International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 02 | Feb -2017 www.irjet.net p-ISSN: 2395-0072

A Conservative Approach With Smart Irrigation System

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Abstract: Clean Water is one of the rarest existing elements present on the earth. So the measure should be taken to conserve it. Coming towards the agriculture which is the base of Indian economy the methods used are still the traditional. This leads to improper use of water. So to meet those requirements the aim is to design the Smart Irrigation System based on the sensors. This System would seek the purpose with the help of moisture and temperature sensors. The moisture sensors and temperature sensor will detect the actual moisture level and temperature give the parameter to the microcontroller and hence the left work will be done on those parameters by sensors. The total system will efficiently meet the water requirements by conserving water and will ease the tradition irrigation system.

Keyword's— Automatic Watering System, Arduino-board,

1.INTRODUCTION:

In this current era the world has facing problem of water . As we all know water is basic need of Agriculture. The Irrigation known as Drip irrigation could be one of the solution to this problem as it save large amount of water. But this not the proper solution to this problem because we can't predict amount of water required for crops. Sometime water may be given in excessive amount or vice versa [1][2]. The water in this system will provide a smarter way for irrigation. This system is an attempt towards the smart irrigation system concept. An electronic device is responsible for sensing the temperature and Moisture conditions. Along with it a Bluetooth devise is added to the hardware device. The sensed environmental conditions are taken and sent to the Server, which has a MySQL database for storage of records. The sensor node is deployed in irrigation field for sensing soil moisture value and the sensed data is sent to controller node. On receiving sensor value the controller node checks it with required soil moisture value. When soil moisture in irrigation field is not up to the required level then the motor is switched on to irrigate associated agriculture field and alert message is send to registered mobile phone. Smart irrigation systems estimate and measure diminution of existing plant moisture in order to operate an irrigation system, restoring water as needed while minimizing excess water use. The effects of the applied amount of irrigation water, irrigation frequency and water use are particularly important. To improve water efficiency there must be a proper irrigation scheduling strategy.

2. OBJECTIVE:

The main objective of this system is to provide correct values of sensors on android app . by using this app user can ON/OFF node using blue-tooth , .and by using this values water can be supplied to the farm. To make better use of our freshwater resources, growers need to have not only an efficient method of delivering the water to the plants, but also an efficient watering scheam, so that the plants are getting watered with the right amounts at the right time

3.LITERATURE SURVEY

3.1 Automated Irrigation System Using a Wireless Sensor Network and GPRS Module.

The system which work automatically for Irrigation with the use of WSN and GPRS module is having the main goal to optimize the usage of water. This type of system is generally consists soil moisture and temperature sensor in WSN within a distributed network. The unit known as gateway is mainly purposed to transfer the data from sensing unit to base station, then actuator perform the function to control the irrigation on given commands and also manage the data from sensing unit. For controlled water supply over field in required and depending upon the condition of field the specialized algorithm is used. The main function of algorithm is to give commands to actuator to provide controlled quantity of water through valve, this algorithm is programmed into microcontroller.

METHODOLOGY: System computation is totally based on micro-controller. The automated irrigation is served by WSN in order to save water. The soil moisture sensor and soil temperature sensor gives Live readings. The device present sensor node are soil moisture sensor, temperature sensor, microcontroller unit and transceiver. The data gathered from sensor is transmitted to microcontroller and communicatin form gateway to particular node is done through Xbee WPAN IEEE 802.15.4. This data is transferred to remote location with help of cellular network.. It uses GPRS protocol. Internet connection allows data inspection of current soil moisture and temperature value and there graphical representation is simple to take decision. Web pages programmed the micro controller as per requirement of crop for water

LIMITATION: Automated irrigation system uses only two parameters of soil like soil moisture and temperature other parameters humidity, light, air moisture, soil ph value not taken for decision making. This system works on soil moisture and temperature sensor threshold value. It just shows the soil condition and system take decision on threshold value these are

previously sated. Sometime system irrigate farm with more or less water not as per crop requirement. Maximum profit scenario is not considered as per crops type and available water.

