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ARDUINO BASED MILK PRODUCTS MONITORING SYSTEM

Divya.B[*1], Deepthika.S[*2], Devi Shruthi.R[*3], Kirthika.B[*4], Sangavai.R[*5]

[*1]Assistant Professor. Biomedical Engineering, SNS College Of Technology Coimbatore, India.

[*2,3,4,5]Electronics And Instrumentation Engineering, SNS College Of Technology Coimbatore, India.

ABSTRACT

The goal of the smart city programme is to identify the technologies that can address challenges that cities must deal with, like bad air quality and health-related difficulties, and to build a network of partner towns to exchange ideas for future advancement. This article discusses the topic of facilitating smarter cities using global sensing. Food safety in both urban and rural regions is a crucial issue because it directly impacts people's health. Recent research has shown that raw milk contains pathogenic organisms that, if consumed, could cause illness, increase the likelihood of disease, and lower quality of life. As a result, methods for real-time and intelligent sensing are required for quality monitoring.

I. INTRODUCTION

In this article, we introduce sense, a low-cost cooperative monitoring instrument that enables real-time knowledge of the gas concentrations in raw milk. Bacterial growth will increase as raw milk is kept for a longer period of time, which leads to an unpleasant odour, taste, and hazardous compounds. Therefore, a monitoring system is required to find and identify milk spoilage and create a healthy product.

In order to prevent problems in the beginning and produce a high-quality final product, this effort aids in the early detection of harmful chemicals in milk. The suggested prototype is an Arduino-based monitoring device that uses TGC gas sensors to keep an eye on any undesired compounds found in the milk under examination. When milk is found to include bacteria, Senescent, or photo oxidation, the concentration of volatile organic compounds (VOC) present in the head space of the milk is significantly reduced and polluted.

II. LITERATURE SURVEY

Milk and dairy products are the main sources of nutrition for humans. Dairy products often contain high levels of protein, sugar, carbs, vitamins, enzymes, and minerals. However, depending on the breed of the cow, the feed, the season, the stage of lactation, and a number of other factors, the quality of the nutrients may vary. In order to enhance the quantity of raw milk accessible, another substance may be added to milk, a practise known as "adulteration." Additionally, milk contamination can happen during sloppy processing, packaging, and distribution. Water is the most common milk adulterant since it increases milk quantity while reducing milk quality.

III. METHODS AND MATERIALS

This study presents the estimation of milk amount and quality using an Arduino board. In this suggested approach, customers will access milk parameter data via their mobile devices. Data can be saved in their mobile memory as a Milk Log using an Android smartphone application, like a serial Bluetooth terminal. Real-time milk parameters, such as ammonia content, sulphur content, methane (MQ2) sensor, carbon monoxide (MQ7) sensor, and other milk adulteration, are recorded by the real-time clock module. This technique studies the milk's composition to determine the quantity and types of adulterants introduced. Adulteration is detected via electronic equipment connected to various sorts of sensors.

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IV. BLOCK DIAGRAM

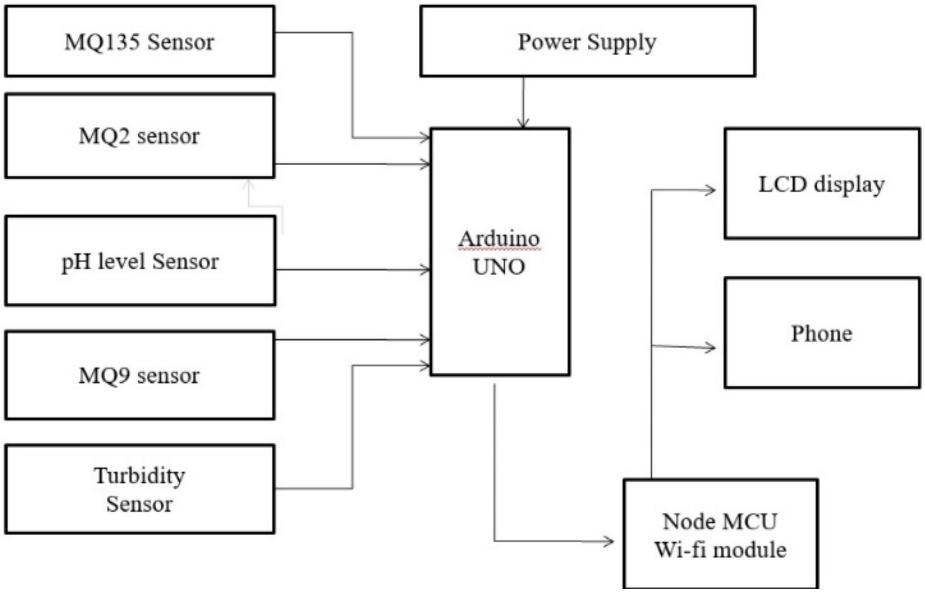

Figure 1: Block Diagram

V. WORKING

Farmers can deliver their milk to this setup at a neighbouring dairy or milk dealer. It is possible to utilize this instrument as a primary milk analyzer. This device is ready for usage once it has been correctly placed and powered on using the power supply module. Data from the various sensors linked to the Arduino Controller are first read. Milk's pH should range from 6.5 to 6.8. This gas sensor can measure hazardous gas emissions from a milk sample or identify microbial activity in milk.

