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Smart Agriculture Using IoT

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Abstract- The biggest problem faced during production of crops, leading to wastage or below par production is non-timely watering in the field or inaccurate amount of water being poured in the field. Due to the human tendency, either more or less amount of water is allowed to enter the field thereby destroying the crop. This marks the first major problem. Also, water-level in the water source sometimes goes less or sometimes get over-drained. Thus, information about scarcity or abundance of water in the reservoir is the second major problem. Many times, the farmer is far away from the field and is therefore unable to get the current status of the field. Hence his periodic visit is must on the field to take care of the water requirement and other production related issues. Thus, automatic control over such parameters would reduce the burden of any individual. With this system, the current problems related to farming are solved and practically implemented solutions are provided. Using Internet of Things (IoT) a whole new concept of farming using networks is introduced reducing labor updating farmer about the live conditions of farm on the mobile devices and providing records of their farm on cloud. It makes the process handy with the click a button reformation.

Keyword–Internet of Things, Android Application, Web Application, Adriano Uno

I. INTRODUCTION

India is the land of villages. This being said the major occupation of majority of villages in India is agriculture. Near about 70% people are dependent upon agriculture. Agriculture has been the backbone of the India and Indian economy and it will continue to remain so for a long time. The majority of the agricultural operations being followed by Indian farmers are obsolete and still farmers continue to use the obsolete methods which drastically affect their final agriculture produce. With the mechanized farm equipments coming into farming sector, the condition of Indian agriculture is slightly improved. However, the process has still labour intensive and the farmer has to go to the field to carry out majority of the tasks. This motivates us to develop a smart solution to reduce the burden on farmers. This system proposes the concept of Smart automated agriculture system using internet of things. This eliminates the use of obsolete methods and automates the agricultural tasks reducing the burden on farmers.

II.LITERATURE REVIEW

Before starting with the system, a brief study was made on the currently existing systems in this domain.

K. Rangan et al., in [1] have discussed An Embedded Systems method to Monitor Green House. They used an embedded system approach to monitor and control the greenhouse parameters. They used measuring humidity, temperature, pH of the water, soil wetness and light intensity sensors.

Wei Ai et al., in [2] have proposed Green House Environment Monitor Technology Implementation Based on Android Mobile application. They have implemented a technology in whichmobile phone is monitoring terminal, monitoring greenhouse environment explained. In this system they used two sensors-temperature and humidity sensors. Sensors are cable type. GPRS is used to send messages.

Akshay et al., in [3] have proposed Wireless sensing and control for precision Greenhouse management.In this system they used a CPU for monitoring and a ZigBee with PIC microcontroller to establish a wireless communication between two distant locations. The range of the ZigBee is limited. Their main purpose is to monitor and control only the temperature and humidity.

M.K. Gayatri et al., in [4] have discussed Providing Smart Agricultural Solutions to Farmers for better yielding using IOT. The issues related to the farmers are hampering the cause of our evolution. One of the solutions for these problems is to help farmers using modernization techniques. This paper explains the advantages of the major characteristics of emerging technologies such as IOT and web service.

Viswanathnaik et al., in [5] have presented IOT based greenhouse monitoring system. The monitoring of the parameters of greenhouse such as temperature and soil moisture through IOT is explained. Irrespective of our place where we are, we can control the parameters.

Apart from these research papers the existing technology was studied which is documented below.

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MANUAL SET-UP: This set-up containes the visual inspection of the plant growth, manual irrigation of plants, turning ON and OFF the temperature controllers, manual spraying of the fertilizers and pesticides. It is time consuming, vulnerable to human error and hence less accurate and unreliable.

PARTIALLY AUTOMATED SET-UP: This set-up is a combination of manual supervision and partial automation and is similar to manual set-up in most respects but it reduces the labour involved in terms of irrigating the set-up.

FULLY- AUTOMATED: This set-up which is well equipped to react to most of the climatic changes occurring. It works on a feedback system which helps it to respond to the external stimulation efficiently. Although this approach overcomes the problems caused due to human errors it is not completely automated and expensive.

