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Automatic Water Conserving Irrigation System

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Abstract: The main aim of this paper is to provide information about automatic irrigation to the plants which helps in saving money and water. The entire system is controlled using ATMEGA 328 microcontroller which is giving the signals to the motor. Moisture sensor and water level sensor are connected to internal ports of the microcontroller. Whenever there is a change in the moisture of the soil or reduction in water level of the reservoir a signal is sent to the micro controller and thus the motor gets activated, and the buzzer and the LED's are also activated accordingly.
Keywords: Arduino, Irrigation, Water Conservation, Automated Irrigation System, RTC module.

I. INTRODUCTION

Water shortage is a major problem right now for a major part of the world. Conserving it is becoming a major task. It is required by everyone from humans, animals to plants. Scarcity of such a resource creates a huge problem. This project focuses on the conserving of water in agriculture. Water wastage occurs in agriculture whenever excess of water is given to the crops. Various types of irrigation techniques currently used are given below.

A. Drip Irrigation

Drip irrigation systems deliver water directly to a plant's roots, reducing the evaporation that happens with spray watering systems. Timers can be used to schedule watering for the cooler parts of the day, further reducing water loss. Properly installed drip irrigation can save up to 80 percent more water than conventional irrigation**,** and can even contribute to increased crop yields.

B. Terrace irrigation

In this process the land is cut into multiple steps and supported by keeping walls while the plain area are used for plantation and the idea is that the water runs down each step watering each column. This led to the usage of steep land for multiple crops.

C. Sprinkler system

This irrigation system is designed on overhead sprinkler fixed on permanent risers. The system is installed underground and the sprinklers level up when water pressure increases, which is a popular method of irrigation used although it is the most inefficient method compared to other water conservation irrigation methods.

D. Rotary system

This method is used for irrigating large areas. This system involves the use of sprinklers which rotate in a circular direction thus covering large area of a field. This system is a low cost irrigation as a single sprinkler covers a large area.

II. LITERATURE REVIEW

In this paper, soil moisture sensor is used which is placed in the soil and water level sensor is used which is placed in the reservoir. The sensor sends the information to the microcontroller. An algorithm was designed which converts the analogue data of the sensor to percentage. This paper designed an automatic irrigation system controlled by a microcontroller ATMEGA328. The moisture sensor and the water level sensor send information to the microcontroller which is send to server via the WIFI module thus the system can be monitored remotely. When the moisture of the soil reduces below the set parameter the microcontroller automatically turns on the motor. The current soil condition is displayed in the LCD and any change in the state of the system is notified via the LED's, buzzer and the LCD display.

III. NEED OF AUTOMATIC IRRIGATION

An automatic irrigation system can be very helpful in consideration of conserving of water. The traditional method of irrigation based on guesswork. The automation of the irrigation process is better in giving the crop water exactly what it needs. The system can be easily coded for different crops, thus accounting for the varying needs of different crops.

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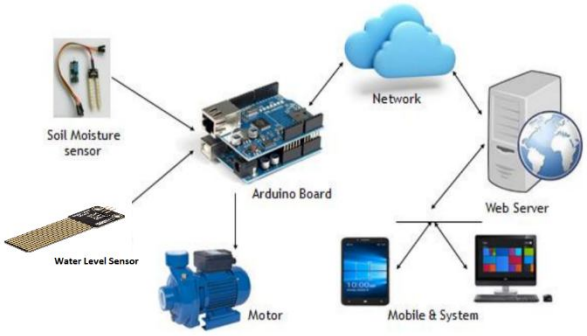


Figure 1: Basic System Structure

IV. SOIL MOISTURE

Soil moisture is an important component in the Atmospheric water cycle, both on a small agricultural scale and in large-scale modeling of land/atmosphere interaction. Vegetation and crops always depend more on the moisture available at root level than on precipitation occurrence. Water budgeting for irrigation planning, as well as the actual scheduling of irrigation action, requires local soil moisture information. Knowledge of the degree of soil wetness helps to forecast the risk of flash floods, or the occurrence of fog. Soil water content is an expression of the mass or volume. The below fig 1 shows Microcontroller based irrigation of water in the soil, while the soil water potential is a system proves to be a real time feedback control system expression of the soil water energy status. The relation which monitors and controls all the activities of drip between content and potential is not universal and depends irrigation system efficiently. The present proposal is a on the characteristics of the local soil, such as soil density model to modernize the agriculture industries on a small and soil texture. Scale with optimum expenditure. Using this system, one the basic technique for measuring soil water content is the can save manpower, water to improve production and gravimetric method. Because this method is based on ultimately profit. Direct measurements, it is the standard with which all other methods are compared.

