Smart Irrigation Management And Monitoring System Using IOT

Tejan satre[1], Niket dare[2], Charanjeet kaur sandhu[3], Krishnendu Nair[4]
Department of Computer Engineering
[1,2,3] Student PCE, New Panvel
[4]Faculty, PCE, New Panvel

Abstract- *This is a Mobile Integrated and smart irrigation system using IOT based on application controlled monitoring system. The main objective of this project is to control the water supply and monitor the plants through a Smartphone, GSM (Global System for Mobile Communication) is used to inform the farmer about the exact field condition, shows a list of crops that would make the system feasible according to region, automatic firm management during farmers absence, automatic sms in case of emergency (i.e fire etc.) when the farmer is absent.[7]*

Internet Of Things (IoT)is a shared network of objects or things which can interact with each other provided the internet connection. IoT plays an important role in agriculture industry which can feed 9.6 billion people on the Earth by 2050.[3] Smart Agriculture helps to reduce wastage, effective usage of fertilizer and thereby increase the crop yield. In this work, a system is developed to monitor crop-field using sensors (soil moisture, temperature, humidity, Light) and automate the irrigation system. The data from sensors are sent to web server database using wireless transmission. In server database the data are encoded in JSON format. The irrigation is automated if the moisture and temperature of the field falls below the brink. In greenhouses light intensity control can also be automated in addition to irrigation. [3]

It is observed that for the first time an android phone-control the Irrigation system, which could give the facilities of maintaining uniform environmental conditions are proposed. [6]The Android Software Development Kit provides the tools and Application Programmable Interface necessary to begin developing applications on the Android platform using the Java programming language. Mobile phones have almost become an integral part of human life serving multiple needs of humans. [4]The Android App developed fetches the sensor data from web server database when it receives request from the GPRS/GSM modem. GSM (Global System for Mobile Communication) is used to inform the farmer about the exact field condition. The information is passed onto the user request in the form of SMS.

The user interface for the application is designed in a way that enables both the monitoring and control of field from the device. The internet connection should be provided to monitor and control the field. This system will be more useful in areas where water is in scarce. [2]This system is 92% more efficient than the conventional approach.[2]

Keywords- Eye Movement, Eye Gaze, Threshold, Face Detection, Viola Jones, Face Recognition[5]

I. INTRODUCTION

In today's environment, people are surrounded with networked sensors embedded in objects that will respond to their requirements.[6] People are expecting an intelligent, embedded and digital environment that can so sensitive and responsive to the presence of people.[13] The Wireless Sensor Network (WSN) consists of spatially distributed autonomous sensors that can monitor physical mediums such as temperature, sound and pressure. Also, sensors cooperatively pass their data through the network to a main location The Internet of things is a revolution agriculture industry, which helps farmers to face a lot of challenges regarding water scarcity, land monitoring, managing the costs and increase the consumption based on the data provided.[7] IOT is used to gather real time data from sensors and sends to application through a cloud storage Sensors are the key that connects available computational power with physical applications. Sensors have been designed for detection of ph range in soil, soil moisture, ultra violet radiation, temperature humidity sensing and water level of crops are been detected. These sensors are typically quite small and thus can be integrated into almost any application related to agriculture. In the field of agriculture, WSN extends its support for distributing data, collecting and monitoring the harsh environment information. Also, the IOT monitors the precise irrigation and fertilizer supply for increasing crop yield while diminishing cost and assisting farmers in real time data gathering.[7] Issues faced in Agriculture In India, Agriculture is the backbone of economy which contributes to the overall economic growth of the country and also supporting more than 50% of human life. There are some challenges in this field especially water scarcity, labor management, marketing the products and consuming the items (e.g. fertilizer) related to the agriculture. Of course, one of the big challenges in this field is water

management. Most of the cases, the utilization of the water is not reached up to 100% and sometimes specific quantity of water is wasted due to the poor water management and alertness. [5]Also, the other major factor in this area, certainly we say global warming which can tune 26% of water scarcity. Soil nutrients are also creating a big issue in the agricultural field even in the developing countries.[8] Hence, a technology based application is needed to monitor agricultural system which decides itself intelligently and performing the actions.