VI. CIRCUIT DIAGRAM

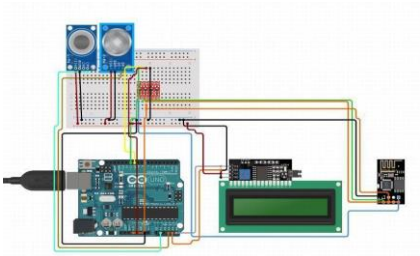

Figure 2: Circuit Diagram

ARDUINO UNO:

Arduino is an open-source electronics platform based on easy-to-use hardware and software.

Figure 3: Arduino

A microcontroller board called Arduino Uno is based on the 8-bit ATmega328P microcontroller. It also includes additional parts to support the ATmega328P microprocessor, including a voltage regulator, serial connectivity, and crystal oscillator. The Arduino Uno comes with a USB connection, a Power barrel jack, an ICSP header, 6 analogue input pins, 14 digital input/output pins (of which 6 can be used as PWM outputs), and other features.

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METHANE (MQ 3) SENSOR:

Electronic devices that detect and distinguish between various types of gases include methane sensors, also known as gas sensors. They are frequently employed to gauge gas concentrations and identify explosive or dangerous gases. Gas sensors are used in manufacturing facilities and factories to find gas leaks and to detect smoke and methane in residential buildings. Gas sensors come in a wide range of sizes (portable and fixed), sensing capabilities, and ranges. They frequently function as a component of a larger embedded system, such as security and hazmat systems, and are typically connected to an interface or audible alarm. Gas sensors require more frequent calibration than many other types of sensors because they are continually reacting with air and other gases.

Figure 4: Mq3 Sensor

CARBONMONOXIDE (MQ 7) SENSOR:

Figure 5: Mq7 Sensor

The MQ-7 gas sensor's sensitive component is SnO2, which has a reduced conductivity in clean air. It uses a cycle of high and low temperatures to detect CO while the temperature is low (heated by 1.5V). Both the sensor's conductivity and the gas concentration are increasing. The additional gases that were adsorbed at low temperatures are cleaned when the high temperature (heated by 5.0V) is reached. Please utilise a straightforward electro-circuit to translate changes in conductivity into a signal that corresponds to gas concentration.

Carbon monoxide is quite sensitive to the MQ-7 gas sensor. The sensor is inexpensive and ideal for a variety of applications, and it may be used to detect different gases that include CO.

MQ135 SENSOR:

An air quality gas sensor is a device that is used to detect, measure, or monitor gases like ammonia, benzene, sulphur, carbon dioxide, smoke, and other dangerous gases. The MQ135 air quality sensor, which is a member of the MQ gas sensor family, is frequently used to identify dangerous gases and smoke in outdoor air. This article provides a quick explanation of how to use a MQ135 air quality sensor to measure and detect gases. It is a semiconductor air quality sensor that can be used for applications that monitor air quality. The presence of NH3, NOx, CO2, benzene, smoke, and other hazardous chemicals in the air greatly affects its sensitivity. For applications involving the detection and monitoring of dangerous gases, it is inexpensively priced.

Figure 6: Mq135 Sensor

VII. SOFTWARE DESCRIPTION

ARDUINO IDE

The term "Integrated Development Environment" (IDE) refers to a piece of official software that was first made available by Arduino.cc and is primarily used for editing, compiling, and uploading code to Arduino devices. With this open source programme, which is simple to install and use to begin compiling code while on the go,

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almost all Arduino modules are compatible. This post will present the software and describe how to install it so that it is ready for application development using Arduino modules.

PH LEVEL SENSOR:

Depending on the source of the milk, the pH of fresh raw milk typically ranges from 6.4 to 6.8. The pH sensor is a device that converts the amount of hydrogen ions present in a solution into a useful output signal. Typically, it consists of a chemical component and a component for transmitting signals.

Figure 7: Ph Level Sensor

TURBIDITY SENSOR:

Turbidity sensors are a piece of technology used to assess a solution's level of cloudiness or haziness as well as the quantity of total dissolved or suspended particles.