III. IMPLIMENTATION

1. The IOT Agricultural Station: The smart IOT based system is developed which consists of different sensors interfaced to arduino which will continuously read the different parameters from the farm and send it to the cloud. The different sensors present in the system are:

- Soil moisture sensor to read the content of soil moisture in the farm.
- The temperature sensor to read the temperature in the farm.
- The humidity sensor to read atmospheric humidity.
- The Intruder sensor to sense the animals or any intruders entering the farm.

The Data read from all these sensors is sent to the remotely hosted server on cloud which will be sent to the farmer's android and web application where it can be visualized. The IOT agricultural station also consists of Relays to control Irrigation and other parameters in the field which can be controlled by farmers directly from the android application as well as web application.

2. The Android Application and Web Application: The Android application as well as the web application is developed in this system where the farmer can monitor the real time data in the field. The data read from the sensor nodes is pushed to the server which shares it with the android application as well as web application. The farmer can login and easily view the real time data in the farm from anywhere in the world over internet. The Application also has provision to control output parameters such as irrigation from anywhere in the world over internet. Buttons are provided which farmer can trigger to control irrigation.

3. SMS notification system: The system also includes the SMS notification system which will send the SMS notification to the farmer using the GSM modem interfaced regarding the intruder status and other status if required.

4. Agricultural Automation System: This is an innovative system where the farmer need not control the parameters such as irrigation automatically. We will develop a Threshold setting system where farmer can set threshold for different output parameters based on the sensor readings. For example, the farmer sets the threshold of 30% moisture for irrigation; the system stores the threshold in the database and communicates with the IOT system. When the sensor value of moisture reaches 30% the irrigation system is automatically triggered. This helps farmer to automate agricultural tasks which ultimately reduces the burden on him.

IV. ARCHITECTURE DIAGRAM

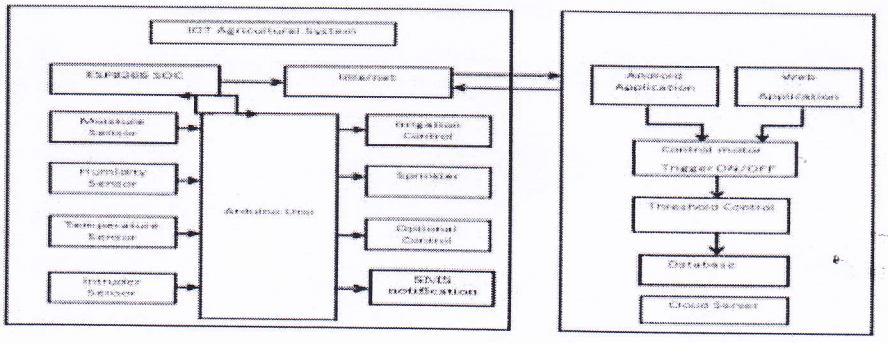

Figure 1. Architecture Diagram

As shown in above Architecture diagram, the data read from the sensors is fed to Arduino Uno. Arduino Uno connected to ESP8266 SOC which is responsible for connecting system to internet. All the data send to the cloud server through internet from there user can view the data. These data are monitored by web or android application. User can control the motor status and also can automate the irrigation supply by setting threshold. If any intruder found SMS will be sent to user.

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V. REQUIREMENTS

- Arduino Uno R3- The Arduino Uno R3 is a microcontroller board based on a removable, ATmega328 AVR microcontroller. The R3 is the third, and latest, version of the Arduino Uno.

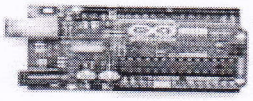

Figure 2. Arduino Uno R3

- Node MCU-It is an open source IOT platform. The ESP8266 is a micro controller designed by Espress if Systems.ESP8266 itself is self-contained WI-FI network. It acts as bridge between micro controller and WIFI.

