Arduino based Automatic Irrigation System using GSM and Sensors

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***Abstract*—**The main aspect of our proposed work is to determine how much to water and when to water. These question always makes a normal person or farmer's mind to think .To make the gardener works easily, the automatic Watering is the most important cultural practice and most labor intensive task in daily greenhouse operation. Watering systems ease the burden of getting water to plants when they need it. To make the gardener work easily, the plant watering system is created. There are various types of automatic watering system that are done by using sprinkler system, tube, nozzles and other. This project uses watering sprinkler system because it can water the plants located in the pots. Whenever we go out of town for few days, we always used to worry about our plants as they need water on regular basis. So here we are making Automatic Plant Irrigation System using Arduino, which automatically provides water to your plants and keep you updated by sending message to your cell phone.

Keywords—*Arduino Uno, GSM Module SIM900A, Soil moisture sensor, Relay Module, LCD 16X2, 12v battery, DC Motor, Connecting wires.*

I. INTRODUCTION

So, to start with, these idea eventually erupted it you can say it around the timeline between the 6000BC to 1800AD and eventually progresses its advancement in the field of the 21st century by various and interesting techniques.

Irrigation methods like sprinkler method ,by rubber pipes, by lateral move such as: side roll, wheel line, wheel move .Non-Irrigation methods like just as non-electric without the use of buckets, ropes ,rubber pipes and etc.. Irrigation using water condensed from humid air. In-ground irrigation techniques.

These were some of the methods for irrigation and they are also sub methods or you can say sub categories for further easy and less time consuming techniques. Generally, most of the systems are manually operated one. These traditional techniques are being is replaced with semi-automated and automated techniques suggested an automated concept of irrigation to use the water efficiently and effectively Automatic Irrigation System using Arduino is created on the base of the soil humidity more or less and simultaneously sending the message to the user/farmer via Gsm module. This also helps the farmer to know when and how much water is required at what time of the day by informing him the soil status of ground and conditions of the soil allowing him to use less physical power and also doing it with sure shot success of accuracy. The project we have undertaken our belt is mainly focusing on the most advance technology that is DRIP /SPRINKLER IRRIGATION. Yes there are other methods too like, bore irrigation, step well irrigation and etc but this method struck me and amazed us as we thought of giving a touch of technology by syncing with the user interface of providing the info to the user/farmer about the soil humidity, whether it is dry or properly moisture. This eventually reduces the labor work, consuming less amount of time to know the status of the soil, gives us the accurate results about the conditions and main thing it also helps farmer to keep a check onto which vegetable is to be sowed accordingly to the moisture present in the soil, the sowing and cultivating differs from season to season but with help of these project, it would help farmers to take less pain and gives them more gain.

TESTS: Our project runs easily on the usage of normal soil used for farming but for different soil we have given a shot to try some experiment on it and also to consider our efficiency of the project on the farmer dependency whether it would help him much accurately and with more ease, we have tested my Working model in and around three different soil and humidity conditions.

The three conditions are as follows:

1) Soil quality is different, the one with fertilizers, and no water.

2) The same soil used but now with half amount of water and that to salt water.

3) The same soil used but now with full amount of water and which is again salt water..

The above test were successfully run and the results will be discussed in my further proposed work under the RESULTS sections at the end.

II. METHODOLOGY

The methodology for the AUTOMATIC IRRIGATION SYSTEM VIA GSM MODULE USING ARDUINO can be explained in a simple block diagram shown below:

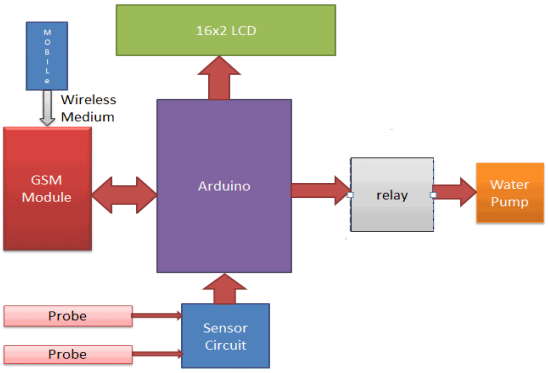

Figure 1:Block Diagram of Project flow

The above block diagram shows us the simple flow of the project and the parts used in the project for summing the desired output. The parts used is described further .

III. COMPONENTS USED

ARDUINO: We can say Arduino is a basic platform used for interfacing the physical components and the backend software script to debug the result which we want to get.

