JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

SOIL MOISTURE CONTENT BASED AUTOMATIC MOTOR PUMPING FOR AGRICULTURE

Koteswara Rao Muvva[1*], Ranjith Krishna Akurathi [2], Haritha Kadali[3], Sai Jahnavi Damacharla [4]
[1,2,3,4]Student
[1]Department of Computer Science and Engineering,
[1]Bapatla Engineering College, Bapatla, India.

[*]Corresponding author :muvvakoteshyadav@gmail.com.

ABSTRACT

Most of these days, to reduce the dependency of rain, Irrigation systems have been using, despite the fact that irrigation systems are used, maximum of them need manual maintenance or to maintain time-based automation. In those kinds of device water is carried out to area on the idea of constant durations which required high manpower for tracking and additionally it reduces the agricultural fields efficiency. With excess water supply, there will be adverse effects on fields. The main aim of our project is to enhance the irrigation system in agriculture by using advanced technical equipment like Arduino uno and soil moisture sensor, sensor module etc., Our project presents design and development of a soil moisture sensor and a response monitoring system on LCD screen. This project is primarily intended for farmers and gardeners who have a need of irrigation advancements. It also applies to those farmers who waste water during irrigation. The project can be extended to greenhouses, where manual supervision is practically non-existent. This principle can be elaborate to create fully automated gardens and farmland.

Key Words: Arduino, Irrigation Systems, Sensor, LCD panel.

1. INTRODUCTION

Regarding with continuous growth in population, the call for water has been improved. Most of the country's economy pivotally dependent on irrigation. The irrigation systems we have today are inefficient in water management, so we came up with this project. We used soil moisture sensor [1] for this system. The benefit of proposed system is it will reduce the human interference and blunders in moisture levels. As per may researches excessive water supply makes plants growing in soil that is too wet suffer from a lack of oxygen which leads to the death of roots and a loss of vigour in the plant [2]. The main motto is to regulate the water flow so that no water is wasted. During monsoon and winter weather seasons, the water float may be optimized relying at the requirement, as a result saving precious water. As the era is enhancing day with the aid of using day, the primary concept is to develop a new automated irrigation system. The result is a scalable, implementable technology that we've got examined and confirmed numerically and withinside the field. By using this sensor, we will discover whether the soil is moist or dry. If it's far dry, pumping motor will pump the water. Soil moisture is a very important element in the Atmospheric water cycle, each on a little agricultural scale and in largescale modelling of land/atmosphere interaction. Vegetation and crops invariably rely more on the moisture offered at root level than on precipitation prevalence. Water budgeting for irrigation planning, also because the actual programming of irrigation action, needs native soil moisture information. Even though we could use GSM module, used for domestic power consumption [3] we haven't used it.

2. PROBLEM FORMULATION

The process of watering the crop sometimes requires more water, and sometimes the water is late, which causes the crops to dry out. This causes much loss to the crop, soil as well as the farmer who is dependent on the crop.

i. It is hard to determine the soil moisture level.
ii. The component of the existing product cannot be replaced, also costly.

3. OBJECTIVE

To make irrigation easier hence increasing the yield through an efficient irrigation system by reducing errors [4] and significantly reduce water demand. To monitor the moisture content of the soil using a soil moisture sensor [1]. To turn the motor ON when the soil moisture falls below a certain reference value. To display the status of the soil and the tank using a 16×2 LCD.

4.MATERIALS AND METHODOLOGY

The hardware requirements are:

1. Arduino Uno
2. Soil Moisture Sensor
3. Potentiometer(100k)
4. LCD Display (16*2)
5.Breadboard
6.JumperWires
7.Relay Module
8.Mini Water Pump
9.9V Battery
10.USB Cable

ARDUINO UNO

Arduino is an open-source platform used for building electronics projects. It is easy to use compared to other Arduino boards, such as Arduino Mega Board. The board consists of 6 Analog Pin Inputs,14 Digital Pins, a Connector, and a Power Jack. It is programmed based on IDE, which stands for Integrated Development Environment. It has a detection length of 38 mm and an operating voltage of 2-5 V [5].

SOIL MOISTURE SENSOR

A Soil Moisture Sensor is one kind of low-cost electronic sensor that is used to detect the moisture of the soil. This sensor can measure the volumetric content of water inside the soil. This sensor is consisting of mainly two parts, one is Sensing Probs and another one is the Sensor Module. The probes allow the current to pass through the soil and then it gets the resistance value according to moisture value in soil. The Sensor Module reads data from the sensor probes and processes the data and converts it into a digital/analog output.

POTENTIOMETER

Potentiometers also known as POT, are nothing but variable resistors. They can provide a variable resistance by simply varying the knob on top of its head. They can be adjusted from zeroΩ (ohms) to its specific maximum resistance.

LCD DISPLAY

The term LCD stands for liquid crystal display. 16×2 LCD is one kind of electronic device used to display the message and data. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters (16×2=32) in total. These LCD modules are low cost, and programmer-friendly, therefore, is used in various DIY circuits, devices, and embedded projects.

BREADBOARD

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to building an electronic circuit.

RELAY MODULE

You will require a relay module if you use a low voltage microcontroller such as an Arduino to control motors or lighting circuits. Relay modules are straightforward components.

MINI WATER PUMP

The mini water pump is a type of pump that has low weight and can be easily portable from one place to another.

