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Smart Agriculture System Using IoT Based

C. N. Bhoyar[1], Pooja Siriya[2], Sanket Ramteke[3], Yash Vairagade[4], Neha Jaiswal[5]
Department of Electronics and Telecommunication Engineering, Priyadarshini College of Engineering, Nagpur

Abstract: Agriculture is becoming an important growing sector throughout the world due to increasing population. Major challenge in agriculture sector is to improve farm productivity and quality of farming without continuous manual monitoring to meet the rapidly growing demand for food. Apart from increasing population, the climate change is also a big concern in agricultural sector. The purpose of this research work is to purpose a smart farming method based on internet of things (IOT) to deal with the adverse situations. The smart farming can be adopted which offer high precision crop control, collection of useful data and automated farming technique. This works presents a smart agriculture system which monitors soil humidity and temperature. After processing the sensed data, it takes necessary action based on these values without human intervention. In IOT-based smart agriculture, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc) and automating the irrigation system. IOT (internet of things) in an agricultural context refers to the use of sensors, cameras, and temperature and moisture of the soil measured and these sensed values are stored in things speak cloud for future data analysis.

I. INTRODUCTION

Smart farming is a farming management concept using modern technology to increase the quality and quality of agriculture products. Farmers in the 21 st century have access to GPS, soil scanning, data management, and internet of things technologies.
The goal of smart agriculture research is to ground a decision-making support system for farm management. Smart farming deems it necessary to address the issues of population growth, climate change and labour that has gained a lot of technological attention, from planting and watering of crops to health and harvesting. other devices to turn every element and action involved in farming into data. We need smart agriculture to expand and develop from what it currently is because this practice will substantially decrease the negative environmental externalities of modern agriculture. Smart cities use internet of things (IOT) devices such as connected sensors, light, and meters to collect and analyse data. The cities then use this data to improve infrastructure, public utilities and services, and more. For farmers, it is difficult for them to understand technical terms and usage of technology, and also it is a cost effective affair.

A. Problem Statement

To provide efficient decision support system using wireless sensor network which handle different activities of farm and gives useful information related to farm. Information related to soil moisture, temperature and humidity content. Due to the weather condition, water level increasing farmers get lot of distractions which is not good for agriculture. Water level is managed by farmers in both automatic/manual using that mobile application. It will make more comfortable to farmers. Performing agriculture is very much time consuming.

B. Problem Definition

It should utilize minimum resources in terms of hardware and cost. This overcomes the manual operations required to monitor and maintain the agricultural farms in both automatic and manual modes. It should be able to measure the increase or decrease in level of water as well as moisture in the soil.

II. PROPOSED SYSTEM

The development of a smart agriculture system using sensors, microcontroller within a lot system is presented. The aim of the implementation is to demonstrate the smart and intelligent capabilities of the microcontroller to allow the decision to be taken on watering the plant based on the continuous monitoring of the environmental conditions in the field. The system is as shown in fig. it also aims at a predefined irrigation schedule as per the farmers convenience uploaded into the application developed for the same. The implementation is a photovoltaic powered automated irrigation system that consists of a distributed wireless network of soil moisture and temperature sensors deployed in plant root zones. These sensors continuously monitor the parameters and send it to the Arduino board for further processing which acts as an IOT gateway.

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This gateway has been given the wireless capability by installing a WIFI module which will be updating the data to the cloud. The IOT gateway also has the GSM capability through the module connected. This receiver unit also has a duplex communication link based on a cellular-internet interface, using general packet radio service (GPRS) protocol, which is a packet-oriented mobile data service used in 2G and 4G cellular global system for mobile communications (GSM).

