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DEVICE TO CHECK HARMFUL CHEMICAL IN FRUITS AND VEGETABLES

K.Kavitha[1],Assistant Professor,
T.Sambasiva Rao[2],M.Mahesh Babu[3],P.Manoj[4],UG Students [2,3,4,]
Department of ECE,
Krishna University College of Engineering and Technology,
Machilipatnam, Krishna District,
Andhra Pradesh.

Abstract:

The "Fruit Quality Monitoring System" is equipped with an Arduino network and a MQ-9 gas sensor to detect the presence of harmful chemicals on fruit. The device detects any signs of chemical contamination and sounds an alert, guaranteeing that the fruit is free of harmful substances and is as fresh as possible. In this hypothetical setting, fruit research is conducted. Inside the cockpit, an Arduino board is connected via wire to a MQ-9 gas sensor. It's possible that a gas sensor may detect volatile organic compounds (VOCs) given out by the fruit's skin. The gas detector can tell how frequently the chamber's air is changed by the fruit it detects within. When harmful gases are detected, the gas sensor will alert the Arduino. When a material is identified, the Arduino processes the data from the sensors and initiates the proper reaction. It's conceivable that the screen might update with the findings in real time. Information about the chemicals detected is shown on an LCD screen, making it easy to ascertain whether or not they constitute a pollution issue and to implement mitigation strategies. If any harmful chemicals are found, a siren will ring to warn customers about the fruit's safety. The findings of this study will hopefully help consumers feel more at ease when purchasing fruit by making it easier to spot potentially harmful substances. If people were to, instance, avoid or thoroughly wash foods sprayed with pesticides, they may reduce their risk of health problems.

INTRODUCTION

Suppliers of fruit must comply rigorously to quality and safety rules to protect the health of their customers. Toxic chemicals and pesticides are only two examples of the kinds of contaminants whose consequences might be catastrophic if consumed by accident. The "Fruit Quality Monitoring System" is able to detect the presence of harmful chemicals on fruit in real time by using a MQ-9 gas sensor and an Arduino. The system also includes a laboratory for assessing fruit quality. The chamber houses the MQ-9 gas sensor, which can detect a variety of toxic substances. When fruit is introduced to the chamber, the gas sensor picks up on a change in the air's chemical composition. Chemicals located on the fruit's exterior. An Arduino board receives the readings from the gas sensor and performs the necessary comparisons and analyses. If dangerous gases are identified, the Arduino will sound an alarm. The LCD panel may provide real-time updates for the operator. The customer might be given an LCD screen that highlights any defects in the fruit. An alert will go off instantly if any harmful compounds are found, bringing attention to the safety of the fruit. The information gathered by the Fruit Quality Monitoring System is useful for both buyers and sellers in terms of making educated judgments about the safety and quality of the fruit they are transacting in. When harmful substances are identified in a timely way, precautions may be taken, such as washing or discarding diseased fruits. The goal of this study is to provide a more trustworthy and effective method for monitoring fruit quality to ensure the safety of fruits for human consumption. Our fully operational system includes a MQ-9 gas sensor, an Arduino board, an LCD display, and a buzzer to keep customers up-to-date on the freshness and safety of the fruit they purchase. 3 In the following paragraphs, we will talk about the MQ-9 gas sensor, the Fruit Quality Monitoring System's Arduino-based hardware and software, and the system's ultimate goals.

LITERATURE REVIEW

Identify Relevant Keywords:

The key to successfully completing your project is a solid understanding of the necessary ideas and technologies, such as "fruit quality monitoring," "gas sensors," "Arduino," and "chemical detection." These criteria may be used to identify research that is of interest to you.

Academic Databases:

If you're looking for scholarly publications or conference papers, try searching Google Scholar, IEEE Explore, Science Direct, or Pub Med. Using the available search tools, you may locate further articles on relevant topics including food safety, gas detection, and Arduino-based devices.

