. Now that can connect everyday objects to internet via embedded devices, seamless communication is possible between people, processes and things.

By means of low-cost computing, the cloud, big data, analytics and mobile technologies, physical things can share and collect data with minimal human intervention. In this hyper connected world, digital system can record, monitor, and adjust each interaction between connected things. The physical world meets the digital world-and they co-operate.

Android Application

Android App is a software designed to run on an Android device or emulator. The term also refers to an APK file which stands for Android package. This file is a Zip archive containing app code, resources, and meta information.

In our proposed system, our specially developed Android app accepts the real time data from sensors through Wi-Fi module and compare the compare the input data with preloaded data to check that respected fruit/vegetable. Also our app captures the real time image of that fruit/vegetable by using the mobile camera, then the captured image is processed according to its color and outlook to specify the defected area of that fruit/vegetable.

III. IMAGE PROCESSING

Introduction

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. The major topics is within the field of the image processing include:

 Image Acquisition
 Image Restoration
 Image Enhancement
 Image Compression

Image Acquisition

In image processing, it is defined as the action of retrieving an image from some source, usually a hardware- based source for processing. It is the first step in the workflow sequence because, without an image, no processing is possible.

Image Restoration

Image Restoration is the process of taking an image with the some known, or estimated the degradation, and the restoring of the original appearance. Image restoration is often used in the field of photography or publishing where an image was somehow degraded but needs to be improved before it can be printed (Figure 3.1).

(a)   (b)
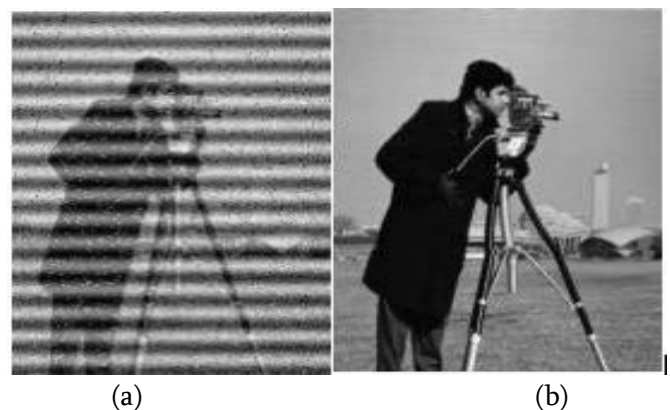
a. Image with distortion
b. Restored image

Image Enhancement

It involves to taking an image and improving it visually, typically by taking the advantages of the human Visual Systems to response. One of the simplest enhancement techniques is to be simply stretch the contrast of an image. Enhancement methods tend to be problem specific. For example, the method that is used to enhance satellite images may not suitable for enhancing medical images.

(a)   (b)

a. Image with poor contrast
b. Image enhancement by contrast stretching

Image Enhancement
Image Compression

It involves the reducing the typically massive amount of the data needed to be represent an image. This done by eliminating the data that are visually unnecessary and by taking the advantage of the redundancy that is inherent in the most images.

High quality JPEG
File Size: 77.9 kb
(a) Normal image

Medium quality JPEG
File Size: 19.11 kb
(b) Compressed image

IV. CONCLUSION

In this effective way we are designed food quality analyzing system. For using this project is very compact and handy to analyze various fruits & vegetables are tested through the comparison of real-time data and preprocessed data are stored in mobile app and easily find quality less food. Nowadays are most of the diseases are spread out through the unhealthy food. Some of the people having an in immunity, they are easily affected by eating unhealthy food. Using this proposed system, we can find a healthy food and eat a healthy food. Finally, this project is also used in food checking department, agricultural forms and also the normal people go to shop using this compact project to buy healthy fruits vegetables, through mobile app.

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