International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 04 | Apr 2021 www.irjet.net p-ISSN: 2395-0072

Handy Device For Pesticide Detection

S.Shachinkguru[1],, D.Jayakumar[2],, P.Dominic[3],, S.Balaji[4],, Mrs.W.Nancy[5]

[1234]UG Student, Dept. of Electronics and Communication Engineering, JEPPIAAR Institute of Technology,Tamil Nadu, India

[5]Assistant Professor, Dept. of Electronics and Communication Engineering, JEPPIAAR Institute of Technology, Tamil Nadu, India

---

Abstract - *Population of the earth is soaring day by day but the resources are limited. To fulfill the need of food the farmers continuously strive to increase the production of crops not only by natural fertilizers but also with the help of artificial chemical fertilizers and pesticides. Chemical fertilizers, pesticides, and herbicides are used to protect the crops from any kind of harm caused by pests, insects and fungi. These may lead to the increase in production but in turn degrade the quality of food. Due to excessive use of fertilizers and pesticides these chemicals enter the food chain and ultimately cause biomagnifications. We are ingesting the same products and they adversely affect our health. Hence we need a portable device which can analyze the organic components of the eatable substance. This research focuses on determining the organic as well as inorganic components of the eatable so that the consumer may know whether the eatable is fit for consumption or not. This research comprises of an electronic device which would detect chemicals present with the help of infrared light. The device would show the ratio of organic components to inorganic components. The consumer can use this ratio as a benchmark to buy the eatables fit for consumption*

Key Words: IR Sensor, Humidity Sensor, Photodiode, Gas Sensor, NDVI

1.INTRODUCTION

India stands second in the production of vegetables and fruits after China with 13.4% of total world's production. Among the total population of 1.25 billions, approximately 110.7 million comes under the category of farmers. Also, India ranked fourth in the world in the production of agrochemicals and fertilizers. Survey conducted by various institutes indicates that 50-70% of vegetable and fruit production are contaminated with pesticide residues . The increasing population of India, results in higher demand for food, indeed decreases in land for farming. Hence to fulfill the demands of increasing population, food is adulterated to get more quantity in short period of time. Also, pesticides on crops are use by farmers above the legal residue limit that is defined by WHO. Fruits and vegetables are considered as main food commodity and highly nourishing component in the human consumption . We eat fruit and five vegetables daily, but are they really safe to eat? What about chemicals that farmers used to keep their crops free of charge from pests? Are these chemicals resided on the food we eat? The answer is YES, food generated is health hazardous and toxic to human health due to large use of pesticides. The most of the fruits and vegetables present in the markets are those which are either artificially grown or are infected with several chemicals used for pests. Such type of chemicals and artificial ripeners are like calcium carbide/ethephon and oxytocin respectively . Authentication and adulteration determination in fruit juices is the important research area. Over so many decades the industries are benefited due to large use of cheap chemicals and the adulteration chemicals over the honest ingredients on food . On the subject of the meaning of pesticides some people have contradictory facts. Dictionary define pesticides as any substances that are used to kill, prevent or repel any pest that interfere with the production, processing, storage or marketing of food, agricultural commodities, wood and wood products or unnecessary species of plants or animals causing harm during or otherwise and which may be administered to animals for the control of insects or other pests in or on their bodies. Although pesticides are highly effective on pests and have some benefits but they can reside in an eatable and cause danger to human health. The use of pesticides will increase in future if proper measures are not taken.

1.1 PROPOSED METHOD

In this system, we have Arduino UNO microcontroller which acts as brain of our system, hence, the entire system program is stored in it. Here in our concept the object (ie). Fruits or vegetables is passed with infrared rays with 960nm IR. The rays reflected from the object is received by the photodiode which is placed opposite to the IR sensor. The Arduino UNO gets the analog values from the photodiode and converts into voltage using a small calculation. All the calculations are programmed in Arduino using Arduino software. The difference between transmitted IR light by IR sensor and received by photodiode gives us the ratio of organic content to inorganic content of the subject. The final result is displayed using IOT.