Review Relevant Research Papers:

You can assess the usefulness of an article by reading its abstract and summary. The fields of gas sensing, fruit quality monitoring, chemical detection, and allied fields all need further research. Keep detailed records of your study's procedures, sensors, and results.

Citations and References:

After tracking out pertinent research articles, you may use the citations they provide to jumpstart your own investigation. It might help you find the most frequently mentioned books in your subject.

Peer-Reviewed Journals:

Professionally reviewed articles from the fields of agricultural engineering, food science, and sensing and instrumentation should be considered. There is a wealth of high-quality, peer-reviewed research on topics including food quality monitoring, analytical methods, and sensor technologies published in the following journals on a regular basis. Meeting Materials: This article provides a summary of recent conferences and symposia on agricultural engineering, sensors, and food security. Articles in these periodicals often report on groundbreaking studies and findings.

EXISTING SYSTEM:

Multiple methods and technologies are used by the various current fruit quality monitoring and chemical detection systems. The Fruit Quality Monitoring System, which is based on a MQ-9 gas sensor and an Arduino, is equivalent to the following commercial systems since it employs the same components:

Gas Chromatography-Mass Spectrometry (GC-MS) Systems:

GC-MS instruments are often used for chemical analysis, but they might also be put to use checking on the quality of fruit. Gas chromatography is used to separate the volatile chemicals in fruit samples, and mass spectrometry is used to identify and quantify them. Despite their high levels of sensitivity and specificity, they are notorious for being cumbersome to use and costly.

Electronic Nose Systems:

Electronic nose devices that simulate the human olfactory system may one day allow us to determine whether or not fruit is fresh and to detect potentially dangerous substances. To identify and classify the volatile substances given off by fruits, these techniques employ chemical sensors like gas detectors. Machine learning algorithms are fed the sensor data to classify the quality of the fruit.

Spectroscopy-based Systems:

The quality of fruit may be evaluated by near-infrared (NIR) or Raman spectroscopy. These devices analyze the chemical composition and other qualitative features of fruit by testing how light interacts with it. However, they may need to spend a lot of money on specialized tools in order to do an examination that is both fast and non-destructive.

Optical Sensor Systems:

The colour, fluorescence, or absorbance of fruit is used as a quality indicator by optical sensor systems. Fruit colour may be analyzed using colorimeters and spectrophotometers to reveal whether or not the fruit has undergone chemical changes. Possible applications for fluorescence-based sensors include the detection of toxins and quality indicators in fruit.

Smartphone-based Systems:

Apps that assist shopper’s rate and review goods have proliferated with the proliferation of smart phones. These programs use the camera and spectrometer of the user's Smartphone to determine the freshness and quality of the fruit in a picture. Retrofitting using the MQ-9 gas sensor or the Arduino platform is not possible. However, each of these techniques brings something new to the table in terms of chemical detection and monitoring in fruit. As a low-cost and simply accessible solution for 24/7 monitoring and warnings, the Fruit Quality Monitoring System integrates the Arduino platform with gas detecting technology.

PROPOSED SYSTEM

With the help of a MQ-9 gas sensor and an Arduino, the proposed Fruit Quality Monitoring System is able to carry out the following operations:

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Follows:

Sensor Integration:

The MQ-9 gas sensor may be discreetly installed in a container used for preserving fruit, where it will be able to detect volatile organic compounds and other harmful contaminants. When the sensor is linked to the Arduino board, sending and receiving data from the host computer is a breeze.

Fruit Placement:

When introducing fruit into the chamber, make sure the cut side is towards the air. The gas detection chamber is designed for just this reason.

Gas Sensing:

Once the fruit is inside, the MQ-9 gas sensor keeps a constant eye on the environment. Pesticides and other potentially dangerous compounds are checked for on the fruit's skin.

