Design and Implementation of irrigation systems using Wireless Sensor Network

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***Abstract*— Internet of Things is a shared network of objects which can interact with each other provided the internet connection.**
Smart agriculture helps to reduce wastage, effective usage of fertilizer thereby increasing the crop yield.
The system is developed to monitor and control the crop field using sensors and automate the irrigation system.
The data acquired from the sensors are transmitted to the web servers using wireless transmission.
The webserver process the request and stores the data in the database. The Irrigation is automated once the control received from the mobile.

Keywords—Internet of Things (IOT); Arduino IDE, Soil Moisture Sensor,DHT11,servo motor,magnetic float sensor,rain drop sensor, ESP8266 wifi module

I. INTRODUCTION (*HEADING 1*)

Irrigation is the artificial application of water to the land or the soil. It is used to assist in the growing of agricultural crops,revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. IOT Plays an important role in agriculture industry. Internet of Things sensors and technologies allows farmers to have a deeper knowledge about their land and crops. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants.

II. LITERATURE SURVEY

Irrigation is the artificial application of water to the land or the soil. It is used to assist in the growing of

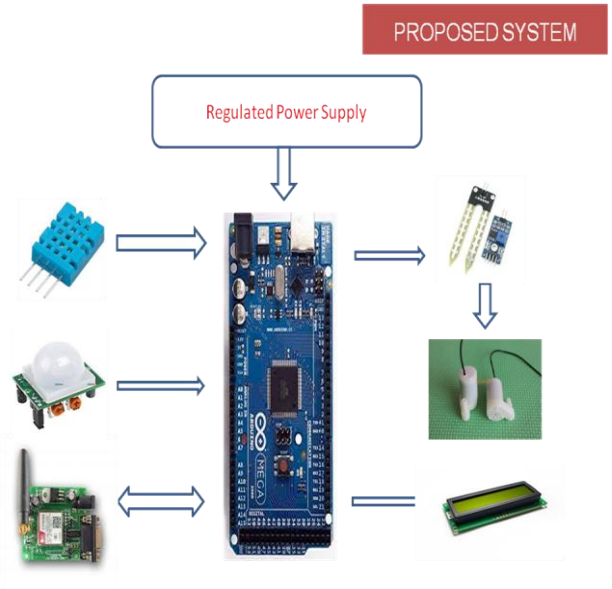
agricultural crops,revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. IOT Plays an important role in agriculture industry. Internet of Things sensors and technologies allows farmers to have a deeper knowledge about their land and crops. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants.measures proportionately more than is customary. This measurement and others are deliberate, using specifications

Drip irrigation is a type of micro-irrigation that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The goal is to place water directly into the root zone and minimize evaporation.

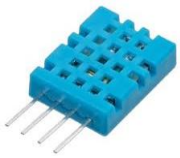
The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers they themselves verify all the parameters and calculate the readings. [1]It focuses on developing devices and tools to manage, display and alert the users using the advantages of a wireless sensor network system. [2]It aims at making agriculture smart using automation and IoT technologies. The highlighting features are smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, human detection and keeping vigilance. [3]The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates.[4]This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigator system through wireless communication technology.[5]It proposes a low cost and efficient wireless sensor network technique to acquire the soil moisture and temperature from various location of farm and as per the need of crop controller to take the decision whether the irrigation is enabled or not.

III SOIL MOISTURE SENSOR

Soil moisture sensor is a sensor which senses the moisture content of the soil. The sensor has both the analog and the digital output. The digital output is fixed and the analog output threshold can be varied. It works on the principle of open and short circuit. The output is high or low indicated by the LED. When the soil is dry, the current will not pass through it and so it will act as open circuit. Hence the output is said to be maximum. When the soil is wet, the current will pass from one terminal to the other and the circuit is said to be short and the output will be zero. The sensor is platinum coated to make the efficiency high. The range of sensing is also high. It is anti-rust and so sensor has long life which will afford the farmer at a minimum cost.



TEMPERATURE SENSOR



The DHT11 detects water vapor by measuring the electrical resistance between two electrodes. The humidity sensing component is a moisture holding substrate with electrodes applied to the surface. When water vapor is absorbed by the substrate, ions are released by the substrate which increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity. Higher relative humidity decreases the resistance between the electrodes, while lower relative humidity increases the resistance between the electrodes.

