IOT BASED AUTOMATIC PLANT WATERING AND SOIL MOISTURE CONTROL SYSTEM

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ABSTRACT

The aim of the project is to study the "**Intelligence soil moisture control and automatic plant watering system**" in agricultural greenhouse based on Node microcontroller automation control. This kind of intelligent soil moisture control system helps to control the moisture level of the field and supply the water if required. In this embedding a control system into an automatic water pump controller depend upon the moisture of the soil. This system also ability to detect the level of water in the green house. The intelligent soil moisture control and automatic plant watering system in agricultural greenhouse designed in the research had wonderful effort of man-machine interface; it is very simple, cheap and convenient high degree of automation system. Not only that this system helps to prevent wastage of water. This system is a prototype, which makes this self-sufficient, watering itself from a reservoir. Solar energy is used in this system makes it more environment friendly. In this system we are providing an automatic water pump controller which pumps water depending upon the moisture of the soil. It is very simple cheap and convenient and high degree of automation system helps to prevent the wastage of water and more friendly.

Keywords: **Soil moisture sensors, microcontroller, WI-FI, Mobile app**

1. INTRODUCTION

In our country most of the population depends upon the agriculture to live their daily lives. Agriculture is a major source of food production to the growing demand of the human population. In agriculture, irrigation is an essential process that influences crop production by supplying water to the needed land. Farmers have to visit their land to check how much amount of water is required for their field. This method takes a lot of time and effort particularly when a farmer needs 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 plant watering system provides a promising solution to farmers where the presence of farmer in the field is not compulsory. In this modern technological era poor farmers of India cannot get enough assistance from others to help them with technology and make their work easier. This equipment helps the farmer to monitor their fields from any place through IOT. This system can be utilized to improve the condition of the green house. These practices will increase crop yield, improve quality of crops, conserve water resources, save energy, and decrease fertilizer supplies.

This system performs:

1. Supplies water according to the moisture level of the soil
2. Automatic alarm system.
3. Reduces Reusing process of excessive water in the fields

2. METHODOLOGY

An automated plant watering system is developed to optimize water utilization for agricultural crops. The system has a distributed wireless network of soilmoisture sensors placed in the root zone of the plants. Using the threshold value they determine the amount of water to be supplied. They have worked with automatic water sprinkling or irrigation system. They opted for different metrics for determining the soil condition and quantity of water. An automated water supply system for urban residential areas showed that such a system can be used to effectively manage water resource. This "Smart plant watering System" is developed to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the moisture content of the earth using the soil moisture sensor without the intervention of human. The benefit of employing these techniques is to decrease human interference and it is quite feasible and affordable. This Smart plant watering system project is using a Node microcontroller, that is programmed to collect the input signal according to moisture content of the soil and its output is given through the mobile app that will operate the pump. The proposed method of this smart intelligence soil moisture control and automated plant watering is to minimize this manual intervention by the farmer, as there is no un-planned usage of water, a lot of water is saved from

being wasted. When there is not enough moisture in the soil and the threshold value decides when the pump should be turned on/off, saves a lot time for the farmers. This also gives much needed rest to the farmers, as they don't have to go and turn the pump on/off manually.

THINGSPEAK:

Thingspeak is an open source Internet of things (IOT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via Local Area Network. Thingspeak enables the creation of sensors logging applications, location tracking applications, and a social network of things with status updates.

EMBEDDED SYSTEM:

An embedded system is some combination of computer hardware and software. These are computing systems but can range from having no user interface. These can be Micro-Processor or Micro Controller based.

IOT:

The internet of things is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, and connectivity which enable these things to connect and exchange data.

3. SYSTEM REQUIREMENTS

3.1 Hardware Requirements: The most common set of requirements defined by any operating system or software application is the physical computer resources, known as hardware. A hardware requirements list is often accompanied by a hardware compatibility list.

- soil moisture sensor
- Relay
- Power Supply
- Node MCU
- Sub Pump

3.2 Software Requirements: Software requirements deals with defining software resource requirements and prerequisites that needs to be installed on a computer to provide optimal functioning of an application.

