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AUTOMATED DRIP IRRIGATION SYSTEM USING WATER PUMP CONTROL WITH GSM MODEM CONTROL

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Abstract: *The initiative is designed to build up an automatic drip irrigation system for controlling the pump motorize ON/OFF by sensing the moisture content of the soil. In the field of crop growing, scarcity of water is of great apprehension thus make use of appropriate technique of irrigation is essential and drip irrigation prove to be most effective in this. The lead intended is for trimming down human involvement and ensure proper irrigation with abridged water consumption.*

The project uses ATMEGA 16 microcontroller which is programmed to receive the input signal of changeable moisture condition of the soil through the BJT based soil moisture sensor. For comparator we are using Op-amp to create an interfacing channel between microcontroller and sensing array.

An output for driving relay to operate water pump is generated when controller receives signal. Liquid crystal display interfaced with microcontroller for displaying the status of soil in different pots and water pump's on/off status. Sensor arrangement is created with two wires or stiff metallic rod inserted a distance apart.

Also this includes 3 flower pots which are different saplings and hence require different water content. This is why it is a more efficient technique of water supply as compared to conventional technique of flood irrigation method. To enhance this initiative GSM module is implemented that delivers a message whenever water pump switches on/off along with soil moisture status for example dry or moist for all 3 different pots.

Key Words: **AUTOMATIC DRIP IRRIGATION, WATER PUMP CONTOL, GSM CONTROL MODULE, ATMEGA16, SOLENOID BASED SENSOR**

1. INTRODUCTION

This graduate project defines the implementation of a mobile driven intelligent and completely automated wireless drip irrigation system. The system together provides a very advanced control over the currently implemented manual system. The implementation involves use of valve control, drip control and pump control using a microcontroller based board.

A mobile phone is used to interface the microcontroller board via a GSM modem and control the valve timings. An additional LCD board is provided to collect moisture and temperature level feedback from various types of plants with different moisture content. This helps the user in collecting different feedback for different types of the moisture level with separate breeds of crops that can be cultivated accordingly. The concept is enhanced by integrating GSM technology, such that whenever the water pump switches ON/OFF, an SMS is delivered to the concerned person regarding the status of the pump.

All the above features are distinct and hence making it better than projects already existing also few more such advantages are differential feedback from each plant, pump and valve control to manage flow to individual drips, complete monitoring over text message, for different seasons variable valve timings can be saved. This it is easy to control as well as beneficial from small ranging home arrangements of flower to varied farm crops.

2. BLOCK DIAGRAM

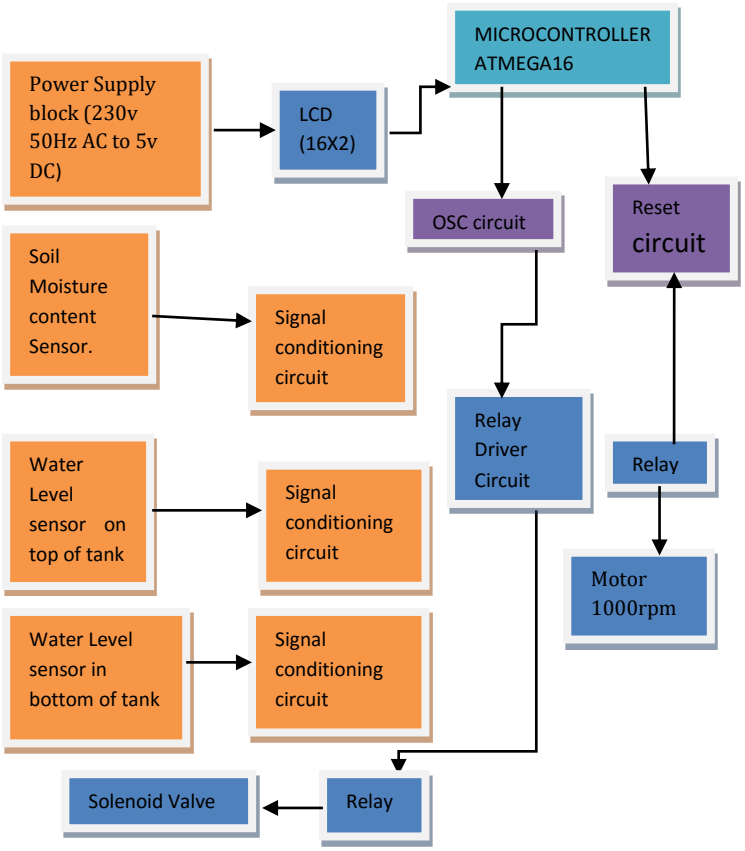

FIGURE NO.1 BLOCK DIAGRAM

3. BLOCK DIAGRAM EXPLAINATION:

a) Power supply block:

The 230v 50 Hz AC mains supply is step down to 12v using step down transformer. The transformer gives output of 12v which is AC, thus it is rectified with the help of Diode Bridge W10M. The output of W10M is DC 12v and is further filtered by a 1000 microfarad capacitor, and then it is regulated using IC 7805. The output produced is +5v dc that is given to microcontroller for its operation.

