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IOT BASED SMART PRECISION AGRICULTURE IN RURAL AREAS

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Abstract - The purpose of this project is to give the farmer a complete irrigation system using the Internet of Things. It may be a challenge to shape a value-efficient automatic irrigation system to scale the waste from backwater. It is important to provide different criteria in order to decide the successful amount of water for plants. The suggested scheme consists of different kinds of sensors with low cost and low power consumption. For example- soil moisture sensor, temperature sensor. The Raspberry Pi is built with sensors to control the opening of the irrigation valve. The phone is used for remote control. Both sensors communicate with The Raspberry Pi. To produce the animal sound and intimate the designated individual using a buzzer and connect with Lora, the sound module is used. The PIR sensor is used for human recognition. Using Lora touch the soil moisture sensor is used to measure the soil moisture level and thus the LCD level view. Additionally, the moisture level value is submitted to the mobile entity accessing the web page.
Keywords - LORA, PIR sensor, Arduino, Soil moisture sensor.

1. INTRODUCTION

Around 97 % of Earth's freshwater are saltwater stored by lakes and waterways, while only the 3 % remaining is fresh water. In the shape of glaciers and polar ice caps, around two-thirds of the volume of water is frozen. Just 0.5 % of the unfrozen groundwater, while the remainder resides underground, is above the earth or in the air. In brief, mankind depends on this 0.5 % to meet all its needs and preserve the world, while adequate fresh water must be maintained in rivers, dams, and other related reservoirs to support it. The condition in India is that it ranks second in farm output with 64 % of monsoon-based cultivated fields.

In India, 55-75% of water use is accounted for by irrigation. Nearly 60 % of the important irrigation water is lost. (Required reference for a bold point or delete the percentage otherwise). The development of an automatic agricultural monitoring system has acquired considerable significance in recent years due to its ability to increase yields and to decrease water consumption.

Precision agriculture has made it possible to improve production from the diminishing farmlands that will in the future be able to feed India's billion-plus population. Precision farming is nothing more than a farming method that makes use of information technologies to ensure that crops and soil obtain just what they need for optimal health and productivity. This method accesses real-time data on the conditions of the soil water quality, the temperature of the atmosphere, and other related details. It's not an easy task to correctly predict crop water demand, involving variables such as crop type, irrigation system, soil type, temperature, crop needs, and soil moisture retention. Considering this aspect, using the wireless sensors, precise soil, and air moisture management system not only allows optimum use of water but also contributes to better crop health. It is expected that the present situation in irrigation practices will be altered by introducing new IoT technology. The use of IoT-based methods, such as the crop water stress index, is expected to increase crop production dramatically. The app uses the data to advise farmers on irrigation, time to harvest, soil health, and market cost for crops. Since wireless drip irrigation control needs relatively little data sharing, either of these forms of the network can be required. Among them, Lora is a comparatively modern technology with the LoRaWAN protocol running on top of it. Currently, the LoRa modem was selected as a radio connexion; there is a lot of growth in LPWAN networks.

2. LITERATURE REVIEW

A. Internet of Things (IOT) for Precision Agriculture-Manish Kumar Dholu, Mrs. K. A. Ghodinde, (2016)

With the number of gadgets attached to it, the Internet is witnessing a very volatile creation nowadays. We used to only have personal computers and cell phones connecting to the internet but now we have the internet of things, i.e. IoT idea of linking items to the internet linking millions of users to it. This IoT implementation leads to the idea of a machine-to-machine connexion that means that two machines can connect to each other and that any previously available data on a private server can now be viewed on the internet so that the user can access it remotely.

B. A Model for Smart irrigation Using IoT - PrDweepayan Mishra, Arzeena Khan, Rajeev Tiwari, ShuchiUpadhay of. K. A. Patil, Prof. N. R. Kale, (2016)

Most of the drainage is performed using conventional stream flow techniques from one end to the other. Such supply will leave the file with various quantities of moisture. Control of water networks can be improved by using a designed watering device configuration connected to the cloud platform and data collection.