- Thingspeak
- Arduino Compiler
- MIT app inventor
- Embedded C

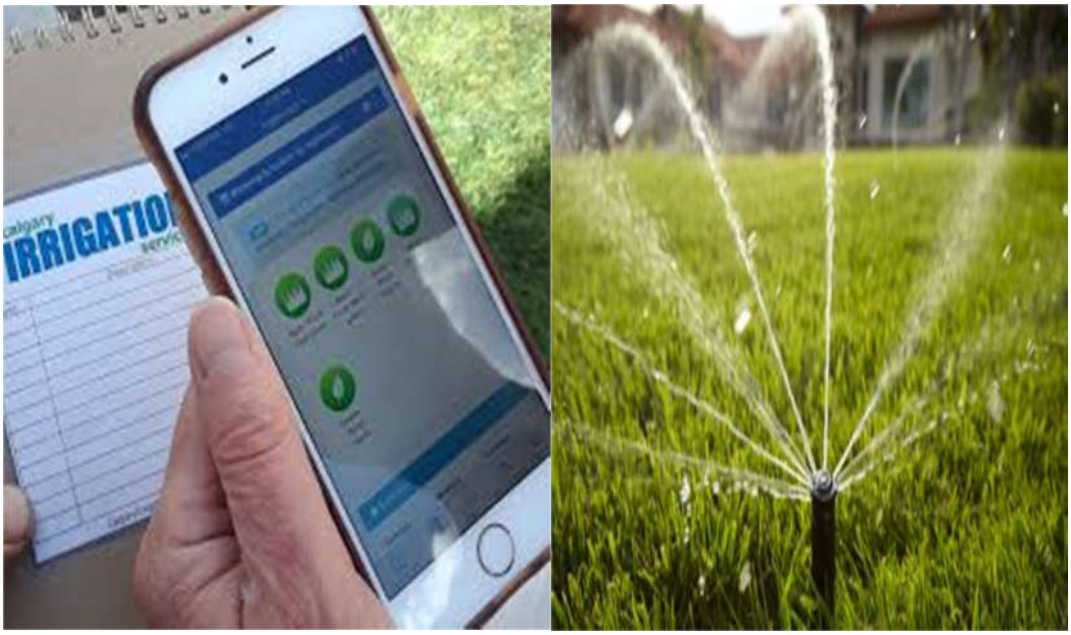
4. SYSTEM STUDY

4.1 EXISTING SYSTEM:

The project irrigation control use to tackle the problems of agricultural Sector regarding irrigation at times, motor pumps are left running for longer time than what is necessary. In our existing system, farmers have to travel to field often at odd hours just to switch on/off the motor due to power supply.
To overcome the drawbacks of existing system like high cost, difficult in maintainance and more wired connections, we introduce the new system which will have wireless connections

4.2 PROPOSED SYSTEM:

The main aim is to control the water management for an irrigation system by automatic method. This method does not require any manual operators. It is designed to manage the irrigation system based on the response to the real time status of the soil moisture. This system controls valves by using automated controller allows the farmer to apply the right amount of water at the right time.
In the proposed system, we introduce the new technology through mobile app we can do watering to the plants. This soil monitoring control system helps the farmers in agricultural field, control the moisture level and supply if water required. It has the ability to detect the level of green house.



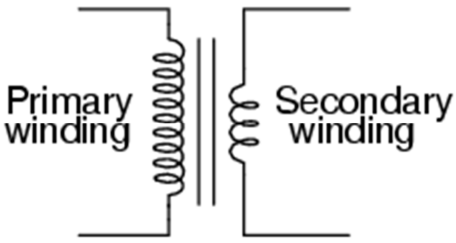
5. COMPONENTS

TRANSFORMER:

So far, we've observed simulations of transformers where the primary and secondary windings were of identical inductance, giving approximately equal voltage and current levels in both circuits. Equality of voltage and current between the primary and secondary sides of a transformer, however, is not the norm for all transformers. If the inductances of the two windings are not equal, something interesting happens:

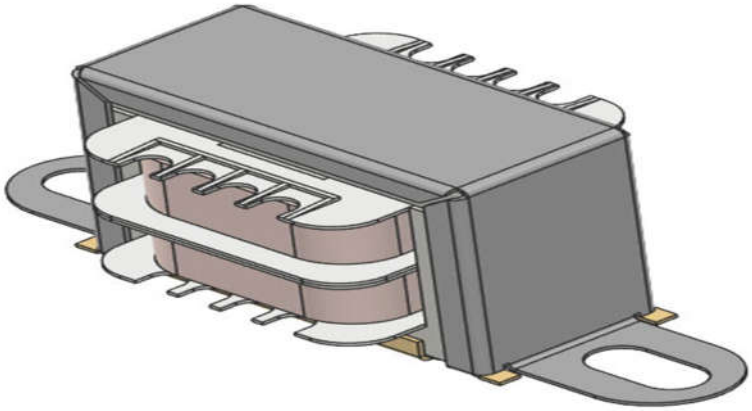
```
Transformer v1 1 0 ac 10 sin rbogus1 1 2 1e-12 rbogus2 5 0 9e12 l1 2 0 10000 l2 3 5 100 k l1 l2
0.999 vi1 3 4 ac 0 reload 4 5 1k .ac line 1 60 60 .print ac v(2,0) i(v1) .print ac v(3,5) i(vi1) .end

freq v(2) i(v1) 6.000E+01 1.000E+01 9.975E-05 Primary winding freq v(3,5) i(vi1) 6.000E+01
9.962E-01 9.962E-04 Secondary winding
```

Notice how the secondary voltage is approximately ten times less than the primary voltage (0.9962 volts compared to 10 volts), while the secondary current is approximately ten times greater (0.9962 mA compared to 0.09975 mA). What we have here is a device that steps voltage *down* by a factor of ten and current *up* by a factor of ten: (Figure below)



Turns ratio of 10:1 yields 10:1 primary: secondary voltage ratio and 1:10 primary: secondary current ratio.

This is a very useful device, indeed. With it, we can easily multiply or divide voltage and current in AC circuits. Indeed, the transformer has made long-distance transmission of electric power a practical reality, as AC voltage can be "stepped up" and current "stepped down" for reduced wire resistance power losses along power lines connecting generating stations with loads. At either end (both the generator and at the loads), voltage levels are reduced by transformers for safer operation and less expensive equipment. A transformer that increases voltage from primary to secondary (more secondary winding turns than primary winding turns) is called a *step-up* transformer



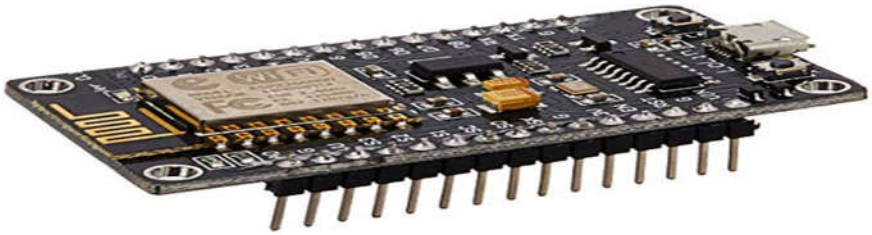
TRANSFORMER

RELAY:

Relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts.
Switching capacity available by 10A in spite of small size design for high density P.C.board mounting technique. UL, CUL, TUV recognized. Selection of plastic material for high temperature and better chemical solution performance. Sealed types available. Simple relay magnetic circuit to meet low cost of mass production.

Node MCU:

The ESP8266is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained "Wi-Fi" networking solution offering as a bridge from existing micro controller to Wi-Fi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.



Node Microcontroller

SUBMERSIBLE PUMP:

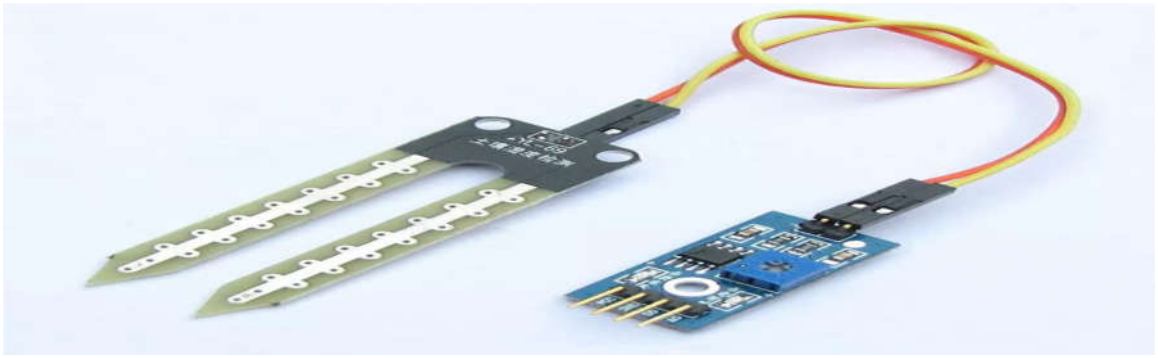
A submersible pump, also called an electric submersible pump, is a pump that can be fully submerged in water. The motor is hermetically sealed and close-coupled to the body of the pump.A submersible pump pushes water to the surface by converting rotary energy into kinetic energy into pressure energy. This is done by the water being pulled into the pump: first in the intake, where the rotation of the impeller pushes the water through the diffuser. From there, it goes to the surface.

The major advantage to a submersible pump is that it never has to be primed, because it is already submerged in the fluid. **Submersible pumps are also very efficient** because they don't really have to spend a lot of energy moving water into the pump. Water pressure pushes the water into a submersible pump, thus "saving" a lot of the pump's energy.

Submersible pump

Soil Moisture Sensors:

Soil Moisture Sensor has a comparator which helps in converting analog data to digital data easy for the processing purpose. Two probes of 5 cm are responsible for collecting the data and to transfer when it is immersed in the soil. The voltage output from the sensor corresponds to the conductivity of thesoil. The moisture content in the soil is determined by the type of the soil and is given as change in resistance value of the sensor. The resistance across soil probes can vary from infinity (for completely dry soil) to a very little resistance (for 100% moisture in soil).This variation in resistance across the probes leads to variation in forward-bias voltage.



Soil Moisture Sensor

6. LANGUAGE SPECIFICATION

Embedded System:

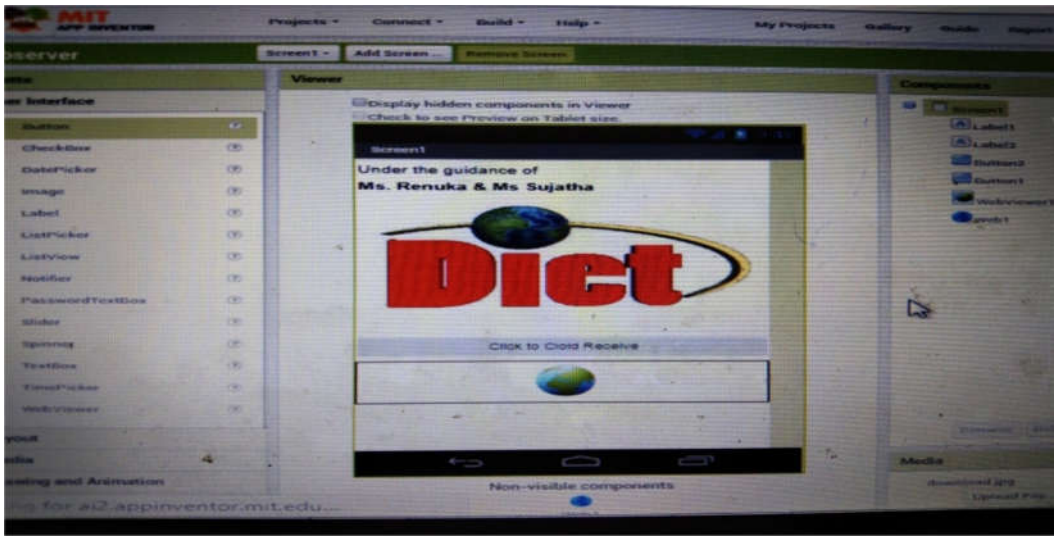
An embedded system is an application that contains at least one programmable computer (typically in the form of a microcontroller, a microprocessor or digital signal processor chip) and which is used by individuals who are, in the main, unaware that the system is computer-based.