The software requirements are:

A computer (Windows, Mac, or Linux)

An Arduino-compatible microcontroller (anything from this guide should work)

A USB A-to-B cable, or another appropriate way to connect your Arduino-compatible microcontroller to your computer (check out this USB buying guide if you're not sure which cable to get)

METHODOLOGY

In this project, there are two functional components [13]. These are soil moisture sensors and a water pump. Therefore, the Arduino board is programmed using Arduino IDE software. A moisture sensor is designed to determine the soil moisture level. The water pump supplies water to the plants. This project uses Arduino Uno for controlling the water pump and soil moisture sensor. The motor can operate from 9 x 12 volts. The soil moisture sensor measures the level of moisture in the soil, turns on the alarm, and sends a signal to the Arduino if irrigation is needed. The water pump supplies the plants until they reach the desired moisture level.

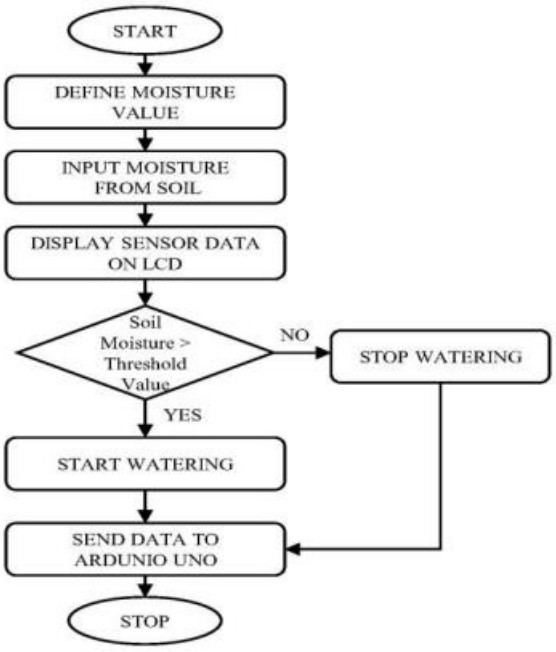

figure 1. Flow Diagram of Proposed System

5.ADVANTAGES OF PROPOSED SYSTEM

1. Highly sensitive, low cost and reliable
2. Works according to the soli condition
3. Complete elimination of manpower
4. Can handle heavy loads
5. Automatically Irrigate crops

6.EXPERIMENTAL RESULT

With automatic water control system, water consumption can be reduced by 50% compared to traditional irrigation system. Also, it can improve soil moisture and minimize soil erosion, weed control, and nutrient loss.

7.FUTURE IMPROVEMENTS

Device embedded with code to manage Water management from home.
To include crop health report generation based on soil moisture.
Can implement a machine to run analysis on soil composition.

8.CONCLUSION

After this product is developed, test run has been done. This product can read moisture percentage from soil and other materials such as tissue. The Soil Moisture Sensor was tested to read the soil moisture of plants and the result is shown in the analysis. This product has achieved the objectives stated. For the upgrade plan, the design of the product's casing can be improved by making it more unique and easier to hold. The next upgrade that can be made to this product is improving the coding of this product to make the reading more accurate.

REFERENCES

[1] Shen Jin, Song Jingling, Han Qiuyan, Wang Shengde, YangYan, School of Electric and Electronic Engineering, "A Remote Measurement and Control System for Greenhouse Based on GSM-SMS" IEEE 8th International Conference on Electronic Measurement and Instrument, 2007
[2] "Irrigation System Controllers", SSAGE22, Agricultural and Biological Engineering Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Available: http://edis.ifas.ufl.edu
[3] "Smart Irrigation System using Arduino"- S.G. Manoj Guru, Etal. March 2017 G. Eason, B. Noble, and I.N. Sneddon,"On certain integrals of Lipschitz-Hankel type involving products of
[4] N. M, R. P. U, S. K. G, and T. S. S, "Automatic irrigation system on sensing soil moisture content," IJIREEICE, 2015, doi: 10.17148/ijireeice.2015.3120.
[5] E. G. Njoku, T. J. Jackson, V. Lakshmi, T. K. Chan, and S. V. Nghiem, "Soil moisture retrieval from AMSR-E," IEEE Trans. Geosci. Remote Sens., 2003, doi:10.1109/TGRS.2002.808243.
[6] Jeng-Nan Juang, R. Radharamanan; "Low Cost Soil Moisture System Brad Rodriguez."Moving Forth Part 7: Camel Forth for the 8051".
[7] "Measurement Scheduling for Soil Moisture Sensing: From Physical Models to Optimal Control," Proceedings of the IEEE, vol.98, no.11, pp.1918, 1933, Nov. 2010
[8] Shock, C.C., J.M. Barnum, and M. Seddigh (1998). "Calibration of Watermark Soil Moisture Sensors for irrigation management", pp.139-146 in Proceedings of the International Irrigation Show, Irrigation Association, San Diego, CA.
[9] Watermark 200SS soil moisture sensor specification manual. Available: http://www.irrometer.com/sensors.html

[10] Gsmworld.com. GSM Association. 2001. Archived from the original on 5 May 2011. Retrieved 5 May 2011. "1982 Groupe Speciale Mobile (GSM) is formed by the Confederation of European Posts and Telecommunications (CEPT) to design a pan-European mobile technology."
[11]"GSM World statistics". gsmworld.com. GSM Association. 2010. Retrieved 8 June 2010.
[12] G.K. Banerjee and Rahul Singhal (2010). "Microcontroller based Polyhouse Automation Controller", 2010 International Symposium on
[13]Gutiérrez J, Villa-Medina J F, Nieto-Garibay A and Porta-Gándara M A, 'Automated Irrigation System Using a Wireless Sensor Network and GPRS Module', IEEE Transactions on Instrumentation and Measurement, 2013.