C. IoT based low-cost smart irrigation system- Deweyan Mishra, Arzeena Khan, Rajeev Tiwari, Shuchi Upadhay, (2018)

The Moisture and Temperature Sensor detects both the quality of water vapour and the temperature around the farm. The Soil Moisture Sensor senses the soil moisture of a plant, if the water content is below the minimum requirement then water is supplied by a water supply relay and the Ultrasonic Sensor checks the water.

3. EXISTING MODEL

Our Country is built on horticulture. For a long time, farmers used to figure the ripeness of soil in recent days and affected presumptions to establish which form of food. They didn't care about the weather, water level, and climate conditions in particular, which were more terrible for an agriculturalist. Given a few doubts, they use pesticides that contribute to a genuine effect on the yield if the inference is not right. Profitability relies on the last step of the crop that farmers rely on.

4. PROPOSED MODEL

Many of the sensors are connected to the Raspberry Pi. Using a buzzer and talking with Lora, the sound module is used to produce the animal sound and intimate the designated individual. The PIR sensor is used for human recognition. The soil moisture sensor is used to measure the soil moisture level and the LCD display uses Lora's touch. The meaning of the moisture level is also sent to the mobile individual accessing the web page. The pump is manually turned on and off through the web screen.

TRANSMITTER SECTION:

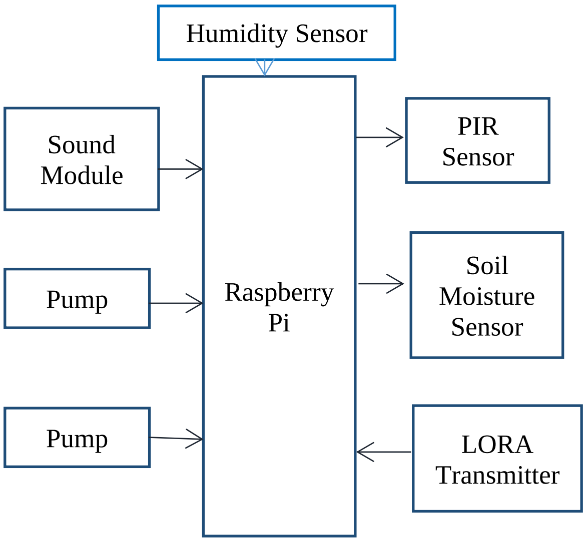

Fig: 1

RECEIVER SECTION:

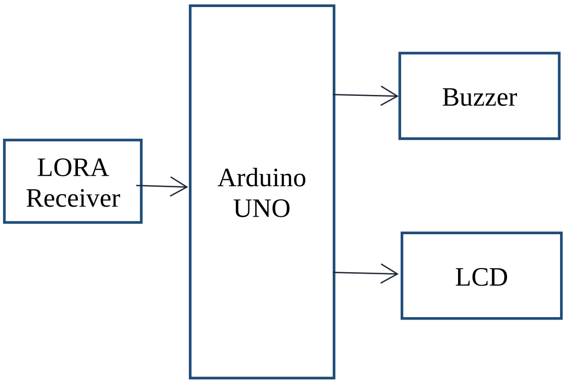

Fig: 2

Here, to warn the user when there is an interruption in the field, we use a buzzer. LORA stands for Long Distance Touch. Using this initiative, we will help the farmers improve crop productivity.

Raspberry Pi:

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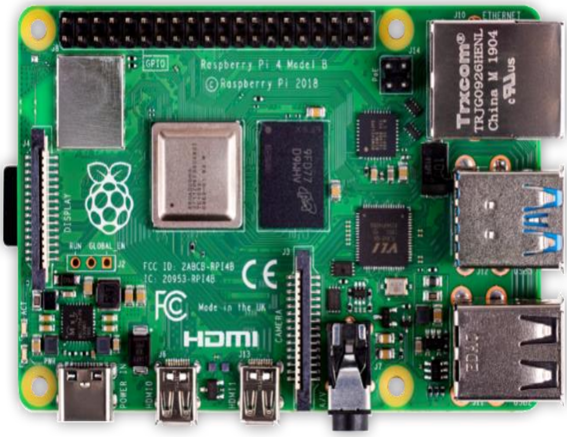


