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IoT Based Smart Agriculture & Irrigation System

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Abstract: *Farming is backbone of economy and it is the fundamental method for occupation. The large population of world depends on farming for living day to day life. Around 70% of Indian population depends on cultivation. Most of the cultivation cannot be productive only by physical activities so have to be handled by innovative technologies. Therefore, we use IoT innovation and SMS notification to address the critical part of farming. The past method of incorporating keen water supply system with smart idea. This undertaking is a follow up to a past method whose highlight features incorporates keen water system with excellent control and insightful basic leadership in terms of exact continuous field information which regulates temperature, moisture and soil dampness of a particular crop. Controlling of every one of these activities will be monitored by PC with Internet and the tasks being performed by interfacing sensors and Arduino. With the observation results decision are to be made*

Key Word: *GSM, ATmega328P, DHT11, Thing speak IoT*

I. INTRODUCTION

Agriculture is known to be one of the main growing sectors in India. The major challenges in agriculture are crop productivity, soil nutrient level, smart irrigation system, crop monitoring, etc. This project assesses the internet of things (IoT) based smart agriculture system using Thing Speak. As the world is trending into new technologies and implementations it is a necessary goal to trend up in agriculture also. Many researches are done in the field of agriculture. Most projects signify the use of wireless sensor network 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 to a greater extent. Hence automation must be implemented in agriculture to overcome these problems. So, in order to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all factors affecting the 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. The mainpurpose of this work is to improve the efficiency of the existing irrigation system and to reduce the human intervention for the complete automation of the system. The proposed system consists of ATmega328P, various sensors, a pi camera, and a motor driver. ATmega328P is the main controlling unit that can control the operation of various sensors and actuators. Thesoil moisture sensor detects moisture level in the soil and irrigates the crop in a structured manner. If there is any variationin moisture level then the sensor will update the observed value and store in the cloud. In a smart monitoring system, the picamera captures the video and transfers it to the cloud through ATmega328P.

II. LITERATURE SURVEY

An IoT Based Crop-field monitoring an irrigation automation system describes how to monitor a crop field. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system is automated. Through wireless transmission the sensed data is forwarded to web server database. If the irrigation is automated then the moisture and temperature fields are decreased below the potential range. The user can monitor and control the system remotely with the help of application which provides a web interface to user.

2.1 IOT BASED SMART CROP-FIELD MONITORING AND AUTOMATION IRRIGATION SYSTEM [R. Nageswara Rao and B Shridhar ISIC Paper.]

Agriculture plays vital role in the development of agricultural country like India. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. Hence the proposed method aims at making agriculture smart using automation and IoT technologies. Internet of Things (IoT) enables various applications crop growth monitoring and selection, irrigation decision support, etc. A Raspberry Pi based automatic irrigation IOT system is proposed to modernization and improves productivity of the crop. main aim of this work to crop development at low quantity water consumption, In order to focus on water available to the plants at the

required time, for that purpose most of the farmers waste lot time in the fields. An efficient management of water should be developed and the system circuit complexity to be reduced. The proposed system developed on the information sent from the sensors and estimate the quantity of water needed. A two sensors are used to get the data to the base station the humidity and the temperature ofthe soil, the humidity, the temperature, and the duration of sunshine per day. The proposed systems based on these values and calculate the water quantity for irrigation is required. The major advantage the system is implementing of Precision Agriculture (PA)with cloud computing, that will optimize the usage of water fertilizers while maximizing the yield of the crops and also will help inanalyzing the weather conditions of the field.

2.2 IoT Based Smart Agriculture System [G. Sushanth, S. Sujatha, "IOT Based Smart Agriculture System", 2018]

Smart Agriculture system is an aborning topic in this materialistic world. This paper describes the concept of featuring and elastingan agriculture platform to the internet world. Agriculture is the most important of human life so it can be improvised by using IoT technology. IoT technology gives a grasp to enhance the power of automation systems in agriculture. Smart agriculture System thatuses the advantages of cutting-edge technologies such as Arduino and Wireless Sensor Network. This paper proposes the concept and features of the sensor world in the internet of things for agriculture which is used to enhance the production of crops. The Agriculture stick being proposed through this paper is integrating with Arduino Technology, Breadboard and mixed with different various sensors and live data feed can be obtained online through mobile phone. India Monitoring environmental conditions are the major factor to improve the yield of efficient crops. The feature of this paper includes the development of a system that can monitor temperature, humidity, moisture, and even the movement of animals which may destroy the crops in agricultural fields through sensors using Arduino board. With its energy autonomy and low cost, the system has the potential to be useful in water-limited geographically isolated areas

2.3 A Novel IOT Based Solution for Agriculture Field Monitoring and Crop Prediction Using Machine Learning [N. Ananthi, J. Divya, M. Divya, V. Janani, "IoT based smart soil monitoring system for agricultural production"]

Agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. Agriculture mainly depends on the soil properties and irrigation water. Due to the change in the weather and climatic conditions, traditional farming systems based on the old beliefs fail to give better result. Proper irrigation has to be done to acquire better Results. Recent development in the technology has a great impact on agriculture. This paper highlights the work done in ML and IOT. In this paper we discuss the Remote monitoring of soil properties using IOT which has an potential to transform agri cultural practices. And also a machine learning model to predict the crop based on the soil properties which lead to increase the high yield productivity.