Figure 3. NodeMCU ESP8266

- DHT11 Humidity and temperature sensor-This comes with calibrated digital signal output. This comes with NTC temperature measurement component and resistive type humidity measurement component.

Figure 4. DHT11 Sensor

- Soil moisture sensor-This sensor is used to test moisture level in soil.This comes with triple output mode digital output is simple output, analog output is more accurate and serial output is exact same reading.

Figure 5. Soil Moisture Sensor

- PIR Sensor-PIR sensors allow to sense motion, almost always used to detect whether a human has moved in or out of the sensors range.

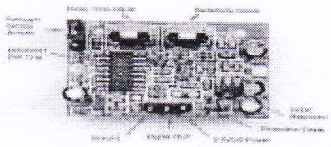

Figure 6. PIR Sensor

- Relay board-Relays are called electromechanical switches. They have very high current rating and both AC motors and DC motors can be controlled through them. Because the motors are completely external part of the complete system.

Figure 7. Four Channel Relay

- GSM Module-GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone.

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Figure 8. SIM800L GSM Module

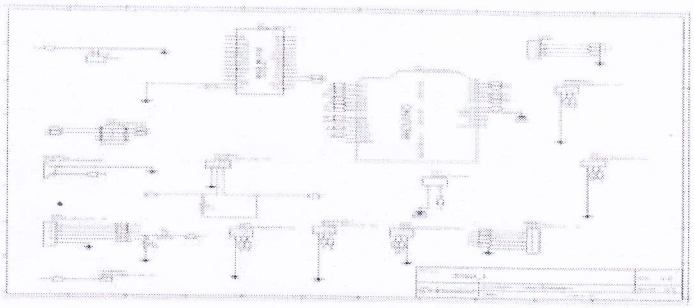

Figure 9. Schematic Diagram

VI.PSEUDO CODE

```
Function setup()
{
Start Serial communication
Communicate with WIFi chip
Connect to Internet
Set all sensors as input
Set relay as output
Set LCD as output
Initialize the system
Register GSM for network
End
}
Function loop()
{
Read data from sensors
Upload it to server
IF (JSON received):
Control outputs
IF (Threshold active):
IF (Sensor Data >threshold):
Trigger Control
IF (intruder found):
    Send SMS notification
```

