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# IOT BASED PESTICIDES MONITORING SYSTEM IN FOOD PRODUCTS

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**Abstract -** *The uses of pesticides, steroids and fertilizers has to be tremendously increasing the negative effects caused to the people in terms of health. Harmful pesticides enter into the human body through fruits and vegetables, so that optimal solution is needed to analyse the disease and the pesticides detected in the fruits the common man is consuming. Hardware design and software design are obtain an accurate and the real time outputs. In this Project, a prototype of the system is developed with the use of four sensors, Node MCU microcontroller and to get the information about the presence of pesticides. The high level of pesticide can be accept legally to be consumed by animals and humans is given by Embedded C Program. If a fruit is detected to belong in a range above or below the threshold level then it is said to contain pesticides. Through IoT, the pesticide content and the values obtained from each sensors are shown in Blynk APP.*

***Key Words*: - Gas sensor, Humidity and Temperature Sensor, Node MCU.**

## 1. INTRODUCTION

Pesticides play a major role in the production of fruits and vegetables. Mainly pesticides are used to flourish the growth of fruits, but there is a level of safe consumption of pesticides. There are many methods by which the pesticides could be detected. A hardware and software simulation using IoT and Embedded has been done in this project to improve the efficiency and accuracy. An IoT (Internet of Things) system mainly consists of sensors/devices that have to be connected to the Cloud with the help of an internet connectivity. Once the data reaches the Cloud, the processing is done and an alert is given to the required person. Pesticides- chemical substances applied into the crops at various stages of cultivation and during the harvest storage of crops. The uses of pesticides is intend to prevent the destruction of food crops by controlling the agricultural pests or unwanted plants and the improve plant quality. Pesticide can be used commercial agriculture has to be led to an increase in farming productivity. Despite the advantages of using pesticides in farming, several incorrect applications can result in high and undesirable levels of the compounds in the produce that reaches consumers. These selection of pesticides used on foodstuffs, over the use of pesticides and the harvesting crops before the pesticides residues have washed out after the application. Monitoring the pesticides in fruits and vegetables samples has to be increased in the previous years since most countries has to be established maximum residue level (MRL) for pesticides in the food products. With the gradual advance of urban construction, the product of vegetables and fruits are most in the supermarkets. Gas chromatography (GC), liquid chromatography (LC) or combinations (GC-MS or LC-MS/MS) are the traditional analytical techniques for the identification and quantity identification of pesticides residues detection. Although these methods are quantitative analysis with selectivity, they are slow, high cost, laborious and not convenient to popular and promote. Moreover, they do not have the ability of information sharing and the remote control. Therefore, they are not suitable for the rapid detection and agricultural (farming) products. Biosensor account for an easy method to be determine pesticides in environmental surrounding and food matrices. The use of biosensors as screening devices is a cost effective and decreasing the number of samples to be analyze by the traditional analytical techniques. With the explosive growth of smart phones, wireless technical systems and sensor technology have a fundamental tools for everyday life. The wave of interconnected devices like microcontroller, SPI, Transformer, LED, sensors, and countless other "things" to the next generation of a hyper connected in world. Interconnected entities can be open with a communication channel with each other based on the IOT. Many technologies serve the blocks such as QR barcode, cloud services, machine-to-machine interfaces (M2M).Also, this application domains. The IOT is used based on the pesticides detection. Due to the above, the purpose of this investigation is used to design a system for pesticide residues detection and agricultural products detection. We intent to allow anyone to interconnect with this system with c programming knowledge. This system can be used in markets and plantations. Otherwise, this system can also be used in the areas of purchasing, storage and transportation.