Fig: 3

The Raspberry Pi is a low-cost, credit-card-sized gadget that uses a standard mouse and keyboard to connect to a computer display or panel. It is a lightweight, capable machine that allows people of all ages to explore programming in languages like Scratch and Python. The Raspberry Pi is capable of interacting with the outside world and has been used in a large variety of automatic manufacturing projects, including music machines and parent detectors at weather stations and tweeting birdhouses through infrared cameras. The Raspberry Pi hard drive acts as the SD card on the board inserted into the slot. It is powered by USB and can be connected to a traditional RCA TV panel, a more modern monitor, or even a device with video output via the HDMI port.

Sound Module:

Fig: 4

A microphone that senses sound signals functions as a sound monitor. The sensor senses the sound signals and produces optical or analogue output. You may use the sound sensor to create fun designs, such as the clap turn. A python module is used in a sound machine. The use of note can detect ambient sound intensity: the sensor can only sense the presence of sound (according to the theory of vibration) and does not know the tone or the scale of the sound source.

Sensitivity adjustable, working voltage: DC 4-6V. The output from Digital switch output (1 s and 0 s + v).

Soil Moisture Sensor:

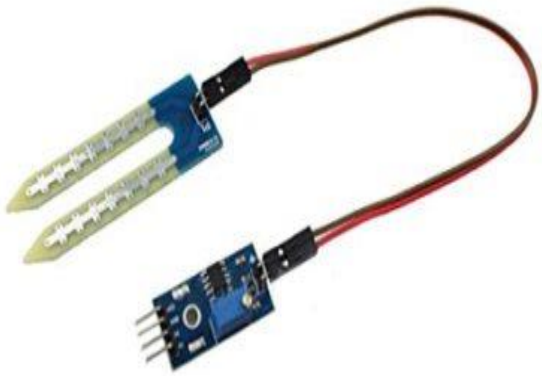


Fig: 5

The Soil Moisture Sensor uses capacitance to measure the dielectric permittivity of the surrounding medium. Dielectric permittivity depends on how much water there is in the soil. The sensor averages the complete length of the sensor to the water material. Potential for soil water or soil moisture tension is a measure of how tightly water clings to the soil and expresses itself in resistance units called bars (one bar is equal in strength to one atmosphere's resistance). Moisture is measured at a depth of 48 inches by six inches or at times 12, 24, and 36 inches. The different depths vary from business to business, from sensor type to type of sensor. Ideally, it would be easier with two to four sensors per quarter segment. Soil moisture is a crucial component for controlling the exchange of water and heat energy between the soil surface and the atmosphere through the plant's evaporation and transpiration. As a result, soil moisture plays an important role in the growth of weather cycles and the production of rainfall.

LORA:

LoRa (Long Range) is a Low Power Wide Area Network (LPWAN) protocol developed by Semtech. It is based on diffusion spectrum modulation methods derived from Chirp Spread Spectrum (CSS) technologies. LoRa is suitable for delivering sporadic communication over large distances at low data rates. The radio interface was developed to allow the transmission of incredibly low signal levels and, as a consequence, even low data rate communication over considerable distances. The radio interface was designed to allow extremely low signal levels to be received and, as a result, even low-intensity signals can be received at large ranges. For remote IoT and M2 M nodes, the LoRa modulation and radio interface has been developed and configured to provide precisely the type of communication required. The low power and long-range capabilities mean endpoints can be installed in a wide variety of environments, in buildings and outside, and yet have the potential to connect with the gateway. Smart metering; inventory tracking, data from sales machines and monitoring; automotive industry; service applications where data reporting and management may be needed are LoRa wireless technology applications. For many uses, LoRa technology is very desirable because of its long-range capabilities. New nodes can be linked and allowed easily, and coverage is easy to provide.

LORA TRANSMITTER

- The transmitter from Lora is linked to the Raspberry-Pi.

- The Lora Transmitter is used by an authorized individual to relay all sensor data to the Lora Receiver.