V. SOFTWARE AND HARDWARE PLATFORM

A. Hardware used

Arduino with ATMEGA328, Moisture sensor, Water level sensor, LCD display, buzzer, LEDs, Relay module, motor, WIFI module, power supply.

B. Software used

Arduino (C Programming)

VI. SYSTEM DESCRIPTION

A. Soil Moisture Sensor

The soil moisture sensor senses the moisture in the soil. The sensor works on the amount of current flowing through the soil. More the current flows more is the moisture in the soil.

B. Water level sensor

Water level sensor senses the water level in the reservoir. It works on the same principle as the soil moisture sensor. Current flows as long as sensor is in contact with the water. As the water in the reservoir recedes the sensor sends alert signals to the microcontroller.

C. LCD Display

The LCD is connected to the microcontroller via an i2c module. The LCD shows the time from the RTC module and the soil and reservoir states are displayed on it. It also displays if the motor is being turned on.

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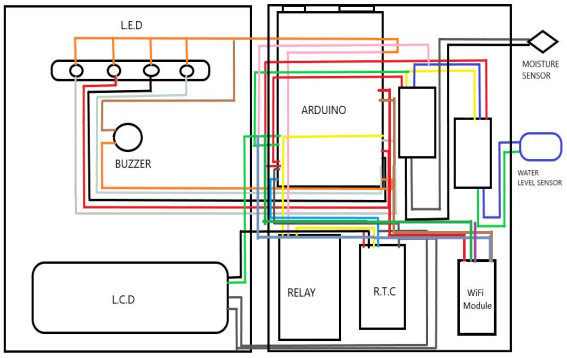


Figure 2 : Circuit Layout of System

D. Buzzer

The buzzer is there for notification via sound for the system state. The different conditions have been assigned a different sound tone. The buzzer is activated for low soil moisture, low water level o reservoir and turning on of the pump.

E. WIFI module

The system is connected to the wifi module which can send the data to a server from there the sensor data can be viewed from anywhere in the world.

F. Relay Module

The relay module is used to connect the pump to the system. When the microcontroller sends signals to turn the pump on or off, the relay receives the signals and accordingly turns the pump on or off.

G. Motor

The motor is connected to the relay. The motor pumps the water from the reservoir to the plant.

H. Power Supply

Power supply of 12V is used for running this hardware system.

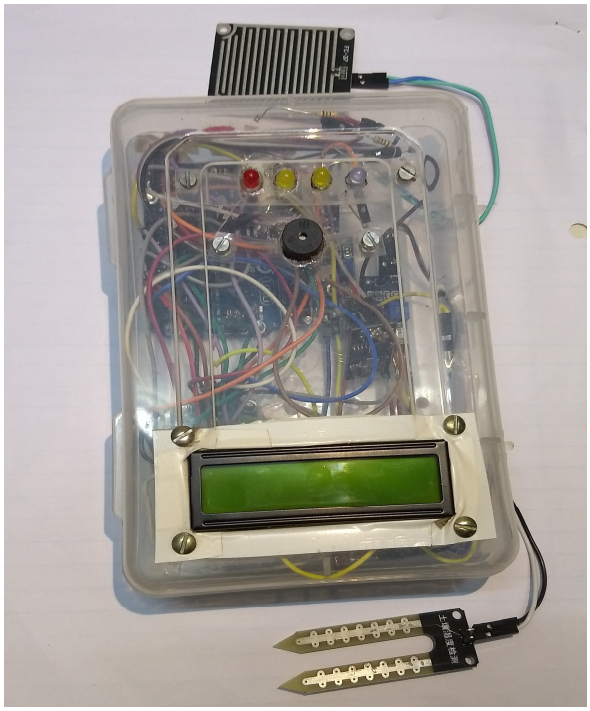


Figure 3 : Hardware Setup

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VII.RESULT

The system used provides us with the reading of the water level in reservoir along with content of moisture in soil. These data are used to keep a track on requirements of the field and to keep a check on the proper functioning of the system.
Automatic plant irrigation system is basically designed for the introduction of the embedded technology in irrigation sector. The automatic operational capability of this system requires the minimum quantity of water for the irrigation work and extends its contribution.