LIQUID CRYSTAL DISPLAY

LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. Each crystal, therefore, is like a shutter, either allowing light to pass through or blocking the light.LCD's consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.LCD's are used in flat screen TV's,smartphones, computer monitors,digital watches,etc.

The LCD can be made in different sizes such as 8x1,8x2,10x2,16x1,16x2,16x4,20x2,20x4,24x2,30x2,32x2,40x2 etc.For example,take LCD 16x2 which means it can display 16 characters per line and there are 2 such lines.All these LCD's performs the same functions such as display characters,numbers, special characters ASCII characters etc.Hence their programming is also the same since they all comes with same 14 pins (0-13) or 16 pins (0 to 15).

- **GND** or **VSS:** Ground or 0V
- **VCC** or **VDD:** Supply Voltage 5V
- **VEE:**Contrast adjustment through a variable resistor
- **RS:** Register select.Generally,every Lcd has two types of registers namely ***Command Register*** and ***Data Register***. When RS=0 or low,Command Register is selected and When RS=1 or high,Data Register is selected.

- **R/W:**Read/Write.When ***RW=1***,data is read from Lcd and When ***RW=0***,writes the data to Lcd.
- **EN:**Enable.Sends data to data pins when a high to low pulse is given.
- **Eight Data pins(DB0 to DB7):**This 8-Data pins carries 8-bit data or command from an external unit such as micro controller.
- **Led+:**Back light of the LCD which should be connected to Vcc or 5V.**Led-:**Back light of the LCD which should be connected to Gnd or 0V

PIR SENSOR

Detecting motions or movements has always been important in most projects. With the help of the PIR Sensor it has become very easy to detect human/animal movements. In this project we will learn how we can **interface a PIR Sensor with a microcontroller like Arduino**. We will **interface an Arduino with PIR module** and blink a LED and beep a Buzzer whenever a movement is detected.
The PIR sensor stands for Passive Infrared sensor. It is a low cost sensor which can detect the presence of Human beings or animals. There are two important materials present in the sensor one is the pyroelectric crystal which can detect the heat signatures from a living organism (humans/animals) and the other is a Fresnel lenses which can widen the range of the sensor. Also the PIR sensor modules provide us some options to adjust the working of the sensor

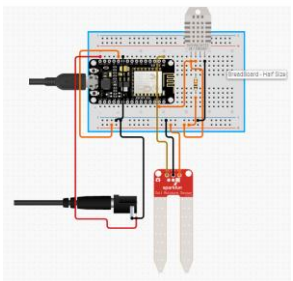
The two potentiometers (orange color) are used to control the sensitivity and trigger on time of the sensor. Basically the Dout pin of the sensor is present in between the Vcc and Gnd pins. The module works on 3.3V but can be powered with 5V as well. On the top left corner it also has a trigger pin setup which can be used to make the module work in two different modes. One is the "H" mode and the other is the "I" mode. In "H" mode the output pin Dout will go high (3.3V) when a person is detected within range and goes low after a particular time (time is set by potentiometer). In this mode the output pin will go high irrespective of whether the person is still present inside the range or has left the area. We are using our module in "H" mode in our project.

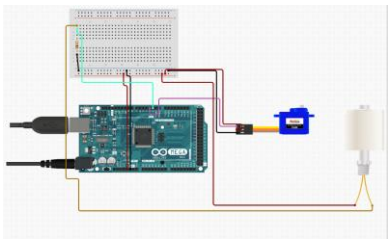
SERVO MOTOR

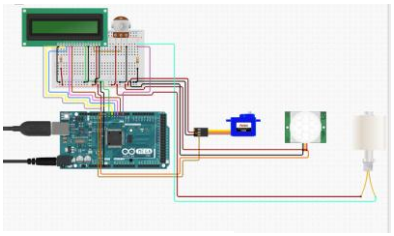
A servo motor is an electric device used for precise control of angular rotation. It is used in applications that demand precise control over motion, like in case of control of a robotic arm.
The rotation angle of the servo motor is controlled by applying a PWM signal to it. By varying the width of the PWM signal, we can change the rotation angle and direction of the motor.

