SMART AGRICULTURE USING IOT

Mrs.K Ranjani, Mr. I Dhivakar, Mr. A Akil karthi, Mr. A Sarath Chandar, Mr. J Dhinesh kumar
Asst. Professor, Student, Student, Student, Student
Electronics & Instrumentation Engineering
SNS College of Technology, Coimbatore - 641035

Abstract : In smart irrigation system which is cost effective and a middle class farmer use it in farm field. Today we are living in 21st century where automation is playing important role in human life. Automation allows us to control appliances automatic control. It not only provide comfort but also reduce energy, efficiency and time saving. Today industries are use automation and control machine which is high in cost and not suitable for using in a farm field. So here we also design a smart irrigation technology in low cost which is usable by Indian farmers. The objectives of this paper were to control the water motor automatically with the help of soil moisture sensor, rain sensor, humidity sensor. Finally send the information (operation of the motor) of the farm field through android application.

Keywords-Internet of Things, Sensors, Integrated Circuit, Wireless sensor network

I. INTRODUCTION

In our country agriculture is major source of food production to the growing demand human population. In agriculture, irrigation is an essential process that influences crop production. Generally farmers visit their agriculture fields periodically to check soil moisture level and based on requirement water is pumped by motors to irrigate respective fields. Farmer need to wait for certain period before switching off motor so that water is allowed to flow insufficient quantity in respective fields. This irrigation method takes lot of time and effort particularly when a farmer need to irrigate multiple agriculture fields distributed in different geographical areas. Traditionally farmers will present in their fields to do irrigation process. But nowadays farmers need to manage their agricultural activity along with other occupations. Automation in irrigation system makes farmer work much easier. Sensor based automated irrigation system provides promising solution to farmers where presence of farmer in field is not compulsory. Really indian farmers need cheap and simple user interface for controlling sensor based automated irrigation system. Now a day's internet is widely used. Using internet farmer know about the agriculture field irrigation status. This helps farmers to know the status of farm field watering direction through a message whether the farmer is far away from field know the status of water motor is ON or OFF and direction of watering.

The rainfall in our country depends on monsoons. Rainfall controls agriculture, but the agriculture is said to be “the gambling of the monsoon” as the monsoon rainfall are uncertain, irregular and uneven or unequal. So irrigation is essential for agriculture. In india there are 80% of the total annual rainfall occurs in four months, i.e. from mid June to mid Octotober..

II. LITERATURE SURVEY

In this paper, soil moisture and temperature sensors were placed in root zone of plants and gateway unit. It handles sensor information and transmit data to applications. The threshold values of temperature and soil moisture sensor into a microcontroller to quantity of water. Another factor is cellular internet interface is used data inspection and irrigation scheduling which is implanted using android application. The automatic system was tested for several days and result with traditional irrigation system was implemented.

Acoustic based technique to detect soil moisture content. The system is based on relationship between two quantities speed of sound and degree of saturation with water in soil. Various sensors are placed in paddy field. Different sensors sense water level continuosly and information to farmer through mobile phone. Farmer can control the motor using mobile phone from remote location. If water level reaches its threshold value, motor automatically power off.

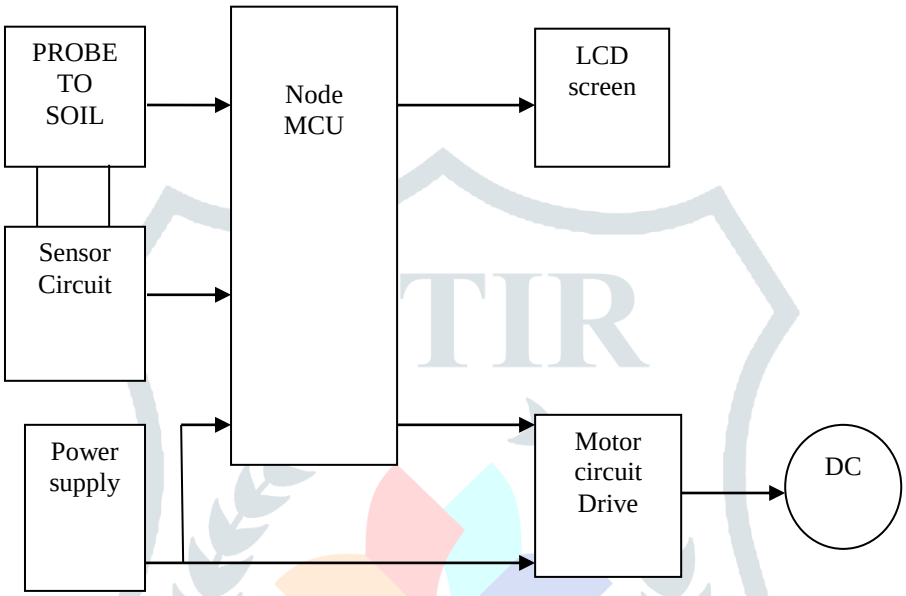
The automatic system designed using ARM and GSM technology.Soil moisture sensor placed in root zone in paddy place that senses water level. The system based on ARM7TDMI core and GSM.

