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A Novel Implementation of Remote Controlling of Agricultural Pump System Using Arduino

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ABSTRACT

Now a days its a challenge to improve development of plant in respect of its growth and to reduce costs which leads to an innovative idea of using an automated irrigation system which will further help in better management of water and human resources. An automated irrigation system have been developed using sensors technology with Arduino to efficiently utilize water for irrigation purpose. The system has soil moisture sensor inserted into the soil of the plants and a water level sensor placed in a water container from where water will be pumped to plants for irrigation. An algorithm has been build out with threshold values of soil moisture sensor to control the water quantity in soil and also a water level sensor has been implemented to measure the water level in tank. This project requires Arduino board having inbuilt ATMega328 microcontroller. This project is need of the hour to convert manual irrigation into an automated irrigation which with the help of soil moisture sensor will detect dankness content of soil leading to turn ON/OFF of pumping motor. Human efforts can be reduced using this technique and increase saving of water by efficiently irrigating the plants. The design has been made with better resource management and low power consumption. This project brings into

play a micro-controller which is of 8051 family, this programmable micro-controller collects the input signals converted into values of moisture in the soil via soil moisture sensors. As the microcontroller starts obtaining the signals, it creates an output that forces a relay for running the water pumping motor. An LCD screen is also linked to the micro-controller to show moisture conditions of the soil and water pump. The water level sensor is used to detect the level of tank so that tank contains efficient water to transfer into crops.

INTRODUCTION

Perfect irrigation is an important feature for growing healthy crops. As India is a country where agriculture is one of the cores of economy, irrigation has to be smart and advanced. As we are stepping into a world of automation, the work load of the farmers can be reduced by formulating an automated system for maintaining a requisite supply of water. So, this automated system has been devised to take care of the daily-watering schedule of the crops. This system will be used for every crop with different moisture levels pre-programmed in the Arduino. Here, Arduino NANO has been programmed to sense the moisture of the soil. When the moisture of the soil drops below a definite level, which is pre-defined in the Arduino, the system will be activated automatically and the plants will be watered keeping them healthy. The system is also helpful in saving water, as the system supplies water to the crop or the plant concerned, when needed. GSM (Global System for Mobile Communications) executes computerized cellular conference systems. Results are sent from the system to the agricultural manufacturer. The coded instructions from the cell phone, controls the entire irrigation system Using the soil moisture level sensor, the system measures the moisture content of the soil and accordingly takes decision when to supply water. As a result, the first pump, gets activated. The system also checks the water level in the reservoir before supplying water from the main tank. If in case, the water of the tank is below the lowest level, at first the system fills the tank from the reservoir with the help of a second pump. When the water level in the tank just touches the highest level, the system stops the second pump and checks for the water level at the highest level. Once it receives the confirmation of the water level, it supplies water to the crop with the help of the first pump. The moisture range of the concerned crop will be pre-programmed in the system. As soon as the moisture reading goes below the specific range, the system delivers water to the concerned crop until the moisture of the soil reaches the moisture content required by the concerned crop. Simultaneously, the farmer always has the power of manually over riding the system, for instance if he wishes not to irrigate the crop even if the moisture content of the soil is below par value as required by the crop, he can just send a message to the system via GSM module, specifying "NO", thereby stopping the entire system.

METHODOLOGY

Our experiment had six basic parts: the pulse generator, sending coil, receiving coil, rectifier, regulator, and load. The copper coil, illustrated by object A, is a single loop of insulated copper wire. Working of this Automatic Plant Irrigation System is quite 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 and GSM module is used for sending alert messages to user on his cell phone. 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 a sufficient moisture in soil.This method is based on ultimately profit. , it is the standard with which all other methods are compared. The components used are explained below:

- Arduino Uno
- GSM module
- Transistor BC547 (2)
- Connecting wires
- 16x2 LCD (optional)
- Relay 12v
- Water pump
- Soil Moisture Sensor

- Resistors (1k, 10k)
- Variable Resister (10k, 100k)
- Terminal connector
- Voltage Regulator IC LM317
- Power supply 12v 1A

Arduino NANO: Arduino is an open-source platform used for building electronics projects as shown in fig 1.1. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

GSM Module: Here we have used TTL SIM800 GSM module. The SIM800 is a complete Quad-band GSM/GPRS Module which can be embedded easily by customer or hobbyist. SIM900 GSM Module provides an industry-standard interface; the SIM800 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data with low power consumption. The design of this SIM800 GSM Module is slim and compact.as shown in fig. 1.2 Quad - band GSM/GPRS module in small size. GPRS Enabled TTL Output

Transistor BC547 (2) : The circuit uses two transistors that work as switches. If the probes do not sense the moisture in the soil, then the resistance between the two probes will increase due to which the transistor Q1 will switch on. If the transistor switches on, it will provide the required voltage at the base terminal of the transistor to make a switch on, then the relay will become activated.