II. LITERATURE SURVEY

We visited a sample number of farmers and found our motive to choose the topic of irrigation management.[5] This is the project from the motivation of the farmers working in the farm lands, who are solely dependent on the rains and bore wells for irrigation of their land. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF whenever required.][8]Moreover, for the power indication they are glowing a single bulb between any one of phase and neutral, meanwhile when there is any phase deduction occurring in other phases, the farmer does not know whether their supply is low. If they Switch ON any of the motor, there will be the sudden defuse in motor circuit causing him loss of motor devise. we studied papers published by researchers and got to following information

● Archana and Priya (2016)

proposed a paper in which the humidity and soil moisture sensors are placed in the root zone of the plant. Based on the sensed values the microcontroller is used to control the supply of water to the field. This system doesn't intimate the farmer about the field status

● Sonali D.Gainwar and Dinesh V. Rojatkar (2015)

proposed a paper in which soil parameters such as pH, humidity, moisture and temperature are measured for getting high yield from soil. This system is fully automated which turns the motor pump ON/OFF as per the level of moisture in the soil. The current field status is not intimated to the farmer[2].

● V. R. Balaji and M. Sudha (2016)

proposed a paper in which the system derives power from sunlight through photovoltaic cells .This system doesn't depend on electricity. The soil moisture sensor has been used and based on the sensed values PIC microcontroller is used to ON/OFF the motor pump. Weather forecasting is not included in this system have introduced the system, which is used for calculating the total size of crop leaves with light intensity readings captured by the sensors . But, his paper has limitations like it can only monitor crops[3]

2.1 Proposed system

Internet Of Things (IoT)is a shared network of objects or things which can interact with each other provided the internet connection. IoT plays an important role in agriculture industry which can feed 9.6 billion people on the Earth by 2050.Our project AUTOMATING IRRIGATION helps to reduce wastage, effective usage of fertilizer and thereby increase the crop yield. In this work, a system is developed to monitor crop-field using sensors (soil moisture, temperature, humidity, Light) and automate the irrigation system. The data from sensors are sent to web server database using wireless transmission. In server database the data are encoded in JSON format. The irrigation is automated if the moisture and temperature of the field falls below the brink. In greenhouses light intensity control can also be automated in addition to irrigation. The notifications are sent to farmers' mobile periodically. The farmers' can able to monitor the field conditions from anywhere. This system will be more useful in areas where water is in scarce. This system is 92% more efficient than the conventional approach.

The sequence of steps involved in our project is:

A. Farmer registration
B. Installation of sensors
C.Water level sensor in well and irrigation sprinkler
D. Wireless Data transmission
E. Data Processing and Decision making
F. Automating Irrigation (Android App)

SEQUENCE FLOW OF THE PROPOSED SYSTEM

•Farmer registration

Basically, the farmers are provided with software, an irrigation sprinkler and hardware. The first step involves the registration of the farmers in the provided software. The n number of farmers can be registered through a mobile no/ aadhar number as a unique identification number. The registered farmers are then verified at the nearby taluka office for land assurance. So that the authorities could verify the land details and start the installation process.

B. Installation of sensors

After the registration, the sensors are being attached according to the range of field area in an embedded hardware kit, the authority's takes up the necessary steps for installation process. Then, a control unit will be provided to the farmer to activate the irrigation sprinkler and a water level sensor in the well, which acts as a water conserver in the period of water scarcity.

C.Water level sensor in well and irrigation sprinkler

Water level sensor in well and irrigation sprinkler the control unit is the irrigation sprinkler which is used to sprinkle the water in the field sufficiently. Based on the threshold value of the soil moisture sensor, the irrigation sprinkler is been actuated and provides the necessary water needed for crops thus conserving water. After sprinkling, it is automatically been switched off. The number of irrigation sprinklers in a particular field is connected to a motor, which is a means of a water supply. The sprinkler can also be an overhead sprinkler. If the temperature is high and the water level is high, pump is been switched on otherwise if temperature is and water level is low irrigation sprinkler is been actuated.

D. Wireless Data transmission to web server

The web application is designed to monitor the field and crops from anywhere using internet connection. The web application is designed using HTML and PHP script.PHP is server side scripting language for the web development. PHP can be used with HTML code and with various web engine frameworks. PHP is an efficient alternative to Microsoft's Active Server pages. The PHP script will parse the data and display it on android device. The webpage developed insert the sensor data in MySQL database when it receives request from the GPRS/GSM modem. The data type used in MySQL is JSON (JavaScript Object Notation).The JSON representation is used here because it is a easy way to store and access database in easy manner. JSON is a data format similar like arrays. It comes in key value pair. JSON is a format in which data is represented as name value pairs. It can be easily read by human and independent of the language used. It uses conventions of programming language like C, C++, JavaScript. The webpage can be easily queried and information can be retrieved in an efficient manner using mobile application.