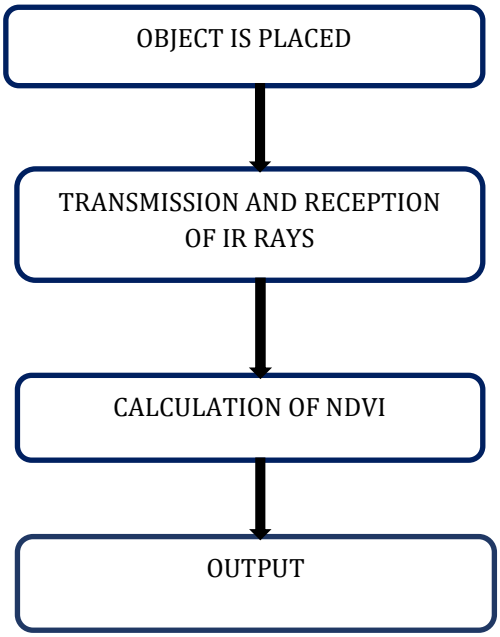


Fig 1: Flowchart for proposed system

1.2 BLOCK DIAGRAM

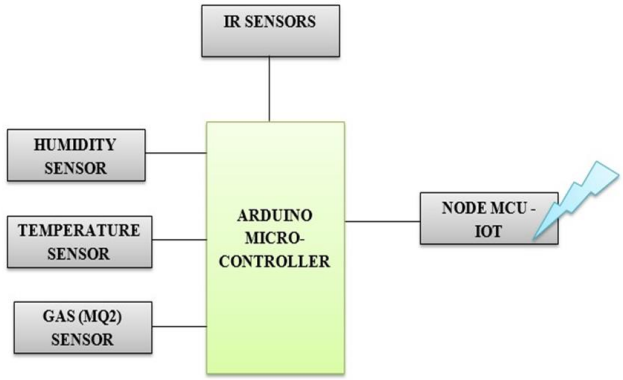


Fig 2: Block Diagram of the System

2. BLOCK DIAGRAM DESCRIPTION

Arduino Micro-controller: Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

Humidity Sensor: A humidity sensor is an electronic device that measures the humidity in its environment and converts its findings into a corresponding electrical signal. ... Relative humidity is calculated by comparing the live humidity reading at a given temperature to the maximum amount of humidity for air at the same temperature. Humidity sensors vary widely in size and functionality; some humidity sensors can be found in handheld devices (such as smartphones), while others are integrated into larger embedded systems (such as air quality monitoring systems). Humidity sensors are commonly used in the meteorology, medical, automobile, HVAC and manufacturing industries.

Temperature Sensor: A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors. Some temperature sensors require direct contact with the physical object that is being monitored (contact temperature sensors), while others indirectly measure the temperature of an object (non-contact temperature sensors).

Photodiode: A photodiode is a semiconductor p-n junction device that converts light into an electrical current. The current is generated when photons are absorbed in the photodiode. Photodiodes may contain optical filters, built-in lenses, and may have large or small surface areas. Photodiodes usually have a slower response time as their surface area increases. The common, traditional solar cell used to generate electric solar power is a large area photodiode.Photodiodes are similar to regular semiconductor diodes except that they may be either exposed (to detect vacuum UV or X-rays) or packaged with a window or optical fiber connection to allow light to reach the sensitive part of the device. Many diodes designed for use specially as a photodiode use a PIN junction rather than a p–n junction, to increase the speed of response. A photodiode is designed to operate in reverse bias.

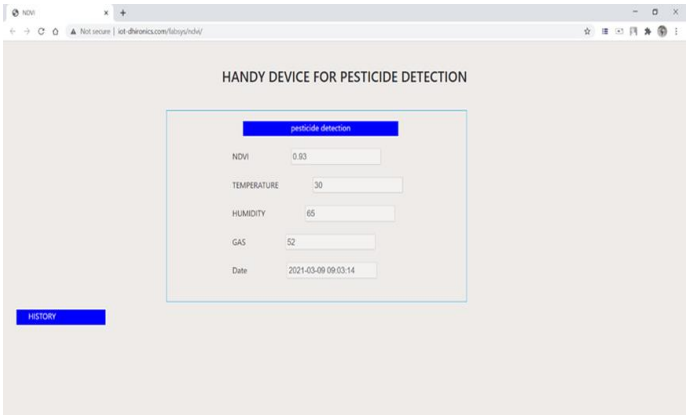
Gas Sensor: Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. ... This type of sensor employs a chemiresistor which comes in contact and reacts with target gasses. Gas sensors are employed in factories and manufacturing facilities to identify gas leaks, and to detect smoke and carbon monoxide in homes. Gas sensors vary widely in size (portable and fixed), range, and sensing ability. They are often part of a larger embedded system, such as hazmat and security systems, and they are normally connected to an audible alarm or interface. Because gas sensors are constantly interacting with air and other gasses, they have to be calibrated more often than many other types of sensors.