VIII. ADVANTAGES

A. Saves water
B. Reduces human intervention
C. Crop Specific Irrigation initiated
D. Discourages weed growth

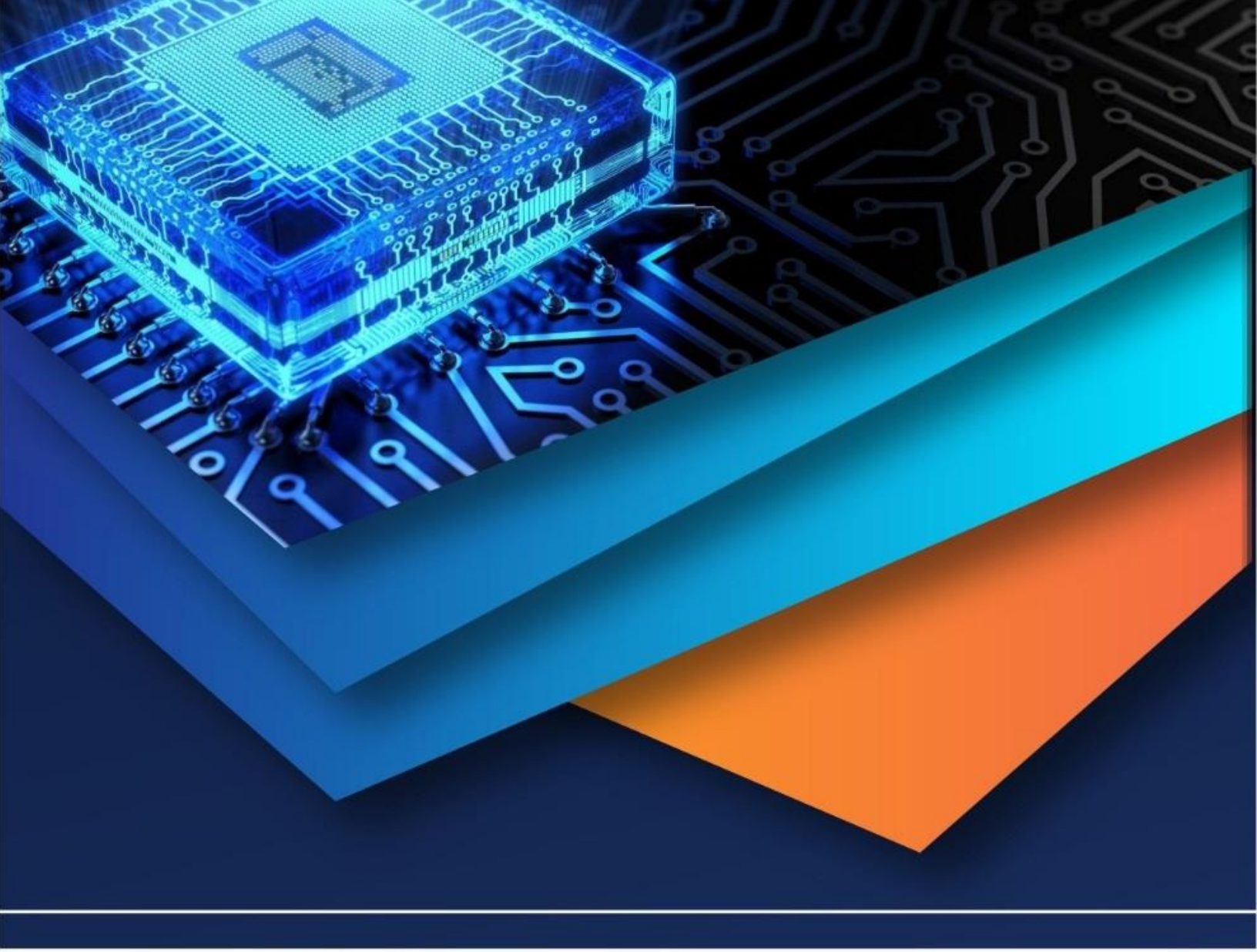
IX. CONCLUSION

The system designed is effective in terms of water conservation when compared to traditional method of irrigation.
The purpose of designing of automatic plant irrigation system is to successfully achieve and fulfill the desired objectives. The system is operational 24/7 which reduces the requirement of human intervention in irrigation process and also minimizes wastage of water. Irrigation process starts and stops exactly when required. The hardware and software performed their function properly to produce desire result which is the requirement of farmer in field. The system can be easily modified for different crops as each has different water requirements and the monitoring of the system can be done sitting anywhere in the world via the internet.

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