The web application also used to monitor the crop field. The web application also used to control the motor and lighting in the field. To control the arduino the processing IDE is used. The webpage and arduino can be communicated using the processing IDE. The processing is a open source like arduino IDE which includes text editor, compiler and display window. The serial library in the processing is used to read and write data to and from external devices. When ON(OFF) button is clicked in webpage it writes 1(0) to the serial port using processing IDE. The arduino will read the bit '1' from serial and switch on the light connected to it using relay.

E Data Processing and Decision making

Ethernet connection at receiver end. Periodically the data are received and stored in database. The data processing is the task of checking the various sensors data received from the field with the already fixed threshold values. The threshold values vary according to the crops planted. This is because different crops need different amounts of water. For example in a paddy field to produce 1 kg of rice 5000 litres of water and for wheat it is liters.Similarly, the temperature and humidity varies for different crops. The sensor values also vary according to the climatic conditions. The soil moisture will be different in summer and winter seasons. The temperature and humidity also varies in summer, winter and rainy season. The threshold values are fixed after considering all these environmental and climatic conditions. The motor will be switched on automatically if the soil moisture value falls below the threshold and vice versa. The farmer can even switch on the motor from mobile using mobile application.

F. Automating Irrigation Software

The mobile application is developed in android. The mobile application helps to monitor and control the field from anywhere. The mobile application uses PHP script to fetch data from MySQL database. In MySQL database all the sensor data are stored. The android fetches the data and encode it in JSON format to be displayed in android device. The user interface for the application is designed in a way that enables both the monitoring and control of field from the device. The internet connection should be provided to monitor and control the field.

2.2 Applications

Being smart about irrigation is a good idea, both for the environment and your back pocket. Up to 50 per cent of all water used in the home is for watering landscapes with the average property owner over-watering by 38 per cent. [3]The good news is that it's also easy to be smart when it comes to irrigation thanks to new developments in irrigation technology.

The conventional controllers are typically timed based and rely on the user to determine how often to irrigate, resulting in excessive amounts of water applied to the garden.

Additionally, once they are programmed, they are rarely changed so weather and other conditions are not factored in.

Smart Irrigation systems can reduce water bills significantly.[2] Whether you are an irrigation installer, landscape, maintenance worker or a homeowner, systems are affordable, save precious water resources and keep landscapes in peak condition. Smart Irrigation systems enable weather-based watering which take into account seasonal, soil, plant and weather conditions to reduce over-watering, providing optimal moisture to the landscape.

1. Save Time – The system does all of the work

Gone are the days where time is wasted with a hose in hand watering the lawn, plants and flowers.[3] Now, with a Smart Irrigation System, timers are set so that watering occurs only when it is best for the landscape and climate the landscape is located. Home owners can go out on a hot day or away on holidays with confidence that landscape will be maintained and that their lawns and plants will be looked after and blossoming on return.

2. Save water – The system is much more efficient than traditional time based systems

The Weathermatic SmartLink system can save as much as 20-50% of the water that would normally be used with a typical irrigation system. The systems can be extremely efficient and will only apply the amount of water required by the plants. There is little to no waste through overwatering, overspray and run off.

3. Save money – Less water means lower cost

With everything programmed to suit each landscape, climate and weather conditions, the landscape will only be watered when required. No water wasted means no money wasted. Additional costs including replacing dead plants that may occur with traditional watering methods are also prevented. It also decreases the taxes needed to build more water infrastructure that may be caused through runoff and erosion.

4. Save the plants – plants will be kept in peak health

With optimal watering plants are kept in perfect health and growth is promoted. Plants and lawn will grow a lot faster when they are watered correctly over a long period of time. More luscious, greener and healthier landscapes can be achieved.[5]

2.3 Hardware and Software Specifications

The experiment setup is carried out on a computer system which has the different hardware and software specifications

Hardware :

• Processor - 2 GHz Intel •HDD-180 GB • RAM -2 GB • AT89s52 MCU • Arduino kit UNO • Power Adapter 12V 1A • LCD 16 x 2 • Switches 12mm (x2) • LEDs 5mm x20 • LED RGB x2 • Buzzer • Relay • DC Motor • Irrigation sprinkler • Humidity sensor (DHT11) • Temperature Sensor (LM35) • Soil moisture sensor • Heat sensor • Transistor BC547 • Resistors: 1K, 10K (10 each) • USB [2]Cable 1 • Jumper wires male to female x15 • Breadboard • Memory of 4 GB RAM or • Web Camera

2.4 Software:

• Arduino software (IDE) • Net beans IDE • Dual-core 64-bit processor • The Android SDK • Java Runtime Environnent 1.6 • Java SE JDK v6. [3]

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