3.2 Automatic Drip Irrigation System using Wireless Sensor Network and Data Mining Algorithm.

Data mining algorithm are used to take decisions on drip irrigation system. Automated drip irrigation system having WSN placed in all over farm and different type of sensors like soil moisture sensor, wind direction, wind speed, soil temperature gives reading to control station and base station. WSN uses ad hoc network which gives self-configuration and flexibility. Sensor data is given to base station and data is received using zigbee. Data processing is done at base station for decision making. Data mining algorithm is used to take decision on data from sensor to drip. All observation are remotely monitor through web application.
METHODOLOGY: Data mining Naïve Bayes algorithm is used for decision making on data set which is real time feed from field sensor. Algorithm check probability of each attribute. Drip irrigation on and off decision are made. Previous data set of agriculture is provided to take decision. All data of field is given to web application for observation. **LIMITATIONS:** Data change as per geological and soil condition system does not work suitably. This system works on Naïve Bayes algorithm for irrigation control. Algorithm works on previous data set for decision making if any attribute is not frequent result is zero.

3.3 Automated Intelligent Wireless Drip Irrigation Using Linear Programming.

Current automated drip irrigation system work on one condition at time like soil moisture, temperature, air direction, soil ph value. If system is working on soil moisture condition then threshold value is for decision of irrigation. Other parameter not consider for irrigation. Water availability and weather condition are also important to save water and get maximum profit.

METHODOLOGY: Automated intelligent wireless drip irrigation system uses linear programming to get maximum profit from available water and crop water requirement. This system calculates water requirement of different crop, available water and maximum profit scenario for different crop field. Decision support system helps to take decision of irrigation for different crop field.

LIMITATION: System use linear programming for maximum profit on defined resources. It causes problem where constrain and objectives are not define. In real time situation object and constrain are not predefined then this system cannot be used.

3.4 A Crop Monitoring System Based on Wireless Sensor Network.

Wireless sensor network crop monitoring application is useful to farmer for precision agriculture. The application monitors the whole farm from remote location using IOT (Internet of Things). Application works on sensor network and two types of nodes. Energy saving algorithm is used in node to save energy. Tree based protocol is used for data collection from node to base station. System having two nodes sensor node which collect all environmental and soil parameters value soil moisture, temperature, air, humidity, light, etc. and second node consist of cam to capture images and monitor crops.

METHODOLOGY: Crop monitoring application consists of two sensor node image sensor and environment parameter collector. These two sensors collect the information about crops. Image sensor collect crop growth, height and second sensor node collect data about humidity, soil condition, etc and this information is collected at base station and then get transfer to internet (web application). Data analysis is get done at server side. Communication is duplex GPRS/CDMA type. RF transceiver is used for communication purpose between to nodes. This application was deployed in Beijing, Henan and Shandong Province for experimentation purpose and temperature, humidity and images of crop data are collected from these location. Application is for agriculture informationization. IOT make it possible.

LIMITATIONS: Environmental changes not consider for sensor reading. System user is not able to program application. There is no controlling system for application.

4. System Design:

This system uses two type of sensors: Temperature sensors and Moisture sensors . this sensors are use to calculate the amount of water required for particular crops, and at what amount of time

4.1 Moisture sensors:

A soil moisture sensor is put into the soil and measures how much moisture is in the root is present. It allows your irrigation system to match the amount of water applied with the amount of water needed by the plants. It allows irrigation if more water is needed or prevents irrigation if the soil is already wet from rainfall. By not watering when your soil has enough moisture, you can

significantly reduce the amount of water used for irrigation. This saves you money.[3].

4.2.Temperature sensors :

This sensors are those which detect **Temperature** or heat and most commonly used among all the sensors.
These temperature sensor vary from simple ON/OFF thermostatic devices which control a domestic hot water heating system to highly sensitive semiconductor [1][3].

A temperature sensor are of two basic physical types they are given below :

- Contact Temperature Sensor Types
- Non-contact Temperature Sensor Types

Again this sensors are divided into three groups of sensors, *Electro-mechanical, Resistive and Electronic* .Among all this the thermistor sensor are most commonly use for agriculture. The **Thermistor** is type of temperature sensor, whose name is a combination of two words THERM-ally sensitive res-ISTOR. Thermistors are made up of ceramic type semiconductor material using metal oxide technology such as manganese, cobalt and nickel, etc. The semiconductor material is formed into small pressed discs or balls which are sealed to give fast response to any changes in temperature. Thermistors have the resistive value at room temperature (usually at 25°C). Like resistors, thermistors are available with resistance values at room temperature from 10's of MΩ. But for sensing purposes those values are generally measured in kilo-ohms. Thermistors are passive resistive devices in which we need to pass a current through it to produce the voltage output. Then thermistors are connected in series with a proper biasing resistor to form a potential divider network and the choice of resistor gives a voltage output at some pre-determined temperature point or value.

