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A Novel Approach for Intelligent Irrigation System with Arduino and GSM

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Abstract: Most of India's land area is agricultural land. Irrigation is method to the supply of water to the land or soil. It is used to help in the growing of agricultural crops, maintenance of landscapes, and rebuilding of disturbed soils in dry areas and during periods of insufficient rainfall. With the water requirements in irrigation being large, there is a need for a smart irrigation system that can save the water. This system aims at saving time and avoiding problems like constant attention provided with animal attack system and short circuit detection. It also helps in water conservation by automatically providing water to the plants/gardens depending on their water requirements.

I. INTRODUCTION

This is an GSM (Global System for Mobile communication) based on Arduino for irrigation. The interface and communication between user and designed system is via Short Message System (SMS) on GSM network if the user is within the range of 10m of designed system. Agriculture is backbone of Indian economy. Irrigation is heart of agriculture. Irrigation is used to help growing crops in the field land during the inadequate rainfall period. Pesticide is used preventing, destroying or mitigating any pest. Both of these are very important for good productivity and both need time to time application in the farm field. In India approximately 20% of farmers are dependent on electric water pumps for irrigation in their field. The soil moisture based irrigation control uses Tensiometric and Volumetric techniques, which are relatively simple but these quantities are related through a soil water characteristic curve that is specific to a soil type. Also the sensors used require routine maintenance for efficient performance. Intelligent automatic plant irrigation system concentrates watering plants regularly without human monitoring using a moisture sensor. To improve water efficiency there must be a proper irrigation scheduling strategy. In this paper a simple system is mentioned using an Arduino to automate the irrigation and watering of small potted plants or crops with minimal manual interference.

II. PROBLEM STATEMENT

In the present aeon one of the greatest problems faced by the world is water scarcity and agriculture being a demanding business consumes plenty of water. Therefore, a system is required that uses water sensibly. Focus of this system is to overcome this problem by using a smart irrigation system. Smart irrigation systems estimate and measure reduction of existing plant moisture in order to operate an irrigation system, restoring water as needed while minimizing unwanted water use.

III. BLOCK DIAGRAM

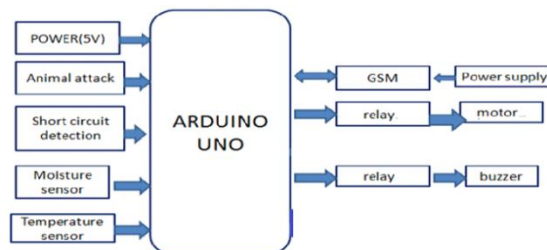


Figure 1: Block diagram

A. Soil Moisture Sensor

sense the moisture level of soil, if the level goes above one particular limit Arduino take appropriate action over it. The soil moisture sensor consists of two probes which are used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value.

B. GSM Module

It is used to send and receive the data through text messages, The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900

C. Temperature Sensor

it is connected to the analogy pin of Arduino, used to measure the atmosphere of land.

D. Relay

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit.

E. Buzzer

A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signalling device. A piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed

F. Arduino

The model we used is ArduinoUno. Arduino is an open-source platform used for building electronics projects. 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.

IV. METHODOLOGY

In this a system has Arduino, Soil moisture sensor, Temperature sensor, Relays, buzzer and GSM Module. This system is having four subsystems such as Animal Attack, Short Circuit Detection, Self-mode and Manual mode. A switch is used to change the mode of the system in manual or self-mode. There is a manual mode in which PUMP will be controlled manually by sending message to a system through GSM while another mode is automatic which is controlled by Arduino will get the inputs from Sensors such as temperature, soil moisture and as per that Arduino will make the PUMP ON or OFF. And at the same time will send the same status to the system for security. when system is made on Arduino will keep the Relays OFF. And check for the Mode switch whether to work in MANUAL mode or self-Mode.

In self- mode, Moisture Sensor senses the low moisture content of the soil and gives a signal to the Arduino. If moisture level is low, then relay will turn on the motor pump. When the moisture content becomes sufficient, the sensor senses this and gives back the signal to the Arduino, Relay gets open and the water pump become turn OFF. Temperature sensor gives the value of temperature to Arduino, according to temperature value, motor will be turn ON or OFF. In manual mode, Arduino keep checking for the incoming message with the help of GSM and if it gets a new message then Arduino reads the content of the message and accordingly turn ON or OFF the motor.

The smart irrigation system was designed to continuously sense the moisture level of the soil. The system responds accordingly by watering the soil with the exact required amount of water and then cut the water supply when the sufficient water provides to the land. Also the amount of irrigation, the moisture sensors was designed using probes made from corrosion-resistant material which can be stuck into soil sample. Voltage levels corresponding to the wet and dry states of the soil sample were computed by measuring the resistance between the moisture detector probes and matching them to output voltages of a comparator circuit.