IR sensor: An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a

passive IR sensor. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

Node MCU: NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS.Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications (see related projects).

3. EXPERIMENTAL RESULTS



The result will appear as shown in above image in webpage using Node MCU which uses IOT.

4. CONCLUSION

In future we can increase number of IR sensors and take their average for more reliable NDVI calculation. Costly and better sensors can be used for less error and efficient calculation. Samples of eatables can be taken and few more parameters can be added to check the pesticides. Further advanced sensors can be used for detection of other harmful chemicals like weedicides, fungicides, etc.

REFERENCES

[1] Sarvesh Rustagi and Pravesh Kumar 2013 Biosensor and It's Application in Food Industry

[2] Vijay Kumar, Niraj Upadhay, A.B. Wasit, Simranjeet Singh and Parvinder Kaur, "Spectroscopic Methods for the Detection of Organophosphate Pesticides ," 2013 in Curr. World Environ., vol. 8, no. 2, pp. 313-318.

[3] M. Usman tahir, Salma Iqbal Naik, Salma Rehman and M. Shahzad, "A quantitative analysis for the toxic pesticide residues in marketed fruits and vegetables in lahore, pakistan," Dec. 2009 in Biomedica., vol. 25, pp. 171 – 174.

[4] A. J. Dhembare, "Bitter truth about fruit with reference to artificial ripener," 2013 in Archives of Applied Science Research, vol. 5, no. 5, pp. 45-54.

[5] Horiguchi,Takuro. "Drifting pesticide detection based on attenuated total reflection of infrared spectroscopy", 2011 in proceedings of IEEE SICE Anuual Conference

[6] Ramachandra TV, Kumar U. Geographic resources decision support system for land use, land cover dynamics analysis. In proceedings of the FOSS/GRASS users conference-Bangkok, Thailand 2004; 12-14.

[7] Xie Y, Zhao X, Li L, Wang H. Calculating NDVI for landsat7-etm data after atmospheric correction using 6s model: a case study in Zhangye City, China. In proceeding IEEE geoinformatics18th international conference on digital object identifier, 2010; 1-4.

[8] Gao, Bo. NDWI: A normalized difference water index for remote sensing of vegetation liquid water from space. Remote Sensing of Environment, 1996; 58, 257-266.

[9] Hu Y, Ban Y, Zhang X, Liu J, Zhuang D. Spatial-temporal pattern of GIMMS NDVI and its dynamics in Mongolian Plateau. In pProceeding IEEE International workshop on earth observation and remote sensing applications 2008; 1-6.

[10] Nageswara PPR, Shobha SV, Ramesh KS, Somashekhar RK.. Satellite-Based assessment of agricultural drought in Karnataka State. Journal of the Indian society of remote sensing 2005; 33 (3), 429-434.

[11] Bhandari, A. K., A. Kumar, and G. K. Singh. 2012 Feature extraction using Normalized Difference Vegetation Index (NDVI): a case study of Jabalpur city.in proceedings of Procidia Technology.

[12] Riczu, Péter, Attila Nagy, Éva Bozsik, Bernadett Gálya, Péter Ákos Mesterházi, and János Tamás 2013 Complex Vegetation Survey in a Fruit Plantation by Spectral Instruments in Journal of Agricultural informatics, vol no. 4, page no. 37-42

[13] Bhadekar, Rama "Developments in analytical methods for detection of pesticides in environmental samples." 2011 in American Journal of Analytical Chemistry.

[14] M. Tsukioka, H. Ishizawa, T. Takano, H. Yamada, K. Nakagawa, N. Tanaka, "Classification of Pesticide Residues in the Agricultural Products Based on Diffuse Reflectance IR Spectroscopy", 2007 in proceedings of SICE Annual Conference, pp.216-219

[15] T. Takano, H, Ishizawa, K. Honda, H, Yamada, "Detection Drift and Classifying Concentration of Pesticide on the Basis of Infrared Spectral Feature Analysis", 2009 in Journal of The Illuminating Engineering Institute of Japan,Vol. 93, page no.5, pp.267-272,.