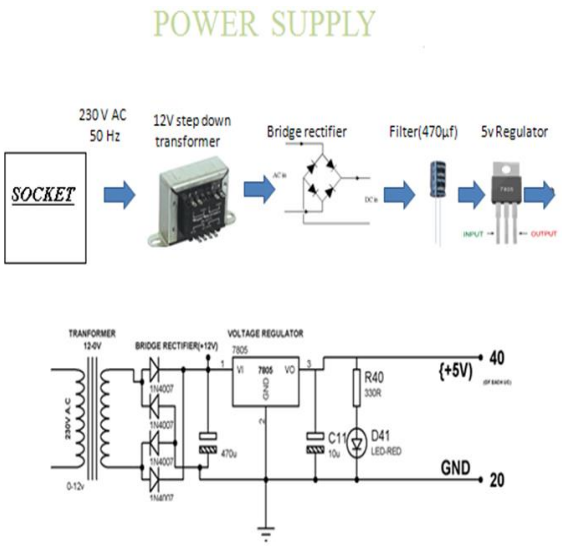

FIGURE NO. 2 POWER SUPPLY BLOCK

b) LCD (Liquid crystal display):

Liquid crystal display is connected to circuit for displaying the message like motor ON/OFF, soil moisture condition

c) THE SENSOR DESIGN AND FUNCTIONING:

The sensor is constructed using a transistor 2N2222 a 10Kiloohm variable resistance pot,100 ohm resistor and two probes as shown in Fig.2 these probes consist of two thin wires which can be immersed into the soil or water under test. The circuit gives a voltage output corresponding to the conductivity of the soil. The soil or air between the probes acts as a variable resistance whose value depends upon the moisture content in the soil.

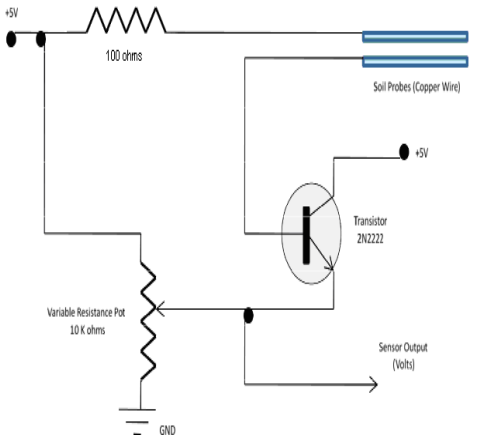

FIGURE NO.3 Sensor design Equivalent diagram of soil moisture sensor

d) Microcontroller:

This graduate project uses a ATMEGA 16 microcontroller due to its varied distinct features and it is a suitable microcontroller for embedded control applications also it is a low power high performance CMOS 8-bit with 8kb of flash memory. On chip flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. It includes 32 programmable I/O lines as well as it is compatible with MCS-51 family products.

e) Relay:

The relay used here works as **electrically operated switch**. Current to be flowing through the coil of the relay will create a magnetic field that will attract lever and will change the switch contacts. The coil current can be on or off so relays have two switch positions and most have **double throw** (**changeover**) switch contacts.

4. EXPERIMENTAL SETUP:

The experimental setup includes a power block which converts the output voltage to 12V using a step down transformer which supplies power. It also includes a microcontroller to which is connected a LCD screen, all the sensors giving input to the microcontroller which processes it in real time and displays it on screen also sends a binary signal to the GSM modem connected to it which sends a message on the registered mobile number.

The GSM modem uses the same supply voltage as the microcontroller.

It includes 3 solenoids which are used for the purpose of valve operation and these are connected to the drip pipe also called as industrial drip pipe supplying water to the plants.

The setup also includes an AC motor which has a speed of 1000 rpm. There are 3 soil moisture sensors for the 3 different plants. It includes relay as well as a resistor and a transistor as seen in the setup.

