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INNOVATIVE SMART TECHNOLOGY FOR FOOD QUALITY MONITORING AND MAINTENCE SYSTEM USING IOT

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ABSTRACT

The monitoring of food quality is crucial in ensuring food safety and reducing food waste. In this paper, we present the design and implementation of a smart food monitoring system that utilizes Internet of Things (IoT) and Machine Learning (ML) technologies. The system includes IoT devices such as temperature and humidity sensors, as well as gas concentration sensors, to continuously monitor food items. The data collected by these sensors is analyzed using machine learning algorithms to determine the freshness of the food. The system also features a web-based dashboard that displays real-time data and alerts when the food items reach a certain threshold level. The dash-board can be accessed remotely using a mobile app, making it easy for users to monitor their food from anywhere. The system's effectiveness was evaluated using various food items, and the results showed that it successfully predicted the freshness of food with high accuracy. By this way we can send food quality verifying hardware to the supermarkets. These quality checking gadgets keep watch an ecological component that causes or speeds up the disintegration of food. Later naturing this venture, food quality is comparable a checking gadget will be intended to screen ecological factors, for example, temperature, moistness, liquor quantity and openness to the brightness. Arduino board is the platform used to design this gadget. The Arduino Uno is associated with many sensors like DHT-11 used for measuring the temperature and humidness checking, MQ3 for liquor and Light Dependent Register to gauge light. This gadget sends estimated values sensor information to the IoT stage. Wi-Fi switch is used to interface ESP8266 Wi-Fi modem is associated with Internet. Sensor information is displayed on the LCD through Arduino. An IOT stage made use for sensor recording and verifying information is web serve.

Keywords: Arduino microcontroller, DHT-11, LDR, ESP8266 Wi-Fi, MQ3, LCD, IOT, ML, BUZZER, etc.

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I. INTRODUCTION

1.1 INTRODUCTION

Microcontroller are widely used in Embedded Systems products. An Embedded product uses the microprocessor (or microcontroller) to do one task & one task only. A printer is an example of Embedded system since the processor inside it perform one task only namely getting the data and printing it. Although microcontroller is preferred choice for many Embedded systems, there are times that a microcontroller is inadequate for the task. For this reason, in recent years many manufactures of general-purpose microprocessors such as INTEL, Motorola, AMD & Cyrix have targeted their microprocessors for the high end of Embedded market. One of the most critical needs of the embedded system is to decrease power consumptions and space. This can be achieved by integrating more functions into the CPU chips. All the embedded processors have low power consumptions in additions to some forms of I/O, ROM all on a single chip. In higher performance Embedded system, the trend is to integrate more & more function on the CPU chip & let the designer decide which feature he/she wants to use.

1.2 EMBEDDED SYSTEM

Physically, embedded systems range from portable devices such as digital watches and MP3 players to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected. Embedded systems span all aspects of modern life and there are many examples of their use. Telecommunications systems employ numerous embedded systems from telephone switches for the network to mobile phones at the end-user. Computer networking uses dedicated routers and network bridges to route data.

EXAMPLES OF EMBEDDED SYSTEM:

Automated teller. machines (ATMS). Integrated system in aircraft and missile. Cellular telephones and telephonic switches. Computer network equipment, including routers timeservers and firewalls. Computer printers, Copiers. Disk drives (floppy disk drive and hard disk drive). Engine controllers and antilock brake controllers for automobiles. Home automation products like thermostat, air conditioners sprinkles and security monitoring

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system. House hold appliances including microwave ovens, washing machines, TV sets DVD layers/recorders. Medical equipment. Measurement equipment such as digital storage oscilloscopes, logic analysers and spectrum analysers. Multimedia appliances: internet radio receivers, TV set top boxes.Small hand-held computer with P1M5 and other applications. Programmable logic controllers (PLC's) for industrial automation and monitoring. Stationary video game controllers.

1.3 CHARACTERISTICS:

Embedded systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are not always standalone devices. Many embedded systems consist of small, computerized parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The software written for embedded systems is often called firmware, and is usually stored in read- only memory or Flash memory chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

1.4 MICROPROCESSOR (MP):

A microprocessor is a general-purpose digital computer central processing unit (CPU). Although popularly known as a "computer on a chip" is in no sense a complete digital computer. The block diagram of a microprocessor CPU is shown, which contains an arithmetic and logical unit (ALU), a program counter (PC), a stack pointer (SP), some working registers, a clock timing circuit, and interrupt circuits.