LORA RECEIVER

- LoRa receiver communicates with UNO Arduino.
- LoRa Receiver is used to collect all data and to allow individual intimate.

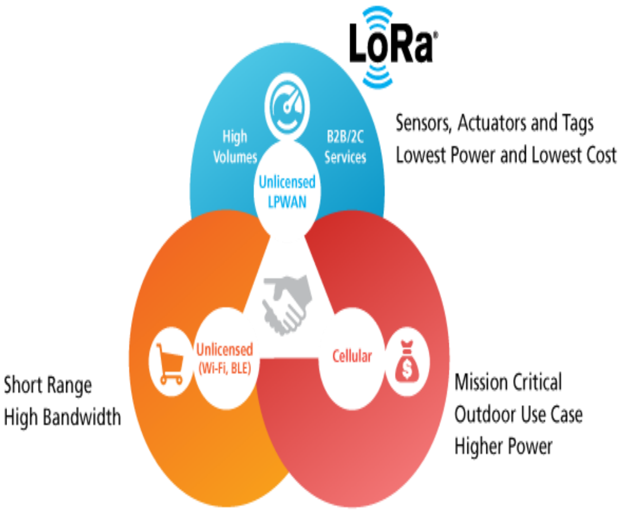


Fig: 6

5. WORKING

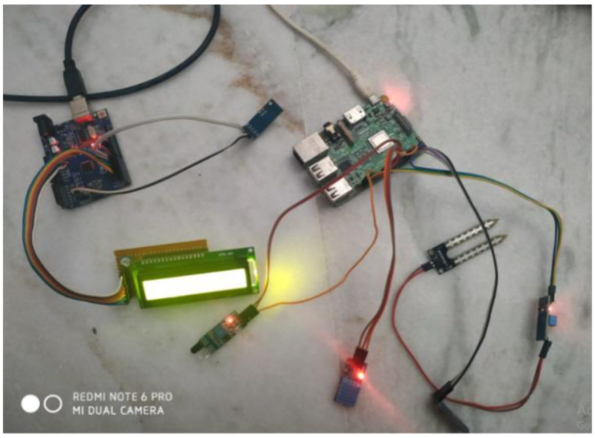
The agricultural region unit managed the adjacent room for plant production. Continuous monitoring and control of environmental parameters in order to achieve most plant growth, such as temperature, humidity, soil moisture, PIR. The main goal of this project is to create a simple, low-cost system based on Raspberry Pi and Arduino to observe the values of changed and controlled environmental parameters in order to achieve optimum plant growth and yield. The DHT11 sensor senses the level of humidity and temperature, the soil moisture senses the quality of soil moisture, and the device even has a PIR sensor. A buzzer and sound module can be attached to the PIR sensor to allow the impediment to be easily detected. It will let the farmer know if some animal is coming into the field and killing crops. The farmer will save its crops in this way. The PIR sensor is also used in a breakaway system to assess if offenders have infiltrated an infrastructure. If high temperature, humidity, and moisture levels are met, the pump should immediately be ON / OFF. Both area units with environmental criteria are submitted to Lora Transmitter. It is used for transmitting the data over a long distance. The Lora receiver is used to obtain all data showing the latest environmental parameter standing.

6. RESULT

A primarily agricultural observance and control system cantered on Arduino is expected. The main sensors used in this project are the DHT11 sensor, soil moisture sensor, sound module, and PIR, which provide the exact value of temperature, humidity, wetness material. In a very greenhouse, this technique is intended for monitoring and observing environmental parameters by a simple transmission of data from the Lora board. Lora Transmitter will give the parameters of the information to the receiver Lora. All information that shows the current state of the environmental parameters is obtained by the Lora recipient. This approach decreases resource consumption, servicing, and complexity. This project is mostly used in the agriculture industry, in a very nursery environment, and inside the facility. There is few example reading of the project.

```
Temperature: 34
Humidity: 81
:::::humidity High:::::
:::::Motion detected:::::
Temperature: 37
Humidity: 49
:::::temperature High:::::
:::::Motion detected:::::
Temperature: 27
Humidity: 92
:::::humidity High:::::
:::::Motion detected:::::
Temperature: 32
Humidity: 65
:::::Motion detected:::::
Temperature: 43
Humidity: 89
:::::temperature High:::::
:::::Motion detected:::::
Temperature:
```