Embedded C:

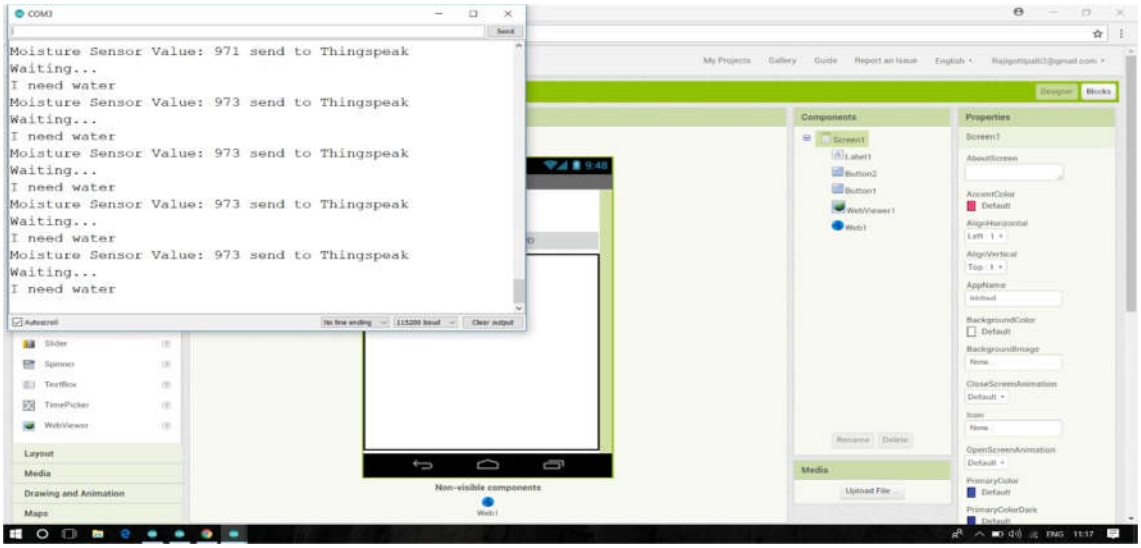
Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

7.2 SCREENSHOTS:

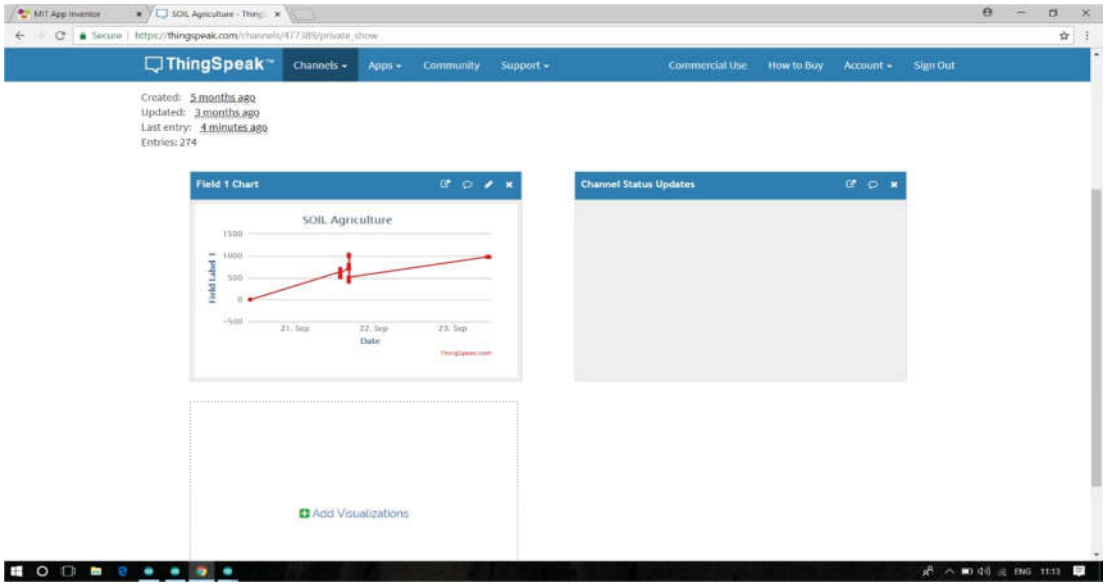
In the mobile app, front end will be:



This is the home page of mobile application. This page contains button option. If you click on that button it will sends the login page of thinkspeak then you can retrieve the status of our soil moisture.



