International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 08 | Aug 2020 www.irjet.net p-ISSN: 2395-0072

National Conference on Recent Advancements in Communication, Electronics and Signal Processing-RACES'20
Organised by: Department of ECE, Velammal Engineering College, Chennai-66

# GREEN HOUSE MONITORING USING VIRTUAL AND AUGMENTED REALITY

**Dr.S.MaryJoans[1]**
*Prof & HOD-ECE, Velammal Engineering College, Chennai*

**Chandrakanth Pandiyen P[2]**
*Electronics and commn. Dept, Velammal Engineering College, Chennai*

**Akshay Kumar S[3]**
*Electronics and commn. Dept, Velammal Engineering College, Chennai*

**Venkatesh M[4]**
*Electronics and commn. Dept, Velammal Engg College, Chennai*

**Nirai Mozhi Celvan P[5]**
*Electronics and commn. Dept, Velammal Engg College, Chennai*

**Nikesh D[6]**
*Electronics and commn. Dept Velammal Engg College, Chennai*

---

**ABSTRACT:** An important objective of the project is to do automatic monitoring of quotidian parameters regularly using various sensors and controlling those parameters without visiting the greenhouse. Agriculture plays a major role in the development of the welfare of a country. Indoor farming has become a major crop growing method on large scale across different countries. A greenhouse is an effective and excellent way to implement indoor farming where different crops are grown in a closed environment. Automation and monitoring system can be implemented in the greenhouse, so that manual labor is avoided. Raspberry bi zero, a microcontroller, controls all the sensors. These sensors can be placed at the plant side to read moisture, humidity, temperature, pH, and Co2. All the sensor's data are then collected to a database. Here, a mobile application acts as an interface between the user and the greenhouse. This interface allows the user to navigate inside the greenhouse using augmented reality without any physical presence of the user. A mobile phone which is a user device here can be used to access the application for the interface. After accessing, user can then see the updated values of the sensor simultaneously monitoring the growth of the crops that are available. The location of the user doesn't matter here and can manage many greenhouses at a time. When a man learns to understand the control of his own behavior of crops, may be justified in believing that he has become civilized in a digitalized and smarter way.

**INDEX TERMS:**

Monitoring, agriculture, sensors, database, user, crops, raspberry pi zero, green house, navigation, augmentedreality.

## INTRODUCTION

Greenhouse or also called a hothouse which is a glasshouse in which different varieties of crop plants are grown with regulated climatic conditions. This greenhouse is equipped with certain screening installations like heating, cooling, and a user will be having a device in which he/she monitors the condition of the plant growth. Greenhouse gases like water vapor, carbon dioxide, methane, nitrous oxide play a vital role here. The interior of the greenhouse is exposed to sunlight and that becomes significantly warmer than the external temperature, protecting its contents in the cold weather. In this greenhouse, the growth of the crop plants is carried out in a closed environment alias isolated environment. The pressure, temperature, and various other factors including sunlight required for the cultivation are controlled and used in an effective way inside the setup of the greenhouse. This project is a setup of various sensors that uses to identify the whereabouts of the various factors that are to be controlled and measure pressure, humidity, and temperature inside the greenhouse and gives the entire data of those conditions of the crop to the user using an augmented reality app. Using this app, the user can control and monitor the status of his/her greenhouse.

This paper investigates the usefulness and gives the importance of using raspberry pi zero and it also leads to the development of a sophisticated future.

Without any human intervention, this concept revolutionizes the user requirements and experiences with the production methods, which will turn your life in a digital practical way.

Hence the sensor data in the greenhouse helps the user to plan an optimum time to carry out the harvesting and see that crop is ready with a value that has been generated is maximized.

It is a paradigm with a ubiquitous presence ofvarious things or objects via wireless communication and thus has a positive effect onefficiency.

**THE PROPOSED GREEN HOUSE SYSTEM:**

Recently, the developments in the field of the Raspberry pi zero technology have led to renewed interest in developing advanced greenhouse technology. Sometimes, plants may suffer from bad circumstances like temperature and light. The main objective of this paper is that the user can just have his mobile device in his hand without going to the field and can simultaneously take care of the crop plants, starting from their growth, requirements, etc. This is done merely in an automated way.

The system has numerous tools that utilize to obtain the desired design of the system:

**HARDWARE USED:**

**UV SENSOR:**

The ultraviolent sensor is placed around in different parts of the greenhouse. These sensors are placed at an equal distance between them which is 70ft apart. The rays emitting from these sensors act as a fence around the plants, any intervention to the plants caused by the menaces (rodents, rats, etc.) leads to a din produced by an ultrasonic generator which averts the plants without causing any considerable hazards. Moreover, a message of intervention will be straight away sent to the user on the detection of an intrusion.