MAGNETIC FLOAT SENSOR

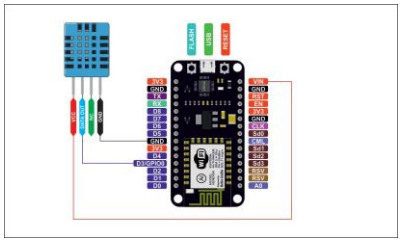
A float sensor is a device used to detect the level of liquid within a tank. The switch may be used in a pump, an indicator, an alarm, or other devices. Magnetic float sensor is an electromagnetic ON/OFF switch. It helps to sense the level of water present in the overhead tank or sump.







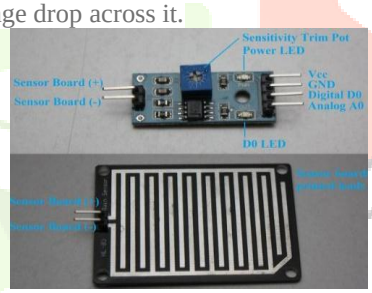
NodeMCU to upload DHT11 readings using https://thingspeak.com. Thingspeak is an open source internet of things applicationto store and retrieve from things using HTTP protocol over a internet.



To complete a circuit, float switches utilize a magnetic reed switch, which consists of two contacts sealed in a glass tube. When a magnet comes close to the contact, they become attracted to each other and touch, allowing current to pass through. When the magnet moves away, the contacts demagnetize and will separate. Float Sensor which we have used is Normally Opened (NO), that is when the float is at its low point, resting on its bottom clip circuit will be open and when float is at its high point, it will complete the circuit. So, when the water level goes down float sensor breaks the circuit and attached led will get off.

RAIN DROP SENSOR

The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and also for measuring rainfall intensity. It is basically a board on which nickel is coated in the form of lines. It works on the principal of resistance. When there is no rain drop on board. Resistance is high so we gets high voltage according to V=IR. When rain drop present it reduces the resistance because water is conductor of electricity and presence of water connects nickel lines in parallel so reduced resistance and reduced voltage drop across it.



Conclusion:

The automated irrigation system was implemented found to be feasible . Cost effective for optimizing water resources for agricultural production. This irrigation system allows cultivation in places with water scarcity thereby improving sustainability. The irrigation system can be adjusted to a variety of specific crop needs and requires minimum maintenance.

References

[1] Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, Miguel Ángel Porta-Gándara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS module", *IEEE Transactions On Instrumentation And Measurement*, vol. 63, no. 1, January 2014.

[2] Stefanos A. Nikolidakis, Dionisis Kandris, D. Dimitrios, Douligeris A Vergadoschristos, "Energy Efficient Automated Control Of Irrigation In Agriculture By Using Wireless Sensor Networks Computers And Electronics In Agriculture" in , Elsevier B.V, pp. 0168-1699, 2015.

[3]Srishti Rawal, Department of Computer Science, VIT university, ”IOT based Smart Irrigation System”, International Journal of Computer Applications,vol.159,February 2017 .

[4] S.G. Manoj Guru, P. Naveen, R.Vinodh Raja, V.SrirengaNachiyar-Assistant Professor,”SMART IRRIGATION SYSTEM USING ARDUINO”-SSRG International Journal of Electronics and Communication Engineering-March 2017.

[5] Ms Shwetha P.S - Student,"SURVEY ON AUTOMATED IRRIGATION SYSTEMS USING WIRELESS ENSOR NETWORKS",International Research Journal of Engineering and Technology(IRJET),vol.03,April 2016.

[6]Associate Professor Baltej Kaur, Danish Inamdar , Vishal Raut,Akash Patil,Nayan Patil-U.G.students," A SURVEY ON SMART DRIP IRRIGATION SYSTEM", International Research Journal of Engineering and Technology(IRJET),vol.03, 02|February 2016

[7] Ms.DeweshvreeRane PGscholar, Prof.P.R.Indurkar-Professor, Prof.D.M.Khatri-Assistant Professor, "REVIEW PAPER BASED ON AUTOMATIC IRRIGATION SYSTEM BASED ON RF MODULE",IIJAICT,vol 1,9|January 2015