Overload relays are used in a motor circuit to protect motors from damage caused from overcurrent. Shortcircuit protection is protection against excessive currents or current beyond the acceptable current rating of equipment and it operates instantly.

When the animal will enter in the land then buzzer will on and it will intimidate to the animal and also send message to the user for the security purpose.

A. Software used: Arduino-Integrated Development Environment (IDE)

IT is an open-source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control the physical world. The Arduino (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects. which also supports the languages C and C++.

A typical Arduino C/C++ sketch consist of two functions that are compiled and linked with a program stub `main()` into an executable cyclic executive program:

Setup(): a function that runs once at the start of a program and that can initialize settings.

Loop(): a function called repeatedly until the board powers off.

After compiling and linking with the GNU tool chain, also included with the IDE distribution, the Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal coding that is loaded into the Arduino board by a loader program in the board's firmware. Arduino more straight forward by allowing the use of an ordinary computer as the programmer. Currently, opt boot loader is the default boot loader installed on Arduino UNO. At a conceptual level, when using the Arduino integrated development environment, all boards are programmed over a serial connection.

```
irrigation_GSM_Moisture_sens_animal_buzzer | Arduino 1.8.4
File Edit Sketch Tools Help

irrigation_GSM_Moisture_sens_animal_buzzer

const int animal_attack = 2;
int attackState;
#include <LiquidCrystal.h>
const int rs = 7, en = 6, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
const int button = 8;
int buttonState;
const int powerRelay = 9;
const int motor = 10;
#include <SoftwareSerial.h>
SoftwareSerial SIM900(11,12);
const int buzzer = 13;

const int MS1 = A0;           //moisture sensor 1
const int MS2 = A1;           //moisture sensor 2
const int MS3 = A2;           //moisture sensor 3
const int MS4 = A3;           //moisture sensor 4
int msState1, Land1;         // state for ms1
```

Figure2: software use

IV. RESULT

This smart irrigation system shows all values moisture content of soil and according to that it will on or off the motor. This system will protect the land from the animal with the help of buzzer. Short circuit detector used to avoid the damage of circuit from the over flow of current. This system can be controlled in two modes such as self-mode and manual mode with the help of GSM.

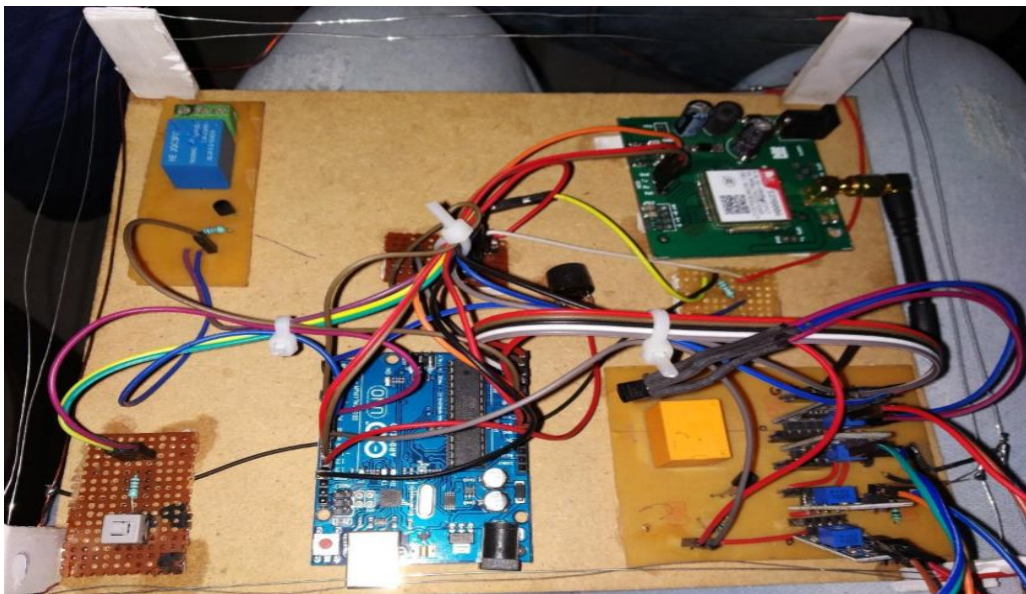


Figure3: actual picture

V. CONCLUSION

Most of the population in the world has an occupation of farming and if we consider the people who do businesses depending upon farming the population will increase manifold. The GSM Based SmartIrrigation System will be monitors and controls all the activities of irrigation system efficiently. GSM Based Smart Irrigation System will be a better circuit for accurate soil moisture control and it is a simple, specific method of irrigation.

It will also help in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits.

VI. FUTURE SCOPE

Pesticides and fertilizer can be added automatically into the water. PIR sensors can be used to detect the motions of animal in the agriculture field. The system can be powered by solar panel, solar controller can be used to control the power of system.



Implementation of weather forecasting will help in saving the water based on the availability of water. It can be add on Bluetooth technology for wireless sensors. We can interface lcd screen in order to display the current status of system.

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