In automatic irrigation technique is implemented using WSN. The idea was developed to improve irrigation system and reduce cost of water. Sensors are placed in farm that sene and collect information. Using this system was control automatically using internet.

The improved method which proposes his paper proposes an automated irrigation system which monitors and maintains the desired soil moisture content via automatic watering. Microcontroller ATMEGA328P on arduino uno platform is used to implement the control unit.

The Process method of irrigation using vocal commands through the GSM technology. The Farmer just needs to open the app and utter the control commands through his phone. The control system at the field involves a PIC microcontroller interfaced with GSM modem to receive the command and decodes it. The motor is turned on/off according to the decoded commands by the controller.

III. BLOCK DIAGRAM



Basic Design:

The design is based on the irrigation which have been used in the agriculture. The design has sensor circuit and LCD screen which is controlled by the IOT and Driver IC.

1V. L293D Motor Driver IC:

L293D is a motor driver IC which allows the DC motor to drive on either forward or reverse direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motors with a single L293D IC. Dual H-bridge motor driver integrated circuit (IC). The l293d can drive small and quiet big motors as well.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in any one direction. As known voltage need to change its polarity for the rotation of the motor in clockwise or anticlockwise direction. In a single L293D chip there are two H-bridge circuit inside the IC which can rotate two DC motors. Due its specifications it is used in all robotic applications for the movement of DC motors. There are two enable pins on l293d. Pin 1 and pin 9, for driving the motor, the pin 1 and 9 need to be high. To drive the motor with left H-bridge you need to enable pin 1 to high. And To drive the motor right H-bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low, then the motor will suspend working and act like a switch. We can simply connect the pin16 (VCC (5V)) to pin 1 and pin 9 of to make them high.

This motor driver is used because of its voltage rating and current rating. It can drive two motors at same time. Due to its voltage rating it can drive small and quite big as well, the maximum voltage for motor supply is 36V. It supplies a maximum current of 600mA per channel, since it can drive motors up to 36V.

There are 4 input pins for L293D (2 and 7) on the left and (15 and 10) on the right as shown on the pin diagram. Left input pins will regulate the rotation of a motor on left side and right input will regulate the rotation on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as 0 and 1. In simple you need to provide 0 or 1 across the input pins for rotating the motor.

4.1. L293D Logic Table

Let's consider a Motor connected on left side output pins (pin 3, 6). For rotating the motor in clockwise direction the input pins have to be provided with 1 and 0 logic.

- **Pin 2** = **Logic 1** and **Pin 7** = **Logic 0** | Clockwise Direction
- **Pin 2** = **Logic 0** and **Pin 7** = **Logic 1** | Anticlockwise Direction
- **Pin 2** = **Logic 0** and **Pin 7** = **Logic 0** | Idle [No rotation] [Hi-Impedance state]
- **Pin 2** = **Logic 1** and **Pin 7** = **Logic 1** | Idle [No rotation]

Same as motor can also operate across pins 15, 10 for the motor on the right hand side.

V. DC Motor:

A DC motor is a rotary electrical machine that converts electrical energy into mechanical energy. The most commonly used permanent magnet type motor. The direction of current flow can change in the motor. It is used for its low cost and high efficiency properties. It runs on the voltage between 4V to 12V, it gives 16 RPM when it is powered by 4v and it gives 60 RPM when it is powered by 12V. It is a commonly used motor for simple robotic systems.

DC motor's +ve and –ve is connected to the 3 and 6th pin of L293D driver circuit. Where 16 of the driver pin is connected to the power pin of the Raspberry Pi and pin 3 and 7 is connected to the GPIO 22 for controlling the motors. The pin 1 is connected to raspberry pi for enabling the driver IC for driving the motors. An external battery or power supply is connected to the pin 8th of the driver IC to drive the connected motors.

VI. Node MCU ESP 8266:

Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266Wi-Fi SoC from Express if Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.

VII. Rain Sensor

A rain sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. The second is a device used to protect the interior of an automobile from rain and to support the automatic mode of windscreen wipers. An additional application in professional satellite communications antennas is to trigger a rain blower on the aperture of the antenna feed, to remove water droplets from the mylar cover that keeps pressurized and dry air inside the wave-guides.

VIII. Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. 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 gardeners.

Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.

XI. Humidity Sensor

Humidity Sensor measure the amount of water present in the surrounding air. This water content in the air is a key factor in the wellness of mankind. For example, we will feel comfortable even if the temperature is 0C with less humidity i.e. the air is dry.