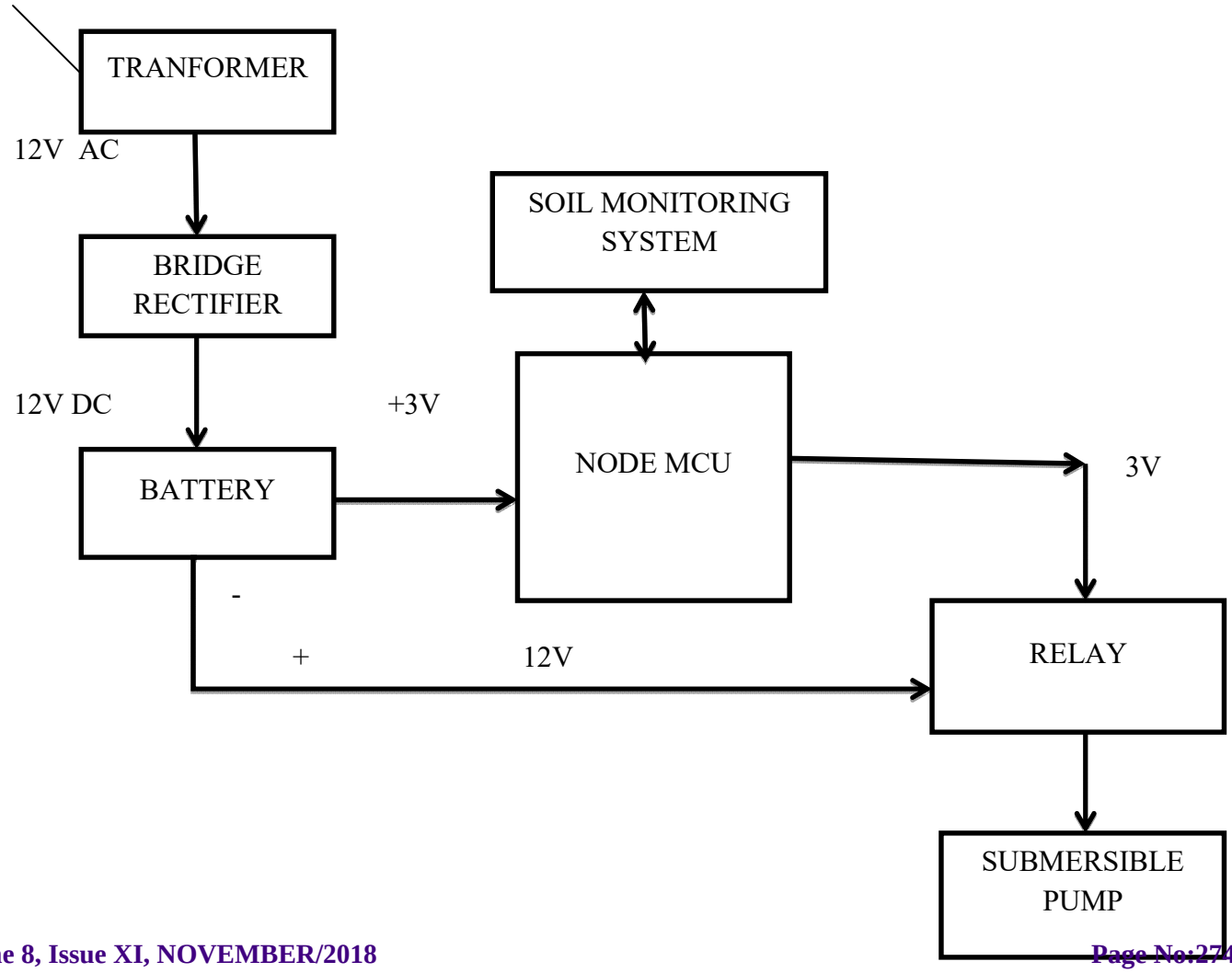
Moisture Sensor Value report in Arduino compiler



Analog representation is generated from the thingspeak

8. BLOCK DIAGRAM

230Volts



Conclusion:

Automated water supply to the plants by detecting the moisture level of the soil. It reduces the labour of the farmer. User can watch the result in mobile through IOT mobile app.

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