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}

End

VI.SCREEN IMAGES

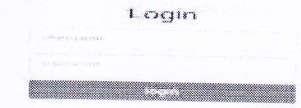

Figure 10. Login Page

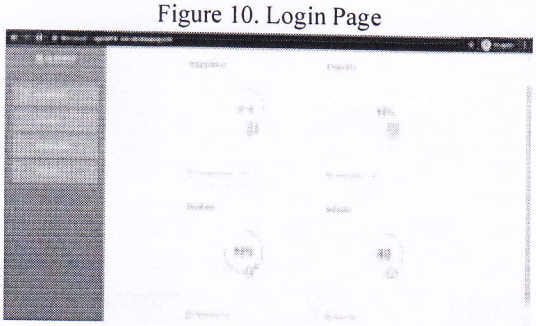

Figure 11. Live Data Page

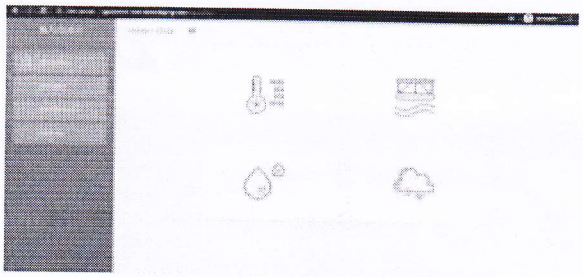

Figure 12. History Data Page

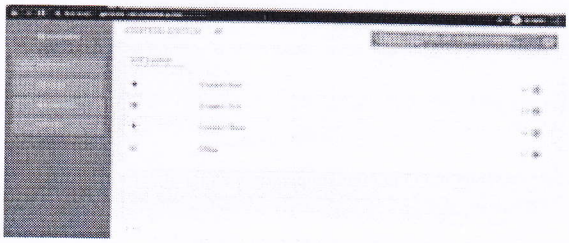

Figure 13. Control Page

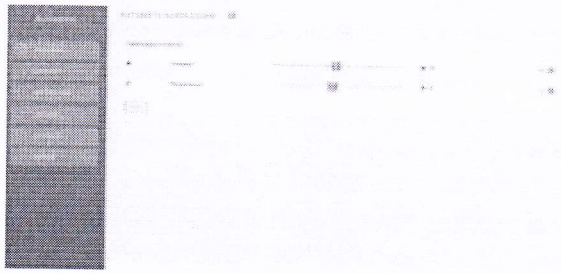

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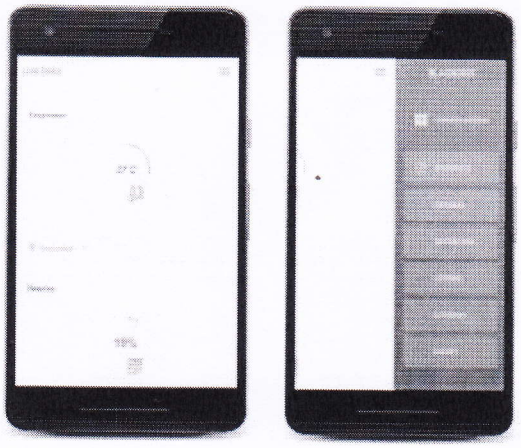
Figure 14. Automate Page

Android Application Layout:



VII.CONCLUSION AND FUTURE WORK

The proposed system deals with the development of automated agricultural system using IOT and android. From the developed system we can conclude that the proposed system will help framers to control majority of the agricultural operations remotely from anywhere in the world using Internet of things and android. The android application developed will help farmer visualize all the data from the farm easily and then can take necessary actions on the basis of the data. The developed system will also help the farmer to detect the intruder in the fields and alert him in the IOT panel. The system is made more advances by implementing automatic threshold system. This will help the farmers to automate some tasks in the field by setting the thresholds for sensor data. If the data crosses the threshold the particular parameter in the farm will be triggered automatically and on normalization it will be turned off automatically. Thus, this project provides farmers with a technology assisted agriculture system which will definitely increase their agriculture produce.

The implemented project has wide scope for further modification. The proposed project can be implemented with robotics to helps farmer carry out physical tasks in the field as well using internet of things.

VIII.REFERENCES

[1] K. Rangan et al. "An Embedded Systems Approach to Monitor Green-House", Recent Advances in Space Technology Services and Climate Change (RSTSCC), 2010.

[2] Wei Ai et al., "Green House Environment Monitor Technology Implementation Based on Android Mobile Platform", Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC), 2011 2nd International Conference on, August 2011.

[3] C. Akshay et al., "Wireless Sensing and Control for Precision Green House Management", Sensing Technology (ICST), 2012 Sixth International Conference, December 2010.

[4] Gayatri et al., "Providing Smart Agricultural Solutions to Farmers for better yielding using IOT",Technological Innovation in ICT for Agriculture and Rural Development (TIAR), 2015 IEEE, July 2015.

[5] Vishwanath Naik et al. "IOT Based Green-House Monitoring System", International Journal of Electronics and Communication Engineering & Technology (IJECET), June 2015.

[6] G. Sandhi et al. "Visually Guided Operation in Green-House", Intelligent Robots and Systems '90. 'Towards a New Frontier of Applications', Proceedings. IROS '90. IEEE International Workshop on, July 1990.

[7] Aji Hanggoro et al., "Green House Controlling and Monitoring Using Android Mobile Application", QiR (Quality in Research), 2013 International Conference, June 2013.

[8] P. S. Asolkaret al., "An Effective Method of Controlling the Greenhouse and Crop Monitoring Using GSM", Computing Communication Control and Automation (ICCUBEA), 2015 International Conference, February 2015.

[9] Thenmozhiet al., "Green House Management Using Embedded System and ZigBee Technology", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, February 2014.