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IOT BASED DETECTION OF PESTICIDE IN FRUITS AND VEGETABLES

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Abstract:
Pesticide detection in fruits and vegetables is an important aspect of food safety. A small amounts of pesticides may remain in or on fruits, vegetables, grains which is negative impact on human health. It is important to monitor and regulate their use to ensure safe consumption of these foods. In this paper we proposed a system to detect the pesticide on fruits as well as vegetable. The system consists of different types of sensors such as ethylene gas ,PH and temperature sensor and Node MCU microcontroller. Pesticides are stated to be present in fruits if they are detected to be in a range above or below the threshold level. The pesticide content and values received from each sensor are displayed in the Blynk APP via IoT. The proposed system have the potential to provide a more efficient and accurate way of detecting pesticides on fruits and vegetables.

Keywords: Pesticides, Snesors, Node MC , IOT.

Introduction

The use of pesticides in agriculture is a common practice to reduce damage to crops from weeds, rodents, insects, and germs, which increases the yield of fruits, vegetables, and other crops. However, many people worry about the impact of pesticides on human health.. India ranked fourth in the world in terms of agrochemical and fertiliser production. According to numerous institutes' research, pesticide residues infect 50-70% of vegetable and fruit production. Farmers use pesticides on crops that exceed the legal maximum residue limit in order to maximise profit in a short period of time. Although pesticides are quite effective against pests, they can persist in the environment [1-3]. The World Health Organization (WHO) notes that while pesticide residues in food may pose a risk to human health, consumers can limit their intake by peeling or washing fruits and vegetables, which also reduces other foodborne hazards such as harmful bacteria. There are many methods to detect the pesticides. This paper represented IoT-based pesticide detection systems have the potential to improve food safety, reduce waste, and increase consumer trust in the food supply chain. This technique could allow the presence of pesticides in fruits and vegetables to be easily detected, providing a fast and efficient way to protect human health from these harmful substances.

Related work

There are several methods available for detecting pesticide residues in fruits and vegetables. These methods can range from traditional chromatographic techniques to more advanced nanotechnology-based approaches. Gas chromatography-mass spectrometry (GC-MS) and high-performance liquid chromatography (HPLC) are two traditional techniques widely used for pesticide detection in fruits and vegetables [4]. These methods involve the separation of the pesticide from the sample by either gas or liquid chromatography, followed by detection using mass spectrometry or UV-Vis spectroscopy, respectively. Advanced techniques, such as polystyrene-coated magnetic nanoparticle pre-treatment and nanotechnology-based sensor development, have also been used for pesticide detection in fruits and vegetables [5]. These methods involve the use of magnetic nanoparticles to extract and concentrate pesticide residues from the sample, followed by detection using various types of sensors. Recently, a novel tablet-based colorimetric method for pesticide detection in plants was developed by a Chinese research team [6]. This method involves the use of an enzyme tablet containing acetylcholinesterase to hydrolyze indoxyl acetate into indole, which is then oxidized in the air to form a blue-green color.

Although these approaches involve quantitative analysis with selectivity, they are slow, expensive, arduous, and difficult to popularise and promote. Furthermore, they lack the capability of information sharing and remote control. As a result, they are unsuitable for quick detection and agricultural (farming) products. With the rapid rise of smart phones, wireless technological systems and sensor technologies have become indispensable instruments in daily life. IoT-based systems allow for real-time monitoring and

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remote access, which can save time and resources for farmers and consumers. Moreover, IoT technology can also be used for agricultural products traceability and to provide transparency to consumers about the origin and quality of the food they consume[7].

Proposed Work

The use of IoT in pesticide detection in fruits and vegetables involves both hardware and software components. The hardware components in IoT-based pesticide detection can include various sensors and devices to detect and monitor, while the software components involve data analysis and machine learning algorithms for pest identification and chemical detection.

Hardware System Description:

- **NodeMCU ESP8266**
- **MQ135 gas sensor**
- **DHT11 Sensor.**
- **PH sensor**

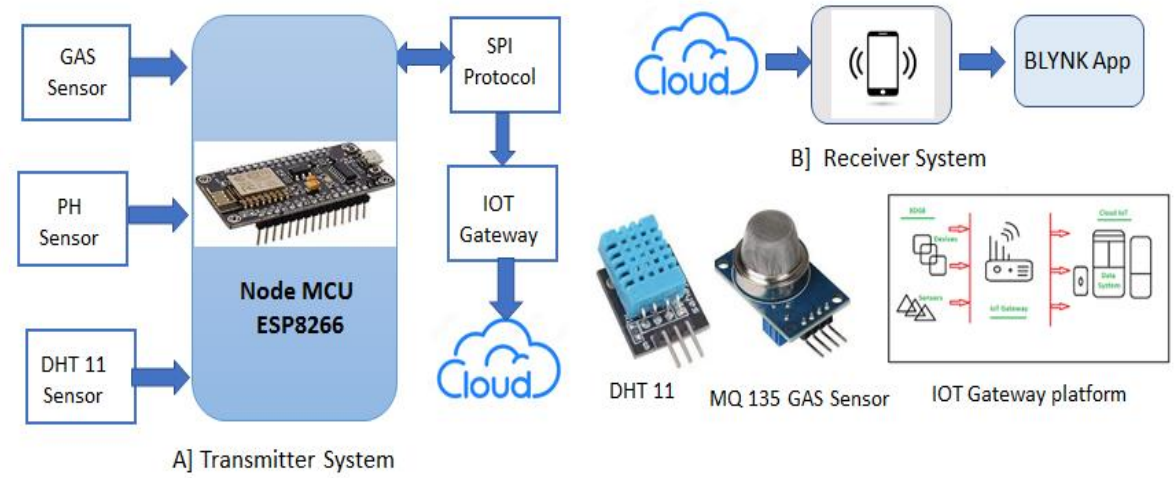

Fig1 . Block diagram of Pesticide Detection System A] Transmitter system B]Receiver System

The proposed system consists of a microcontroller ESP8266 which acts as the main processing unit for the entire system and where all the sensors such as gas ,Ph, DHT11 and devices are connected. When a suitable connection with the server device is established, the data collected from numerous sensor devices implanted in specific areas of interest is quickly transferred to the webserver. This processed sensor data is then uploaded and saved on a website as a database using any Wi-Fi module, such as Node-MCU. The data collected will be saved on the cloud. The cloud data can be used for parameter analysis and continuous monitoring. Temperature, humidity, and gas level recorded at regular intervals. All this information will be stored in the cloud, allowing us to monitor temperature, humidity, and gas levels at a given place at any time.

The MQ135 Gas sensors are used in air quality control systems and are suitable for detecting gases such as CO2, Smoke, NH3, NOx, Alcohol, Benzene, etc. In the system we used MQ135 if any of the gases present in fruits as well as vegetables. When fruit becomes rotten or ripe, the fragrance changes, but this does not indicate the presence of pesticides in the fruit. The gas sensor will detect the substances that are present [8]. Temperature and Humidity sensor is also used detect whether fruit is healthy or unhealthy to eat, by measuring the temperature. It will detect the amount of heat created by the fruits, and if the temperature is higher than the normal ambient temperature or the heat generated is greater than 40 degrees Celsius, the fruit is considered diseased.

Here the values from sensors are connected to ESP 8266 as control unit and we programmed the microcontroller board in C using the Arduino IDE, which includes a code editor, a message area, a text console, a toolbar with buttons for basic functions, and a series of menus and sent to cloud server Think Speak through Wi-Fi module. The combined sensor results are made available to users via the built

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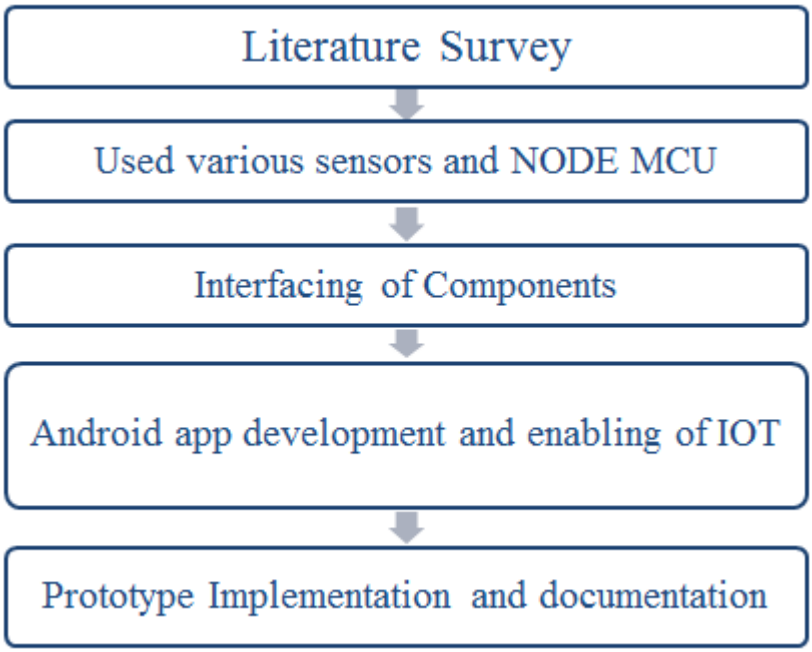
Android application. The Android app was built using the Blynk platform, which allows us to easily create interfaces for controlling and monitoring hardware projects. A blynk notification will be delivered to your smartphone[9-10].