Data Processing:

An Arduino board receives data from the gas sensor. In order to identify whether potentially dangerous compounds are present, the Arduino board compares and computes the sensor results. The sensor data may be compared to a threshold or reference values to determine whether chemical contamination is present.

Alert Generation:

The gas sensor will activate safety features if it detects concentrations of volatile organic compounds that are too high. After being triggered by the Arduino, an LCD screen displays the user's input in real time. Users may see further information about the identified substances on the LCD screen and make educated decisions about how to protect themselves from potential exposure. A buzzer also proclaims the fruit's deliciousness.

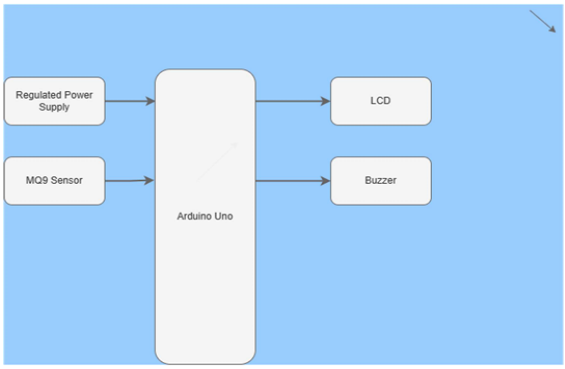
User Response:

Users may be motivated to take action after seeing relevant information on the LCD screen and hearing it announced by the buzzer. If the degree of contamination is too high, they may opt to wash the fruit properly to eliminate any toxins or discard it.

Continuous Monitoring:

The gadget monitors the relative humidity and temperature within the chamber while the fruit is still inside. Customers get immediate feedback, so they may make educated decisions while buying fruit. The suggested system is based on the gas detection capabilities of the MQ9 sensor, as well as the processing power and display output of the Arduino board. When these features are combined, the gadget may identify harmful compounds in food rapidly and cheaply.

BLOCK DIAGRAM



WORKING FLOW:

The MQ-9 gas sensor and Arduino will function as follows in the proposed Fruit Quality Monitoring System: 10

Initialization:

Once power is connected, the Arduino board sets up the MQ-9 gas sensor, LCD display, and buzzer.

User Interaction:

The exposed side of the fruit is placed into the hermetically sealed compartment.

Gas Sensing:

The MQ-9 gas sensor instantly starts monitoring the air quality within the building. The levels of volatile organic compounds (VOCs) and other possibly harmful elements on the fruit's exterior are measured.

Data Acquisition:

The gas sensor continually sends data to the Arduino board, such as the concentrations of gases in the air.

Data Processing:

An Arduino board receives the data from the sensors and does any required comparisons and analysis. The article compares the amounts of the newly discovered chemicals to a safe threshold.

Alert Generation:

When dangerous gas levels are detected, the Arduino will take appropriate action. When the button is pressed, the drug test results appear on an LCD screen in real time. Consumers may also be warned through audible alerts if the fruit they are about to purchase has gone bad.

User Response:

Based on the information shown on the LCD screen and the audible indication from the buzzer, the user may take the appropriate action. If the degree of contamination is high enough, they may decide to wash the fruit thoroughly to remove the poisons, or they may decide to just discard it.

Continuous Monitoring:

The gadget monitors the relative humidity and temperature within the chamber while the fruit is still inside. The gas sensor and Arduino's constant data processing ensure that the user is always aware of the situation and on the lookout.

System Shutdown:

Once the fruit is removed from the chamber or the machine is turned off, the monitoring will cease. 11 As part of the procedure to guarantee the quality and safety of the fruit, it is routinely tested for the presence of potentially harmful compounds on its surface. In an effort to safeguard our clients and inspire them to eat more fruit, we combined a MQ-9 gas sensor, Arduino board, LCD display, and buzzer into a single gadget.

