LOW COST MICRO CONTROLLER BASED AUTOMATIC PLANT IRRIGATION SYSTEM

DrMeenu D Nair [1], Janani S[2], Jayasuriya M U[3], Keerthika M[4], Priya R[5]
1,2,3,4,5 Department of Electrical and Electronics Engineering
Karpagam College of Engineering, Coimbatore-32

Abstract: Automatic irrigation system indicates that the system checks the moisture content in the soil, based on that pumping motor will automatically pumps the water into the field. Here we are using soil moisture sensor. By using this sensor, we can find whether the soil is wet or dry. If it is dry, pumping motor will pump the water. In this system, the main controlling device is microcontroller. Here soil sensor will give the status of the soil to the microcontroller, based on that microcontroller will display the status of the soil on the LCD and switch on or off the pumping motor through relay. The pumping motor will pump the water into the field by using drip water system until the field is wet which is continuously monitor by the microcontroller. In irrigation process, most parameter of monitoring is soil, so we have to monitor the soil condition, whether the soil is dry or Wet. If it is dry, then by using pumping motor, water has to be pumped automatically. The main aim of our system presenting here is to monitor the moisture content in the soil in cultivating field. Based on soil moisture, pumping motor will be automatically switch on or off through relay. This saves the water at the same time and on the other hand the plant can get optimum level of water, so increasing productivity of crop.

I. INTRODUCTION:

Agriculture is the backbone of Indian Economy. In today's world, as we see rapid growth in global population, agriculture becomes more important to meet the needs of the human race. However, agriculture requires irrigation and with every year we have more water consumption than rainfall, it becomes critical for growers to find ways to conserve water while still achieving the highest yield. But in the present era, the farmers have been using irrigation technique through the manual control in which they irrigate the land at the regular interval.

Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology we can control water wastage and to maximize the scientific technologies in irrigation methods. Hence it can greatly improve the utilization of water and can increase water productivity.

To avoid the problemof, food scarcity and water scarcity we have to promote the agriculture sector. But water wastage is more in this sector in the form of water logging while watering the agricultural fields through irrigation. Therefore a automatic plant irrigation system has to be designed for the proper water supply in the fields**.** The main aim of this project was to provide water to the plants or gardening automatically

using microcontroller (Arduino Uno). We can automatically water the plants when we are going on vacation or do not we have to bother my neighborhoods. This paper proposes a low cost automated irrigation system.

II. PROPOSED SYSTEM

Irrigation is defined as artificial application of water to land or soil. Irrigation process can be used for the cultivation of agricultural crops during the span of inadequate rainfall and for maintaining landscapes. An automatic irrigation system does the operation of a system without requiring manual involvement of persons. Every irrigation system such as drip, sprinkler and surface get automated with the help of and detectors such as computer, sensors and other mechanical devices.

An automatic irrigation system does the work quite efficiently and with a positive impact on the place where it is installed. Once it is installed in the agricultural field, the water distribution to crops and nurseries becomes easy and doesn't require any human support to perform the operations permanently. Sometimes automatic irrigation can also be performed by using mechanical appliances such as clay pots or bottle irrigation system. It's very hard to implement irrigation systems because they are very expensive and complex in their design. By taking some basic points into considerations from experts' support, we have implemented some projects on automatic irrigation system by using different technologies.

Automatic irrigation system proves to be very helpful for those who travel. If designed and coded properly, automatic irrigation systems can be very cost effective and can do a lot of water conservation. Watering with a pipe or with oscillator wastes water and none of this method aim plant roots. Automatic irrigation systems can be designed in such a way which gives required amount of water in a targeted area, and which will also promote water conservation. The block diagram of automatic irrigation system is shown in Fig.1

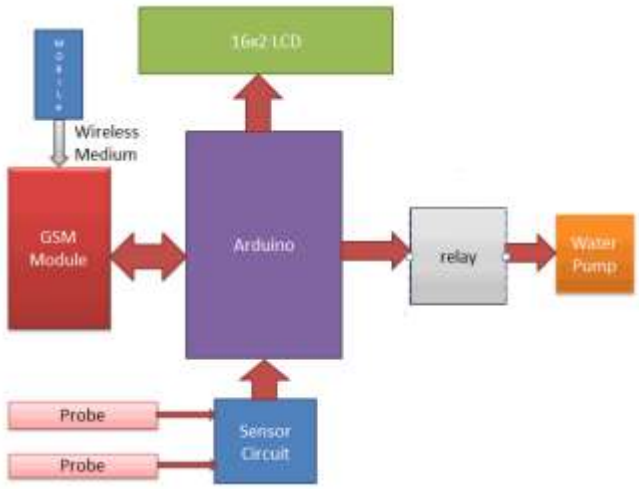

Fig.1.Block diagram of automatic irrigation system

III. HARDWAREIMPLEMENTATION

The automatic irrigation system on sensing soil moisture project is intended for the development of an irrigation system that switches submersible pumps on or off by using relays to perform this action on sensing the moisture content of the soil. The main advantage of using this irrigation system is to reduce human interference and ensure proper irrigation. The varying conditions of the moisture in the soil.the moisture conditions of the soil, wetness, dryness, etc.

Once the microcontroller gets the data

from the sensing material – it compares the data as programmed in a way, which generates output signals and activates the relays for operating the submersible pump. The sensing arrangement is done with the help of two stiff metallic rods that are inserted into the agricultural field at some distance. The required connections from these metallic rods are interfaced to the control unit for controlling the operations of the pump according to the soil moisture content.