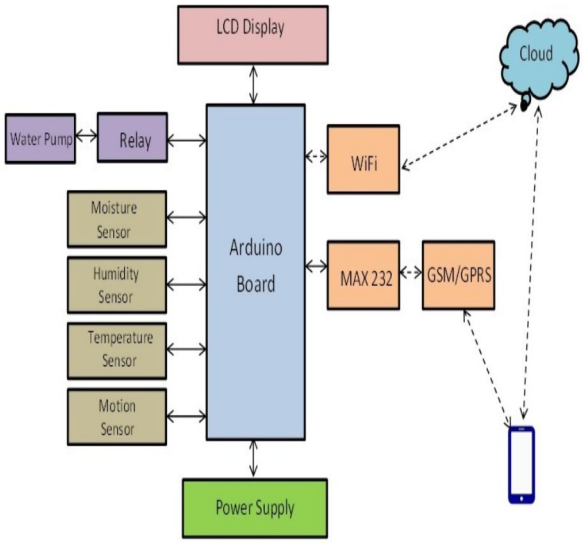


Fig 1. Hardware block diagram

The data being uploaded to the cloud allows the user to continuously view the parameters from the comforts of his/her Home or wherever on the go. The system has the capability to adapt based on the user input which the farmer can input through the smart agriculture application. The farmer can select a profile based on the season and the crop for irrigation and schedule and plan the water resource utilization sensibly. The volumetric water content in the soil is a primary factor which gives a suggestion that the water is required for the crops. In the absence of this system the farmer has to manually inspect these for all the crops by inspecting the soil in the field which is motion sensor to detect the presence of any animal in the field and send notification to the farmer in their presence. The distance range for which the farmer needs to detect the animals can be allowed to set by the farmer himself in the application in the beginning.

III. SYSTEM DESIGN

The system architecture consists of a Arduino uno R3microcontroller board, sensors like LM 35 temperature sensor, humidity, moisture and motion sensor, a WI-FI module i.e. ESP8266 and GSM Module. The software consists of an android application which includes setting up of the profile for predefined irrigation based on the seasons or on daily and weekly mode. The software has also been programmed to send a notification to the farmer whenever the physical parameters sensed are below the threshold value and based on the farmers input a control signal will be sent to the Arduino uno to either switch ON/OFF the irrigation.

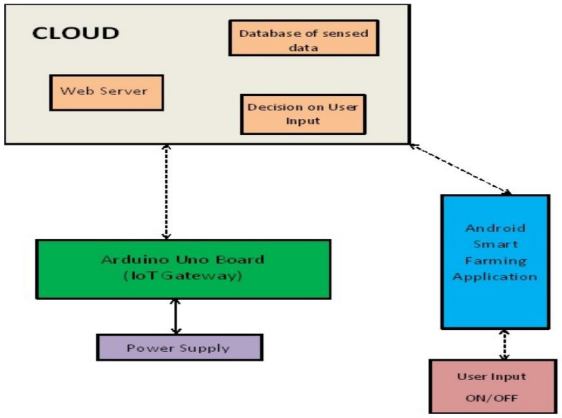


Fig 2. IOT implementation

The Arduino uno board controls all the activities taking place on board and acts as the LOT gateway. Sensors sense all the physics parameters and convert the analogue value to digital value. Temperature and humidity sensors are used to measure the temperature and humidity respectively on field. Soil moister sensor are of capability type, and are used to measure the moisture of the soil.

The yield of crops is affected by the speed with which the wind blows also. This is also measured in our developed system. For capturing data in real time from the sensors, a RTC module is also incorporated. This data is then transmitted to the LOT gateway. The LOT gateway then transmits the data to the cloud using the WI-FI module.

The cloud in our system will include a web server, a database and a decision logic. The database will maintain the data received from the IOT gateway. The decision logic then decides whether the farmer action is needed to water the plants. For example, in the developed system a threshold for temperature is kept at 25 degrees whenever the temperature goes above the threshold temperature, the database will trigger an action to the decision logic which then send a notification to the development smart farming android application.

The farmer will also get notified by a SMS to his registered mobile phone. Based on the farmers action whether to turn ON/OFF the watering, a signal will be sent to the cloud and from the cloud to the gateway which will then send a signal to trigger the relay and turn on the water pump.

IV. IMPLEMENTATION

1) *Implementation of IOT in the Field of Smart Agriculture:* The global population is predicted to touch 9.6 billion by 2050-this poses a big problem for the agriculture industry. Despite combating challenges like extreme weather conditions, rising climate change, and farming's environmental impact, the demand for more food has to be met. To meet these increasing needs, agriculture has to turn to new technology. New smart farming applications based on IOT technologies will enable the agriculture industry to reduce waste and enhance productivity. It is the application of modern ICT (information and communication technologies) into agriculture. In IOT based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.). the farmers can monitor the field conditions from anywhere.
2) *Implementation of Soil Moisture Sensor in Smart Agriculture:* Soil moisture sensor measures the volumetric water content in soil. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardener. Soil moisture sensor aid good irrigation management. Good irrigation management gives better crops, uses fewer inputs, and increases profitability. Soil moisture sensors help irrigators to understand what is happening in the root zone of a crop.
3) *Implementation of Water Level Sensor in Smart Agriculture:* Water source is necessary and an important factor in agriculture and farm production and is a key of our quality of life as well. Monitoring water level of a water source, such as water tank or bore well etc., plays a keys role in water management. keeping track of water level in a water source can be used to preserve water and to study the water us age. Thus, monitoring water level is an important task in agriculture. In this prototype experiment of the proposed system Arduino UNO board along with ethernet shield for internet connectivity in used. A water level sensor in this prototype is only used for demonstration purpose.