RESULT:

The following is the result of our efforts to develop a Fruit Quality Monitoring System using an Arduino and a MQ-9 gas sensor:

Chemical Detection:

The device promptly takes action whenever it detects potentially dangerous substances, such as pesticides, on the surface of the fruit. The MQ-9 gas sensor is reliable due to its sensitivity to volatile organic compounds. The system takes in information from various sensors, processes it, and then evaluates it in relation to a reference standard.

Real-Time Feedback:

Compounds as they are discovered are shown in real time on an LCD screen. A warning message or the kind of chemical may be shown if pollutants are found. Consumers will be better able to weigh the benefits and drawbacks of purchasing the fruit with this information in hand.

Audible Alert:

When potentially harmful compounds are detected at concentrations over the system's threshold, an audible warning will sound. An alert will sound if a possible epidemic is detected. This notice serves as a cautionary note to anybody thinking about eating the fruit.

User Intervention:

Thanks to the LCD screen and blaring alarm, users can determine whether or not the fruit is safe to eat. They may decide to fully wash the fruit to eliminate the poisons or toss it out if they find the degree of contamination to be unacceptable. People may consume less fruit that has been treated with pesticides if this user intervention is implemented.

Continuous Monitoring:

As long as the fruit is contained in the chamber, the machinery will monitor its surroundings. This allows for continuous monitoring of the fruit's quality. The gas sensor and Arduino work together to provide continuous feedback on the mixture's chemical composition and to notify the user of any sudden changes. Since the Fruit Quality Monitoring System can accurately detect potentially harmful substances on the fruit's surface and offer prompt feedback and warnings, its users may have trust in the results it generates. This strategy seeks to provide customers with information on the quality and safety of fruit in an effort to promote healthy eating and reduce the risks associated with swallowing food tainted with chemicals.

Conclusion:

To further ensure the safety of our food supply, we propose combining the MQ-9 gas sensor with an Arduino-based Fruit Quality Monitoring System. Thanks to the combined processing capacity of the Arduino board and the gas detection capabilities of the MQ-9 sensor, consumers can now make educated judgments about the freshness and quality of the fruits they purchase. It seems that VOCs present on the surface of the fruit may be detected and analyzed by the system. Customers may be notified in real time by sirens in the case of chemical contamination and given the option to either wash the products or throw them away.

Future Scope:

The Fruit Quality might be improved and expanded in a number of ways in the future.

Monitoring System:

In order to identify a wider variety of dangerous compounds, more work has to be put into developing sensitive and selective gas sensors. This data might be used to boost the system's efficiency and pinpoint the origins of a certain kind of pollution.

Multi-Sensor Integration:

A more in-depth analysis of fruit quality may be possible with the use of many gas sensors or other sensing technologies. The analysis of chemical composition and quality qualities might be aided by combining gas sensors with other sensors, such as optical sensors or spectroscopic methods.

Data Analysis and Machine Learning:

Machine learning algorithms and other advanced data analysis approaches may improve the system's capacity to categorize and detect specific contaminants based on sensor data. Detection rates are enhanced since the system may be tuned to the unique chemical signatures of various fruits. 50 Cloud computing and mobile networks

Integration:

Bluetooth and Wi-Fi wireless connections improve long-distance communication and data capture. Customers may check on the health of their fruit from anywhere using cloud-based notifications. Customer Happiness and

Mobile Applications:

Create user-friendly interfaces, such mobile applications, to expand your clientele. Soon, we may be able to use our smart phones to instantly rate the quality of fruit, show the results with relevant historical data, and get tailored suggestions based on our own preferences.

Scalability and Commercial Viability:

Find out how this cutting-edge technology may be used in settings like as storage facilities and food processing plants. Cost, time, integration complexity, and compliance requirements are only some of the business contexts that must be taken into account to ensure the system's flexibility. Potentially dangerous substances on fruit might be quickly detected with the use of the Fruit Quality Monitoring System, which could considerably aid food safety activities. More study is required to improve system performance, encourage better diets, and guarantee the quality and safety of fruits in a variety of contexts.

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