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Renewable Energy Integration into Cloud & IOT-Based Smart Agriculture

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ABSTRACT: Climate changes and rainfall 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. One of the important applications of IOT is Smart Agriculture. It reduces wastage of water, fertilizers and increases the crop yield. 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 project, sensor technology and wireless networks integration of IOT technology has been studied and reviewed based on the actual situation of agricultural system. Temperature sensor, Humidity sensor and Rain sensor which senses the temperature, moisture content in the soil. A combined approach with internet and wireless communications, Remote Monitoring System (RMS) is proposed. Major objective is to collect real time data of agriculture production environment that provides easy access for cultivation and increases the crop yield. By monitoring the field using the IP address Nutrient deficiency in the soil are detected and rectified.

I. INTRODUCTION

Things on the earth connected to each other with the help Internet of Things for communicating with each other. Internet of Thing connects thing to thing, the thing to human and human to things for sharing information. The Main goal of the Internet of Things is to bring out the large network be connected. Combining and connecting various types of device to each other forms a large network. Cost saving, automation in everything and communication are major pillars of the Internet of Things. It allows users to remotely monitor and control routine activities. Using the internet and handheld devices like smartphones and IoT makes farmers' life easy. It ultimately increases productivity and saves the cost and time of farmers. Remotely enables objects to be sensed and actuated with in-network using the Internet of Things.

Internet of Things plays a vital role in automated irrigation, smart farming, monitoring greenhouse, crop monitoring, crop growth monitoring, pest controlling and monitoring, insect population controlling and monitoring, etc. Collects real-time data from various sensors placed into the farms. The node contains sensors like temperature sensor, soil moisture, humidity sensor, ultrasonic sound, light intensity, atmospheric pressure sensor, and leaf wetness sensors. With the help soil pH values and environmental conditions, soil condition is measured. According to results, required pesticides list is generated. Align with environmental conditions suitable solution is generated. The solution is provided to the farmers which result in over usage of pesticides into the farm. Also saves cost and time and increases the productivity of the crop. It's proved by science music helps to increase the growth ratio of crop and increases crop productivity. The major issue in the agricultural field is pest control. Farmers make use of chemical for controlling pest in the farm. This harms crop growth as well as farmers health. An appropriate list of chemicals aligns with environment suggested to the farmers. Significantly proved, with various frequency ranges pets get affected. Various sound frequencies effects on pest brain and nerves system. This also effects on reproduction system of pets. Use of sound emitter will result in pets controlling. Making use of ultrasonic sound emitter into the fields helps in pest control. Generating various frequency farmers can control pest and saves cost. Also, it will increase the growth of the crop.

II. THE KEY ADVANTAGES OF USING IOT IN ENHANCING FARMING ARE AS FOLLOWS:

1. Soil management such as Light Intensity level, Temperature and Moisture content, water level etc can be identified easily so that farmer can sow seeds according to soil level.

2. Water management can be efficiently done using IoT with no wastage of water using sensors.
3. Crop monitoring can be easily done to observe the growth of crop. IoT helps to continuous monitor the land so that precautions can be taken at early stage.
4. It increases productivity, reduce manual work, reduce time and makes farming more efficient.

III. EXISTING SYSTEM

Agriculture is the back bone of our Nation. In olden days farmers used to guess the fertility of soil and made assumption to grow which type of crop. They didn't know about the moisture, level of water and particularly weather condition which terrible a farmer more. They use pesticides based on some assumption which made lead a serious effect to the crop if the assumption is wrong. The productivity depends on the final stage of the crop on which farmer depends.

Drawbacks of Existing System

- Productivity may or may not be more
- We cannot estimate weather conditions as pollution is increasing gradually etc

IV. PROPOSED SYSTEM

To enhance the productivity of the crop there by supporting both farmer and nation we have to use the technology which estimates the quality of crop and giving suggestions. Wireless sensor network are sensors of different types are used to collect the information of crop conditions and environmental changes this information is transmitted through network to the farmer or devices that initiates corrective action. Some disadvantages in communication must be overcome by advancing the technology to consume less energy and also by making user interface ease of use.

V. LITERATURE REVIEW

Vijay Kumar [1], Lin Zhang [2] work on automated water sprinkler irrigation system. Provide information regarding water usage, soil pH values using wireless sensor technology. WSN nodes formed with sensors like moisture sensor, temperature sensor, soil pH, atmospheric pressure sensor and leaf wetness sensor. All information collected from nodes and according to the soil moisture level sprinklers are controlled automatically and stopped when an adequate level of water is sprinkled. All information regarding water level and soil pH send to the farmer's mobile through the GSM module. Using this information farmer plans for fertilizers.