But if the temperature is 100C and the humidity is high i.e. the water content of air is high, then we will feel quite uncomfortable. Humidity is also a major factor for operating sensitive equipment like electronics, industrial equipment, electrostatic sensitive devices and high voltage devices etc. Such sensitive equipment must be operated in a humidity environment that is suitable for the device

X. Temperature Sensor

Temperature is the most often-measured environmental quantity. This might be expected since most physical, electronic, chemical, mechanical, and biological systems are affected by temperature. Certain chemical reactions, biological processes, and even electronic circuits perform best within limited temperature ranges. Temperature is one of the most commonly measured variables and it is therefore not surprising that there are many ways of sensing it. Temperature sensing can be done either through direct contact with the heating source, or remotely, without direct contact with the source using radiated energy instead. There are a wide variety of temperature sensors on the market today, including Thermocouples, Resistance Temperature Detectors (RTDs), Thermistors, Infrared, and Semiconductor Sensors..

MODULE WORKING PRINCIPLE:

Supply to IO trigger should be at least 10us sequence.

The module automatically sends eight 40kHz square wave and automatically detect whether to receive the returning pulse signal.

If signals returned, an outputting high level and the time of high level continuing isthe time of that of the ultrasonic transmitting to receiving. Test distance = (high level time * sound velocity (340M/S) / 2. Sensor

PINs:

VCC: +5VDC
Trig: Trigger (INPUT)
Echo: Echo (OUTPUT)
GND: GND

SPECIFICATION:

The sensor is used because of its non-contact type measurement of land. The range of the sensor is 2cm-400cm and the measuring angle is 300 degree. The resolution of the sensor is 0.3cm.

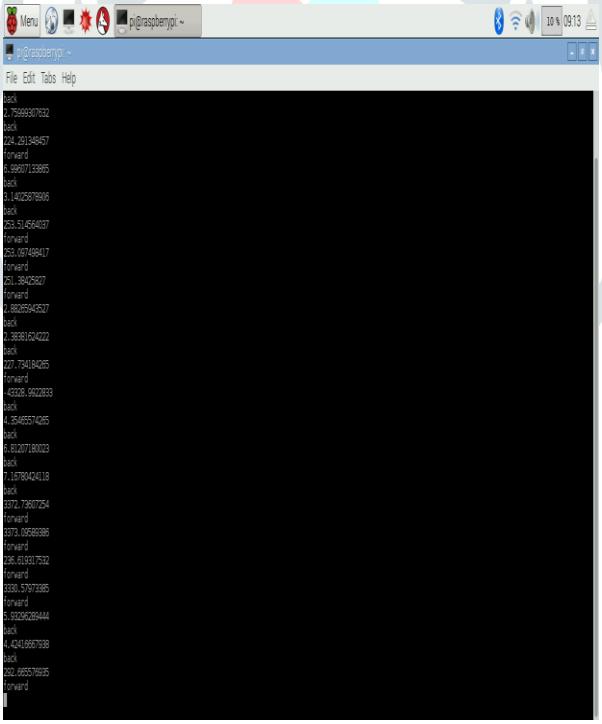
CONNECTION:

The Vcc pin from the sensor is connected to the power pin of IOT. Trigger and Echo pin of the sensor is connected to the GPIO 17 and 27 respectively. Where GND pin of the sensor is connected to the ground pin of the IOT.

RESULT:

Thus the sensor makes smart irrigation by sensing the soil moisture level. The moisture level is different for different soil. The optimal level is programmed in the IOT based on the soil , if the water level goes below condition the plant is watered . The automated control is implemented here to avoid damage of crops due to surplus or deficit usage of water. The already existing system uses simple water pumps to supply water to the crops as and when required by manual control. But, the proposed system uses automatic control by using continuous monitoring. Thus the continuous monitoring of the agriculture was designed and developed using various microcontrollers. In existing method, only discontinuous was obtained by the use of GSM which led to inefficient use of water and electricity. Hence by incorporating this method, the water and electricity was used efficiently. Compared with the existing method it gives better performance. So we can avoid these problem in a very efficient and innovative manner with the help of Node MCU through very sensitive sensors.

FIG 1: SCREENSHOT OF O/P



CONCLUSION:

In this paper we present a prototype for smart controlling agriculture system. Here prototypes includes sensor node and control node. 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 through android application. The experimental results show that the prototype is capable for automatic controlling of irrigation motor based on the feedback of soil moisture sensor. This system is used in a remote area and there are various benefits for the farmers. By using the automatic irrigation system it optimizes the usage of water by reducing wastage and reduce the human intervention for farmers. It saves energy also as it automatic controlling the system. So there are the system is OFF when the field is wet and

automatically start when the field id dry. And we present also less number of sensor nodes to use in a large area of field so the cost of the system also decrease. And power consumption of the wireless network devices are also less and the system perform a long time function.

REFERENCE

1. H.N. kamalaskar, International journal of engineering sciences & research technology (UESRT) survey of smart irrigation system,

2. Water conservation potential of landscape irrigation smart controllers.

3. S. Harishankar,"Advance in Electronic and Electric Engineering", Solar Powered Smart Irrigation System.

4. Anthony A, Trisha Sinha, International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE) Prototype for Automatic Controlling and Remote Accessing of Irrigation.

5. C. Gruhier, "Soil moisture active and passive microwave products: intercomparison and evaluation over a Sahelian site", vol. 14, 2010.