## 2. RESEARCH AND COLLECT DATA

Increase the population in India, results in higher demand for food as well as decrease in land for farming. Hence fulfil the demand, food is adulterated to get more quantity in short period of time. Moreover, pesticides in crops can be using above the legal pesticides residue limited by

farmers to get gain more profit in short period of time. Among organophosphate pesticides, chlorpyrifos can be used in fruits and vegetables. Chlorpyrifos has toxic effects in the human body particularly on brain and nervous system in our human body. In this project, design of sensors used to pesticide detection using parameters like electrical and electronics conductivity and pH levels. It found the value of conductivity in pesticides samples containing samples of bitter gourd, bottle gourd and tomatoes are 32.4%, 11.7% and 18.09% and also between the pesticides and supermarket samples are 33.4%, 8.9% and 16.55% respectively. The most variation among different samples shows in the pesticide residue. Hence, this type of method can be used to the pesticides detection in fruits and vegetable samples. The sensor system is easy, fast and timing undemanding method. So, that the electronics device can be used to check the impurity in other liquids like water, milk, liquid items etc. Pesticides substance which different in their physical properties, chemical properties and identical properties from one to another. Hence, they are classified into based on the properties. Recently, the most popular classifications of pesticides can be used in the classification based on the mode of entry, pesticides and the pest organism, the chemical composition. The toxicity of pesticides, World Health Organisation classified into the 4 types: extreme highly, moderately (normal), and slightly dangerous. Improper application of pesticides causes a severe harmful effect into the living system and the environment system. Most of the pesticides do not distinguish between the pests and the other similar incidental 6 lifeform and kill them all pesticides. The toxicity of insecticides organism is usually expressed to the LD50 (lethal dose 50 percent) and LC50 (50 percent lethal concentration).

## 3. STUDIES AND FINDINGS

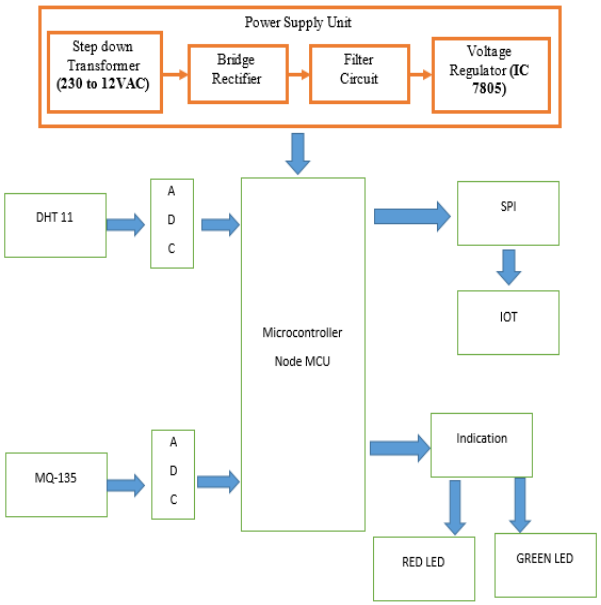
There are many different types of pesticides, the term "cide" - "to kill."

1. Algaecides is used for killing and slowing the growth of algaes.
2. Antimicrobials can be controls the germs and microbes such as bacteria and viruses.
3. Biopesticides are made living things, come from living things, or they are found in nature environment.
4. Desiccants can be used to dry up the living plant tissues.
5. Defoliants - plants to drop their leaves.
6. Disinfectants control the germs and microbes such as bacteria and viruses.
7. Fungicides can be used to control the fungal problems like molds, mildew, and rust.
8. Herbicides kill the growth of unwanted plants, aka weeds.
9. Illegal and Counterfeit Pesticides are sold illegally.

## 4. SYSTEM DESCRIPTION

Hardware system architecture consists of the IOT part where the four different sensors (Gas, Moisture, pH, Temperature) are used to sense the presence of pesticides in the fruits that are available from the market. Then the sensed values are send to the micro controller; Node MCU is used as the controller in our project. Once the controller gets this data, it is sent to Blynk App. A channel is created in Blynk App to which the controller updates the values through the module.

