IOT BASED AGRICULTURE MONITORING, CONTROLLING SYSTEM AND PREVENTION OF WILD ANIMALS ENTERING INTO THE AGRICULTURAL FIELDS

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Abstract: Climate changes, rainfall and animals such as elephant entering the farm land and damaging the crop fields has been erratic over the past decade. Due to this in recent era, climate-smart methods called as smart agriculture is adopted by many Indian farmers. Smart agriculture is an automated and directed information technology implemented with the IOT (Internet of Things). IOT is developing rapidly and widely applied in all wireless environments. In this paper, sensor technology and wireless networks integration of IOT technology has been studied and reviewed based on the actual situation of agricultural system. A combined approach with internet and wireless communications, Remote Monitoring and controlling System (RMCS) is proposed. Major objective is to collect real time data of agriculture production environment in the agriculture land and animal monitoring that provides easy access for agricultural facilities such as alerts through Short Messaging Service (SMS), E-Mail Alert and advices on weather pattern, crops etc

Keywords: Smart agriculture, Soil moisture sensor, IOT, Cloud networking, Wi-Fi networking, Animal monitoring

I. INTRODUCTION

As the world is trending towards new technologies and implementations it is a necessary goal to trend up in agriculture too. Many researches are done in the field of agriculture and most of them signify the use of wireless sensor network that collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity . Hence, automation must be implemented in agriculture to overcome these problems. In order to provide solution to such problems, it i necessary to develop an integrated system which wills improve productivity in every stage. But, complete automation in agriculture is not achieved due to various issues. Though it is implemented in the research level, it is not given to the farmers as a product to get benefitted from the resources. Hence, this paper deals about developing smart agriculture using IoT and given to the farmers.

II. LITERATURE SURVEY

The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers they themselves verify all the parameters and calculate the readings.

[1] **Smart Precision Based Agriculture Using Sensors**

It focuses on developing devices and tools to manage, display and alert the users using the advantages of a wireless sensor network system.

[2] **IoT Based Smart Agriculture**

It aims at making agriculture smart using automation and IoT technologies. The highlighting features are smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, human detection and keeping vigilance.

[3] **Providing Smart Agriculture Solutions to Farmers for Better Yielding Using IoT**

The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates.

[4] **Smart Farming System Using Sensors for Agricultural Task Automation**

This idea proposes a novel methodology for smart farming by linking a smart sensingsystem and smart irrigator system through wireless communication technology.

[5] **Design and Development of Precision Agriculture System Using Wireless Sensor Network**

It proposes a low cost and efficientwireless sensor network technique to acquire the soil moisture and temperature from various location of farm and as per the need of crop controller to take the decision whether the irrigation is enabled or not.

[6] **Automated Irrigation System Using a Wireless Sensor Network and GPRS Module**

It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural crops. In addition, a gateway unit handles sensor information.

[7] **Real- Time Automation and Monitoring System for Modernized Agriculture**

The atmospheric conditions are monitored and controlled online by using Ethernet IEEE 802.3.The partial root zone drying process can be implemented to a maximum extent.

[8]It is designed for IoT based monitoring system to analyze crop environment and the method to improve the efficiency of decision making by analyzing harvest statistics.

[9] **Agricultural Protection System Based on IoT**

In this paper image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. The variations are seen in color, texture and morphology.

[10] **A Hybrid Wired/Wireless Networking Infrastructure for Greenhouse Management**

In this paper, greenhouse is a building in which plants are grown in closed environment. It is used to maintain the optimal conditions of the environment, greenhouse management and data acquisition

III.EXISTING SYSTEM

Traditionally, Agricultural lands are monitoring by the formers directly.

- In Existing System was related to wireless sensor network, researchers measured soil related parameters such as temperature and humidity.
- Sensors were placed below the soil which communicates with relay nodes by the use of effective communication protocol providing very low duty cycle and hence increasing the life time of soil monitoring system.
- The system was developed using microcontroller, universal asynchronous receiver transmitter (UART) interface and sensors while the transmission was done by hourly sampling and buffering the data, transmit it and then checking the status messages.

Disadvantages:

- The drawbacks of the system were its cost and deployment of sensor under the soil which causes attenuation of radio frequency (RF) signals
- If the formers having more than one land, they have to appoint the person to monitor the land parameters and to protect the animals.

IV.PROPOSED SYSTEM

- A sensor node is installed in every Agricultural Lands.
- It senses moisture and temperature of the field falls below the brink.
- In Agricultural Lands, The wild animal's detection can also be automated in addition to irrigation.
- When animals enters in to the land, the PIR will detect and Alarm will be produced and repel the animal.
- The notifications are sent to farmers' mobile periodically and updated in IoT Cloud. The farmers' can able to monitor the field conditions from anywhere. This system will be more useful in areas where water is in scarce.
- When the land is Dry, formers can monitor and control the pump by switching on and off by using IoT Cloud.
- This system is more efficient than the conventional approach.