III. PROPOSED SYSTEM

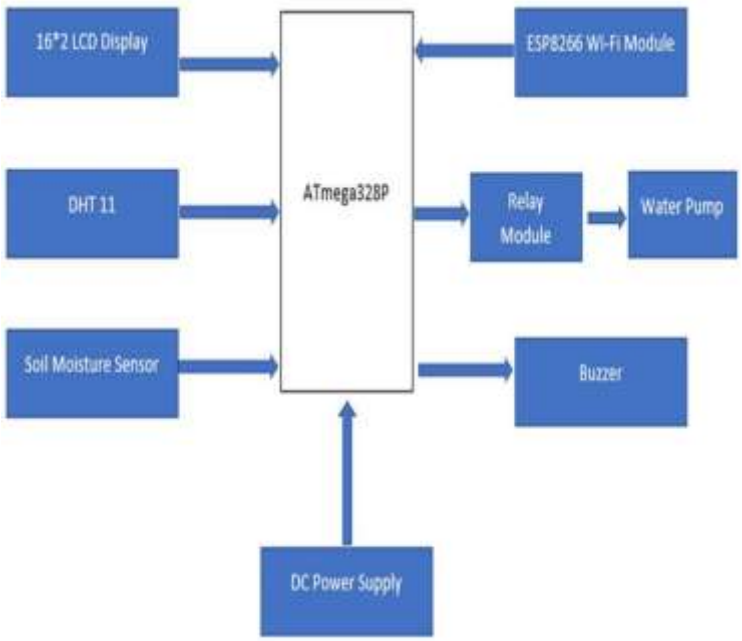

Fig 3.1 Block Diagram of Proposed System

3.2 Explanation of Proposed System

3.2.1 Soil Moisture Sensor :-

A device which is used to sense the moisture level in the sand is called soil moisture sensor When the sensor senses the water shortage in the field, the module output is at high level else the output is at low level. This sensor reminds the user to water their plants and also monitors the moisture content of soil. It has been widely used in agriculture, land irrigation and botanical gardening

3.2.2 The DC 3-6V Mini Micro Submersible Water Pump :- shown in Figure 5 is a low cost, small size Submersible Pump Motor. It operates with a 2.5 to 6V power supply. It can pump up to 120 liters per hour with a very low current consumption of 220mA. Just connect the tube pipe to the motor outlet, submerge it in water, and power it.

3.2.3 The Node MCU (ESP8266) :- is a microcontroller with an inbuilt Wi-Fi module. The total pins on this device are 30 out of which 17 are GPIO (General Purpose Input/Output) pins which are connected to various sensors to receive data from the sensors and send output data to the connected devices. The Node MCU has 128KB of RAM and 4MB flash memory storage to store programs and data. The code is dumped into the Node MCU through USB and is stored in it. Whenever the Node MCU receives input data from the sensors, it crosschecks the data received and stores the received data. Depending on the data received it sends apulse to the Relay Module which in turn acts as a switch to on or off the pump. The operating frequency of the Node MCU rangesfrom 80 to 160 MHZ and the operating voltage of this device range from 3 to 3.6V. The Wi-Fi module presents in the Node MCU range from 46 (indoors) to 92 (Outdoors) Meters.

3.2.1 Temperature Sensor (DHT-11)

is used to monitor temperature and humidity of the atmosphere. The DHT-11 is a basic ultra low cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and split out a digital signal on the data pin. The DHT-11 calculate relative humidity by measuring the electrical resistance between two electrodes

3.2.2 A relay :-

is used as electrically operated switch. It has a set of input terminals for a single or multiple control signals and a set of operating contact terminals. The switch may contain number of contacts in multiple contact forms which make contacts or break contacts. Relay is used to turn on the water pump in order to maintain the moisture level of the crop Power supply.

IV.METHODOLOGY

4.1 Hardware Used

4.1.1. Arduino Uno:

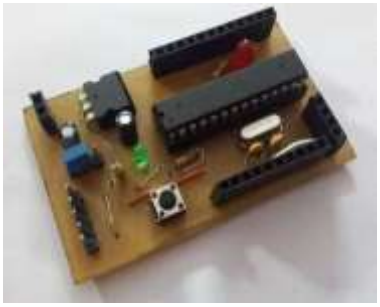

Fig. 4.1 Arduino Equivalent Circuit

Arduino is an open-source electronics podium based on easy to use hardware and software. Arduino boards are able to interpret inputs light on a sensor, a finger on a push button, or a Twitter message and turn it into an output activating a motor, turning on an LED, publishing somewhat online. Over the years Arduino has been the brain of thousands of projects, from on a daily basis objects to compound technical instruments.