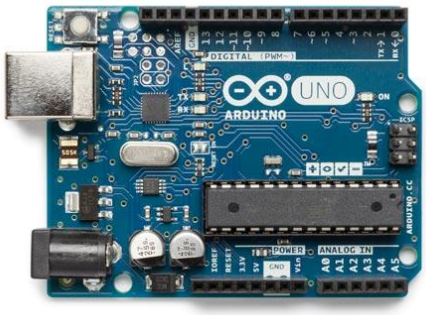

Figure 2:Arduino UNO

The biggest question one can ask is that why Arduino Uno only? I mean there are various other interfacing peripherals which can be used instead of Arduino Uno but why these board only? What is so special about this board that we can use and has great advantage if we make use of it.

Advantages according to me are as follows:

1) Debugging:-The Arduino Society provides the easiest debugging environment which runs cross-platform also .

2) The ON-Board debugger is available.

3) To write simple functions like delay or interrupt is easy and that without referring to the datasheet.

4) Peripherals and Modular designing : Arduino Ecosystem has fantastic modular design you can simply add the already designed shields to the board without any wire , just plug and play it, peripherals like motor shield , Bluetooth shield , Wifi and what not which is already made.

5) It is ready to use.

6) Example of code for easy programming and understanding .

7) A great and huge community of the people working on the same environment makes it easy to resolve the problems.

8) There is a large assortments of preloaded libraries for interfacing the hardware peripherals to a wide range.

9) Yes , not to forget the price too. In a way it is cheap or can say it is affordable.

GSM MODULE SIM900A:

Figure 3:GSM Module SIM900A

To get the user aware of the soil conditions easily and a in a quick manner we have used this module by interfacing it on the Arduino Uno board and with this the user gets a text message.

But does anyone make it shot on thinking that why GSM SIM900A only why no other modules available in the market? What are the advantages of using this particular model only. Basically , we can use GSM300 also instead of using GSM900A..

Some of the differences which helps us to conclude that SIM900A is better to use are listed below:

SIm900 is quad band model which allows to be operated in 850,900,1800,1900Mhz bands whereas in Sim300 it can only work in 900,1800,1900 only.

SIM900 has all the AT commands working as a sms/call. Works in the voltage supply of 3.4 to 4.5v

If the project requirement has cloud interfacing or we can say that if it is web server based project then we should use SIM900 only. It is more reliable as it is a newer version SIM300

SOIL MOISTURE SENSOR:

Figure 4:Soil Moisture Sensor

Connected one terminal in GND , one in VCC and other in the Arduino pin.

It senses the moisture in the soil and let the user know about the status of the humidity of the soil.

IV. WORKING

Arduino is used for controlling whole the process of this Automatic irrigation system. The output of the soil sensor is connected to the digital pin D7 of Arduino. If the presence of the moisture in the soil is not there, motor will get on and if its already present it will be off state and respectively send the sms to the user. GSM MODULE is used for sending SMS to the user. Here we have TTL SIM900A GSM module , which gives and takes TTL logic directly(user may any GSM module).

12v Relay is used to control the 220vac small water pump. The relay is driven by a BC547 transistor. An optional LCD is also used for displaying status and messages. Working of this **Automatic Plant Irrigation System** is quit simple . First of all it is a **Completely Automated System** and there is no need of manpower to control the system. Arduino is used for controlling the whole process an GSM module is used for sending alert messages to user on his cellphone. If moisture is present in soil then there is conduction between the two probes of Soil Moisture sensor and due to this conduction , transistor Q2 remains in triggered/on state and Arduino Pin D7 remains low. When Arduino reads LOW signal at D7 , then it sends sms to user about, "Soil Moisture Is Normal. Motor turned OFF " and water pump remains in Off state. Now if there is no moisture in soil then Transistor Q2 becomes Off and Pin D7 becomes High. Then Arduino reads the Pin D7 and turns On the water motor and also sends message to user about "Low Soil Moisture detected . Motor turned ON." Motor will automatically turn off when there is sufficient moisture in the soil…

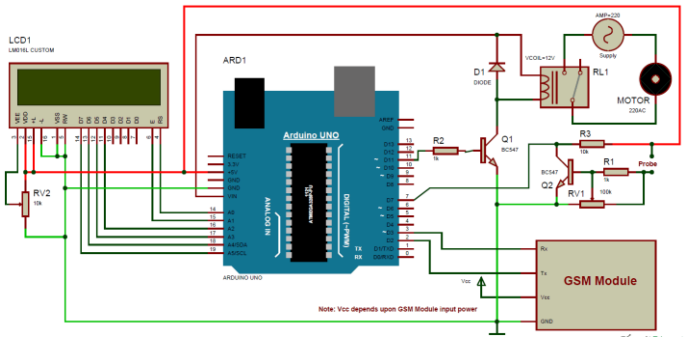

Figure 5:Simulation of proposed work using PROTEUS .
The above is the PROTEUS design of the project simulation.