**Transmitter unit**




**Receiver unit**


Fig 1: Block diagram for proposed system

## 5. HUMIDITY SENSOR:

The HH10D is a humidity sensor module is comprised a capacitive type of humidity sensor, a CMOS is convert a capacitor to frequency and then EEPROM - used to hold the calibration factors. Due to the capacitor type humidity sensor, that system can be respond to humidity change rapidly. Each sensor can be calibrated twice at two different type of accurate humidity chambers and two same sensor related coefficients are stored into the EEPROM on the module. Humidity is presence in the water and air. The presence of water vapour also affect the

various physical process, chemical process, and biological processes.

Fig 2: Humidity sensor

Measuring of Humidity in industries is dangerous because of it may be affect the business cost of the product at the same time health and safety of the human personnel. Hence, it is especially in the control systems to the industrial technical processes and human being comfort zone. Controlling or monitoring the humidity is most importance in many industrial & domestic related applications. In semiconductor industries, humidity or moisture levels can be used to properly controlled & monitoring during the water processing. In medical applications, humidity control is required for respiratory system equipments, incubators, pharmaceutical processing, and biological related products. It is also necessary in chemical gas purification, hair dryers, film desiccation paper, textile production, and food processing. In farming related things, measure the humidity is necessary for plantation protection processes (dew prevention), soil moisture monitoring related processes, etc. This humidity sensor used a light for detection .The operation involves when an electric pulse is high voltage is applied to the ultrasonic transducer then it gets vibrates in a specific spectrum of frequency at the same time generate the burst of sound waves. If the object comes in the line of the sight sound reflects as echo and an electric pulse is produce.

## 6. MQ135

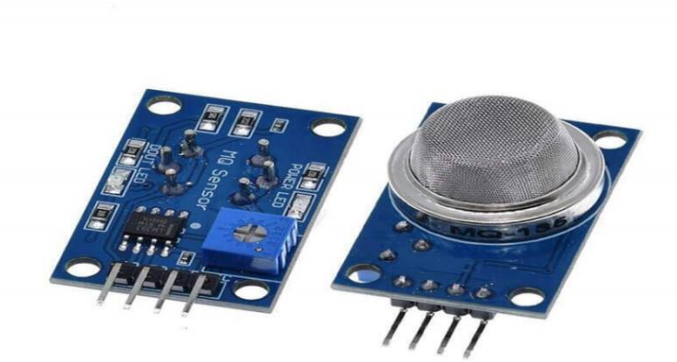



Fig 3:Gas sensor

The digital pin / the analog pin do this. The power module with 5V and we should be notice the power of LED on the module to glow and when no gas is present it detected the output LED will remain turned off that is digital output pin will be remains 0V. Remember that these sensors have to be kept on pre-heating time (mentioned in features above) before we can actually work with it. Now, introduce the sensor to the gas we want to detect the gas and we should see the output LED to go high along with the digital pin, if not use the potentiometer until the output gets high. Now at any time our sensor gets introduced the gas at this particular concentration then the digital pin will go to high (5V) otherwise will remain low (0V).

## 7. NodeMCU ESP8266

NodeMCU includes firmware which runs on the ESP8266 Wi-Fi SoC from Express if system and hardware, which is based on the ESP-12 module. The NodeMCU ESP8266 is develop the board equips the ESP-2E module containing ESP8266 chip having tensilica xtensa 32-bit LX106 RISC microcontroller. This microprocessor supports 80 to 160 MHz adjustable clock frequency and supports RTOS. There's also contain 128 KB RAM and 4MB of Flash memory to store data and programs.It is high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features used for IoT based project. It also supports the SPI, UART and I2C interface.