**pH SENSOR:**

In general, a pH sensor measures the level of pH in plants. The pH value is a key factor for plant growth as it influences the availability of essential nutrients. A greenhouse usually consists of assorted types of plants with each having a distinct value of pH for their growth. Mostly a pH of 6.5 is optimal and most plants thrive in a range between 6.0 to 7.0. However, there are few plants that prefer more acidicpH and some go good with soil which is neutral to slightly alkaline. The data secured by these pH sensors are used to perceive the contemporary pH values of the plants. The fertilization of soil is then carried out based upon the sensor values of pH, in order to perpetuate the prescribed values of ph. The senor values will be tracked consistently to attain the desired pH value which assists better crop yield.

**SOIL MOISTURE SENSOR:**

The soil moisture sensor is used to maintain the dampness of the soil. The senor placed in the soil measures the dampness and provides the value, the watering is then carried out based on the sensor values which is done using a cylindrical measuring component, rain gauge. The rain gauge lays out an approximation for the level of watering to be instigated. The rain gauge calculates using the formula, **Average vol of water = Depth * radius * radius * 3.14**

**HUMIDITY, TEMPERATURE AND MOISTURE SENSOR:**

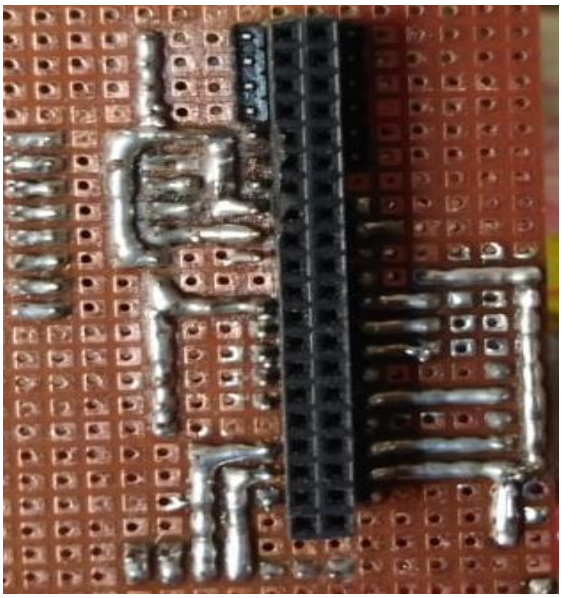
The general essential factors or parameters for plant growth are humidity, temperature, and moisture which differ for each plant based upon their nature. These sensors used to measure the value of these parameters from the plants, these data are then used to deliver the required results for the effective plant growth. The relation can be depictedas, **TEMPERATURE 1/MOISTURE**

**1/HUMIDITY**

The rise in temperature inside the greenhouse seeds to a drop in the moisture level. In order to balance the temperature difference, a fogger is used which involves streaming water inside a micron hole of 10^- 9, results in a fog that increases the moisture content in the greenhouse thereby resolving the imbalance in the temperature. Likewise, when the temperature level drops inside the greenhouse, the moisture content increases. The greenhouse is nowunlatchedto sunlight which decreases the moisture level thereby balancing temperature.

**CO2**:CO2 is an important factor to achieve the effecting yielding of crops. The CO2 sensor used gives the value of CO2 content in the plants. The sensor scrutinizes the values consistently and any degradation or fall from the optimal rate will set on the Co2 and O2 cylinders thereby maintaining the co2 level credibly.

National Conference on Recent Advancements in Communication, Electronics and Signal Processing-RACES'20
Organised by: Department of ECE, Velammal Engineering College, Chennai-66



**SOFTWARE DESIGN-**

The proposed system uses raspberry pi zero which Is a microcontroller, which is effective in numerous control issues, which may have a problem if managed the system by using direct methods. It ensures the **stability and robustness of the system.'**

**AUGMENTED REALITY:**

Augmented reality is a technology that superimposes a computer-generated image on the real world, where imaginary objects can view through a device such as smartphones, augmented reality glass, google lens, etc. These devices are the medium through which the user enters into the imaginary world. We track each object and design an augmented reality code which helps us to identify the individual and unique parameter readings which is uploaded and viewed through the database.

**Software:**

Unity, Vuforia along with c sharp is used to build the application which interacts with the user. Here the bridge between the user and real word is constructed using augmented reality. We use this augmented reality along with iota so that the user will be in the real world through this medium where he can travel to many worlds simultaneously so that he can monitor and control various parameters. These various parameters include such as temperature, humidity, relative humidity, co2, oxygen, soil moisture, pH, etc. In our case, we can monitor many greenhouses simultaneously sitting in a single place.