Joseph Haule [3] designed a system using a wireless sensor network for automation in irrigation. Based on moisture levels of soil optimum use of water distribution managed through automatic communication using wireless sensor technology in irrigation. A designed process which set parameters like time for water and the frequency of watering for proper water management and produce a high-quality crop. Build system using wireless sensor technology with making use Zigbee for battery life. The overall system is controlled with devices based on inputs received from various sensors with efficient manner.

G. Nisha [4] designed a system for automated irrigation using WSN and disease monitoring using Image processing technique. Images captured from the camera mounted in the field and send through WSN nodes for processing and inform to the farmers using GSM modules. An automated irrigation system designed for the adequate use of water in farming in dry areas using distributed nodes consisting of sensors like moisture, temperature, etc placed in the field. Automated irrigation system builds using WSN, Zigbee protocol, microcontroller, solar panels, and cellular network. Desired threshold values set for the proper functioning of the automated irrigation system.

R. Balamurali, K. Kathiravan [5], Yunseop Kim [6] proposed a system considering parameters low power consumption, appropriate network topology, protocols with high reliability. Research major focuses on automatic irrigation monitoring and controlling. Using a wireless sensor network with network capabilities and sensor nodes deployed as Adhoc for monitoring and controlling the irrigation system. Operates based on data collected from sensor nodes which collect data from water level and motor movement. A system contains base stations place near to the residence which process all data and reduced farmers efforts, save the cost, minimal training required for installation of the system.

BLOCK DIAGRAM:

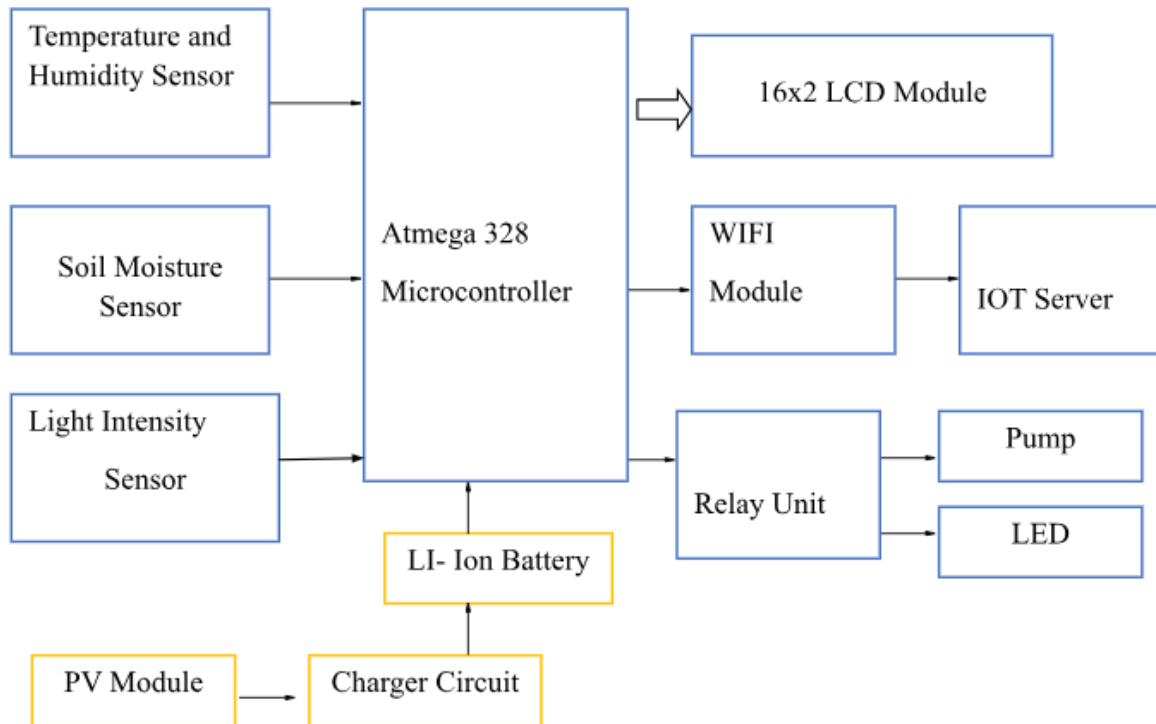


Fig1: Functional Block Diagram

VI. METHODOLOGY

The smart agriculture monitoring system is tested under various conditions. The soil moisture sensor is used to test the soil for all climatic conditions and results are interpreted successfully. The moisture output readings at different weather conditions is taken and updated. Wi-Fi is used to achieve the wireless transmission. The values of soil moisture sensor purely depend on the resistivity of the soil. The value of the sensor at beginning of wet condition is 0. The sensed value is sent to microcontroller through NodeMCU and motor pump gets OFF in this condition. The maximum threshold value upon dry soil is 100. When the sensed value by sensor reaches the threshold value, the microcontroller trigger the relay and motor gets ON. When sufficient amount of water is supplied to plants, the motor pump is turned ON and is turned OFF automatically.

VII. SIMULATION TOOLS

PROTEUS DESIGN SUITE

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

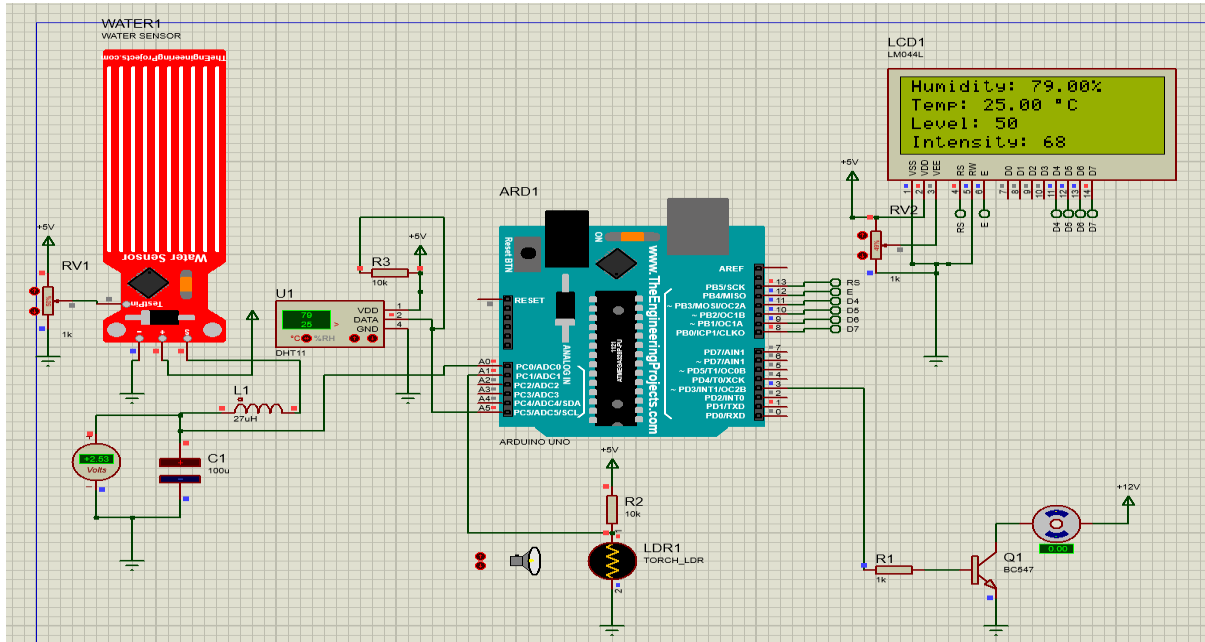


Fig 2 : Simulation Results and Schematic Diagram using Proteus Design Tool

The above diagram shows the schematic diagram using Arduino Uno board, a LCD module which displays the variable parameter values, sensors like LDR, DHT11 and level sensors are interfaced with controller board, a DC is interfaced to the Arduino via a transistor, when ever the level of the water goes low the motor is triggered. The program file is loaded in the microcontroller and the results are taken.

Hardware Implementation:



Fig3 : Hardware Model Implementation

The designed schematic is assembled into a hardware circuit with real sensors and IOT Application designed using Blynk Cloud server. The sensor is placed near a plant and its soil moisture content is monitored in LCD Module, at regular intervals the data is updated to the server. The DHT11 sensor gives the environmental temperature and Humidity data. Arduino board collects all the sensor data, displays it in a display, controls the water pump when the moisture level is low and transfer data to NodeMCU. The WIFI module is programmed in such a way that it connects to a Local hotspot from where it gets internet and also to an IOT server. The data to the server is updated every 5 seconds. The information can be monitored in IOT cloud page and also through a mobile application.