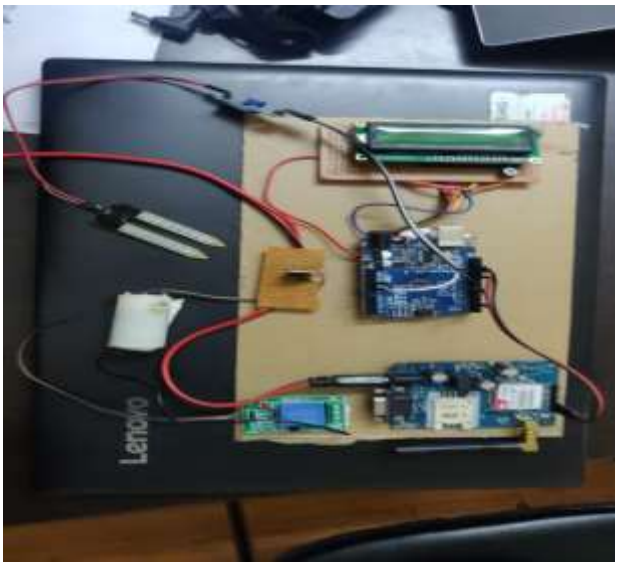

Fig 2 Hardware implementation of automatic irrigation system using Arduinouno

In the programming part, to facilitate communication between Arduino and LCD module, we make use of a built a library in Arduino<LiquidCrystal.h> – which is written for LCD modules making use of the Hitachi HD44780 chipset (or a compatible chipset). This library can handle both 4bit mode and 8bit mode wiring of LCD. In 4bit mode, data is sent using 4 data pins and 3 control pins. In our project, R/W pin is always grounded so we require only 6 pins in 4 bit mode, thus saving no of pins. During interfacing the library is first initialized and then define pins using the command LiquidCrystal LCD (RS, E, D4, D5, D6, D7), pins are assigned in this order. In program we can see this command as LiquidCrystallcd(13,12, 11, 10, 9, 8), here RS pin to 13, Enable pin to 12, D4 pin to 11, D5 pin to 10, D6 pin to 9 and D7 pin to 8 respectively.

The Arduino reads the sensor output through the analog input pins using analogRead function. For example "analogRead(moisture_sensorPin);" converts the voltage (in the range 0 to 5V) at the A0 pin into a number (in the range 0 to 1023) This way the voltage at A0 is compared to a fixed number (avg_moisture) for identifying the current status of the soil .
The status of the float switch is compared to identify the current water level and according to these both sensor status the controller will switch the motor to ON or OFF condition. If values from the float switches is high and if the reading from the moisture sensor is low, then controller will show a full level tank status and a low level moisture status on LCD and switches the motor to ON condition. This is done by giving a signal to the base of the BC547 transistor which is connected to the 4th pin of the Arduino UNO. The controller will also switch the moisture status LED and the tank status LED OFF by writing a digital 0 to the 2^{nd} and 3^{rd} pin of Arduinouno. The motor will be in ON condition until the moisture content goes above reference value or if the float switch status become low.

IV. AUTOMATION OF THE PROPOSED SYSTEM

In the field of agriculture the most important part is: firstly, to get the information about the fertility of soil and secondly moisture content of soil. After measuring these two factors a farmer can start sowing of seeds. Here a system is developed based on GSM network. The sensor nodes can obtain the soil moisture, temperature, humidity information in real time, and then transferred to the remote monitoring centre by the gateway via the transmission network. This intelligent agriculture monitoring system has the useful characteristics of low power consumption, low cost, large network capacity, flexible disposition, and minor influence on the natural environment. In irrigation process the water level is sensed by the sensors and the information are processed by the controller and transmitted over the GSM module.

At the base station the data is received by the Receiver module and transferred to PC through RS232 interface. The data will be processed by the microcontroller and then can be transmitted to farmer's mobile phone using GSM module. Then these commands can be further given by the farmer through GSM which will initiate or terminate the irrigation process via relay controlled motor in the field depending on the moisture conditions of the soil. This flow chart gives an outline of the systems general operation. The main loop runs 10 times a second, each time servicing the next channel. When it's done with the fifth channel, it does the first channel.

Each of the five channels have their own set of Presets The minimum moisture maximum moisture, minimum time between water, and maximum time between water. The ADC returns a value from 0 to 1023, depending on resistance of the soil. All Presets can be set with any number from 0 to 4095, although setting a moisture level preset above 1023 is of no use. As for min./max. Time, valid and useful setting range is from 0 to 4095 hours. This allows up to about 170day periods. When the learn button is pressed, each channel only updates its own set of presents.

The "Clear" feature causes the system to read the moisture of each plant's soil, and set each channel's min. and max. presets to equal the current moisture reading. This causes any change in soil conductivity to be seen as a "new high" or a "new low", which can be learned with subsequent presses of the "Learn" button.

V. CONCLUSION

The proposed system consists of less hardware as compared to the previous model hence it is compact as compared to the previous system. It is more cost efficient, This claim is made on the fact that the proposed system does not need the heavy and expensive hardware for implementation. This type of automated irrigation system consumes 40-50% less water as compared to the traditional system Ideal growth condition is been provided when small amount of water is been applied over large amount of time. This smart irrigation system extends watering time for plants, and provides ideal growth condition. It saves time and

timer delay as per the environmental condition can be added for automatic watering. This smart irrigation system can be adjusted and modified according to the changing environment. It is simple to operate it starts by designing the map of your garden and marking the location of planting.

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