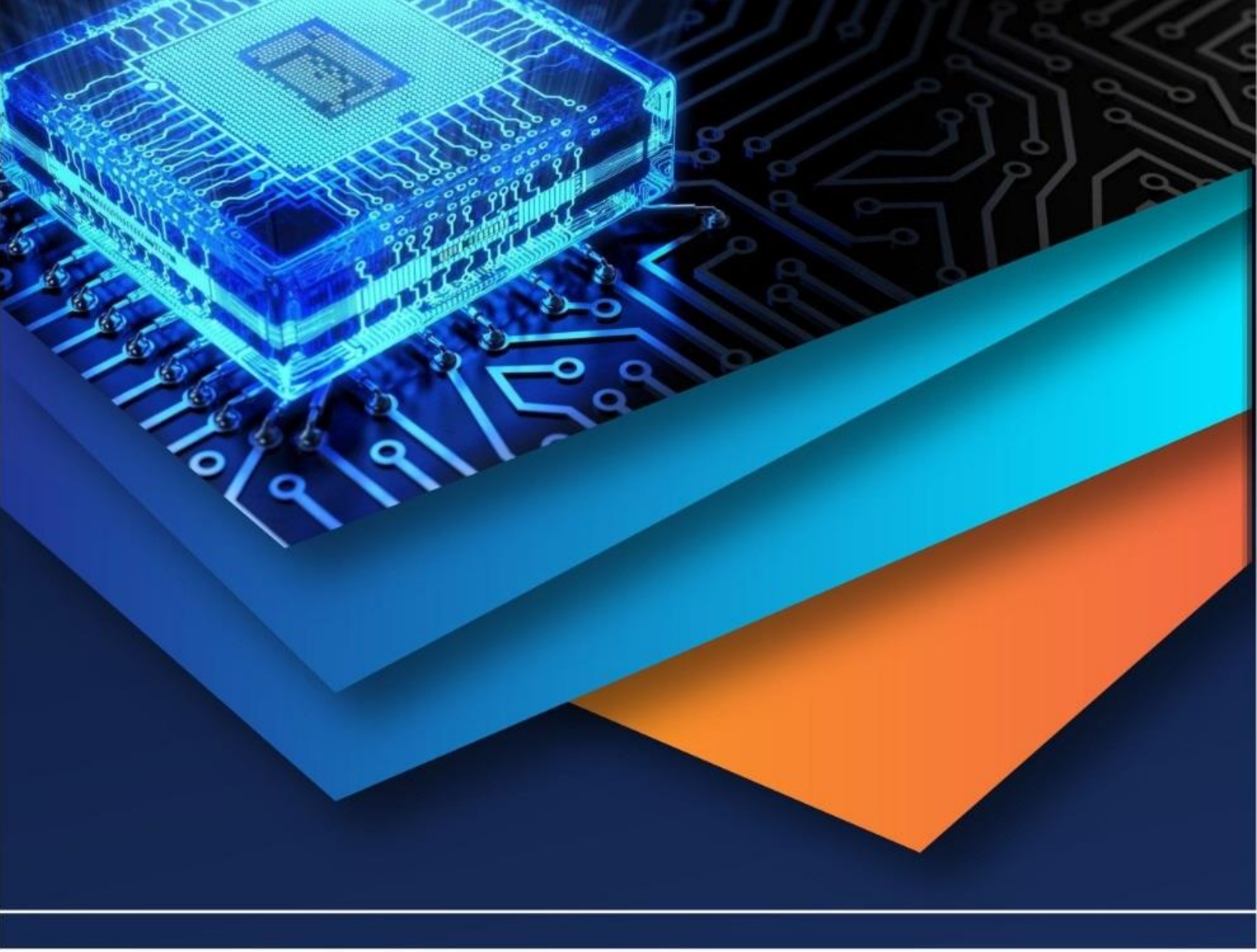
V. CONCLUSION

We have designed automated smart agriculture system which reduces the time and resources that is required while performing it manually. This system uses the technology of internet of things. The system also measured moisture of soil and level of water in field. This system works well in the ideal conditions and further improvement can be made when the conditions are not ideal like proper illumination or lightning.

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