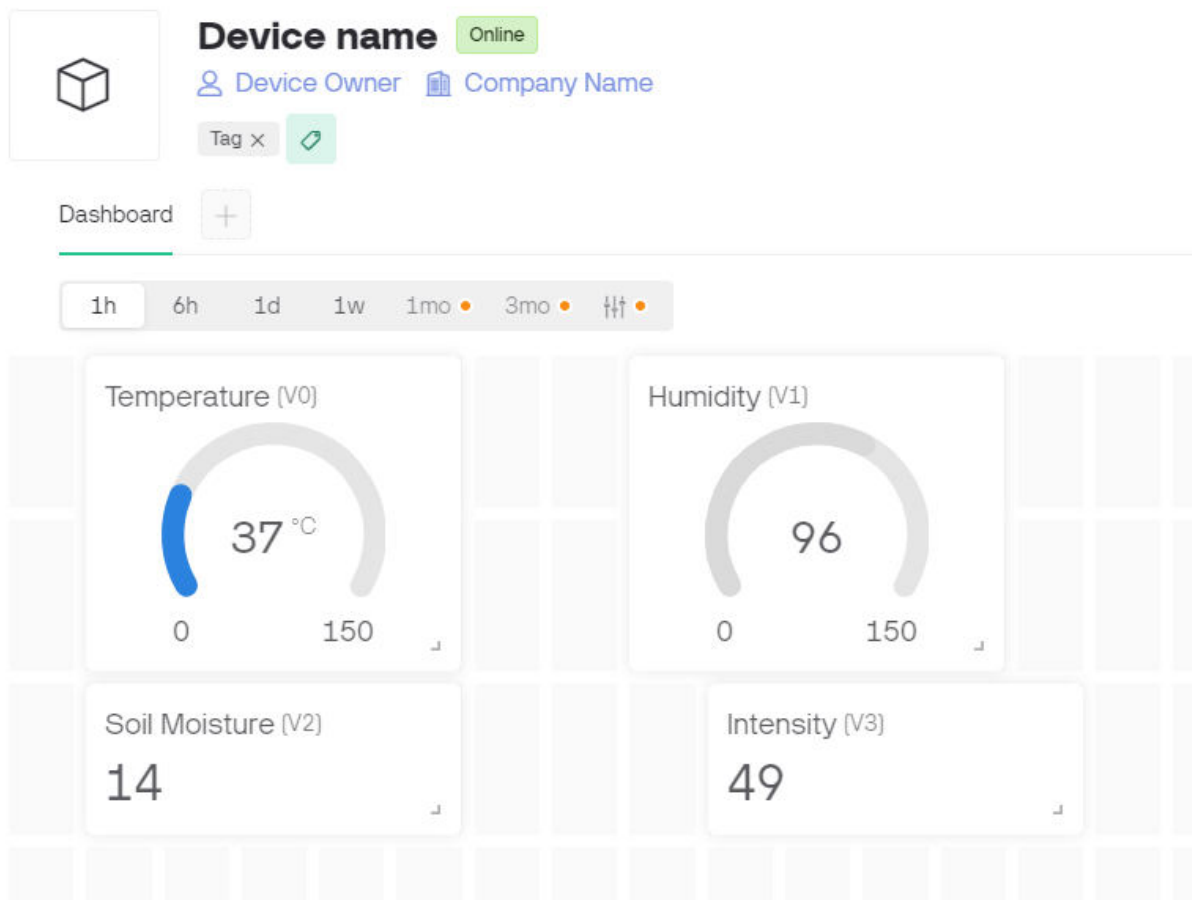


Fig4: Web dashboard Results

VIII. CONCLUSION

IoT will help to enhance smart farming. Using IoT the system can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled. IoT works in different domains of farming to improve time efficiency, water management, crop monitoring, soil management and control of insecticides and pesticides. This system also minimizes human efforts, simplifies techniques of farming and helps to gain smart farming. Besides the advantages provided by this system, smart farming can also help to grow the market for farmer with single touch and minimum effort.

IX. FUTURE SCOPE

The project has vast scope in developing the system and making it more user friendly and the additional features of the system like:

- By installing a webcam in the system, photos of the crops can be captured and the data can be sent to database.

- Speech based option can be implemented in the system for the people who are less literate.
- GPS (Global Positioning System) can be integrated to provide specific location of the farmer and more accurate weather reports of agriculture field and garden.
- Regional language feature can be implemented to make it easy for the farmers who are aware of only their regional language.

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