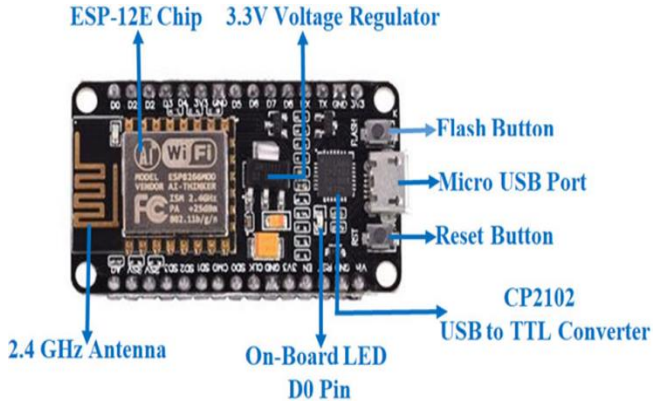



Fig 4: NodeMCU ESP8266

**Programming NodeMCU ESP8266 with Arduino IDE**

The NodeMCU Development Board is very easily programmed with Arduino IDE and it is easy to use. Programming NodeMCU with the Arduino IDE will take time in between 5-10 minutes. If you need this Arduino IDE, use a USB cable and NodeMCU board. We can check this Getting Started Tutorial for NodeMCU to prepare our Arduino IDE for NodeMCU.

**Uploading your first program**

Once Arduino IDE is installed on the desktop, connect the board to the computer using the USB cable. Now open the Arduino IDE and choose the correct board by selecting the steps wise methods of Tools>Boards>NodeMCU1.0 (ESP-12E Module), and choose the correct Port by selecting Tools>Port. Then we get it started with the NodeMCU board and built-in LED and the example code by the selecting of Files>Examples>Basics>Blink. Once code is filled into your IDE, click the 'upload' button gives in the top bar. Once the upload is finished, we should see the built-in LED of the board blinking or glowing.

## 8. EXPERIMENTAL SETUP

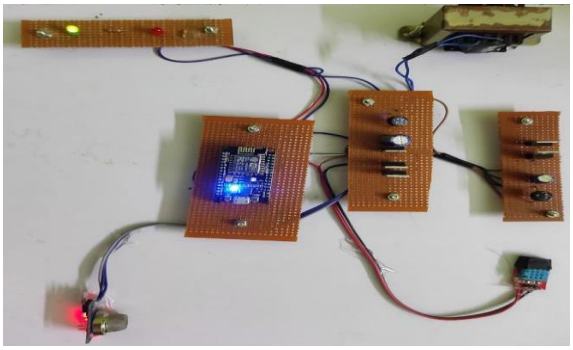


Fig 5: Transmitter section

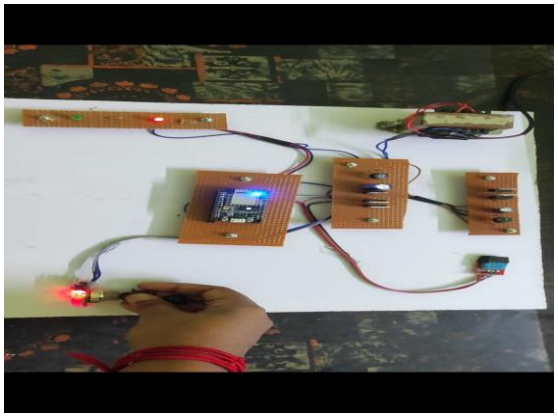


Fig 6:Receiver section

## 9. CONCLUSION

IOT technology can be monitoring the agricultural food products easier, automatic, effective. The establishment and application of agricultural products quality and safety system is based on IOT technology, will provide the whole process of tracking and detecting the food products and meet the public needs of high-quality and safe agricultural products. In recent years, IOT technology has been applied in different areas, but less adoption in monitoring quality and safety of agricultural products. Through review on the technology of IOT and the applications in monitoring agricultural products are quality and safety from production, processing circulation, sales of the whole supply chains, it shows that consumers can required agricultural products more informative for risk management and traceability, and producers can get high quality and yield products with low input through precision agriculture based on the IOT technology. The application of this pesticides detection devices has been performed on real samples.

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