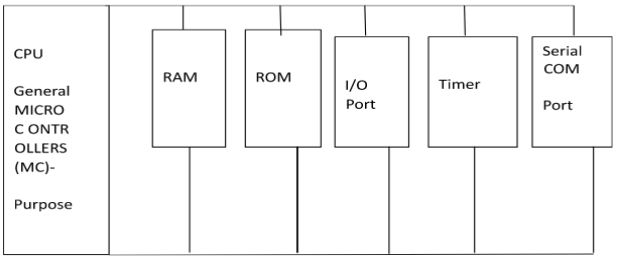

Fig 1.1 Block diagram of microprocessor

1.5 MICROCONTROLLER (MC):

Figure shows the block diagram of a typical microcontroller. The design incorporates all of the features found in micro-processor CPU: ALU, PC, SP, and registers. It also added the other features needed to make a complete computer: ROM, RAM, parallel I/O, serial I/O, counters, and clock circuit.

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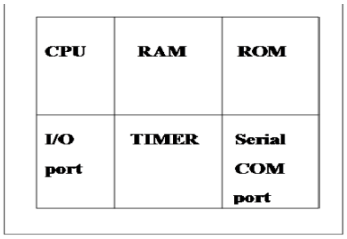

Fig 1.2 Microcontroller

1.6 COMPARISION BETWEEN MICROPROCESSOR AND MICROCONTROLLER

The microprocessor must have many additional parts to be operational as a computer whereas microcontroller requires no additional external digital parts. The prime use of microprocessor is to read data, perform extensive calculations on that data and store them in the mass storage device or display it. The prime functions of microcontroller is to read data, perform limited calculations on it, control its environment based on these data. Thus the microprocessor is said to be general-purpose digital computers whereas the microcontroller are intend to be special purpose digital controller. Microprocessor need many opcodes for moving data from the external memory to the CPU, microcontroller may require just one or two, also microprocessor may have one or two types of bit handling instructions whereas microcontrollers have many.

II. LITERATURE SURVEY

2.1 INTRODUCTION

It is essential to keep up with food handling and cleanliness to keep it new and palatable, which decreases food squander. It is important to screen the nature of food and keep it from spoiling and rotting because of barometrical factors like temperature, moistness, mugginess. So, in this IOT project we will construct a food checking gadget utilizing Arduino to screen and control the temperature and stickiness, dampness content, variety, methane discharges in the put away climate. In this way, it is helpful to send quality observing hardware in food stores. These quality checking gadgets screen natural factors that reason or speed up food decay. The framework planned by us is expected for checking food quality. It continually screens the gas level, mugginess and temperature of vacuum-stuffed food. Pollution of food can happen in the creation cycle, yet additionally to a great extent made by wasteful food dealing with due unsatisfactory ecological circumstances during food transport and capacity. There are many elements that lead to food contamination, ordinarily changes in temperature and mugginess are significant variables. In this way, a checking framework equipped for estimating the fluctuation of temperature and dampness during transport and capacity is of principal significance. In these days everybody is impacted by the food they devour, unhealthy food, however completely bundled food sources, vegetables, items ate and utilized in day-to-day existence, since they all don't offer quality because of their temperature, moistness, oxygen content changes occasionally

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2.2 LITERATURE SURVEY.

To develop an intelligent system, artificial intelligence (AI) covers numerous techniques. Among several AI techniques, fuzzy logic is a technique which is used to handle the fuzzy information and rule-based inference so as to construct decision support in real-life applications. Fuzzy set theory is applied to estimate the expiry of food commodities .

Machine learning (ML) is a process that uses sample data to train the model in order to make decisions. The proposed system uses ML systems such as GPRand SVR to calculate the age of fruit and decide the edibility of the fruit. Deep learning helps the machine to behave similar to human brain by extracting features automatically by neural network and then training them to make decisions. In the system has been proposed that takes food color as a major factor of decomposition. It is applicable only for cooked product. It uses a trained back propagation neural network as a distinguisher. This system is being applied to numerous food products and has given accurate results. In the proposed system uses CNN as a method to detect the fruit type and quality.

IoT is an emerging concept for connecting objects or things with the internet using sensors, actuators and other identification and sensing technologies so as to achieve smart recognitions, positioning, tracing, monitoring and administration. The IoT sensing system combines the features of intelligent sensor, wireless communication and radio frequency identification (RFID) technology. Therefore, Internet of things is feasible in establishing a visibility and traceability system in handling perishable food.

III. PROBLEM STATEMENT

Traditional methods of food quality monitoring often involve manual checks and are not real-time.Limited use of technology to predict food freshness accurately.Lack of remote monitoring capabilities

3.1 DISADVANTAGES OF EXISTING SYSTEM

Manual checks are time-consuming and prone to human error.Inability to provide real-time alerts and data.Limited predictive capabilities for food freshness.No remote monitoring, making it difficult to manage food quality efficiently

.IV. PROPOSED SYSTEM

A smart food monitoring system using IoT and ML technologies. Continuous monitoring of temperature, humidity, and gas concentration. Real-time data analysis and alerts through a web-based dashboard and mobile app.Use of Arduino Uno, DHT-11 sensor, MQ3 sensor, LDR sensor, and ESP8266 Wi-Fi modem. Data displayed on an LCD and sent to an IoT platform for recording and verification..