ADVANTAGE

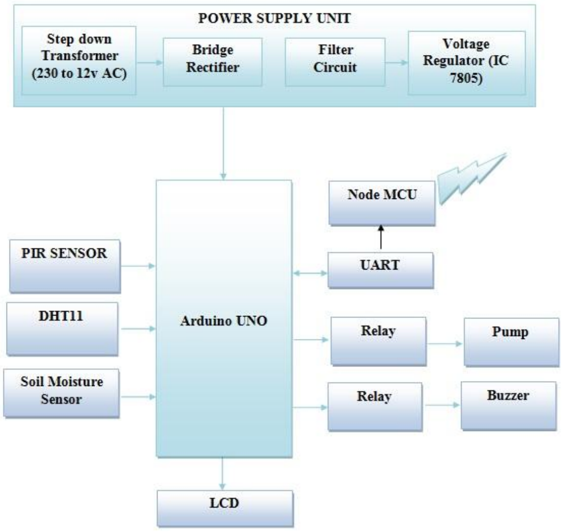
- Formers no need to wait and watch to protect the animals to enter into their agricultural lands.
- Since most of the monitoring and controlling is done remotely, it will help the farmer to gain information which is crucial for the business during his/her spare time

IOT CLOUD

Cloud offers a platform for developers that enable them to easily capture sensor data and turn it into useful information. Cloud platform is used to send data to the cloud from any Internet-enabled device. We can then configure actions and alerts based on our real-time data and unlock the value of our data through visual tools. Cloud offers a REST API that allows you to read and write data to the resources available: data sources, variables, values, events and insights. The API supports both HTTP and HTTPS and an API Key is required. The variables are created and unique variable ids are assigned to it. The values are plotted in a graph with the date and time in X axis and the values in the y-axis. All the values are displayed to the user with the corresponding date and time and hence the values can be viewed at any time by the user. The threshold values can be set on the Cloud platform an email or sms or call can be sent to the user when the threshold levels are met. Hence Cloud is an Inter of Things platform which helps in monitoring all the parameters and displays the values to the user. A threshold values are also set to take corrective actions. The API key which is generated in Cloud should be added in the Arduino code to connect to the cloud. An APIkeyisthe "Master Key"; a unique and immutable key that is used only to generate our account's tokens. A token is a temporary and revocable key which is to be used in our API request. It gets created ones an account is created in Cloud. Tokens created in our account profile will never expire

V. SYSTEM BLOCK DIAGRAM

Smart agriculture also known as precision agriculture allows farmers to maximize yields using minimal resources such as water, fertilizer and seeds. By deploying sensors and mapping fields farmers can begin to understand their crops at a microscale, conserve resources and reduce impact in the environment. Advances in sensor technology have also proven beneficial to the agricultural industry through its application for infield soil analysis.



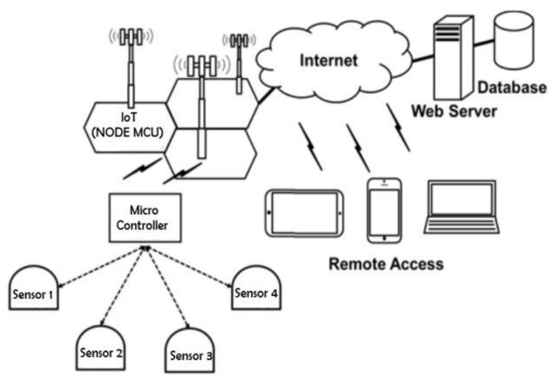


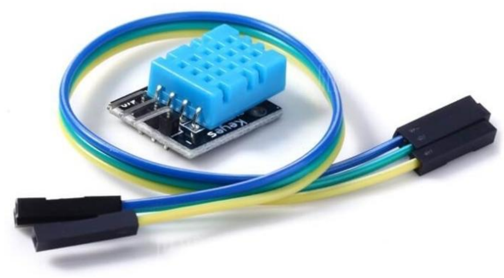
Figure 1: Configuration of the Agriculture monitoring system. Based on microcontroller, IoT, and Sensors.

VI. IMPLEMENTATION

6.1. SENSORS DATA ACQUISITION

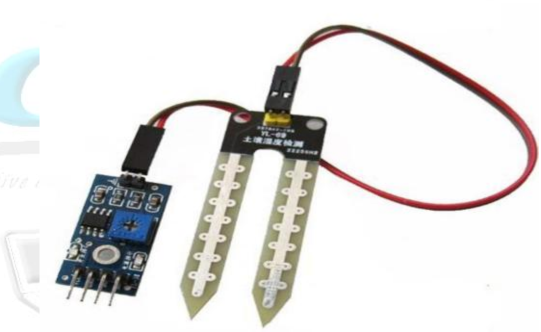
There sensors used are already discussed. Let discuss about data acquisition from sensors one by one. The sensor is interfaced with Arduino microcontroller and programmed. Once it is programmed it is placed inside a box and kept in the field. An IR is an electronic **sensor** that measures infrared light radiating from objects in its field of view which is to be monitor the animal motion in the agricultural land.