4.1.2 Temperature Sensor (DHT 11):

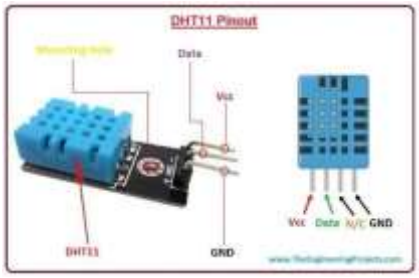

Fig 4..2 Humidity Sensor Temperature Sensor (DHT-11)

is used to monitor temperature and humidity of the atmosphere. The DHT-11 shown in Figure 3 is a basic ultra low cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and split outa digital signal on the data pin. The DHT-11 calculate relative humidity by measuring the electrical resistance between two electrodes.

4.1.3 Soil Moisture Sensor:

Fig. 4.3. Soil Moisture sensor

A device which is used to sense the moisture level in the sand is called soil moisture sensor and is shown in Figure 2. When the sensor senses the water shortage in the field, the module output is at high level else the output is at low level. This sensor reminds the user to water their plants and also monitors the moisture content of soil. It has been widely used in agriculture, land irrigation and botanical gardening.

4.1.4 LCD Display:

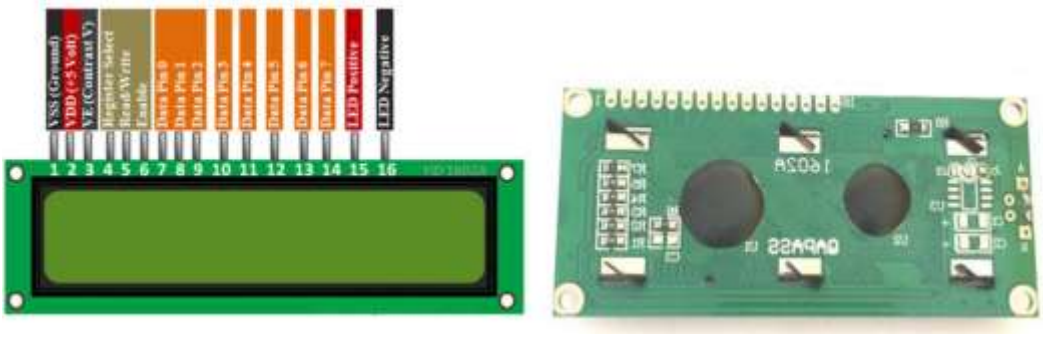

Fig. 4.4 16*2 LCD Display

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits

4.2 Software Used

4.2.1 Arduino IDE Arduino IDE :-

(Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the Arduino. It is a cross- platform software which is available for every Operating System like Windows, Linux, macOS. It supports C/C++ language It is open-source software, where the user can use the software as they want it to. They can also make their own modules/functions andadd them to the software. It supports every available Arduino board including Arduino mega, Arduino Leonardo, Arduino Ethernetand more Word file is called a Document similarly, Arduino file is called a Sketch where the user writes code The format of Arduino is saved as .ino file

4.2.2 Embedded C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

4.2.3 Fritzing

Fritzing is a great open source tool for anyone to teach, share, and prototype their electronic projects! It allows you to design a schematic, and thus a part, which can then be added to very professional-looking wiring diagrams. You can even design your own PCBs and have them fabricated from the files you design.

V. PRECISION FARMING

Application:

Precision farming, also known as precision agriculture, is anything that makes the whole process of farming accurate and controlled when it comes to raising livestock and growing crops.

Smart Greenhouses

Greenhouse farming is concerned with increasing the yields of vegetables, crops, fruits etc. Greenhouses control theenvironmental factors through manual intervention or a proportional control mechanism.

Remote sensing

IoT based remote sensing makes use of sensors placed along the farms such as weather stations for accumulating data that is carried forward to analytical tools for analysis.

VI.RESULT

6.1 Simulation Results

The yield appeared beneath signifies the temperature, soil dampness state and the gate crasher discovery. The next outcome is the yield as of the Android purpose that is produced in the cell phone. It decides the temperature, stickiness, dampness as well as the interloper discovery. The yield appeared beneath means the temperature, soil dampness state with the gate crasher identification. The second outcome is the yield from the Android purpose that is produced in the cell phone. It decides the temperature, dampness, dampness with the gate crasher location.

6.2 Hardware Results

Fig 6.2.1 Temperature of Soil

Fig 6.2.2 Moisture of Soil

Fig 6.2.3 Humidity of Soil

VII. CONCLUSION

[1]. IOT will help to enhance smart farming. Using IoT the system we can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled.

[2]. Monitoring in fields where the human being not capable to provide security. Such system we are developing in the field where the crops are costly are monitored and all the climatic conditions are well maintained important. In this area we are provide such kind of system

[3]. This idea of modernization of farming is straightforward, reasonable and operable. As relying upon these parameter esteems rancher can without much of a stretch choose which fungicides and pesticides are utilized for enhancing crop creation

[4]. The points of interest like water sparing and work sparing are started utilizing sensors that work consequently as they are modified.

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