4.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

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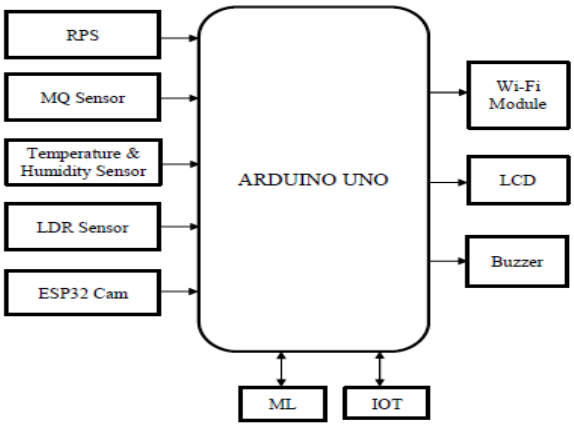


V. BLOCK DIAGRAM OF PROPOSED SYSTEM

HARDWARE COMPONENTS

The following hardware tools used in the proposed system

Power Supply, Arduino UNO, Q Sensor, Temperature & Humidity Sensor, LDR Sensor, ESP32 Cam, Wi-Fi Module, LCD, Buzzer

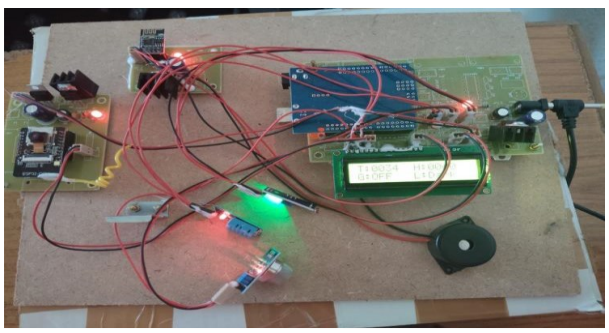
SOFTWARE COMPONENTS

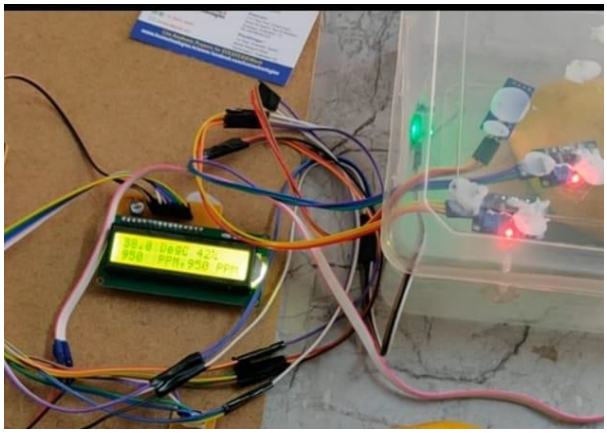
The following software tools used in the proposed system : Arduino IDE, Proteus Design Tool