4.3 Arduino (Micro Controller):

Arduino is a microcontroller based kits for building digital devices and interactive objects that can able to sense and control the physical devices. An Arduino board consists of an Atmel 8-, 16- or 32-bit AVR microcontroller. With some components that provide programming and incorporation into other circuits. Important part of arduino is that it provide standard connecter, which connect the CPU board to a various type of interchangeable add-on modules termed shields.The Arduino provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It is come from the IDE for the languages Processing and Wiring. It was created for people who do not have knowledge about electronics. It includes a code editor which provides syntax highlighting, brace matching, cutting/pasting text, searching/replacing text and automatic indentation, and also simple one-click mechanism to compile and upload programs to an Arduino board. It also provides a message area, a text console, a toolbar with buttons for common functions and a series of menus.

Diagram 2.3.1 : Arduino device[1]

4.4 Bluetooth Device:

Bluetooth is a wireless connectivity device which is use to provide wireless connectivity. The Arduino-Bluetooth device is use to provide connectivity with the aduino device by using Bluetooth we can control the arduino form our smart phone[1]

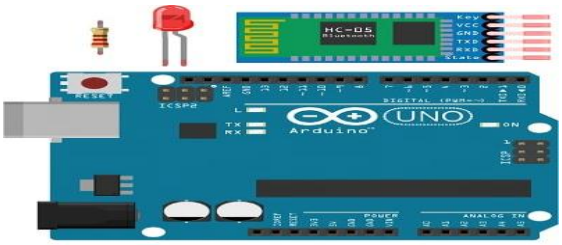


Diagram 2.4.1: arduino with Bluetooth device[1]

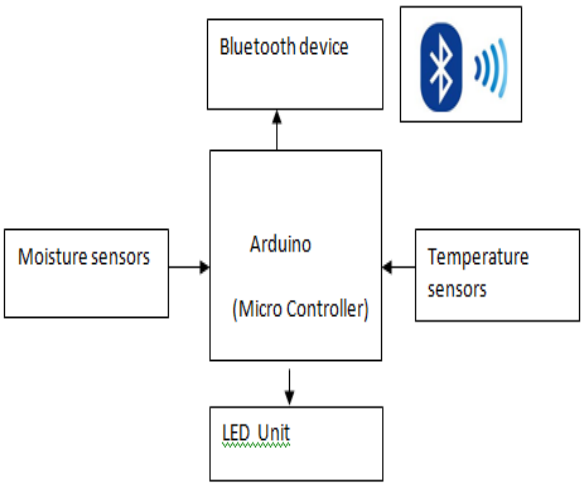


Figure 1: block diagram of monitoring unit

5. System Architecture:

The System Architecture for Smart Irrigation System are give below in which
Hardware

1. Bluetooth Module HC 05/06
2. Arduino & Battery (with cable)
3. LED
4. 220Ω Resistor
5. Android device

Software

1. Arduino IDE
2. Android Studio.

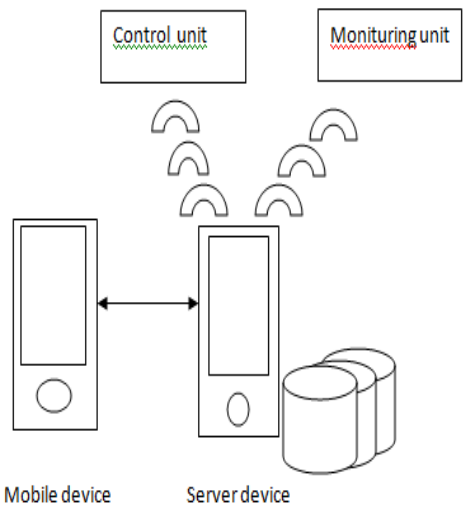
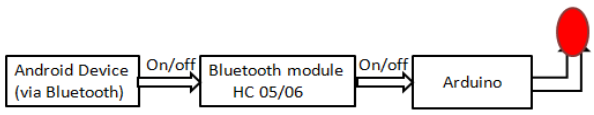


Fig 3.1: System Architecture

There are three main parts of this System Architecture one is Android smart phone, Arduino-Bluetooth device and Arduino.the connectivity between all this devices are shown in the diagram.