**BENEFITS:**

Using augmented reality, we can get rid of regular maintenance so that the efficient yield of the crop will be attained. Where without using augmented reality user will fell a little difficult to maintain each crop, thus augmented reality reduces the maintenance and make the project maintenance free. We make use of augmented reality code to identify each and every plant and this fetches the data from the database and provides us the report of the corresponding parameter readings. An application i9s build so that the user can install it in their smartphones.

Another use of this application which is build using augmented reality is that not only the traders and owner of the greenhouse but also the consumers or the customer who buys the yield from the greenhouse can also monitor the crops. By this, each customer gains the trust of buying the end product.

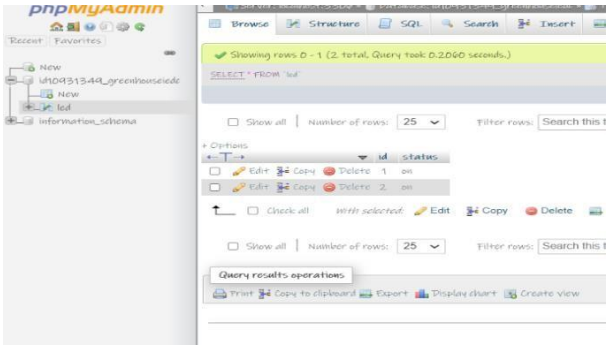
National Conference on Recent Advancements in Communication, Electronics and Signal Processing-RACES'20
Organised by: Department of ECE, Velammal Engineering College, Chennai-66

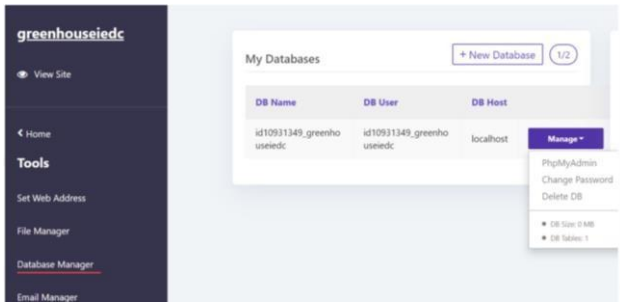
**Database Management in green house monitoring**

A structured set of data held in a computer especially one that is accessible in various ways is called a database. One of the most popular databases that are used is the SQL database. SQL is a Structured Query Language which is a computer language used for storing, manipulating, and retrieving data in a relational database. It allows users to access data in relational database management, to describe the data, to define the data and manipulate it in the database.

With the automation anywhere, use the Database Connect command to establish a connection to ACCESS DATABASE. In this database, it performs tasks such as updating data or retrieving data from it.

This Database plays a vital role in the Green House Monitoring System Using AR and VR because the user knows all the required data or info about the plant's conditions and that gets automatically updated to the database and that is very helpful for the user to retrieve it.




**Indoor Navigation system**

**INTRODUCTION**

The increasing demand for accurate and affordable indoor positioning has caused an increase in research to achieve it. The most widely used positioning system like GPS does not have reliable accuracy indoors. Indoor Navigation System using fingerprint compares the accuracy of the deterministic kNN algorithm and probabilistic Naïve Bayes algorithm for positioning.

A variant of the Dijkstra's shortest path algorithm is used to find nodes on the shortest path from a source node to a destination node on a server. The Positioning System developed determines the source node and the user provides the destination node as an input.

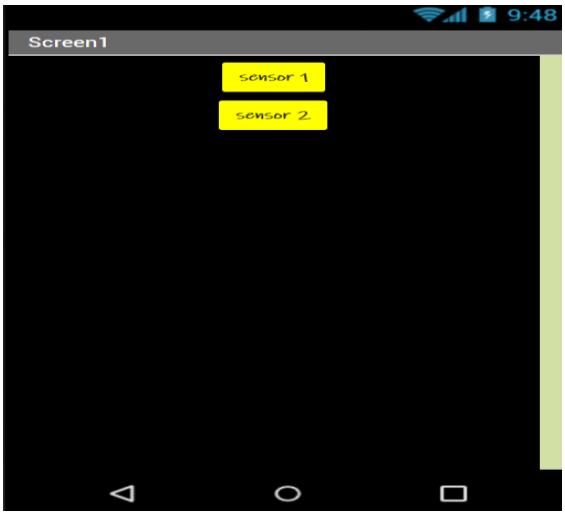
**SYSTEM DESIGN**

In this method, the greenhouse area is surveyed in order to build a radio map for indoor positioning. This radio map built is used to develop a pattern recognition model. The developed pattern recognition model is later reclaimed to appraise the position of target devices.