V. MODEL

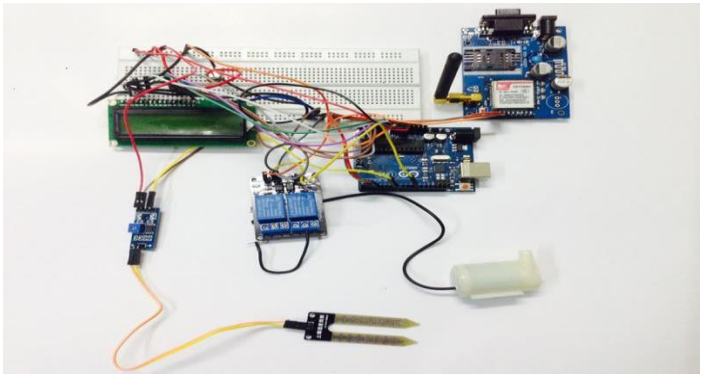

Figure 6: Hardware Model .

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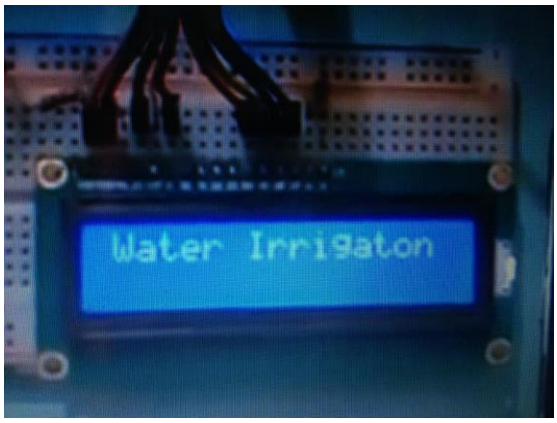

Figure 7: Output when model starts.

Figure 8: Message when moisture level is normal.

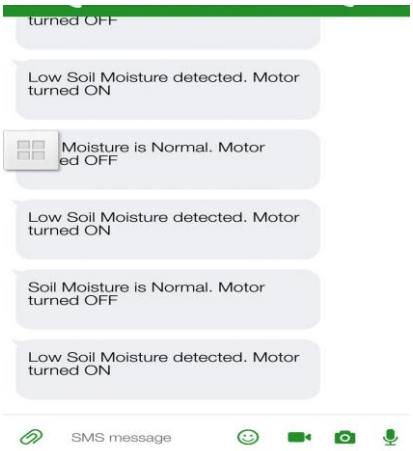

Figure 9:Message send to the user for moisture alert and motor operation

VI. APPLICATIONS

1) Now no need to check manually whether the plant requires the water or not.
2) Water wastage is also controlled as the process uses sensor to sense the moisture.
3) Can be handy and can be used anywhere.
4) Less manpower is required as it is totally Automatic and can be operated via our Mobile or GSM handset.

VII. RESULTS

1)Soil quality is different ,the one with fertilizers, and no water.
So by checking the given condition, we tend to know that the sensor detected that there is no moisture in the soil and hence a message is send to the user and the motor is turned on.
2)The same soil used but now with half amount of water and that to salt water.
So, by checking the above given condition we tend to know that the soil moisture sensor although detects that there is moisture in the soil and the motor is turned off , but it find it little difficult as it was not a stable number showing on the serial monitor. But , yes it detects that too and is very good at it.
3) The same soil used but now with full amount of water and that to salt water.
So, by checking the final condition we tend to know that the sensor detects that there is moisture and a lot of them and therefore, motor is turned off and the respective message is send to the user.

VIII. CONCLUSION

From the data we conclude that, irrigation process is done better than before to yield the proper production done before and usage of water level is limited how much that system needed only . Due to the regular updates to the given, we can get proper knowledge to the system can work perfectly for indefinite of time period, even if in its abnormal circumstances and increase the production rate also. It will also reduce the human factor, energy, power.
To sum up the project of Automatic Irrigation System using Arduino, we can say one thing about it , if one uses this project in a proper way then, it would definitely help the users/farmers to maintain the soil quality and as well as it would help them to cultivate the different kind of vegetables and will eventually help us too by remaining healthy by eating the food nurtured by them . This method is the most easiest way to know when to and how much water one should use to maintain the soil humidity and also this project reduces the man-work(human labor) in a most evolutionary way by just sitting idle in a place and getting the updates of the soil wherever you are.

IX. REFERENCES

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