Bluetooth HC 05/06 works on serial communication. Here the android app is designed to send data to the arduino Bluetooth module when the button is pressed on the app. [1][2]At the other end arduino Bluetooth module receives the data and sends it to the Ardunio through the TX pin of Bluetooth module(connected to RX pin of Arduino). The code uploaded to Arduino checks the data received from the arduino Bluetooth and compares. If received data is 1 the LED turns ON. And when it received data 0 it will turn off. You can open the serial monitor and watch the received data while connected. Diagram below shows Connecting the Arduino Bluetooth hardware

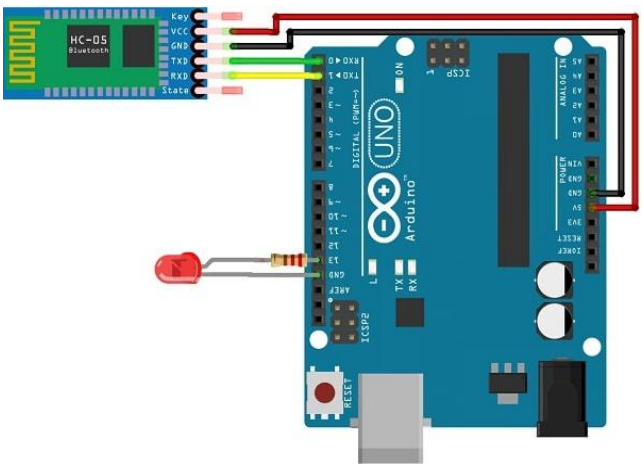


Diagram 3.1 :Arduino with Bluetooth connectivity[1]

There are four connection can be made between Bluetooth device and Arduino. For that for connection different pins are use, combination of those pins are shown below[1].

Arduino Pins Bluetooth Pins

RX (Pin 0) ———> TX

TX (Pin 1) ———> RX

5V ———> VCC

GND ———> GND

Connect an LED positive to pin 13 of Arduino through a resistance(valued between 220Ω – 1KΩ). Connect its negative to GND.

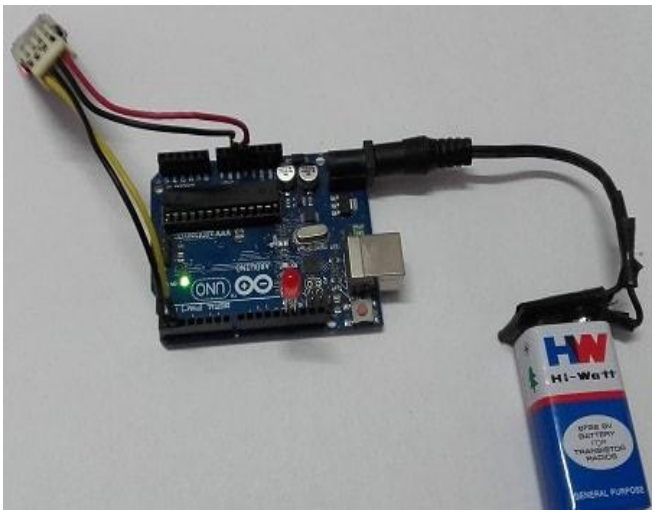


Diagram 3.2. : connect the Bluetooth module to the Arduino using jumper wires and a connector[1].

6. CASE STUDY OF PREVIOUSLY PROPOSED SYSTEM AND EXXISTING SYSTEM.

The previously propose system used two level of sensors that were soil moisture sensors and temperature sensor within some limitation of usage under some circumstances. This used microprocessor with connectivity given through Xbee and GPRS/GSM module. They were built only for sprinkler irrigation which implied the limited usage. Some made the use of data mining for the automated irrigation but it would not be so reliable as it does not use any physical interventions. Under such circumstances the need of proper automated irrigation would be addressed by the proposed system.

7. ADVANTAGES OF PROPOSED SYSTEM

Reliable: As the part from existing system does not meet reliability by overcoming some limitation of the limited usage of existing system, aim is to design a reliable system.

Flexible: As the existing system were limited to the usage for some technique the proposed system would be rather flexible for usage in many other technique.

Cost Efficient: In Proposed system, the term gcs(google cloud service) is introduced which is the replacement for GSM/GPRS module of existing system. This would serve the low cost for developing of proposed architecture.

Adaptable: System with minimum cost and with a usable system in many circumstances will be an adaptable means for user this would be served by proposed system.

8. CONCLUSION

Here the approach was the conservation of water which was implicated in use of irrigation. So by looking forward developing a automated irrigation system was the Aim. The automated system would be proposed with help of WSN, microcontroller, Bluetooth, GCS. The lone attention of sensors is to gain physical parameter from soil and environment which would be monitored and then given to the control unit for the further action. The further action could be taken place by actuators.