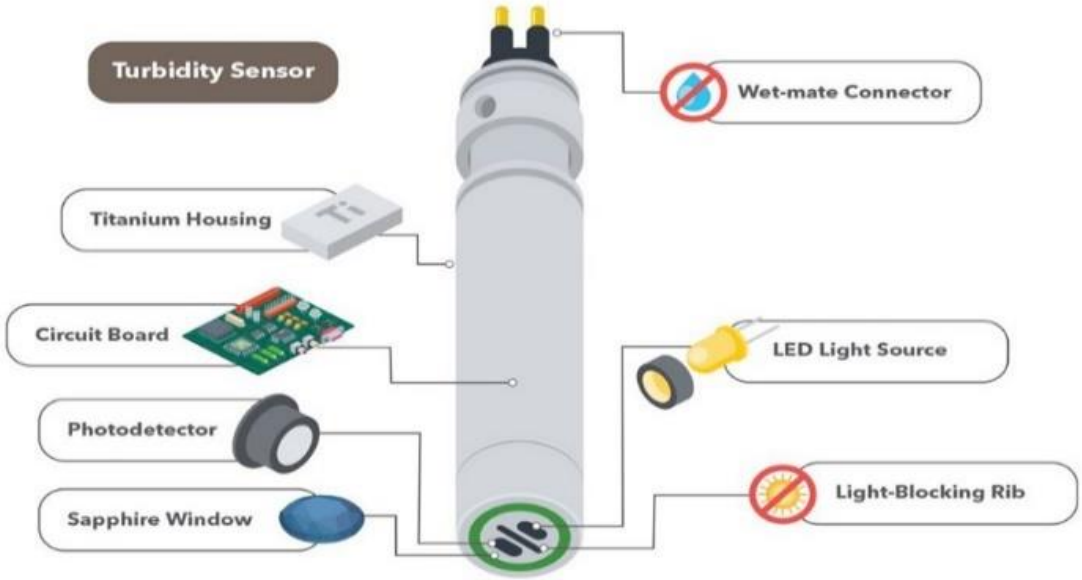

Figure 8: Turbidity Sensor

In order to use a contemporary turbidity sensor, a sample must be collected and placed into a vial. The vial is then put within the apparatus, and a fixed light beam is directed through the sample to measure how much light is transmitted and how much light is scattered by photodetectors, which are typically positioned 90 degrees away from the sample.

VIII. EXPERIMENTAL RESULTS

The proposed model was assessed to determine how effectively raw milk works. Without adding any preservatives, milk samples were obtained for this project from nearby farms. These milk samples were placed 3 cm from the surface of the milk and directly exposed to the sensor array. Flash Magic software then gathered each sensor's response..

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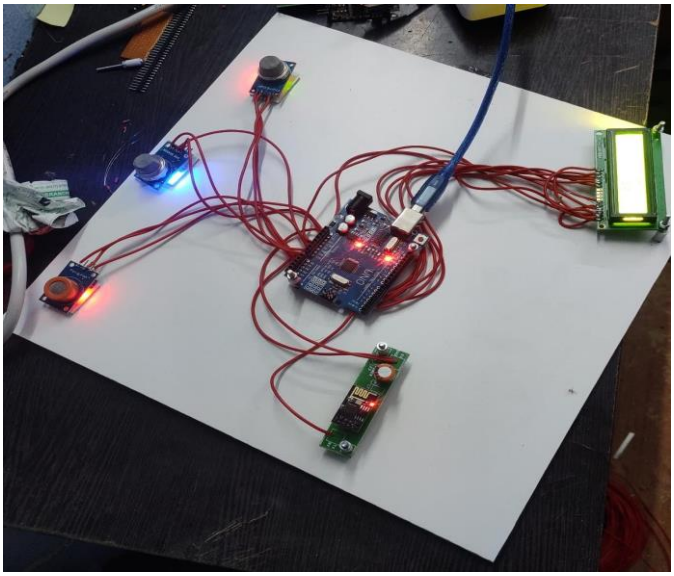

Figure 9: Experimental Results

IX. CONCLUSION

Because the proposed work involves the integration of heterogeneous sensors in a distributed system that carries out the action in the physical world based on the environmental information gathered by the sensors and describes the application related constraints and requirements, one of the key aspects of our work is so related to the Internet of things. To determine the quality of raw milk in real time, an electronic nose based on metal oxide semiconductors is utilized. The milk samples were obtained from nearby farms without the addition of preservatives, exposed directly to a sensor array at a distance of 3 cm, and the reaction was recorded using the flash magic programme.

The presence of volatile organic molecules, which are a primary contributing factor to milk's off flavours, is detected using this unique technology, which is employed for decision-making with a threshold limit. The developed usense or e-nose prototype exhibits the highest performance, and its responsiveness is validated in real time. It is the finest model for real-time study of the quality of raw milk with regard to cost and flexibility, to put it simply. This type is transportable and user-friendly. When compared to existing methods, it exhibits noticeable selectivity and enhanced response. uSense has undergone rigorous testing through experimental measurements carried out in many cities and has proven to be both dependable and effective.

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