After the pattern recognition model is built, the target device sends the RSSI values it sees to a server that uses the trained classifier to predict the position of the target device.

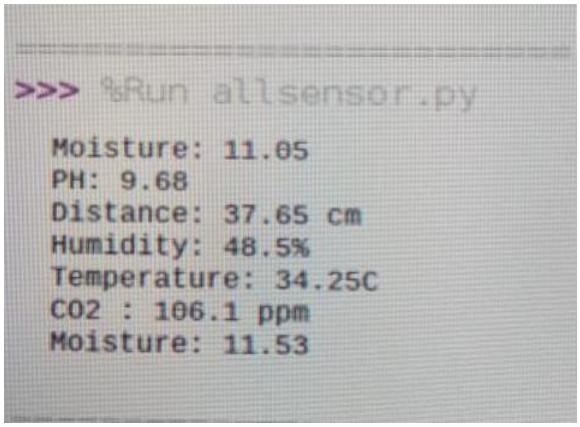
Now, the RSSI data is collected by using our very own RSSI data collection Android. This Android application induces spontaneous collection of RSSI data and prompts label of the current location from the data collecting personnel. It then forwards the RSSI data and labels to a data collection server running on the Raspberry Pi. The app not only sends the set of RSSI values of Wi-Fi signals it detected but also sends accurate information on the detection of RSSI values with the access points. The MAC address is used to recognize the wireless access points. Once the data for all the access points are collected, the server cut out and stores all the collected data in a NumPy compressed array format (.npz).

| Parameter | Reading |
|---|---|
| Moisture | 0 to 40 |
| pH | 9 |
| Distance | 0 to 2m |
| Humidity | 0 to 70% |
| Temperature | 34(vary acc to crops) |
| Co2 | 106.1ppm |




**RESULTS:**

After completing the prescribed works and make sure of the correct execution in acceptable time.




**Conclusions**:

After completing the implementation (hardware and software) of the greenhouse setup and thus resulting prototype has also numerous advantages. Raspberry pi zero provides features that may make the works of the peasant much easier by enable them to monitor their crop plants.

The main objective of this Greenhouse monitoring is to make it more innovative, user friendly, time saving and more efficient than the existing system.

Importance of organic crop growth lead to the idea of this project. It is very important to have such a system in order to grow crops of different requirements in a single closed environment in order to provide and cultivate crops with ease. The system here implemented has been tested and proved to be very helpful in monitoring multiple greenhouses thereby making indoor cultivation more flexible, reliable andefficient.

**References**

[1] P. P. Reddy, Sustainable Crop Protection Under Protected Cultivation: Springer, pp. 13-21, 2016.

[2] C. Wenshun, Y. Lizhe, C. Shuo, and S. Jiancheng,"Design and implementation of sunlight greenhouse service platform based on IOT and cloud computing," in Measurement, Information and Control (ICMIC), 2013 International Conference on, pp. 141-144,2013.

[3] T. N. Quynh, N. Le Manh, and K. N. Nguyen, "Multipath RPL protocols for greenhouse environment monitoring system based on Internetof Things," in Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), 2015 12th International Conference on, pp. 1-6,2015.

[4] J.-c. Zhao, J.-f. Zhang, Y. Feng, and J.-x. Guo, "The study and application of the IOT technology in agriculture," in Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference on, pp. 462-465, 2010.

[5] D. Robotics, "DHT11 Humidity &Temperature Sensor," ed,2010.

[6] T. Dean, J. Bell, and A. Baty, "Soil moisture measurement by an improved capacitance technique, Part I. Sensor design and performance," Journal of Hydrology, vol. 93, pp. 67-78, 1987.

[7] National Laboratory for Scientific Computation, Av. Getulio Vargas, 333 - Quitandinha-Petropolis-RJ Brazil

[8] K. Ahlers and A. Kramer. Distributed augmented reality for collaborative design applications. European Computer Industry Research Centre, 3-14, 1995.

[9] L. Jiang, "A WLAN Fingerprinting Based Indoor Localization Technique," Lincoln, USA,2012.

[10] S. He and S.-H. G. Chan, "Wi-Fi Fingerprint- based Indoor Positioning: Recent Advances and Comparisons," IEEE Communications Surveys & Tutorials, vol. 18, no. 1, pp. 466 - 490, 2015.