Fig: 7 The snapshot of the hardware,



The various condition for which alert is given,

Fig 8. During Normal Condition:

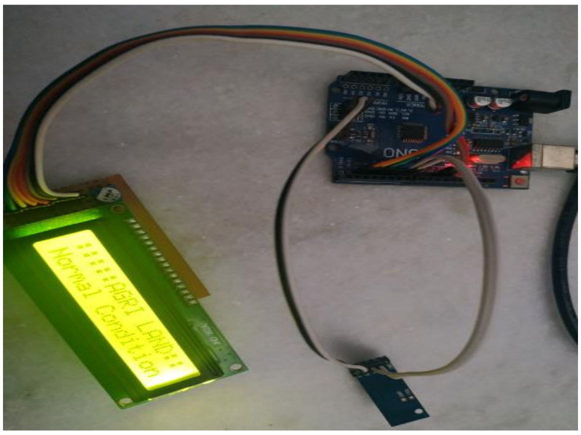


Fig 9. When the temperature is high:

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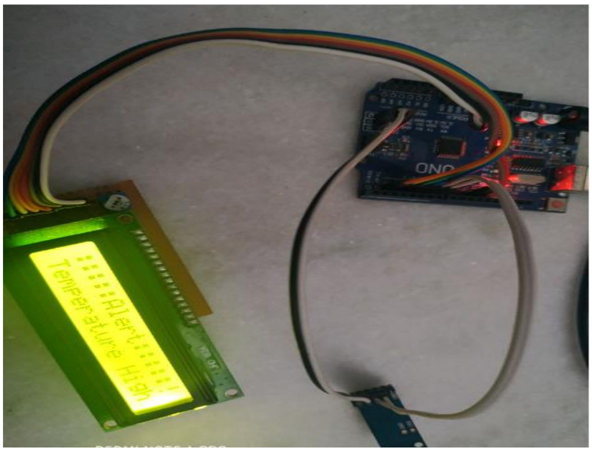

Fig 10. When Motion is detected:

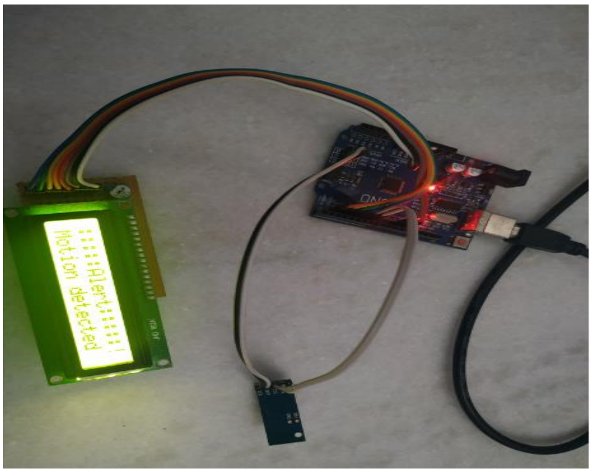

Fig: 11

7. FUTURE SCOPE

- The soil should be checked so that we know which crop is acceptable for that sort of soil.
- The harvest time can be estimated and told beforehand.
- It is possible to support organic fertilizers.

8. ADVANTAGE

- Quality containment and elimination of inventory due to improved output efficiency. You would be able to minimize the chances of reducing the yield by being able to see any irregularities in crop growth or animal welfare.
- Increased market productivity by the integration of procedures. You can automate several processes through the development chain, such as fertilizer, fertilization, or pest control, by using smart devices.
- Reinforced continuity and product numbers. Achieving greater production process regulation and sustaining higher crop quality and growth capability levels by automation.
- Scalability
- Power consumption

- Smart agriculture faces some limitations that are holding back IoT growth, considering its potential opportunities. Any of the key reasons for extensive power usage include long-term sensor deployment, frequent use of GPS, and GPRS transmission of sensed data.
- Data rate

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