6.2. DHT SENSOR:



The DHT11 temperature and Humidity sensor is used. The total amount of water vapor in air is defined as a measure of humidity.. Relative humidity is calculated because when there is a change in temperature, relative humidity also changed. The temperature and humidity changes occur before and after irrigation. The amount of water droplets in air is increased after irrigation. This causes decrease in temperature which in turn increases the relative humidity of the surroundings. The temperature and humidity reading are often notified to the user so that the user can be able to know the field conditions from anywhere. The temperature and humidity sensor can also be used in green houses.

5.3 SOIL MOISTURE SENSOR



1. This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, else the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

6.3.1Features

- Sensitivity adjustable.
- Has fixed bolt hole, convenient installation.
- Threshold level can be configured.
- Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

6.3.2Applications

- Agriculture
- Landscape irrigation

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6.4. PIR SENSOR

B0061 is a pyroelectric sensor module,developed for Human/Animal body detection. A PIR detector combined with a fresnel lens are mounted on a compact size PCB together with an analog IC (SB0061) and limited components to form the module. High level output (3.3V) of pre-settable variable width (5Secs -18 Minutes) is provided.

Circuit diagram of the PIR Motion Sensor Light and Switch based on SB0061 shown here can be used for security or corridor lighting in power saving mode. The 12V DC supply required for the whole circuit can be fed from any standard 12V ac mains adaptor/battery.

Working of the circuit is simple and straight forward. When any movement is detected within near 5-6 metres, around 3.3 Volt is appeared at the base of Transistor T1 and it conducts to fire the next relay driver transistor T2. As a result, the 12V DPDT relay is energised to power the White LED through current limiting resistor R3. Spare relay contacts can be used as a switch to control any suitable external load. The white LED and the relay remains ON for a duration based on the mono time setting in SB0061, ie from 5 Secs to 18 Minutes.

6.5 NODE MCU

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It 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

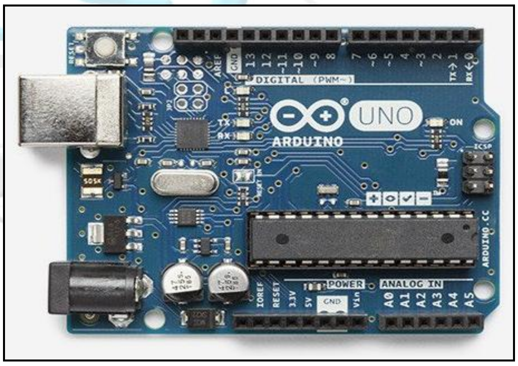
The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

The chip first came to the attention of western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.

The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.

The successor to these microcontroller chips is the ESP32.

6.6. ARDUINO UNO:



Arduino/Genuine Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

6.7. ARDUINO IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Writing Sketches : Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

NB: Versions of the Arduino Software (IDE) prior to 1.0 saved sketches with the extension .pde. It is possible to open these files with version 1.0, you will be prompted to save the sketch with the .ino extension on save.

Verify: Checks your code for errors compiling it.

Upload : Compiles your code and uploads it to the configured board. See uploading below for details.

Note: If you are using an external programmer with your board, you can hold down the "shift" key on your computer when using this icon. The text will change to "Upload using Programmer"

6.8 APPLICATIONS:

Our idea not only tries to mitigate the primitive techniques related to agriculture but also serve the community by opening new avenues for employment. The applications are extensive with easy implementation.

The foremost function of our project is to monitor the land temperature and humidity using digital means. This will provide the accurate values of various parameters upon which the growth depends. Besides this, it will help the farmer to monitor more than one agricultural land at the same time.

We plan to make it user-friendly by involving a simple web portal along with mobile messaging. Since monitoring through our system requires less manpower, people with physical disabilities can be employed for the monitoring of fields.

Overall, our project idea is feasible, which can easily be implemented and has a wide scope in terms of its application.

VII. CONCLUSION

The sensors are successfully interfaced with raspberry pi and wireless communication is achieved. All observations and experimental tests prove that this project is a complete solution to the field activities irrigation problems. Implementation of such a system in the field can definitely help to improve the yield of the crops and aids to manage the water resources effectively reducing the wastage

Future Work: Our project can be improvised by using a sensor to note the soil ph value such that usage of unnecessary Fertilizers can be reduced. A water meter can be installed to estimate the amount of water used for irrigation and thus giving a cost estimation. Further, it also reduces the investment of farmers.

VIII. REFERENCES

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