Jumper wires: (m/f) Jumper cables, also known as booster cables or jump leads, are a pair of insulated wires of sufficient capacity with alligator clips at each end to interconnect the disabled equipment/vehicle with an auxiliary source, such as another vehicle or equipment with the same system voltage or to another battery

LCD: LCD is used to display messages and status. LCD used in 4bit b mode and driven by Arduino library.

RELAY: A 12V Relay is used to control the 220VAC small water pump. The relay is driven by a BC547 Transistor which is further connected to digital pin 11 of Arduino.

Water pump: A 12v dc water pump is used to artificially supply water. It can be triggered on and off by sending signals as required

Soil moisture sensors: It measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons. soil moisturesensor.

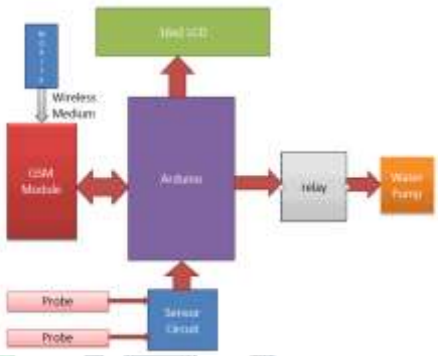


Fig No 1: Block diagram of Remote controlling agricultural pumpsystem using Arduino.

ADVANTAGES

- Farmers can control land moisture from a remote location.
- Increases productivity.
- Farmers can invest time in other vital tasks.
- It is very easy to design and implement. It will save farmers time and money

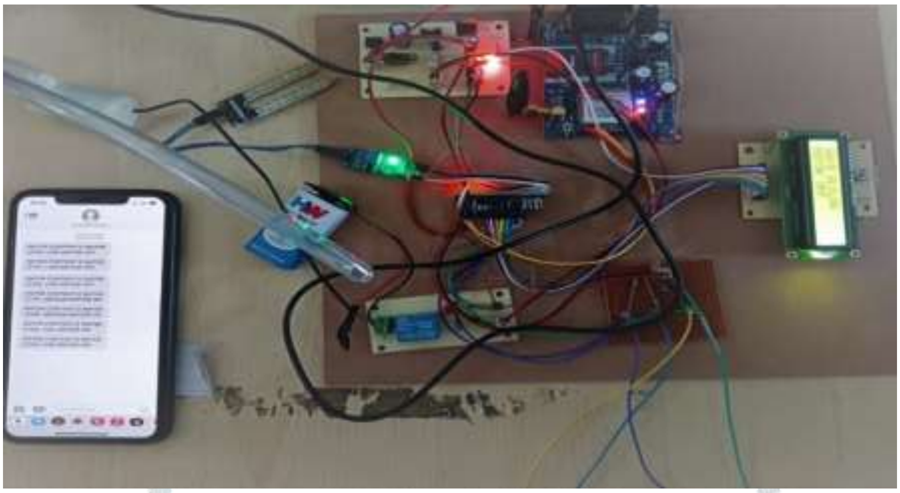
DISADVANTAGES

- The smart farming based equipment require farmers to understand and learn the use of technology.
- This is major challenge in adopting smart agriculture

farming at large scale
across the countries.

RESULT

Irrigation becomes easy, accurate and practical with the same soil sample impossible. Because of the idea above shared and can be implemented in agricultural difficulties of accurately measuring dry soil and water fields in future to promote agriculture to next level. The Volumes, volumetric water contents are not usually output from moisture sensor and level system plays major determined directly. Role in producing the output.



Figureno 2: Practical working of project

CONCLUSION

The Arduino based automatic irrigation system is simple and precise way of irrigation. Hence, this system is very useful as it reduces manual work of the farmers and also helps in the proper utilization of resources. It eliminates the manual switching mechanism used by the farmers to ON/OFF the irrigation system. This
project can be extended to greenhouses where manual supervision is less. Fully automated gardens and farm lands can be created using this principle in the right manner on large scale**.**

FUTURE SCOPE

This system is available for a specific crop as a specific level of moisture is programmed in the he ince the scope of the project was using the water pumping system for irrigation and control this system by microcontroller, there are extra things could be added to improve this project. A water level sensors could be added to irrigate the land with the suitable amount of water. Also, noise sensor could be added to protect the farm field from the animals or even human get closer to the farm by producing a noisy sound as an alarm or buzzer.Another idea should be added in this project is to add an electronic gate valves in order if there are multi farms need to be irrigated individually at different times controlled by one system shown in Figure 15. Each land area should has its own sensors connected to the controller as an input. Also, the electronic gate valves should be connected to the controller as an output. Another recommendation should be considered in this project is that the farmer should have the option of controlling the water pump in case of crops is damaged, so no need for irrigation even the soil is dry because there is no plants. Also, improve this system to include the other functions rather than irrigation only. We could add seeding, ploughing and fertilizing functions to be implemented automatically whether using Arduino or PLC as a controller.Moreover, develop using the GSM Module for remote control. For example, use this technology to remotely switch ON/OFF the AC in home or Open/Close the door of the home and other functions in order to make a smart house

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