Results and Discussion

The proposed system system determines the pesticide in apple, tomatoes and Cabbage samples collected from both market and agriculture farms. Four samples of each vegetable are investigated. It was discovered that the majority of pesticide-containing samples differ greatly from pesticide-free samples in terms of values. That large variation shows the presence of pesticide in samples and serious threat to human health. Tables 1 Demonstrate the relative percentage difference between in pesticide-containing samples and organic sample. The relative percentage deviation between the pesticide containing sample and the organic samples is very large. Hence, shows the presence of pesticide in the samples collected from market not in organic.

Table1 . Shows Relative % Deviation in Various Type of Samples

Sample type	No. of samples analyzed	Relative % deviation	
		Pesticide containing samples	Organic Sample
Apple	4	10.2%	2.1%
Tomatoes	4	15.4%	2.5%
Cabbage	4	20.1%	2.8%

Conclusion

Pesticides used in fruits and vegetables are harmful to human health, and there are various methods for detecting them. This paper discussed about various methods used to detect the pesticide levels in fruits and vegetables and also demonstrated technical implementations in the research fields of safety of agricultural products as pesticide content detection using IoT . The pesticides are detected using IoT, which is an appropriate solution because we detected the quality of the fruit using the sensor. This proposed system monitor the various parameters of fruit and vegetable like gas, pH and Temperature value of different samples for the presence of pesticide residue. The findings of the testing show that the values of the

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parameters change with the amount of pesticide in different samples. Pesticide in vegetable and fruits samples were successfully detected using this technology. As compared to other existing systems, the suggested system is the most dependable, real-time, and generates the greatest results. The performance is quite precise.

References

1. Deepali Gupta , Balwinder Singh , Harpreet Singh Design and Development of Pesticide Residue Detection System using EC and pH Sensor. http://dx.doi.org/10.5815/ijem.2016.02.02
2. Selvi, S., Karthikeyan, R. and Vanitha, U., "Organic farming: Technology for environment-friendly agriculture," in Proc. International Conference on Advances in Engineering, Science and Management (ICAESM), pp.132-136, March 2012
3. Selvi, S., Karthikeyan, R. and Vanitha, U., "Organic farming: Technology for environment-friendly agriculture," in Proc. International Conference on Advances in Engineering, Science and Management (ICAESM), pp.132-136, March 2012
4. R. Sambasivam, P. Arun, N. Gokula Krishna, R. Mohamed Faris. MONITORING THE PESTICIDE LEVEL IN FRESH FRUITS AND VEGETABLES BY USING IOT
5. Sharma, A., Dubey, J.K., Katna, S. et al. Validation of Analytical Methods Used for Pesticide Residue Detection in Fruits and Vegetables. Food Anal. Methods 14, 1919–1926 (2021). https://doi.org/10.1007/s12161-021-02027-y
6. Narenderan ST, Meyyanathan SN, Babu B. Review of pesticide residue analysis in fruits and vegetables. Pre-treatment, extraction and detection techniques. Food Res Int. 2020 Jul;133:109141. doi: 10.1016/j.foodres.2020.109141. Epub 2020 Mar 3. PMID: 32466907.
7. Bedair, H., Rady, H.A., Hussien, A.M. et al. Pesticide Detection in Vegetable Crops Using Enzyme Inhibition Methods: a Comprehensive Review. Food Anal. Methods 15, 1979–2000 (2022). https://doi.org/10.1007/s12161-022-02254-x
8. D.Nagajyothi, 2P. Hema Sree, 3M.Rajani Devi, 4G.Madhavi, 5Sk Hasane Ahammad IOT-Based Prediction of Pesticides and Fruits DiseasesDetection Using SVM and Neural Networks
9. Anju Sosa John, Greeshma Thomas, Sona Sussan Zacharia, Er.Anu Raj ,Er. Agitha M IoT BASED REAL TIME AIR AND NOISE POLLUTION ALERT SYSTEM FOR ASTHMA AND ANGINA PATIENTS
10. R. Kanmani, M. Yuvashree, S. Sneha, V. Sahana Reshmi, R. Pavithra IOT BASED PESTICIDES MONITORING SYSTEM IN FOOD PRODUCTS