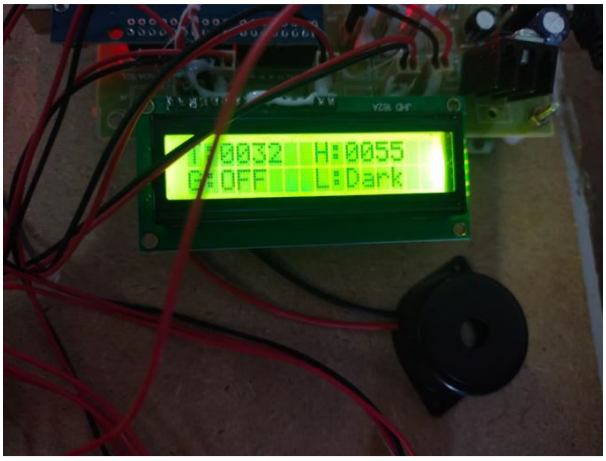
TECHNOLOGY USED

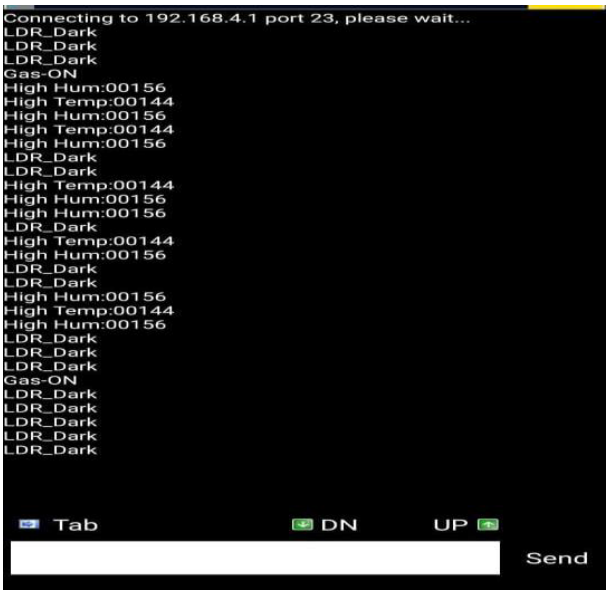
IOT

VI. RESULT AND DISCUSSION









A food quality monitoring, is Used to determine the food freshness by using IOT and Algorithms by sensing the temperature humidity and gas concentration sensors continuously monitor food items. Food monitoring system, utilizes a methane sensor

detect the methane gas emissions resulting from the food The methane sensor connected to a microcontroller, which is programmed to read the sensor data and analyze it for signs of spoilage. If methane levels exceed the threshold, it indicates that food is spoiling and methane gas is emitting. The microcontroller is then connected to a wireless module, such as Wi-Fi or Bluetooth module which allows it to communicate with the user's mobile which have blink app installed, which allow the user to receive real time alerts and Notification based on data.

VII. CONCLUSION

An IOT-based internet checking approach can address the basic requirements of lessening food squander, expanding transportation productivity, and following food. Food contamination has been the wellspring of innumerable illnesses to diminish and forestall sickness. Recognition of normally radiated gases like methane, alkali, and ethylene as fooageod food deterioration are utilized to recognize wastage of food Arduino. Utilizing sensors to recognize the existence of the gases in the food varieties can assist with distinguishing food decay well before and forestall the utilization of ruined food. To additionally grow the utilization of the framework and increment the responsiveness of such recognition strategies, various sorts of sensors can be associated. Location of liquor level in nourishment for extending detecting fields, used in fluid cycle food streams, the consideration of the Nano-Detect cycle will be utilized to foster online and disconnected observing frameworks (sensors) that join the mastery of delicate sub-atomic natural cycles with the capability of nanotechnology. Utilizing high accuracy sensors to expand the detecting region. Mix of at least two food sensors that show double boundaries. In light of how much calories consumed; a strain sensor is incorporated to assist with keeping a fair eating routine..

REFERENCE

1. Ki-hwan ecom, chang won lee, Nghia Truong Van, Kyung Kwon Jung, Joo Woong Kim and Woo Seung
choi "food poisoning prevention monitoring system based on the smart IOT system "International Journal
of multimedia and ubiquitous Engineering Vol.8, No.5(2013), Pp.213-322.

2. Yousefi H., Ali M M., Su H M., Filipe C D., and Didar T F. Sentinel wraps: Real-time monitoring of food
contamination by printing dnazyme probes on food packaging. ACS Nano, (pp. 3287–3294). (2018).

3. Kong Xiangsheng "Design and Implementation of food monitoring system based on Wsn", Xinxiang
University, Xinxiang china (2019).

ISSN 2347–3657
Volume 13, Issue 2, 2025

4. Chanthini B., Manivannan D., and Umamakeswari A. Perishable Food Quality Monitoring – An Internet
of Things (IoT) Approach, International Journal of Pure and Applied Mathematics (2017).
5. P. Sundaravadivel, K. Kesavan, L. Kesavan, S. P. Mohanty and E. Kougianos, "Smart-Log: A
DeepLearning Based Automated Nutrition Monitoring System in the IoT," in IEEE Transactions on
Consumer Electronics, vol. 64, no. 3, pp. 390-398, Aug. 2018.
6. T. T. Thai, L. Yang, G. R. DeJean and M. M. Tentzeris, "Nanotechnology Enables Wireless Gas Sensing,"
in IEEE Microwave Magazine, vol. 12, no. 4, pp. 84-95, June 2011.
7. S. Bhushan, B. Bohara, P. Kumar and V. Sharma, "A new approach towards IoT by using health care-
Automation (ICACCA) (Fall), Bareilly, 2016.
8. Alexandru Popa 1, Mihaela Hnatiuc 2, Mirel Paun 2,” An Intelligent IoT-Based Food Quality Monitoring
Approach Using Low-Cost Sensors”, MDPI, 13 March 2019.
9. Daniel Dorcea, Le Hoang Son, and Simona Ghita, ||” IoT-Based Food Quality Monitoring Approach” ||
January 2019.
10. Arun kumar g ||” an arduino sensor-based approach for detecting the food spoilage” ||july 2