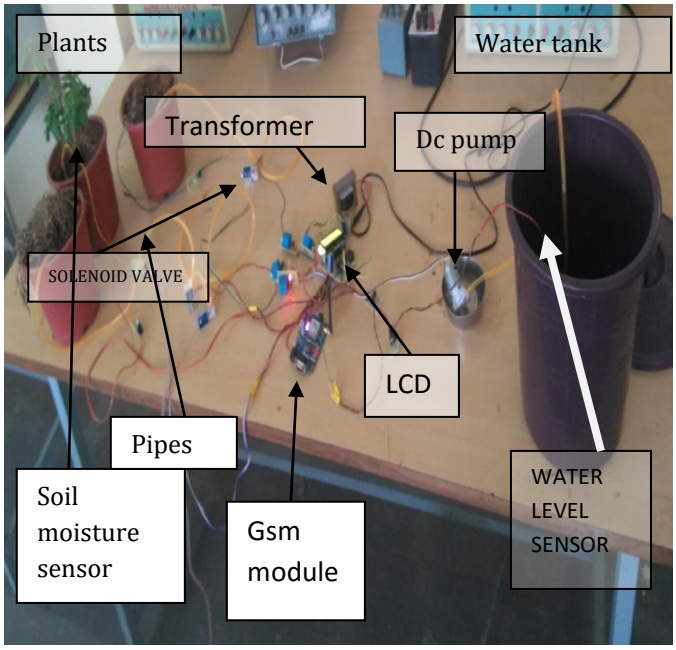

Fig-4 ACTUAL EXPERIMENTAL SETUP

5. ADVANTAGES

1. This is a live monitoring service.
2. There we will use automatic sensors.
3. AC external port is available at the output.
4. Avoid overflowing and running dry too.
5. Saves Electricity.

6. APPLICATIONS

1. It is used in industrial automation.
2. It is used in home automation.
3. Aid for farmers as they can control various types of crops on and off by automated system with individual solenoid control.
4. It can monitor crop cultivation

7. Features

1. Variable & programmable valve timings for various areas of the fields.
2. Differential feedback from each plant
3. Analog sensor array is used for moisture level, temperature, etc. feedback.
4. Micro-controlled board for intelligent hardware control.
5. Pump as well as valve control to manage the flow to individual drips.
6. Variable valve timings can be saved for all conditions and seasons so that the users won't have to re-enter the values every time
7. Complete monitoring and control only using SMS messages

8. Work on AC and DC power supply.

8. RESULTS (GRAPHICAL REPRESENTATION):

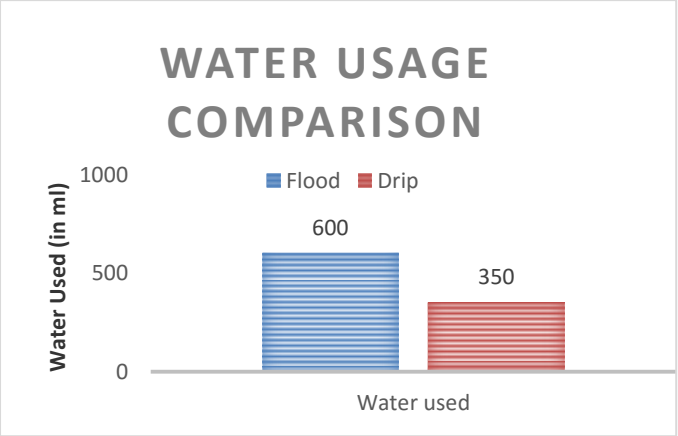

CHART NO.1 WATER USAGE COMPARISON

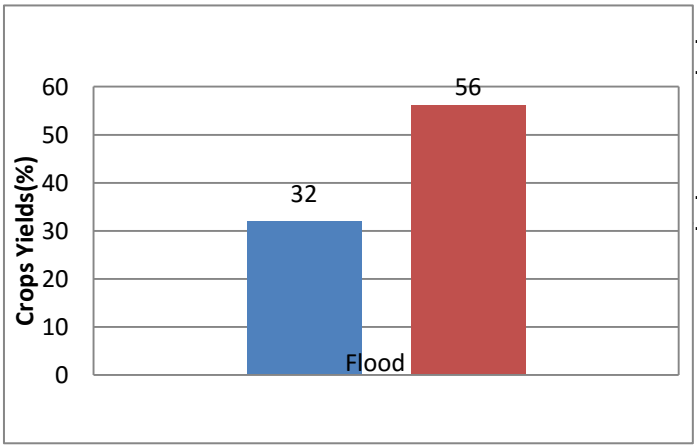

CHART NO.2 CROPS YIELD (IN %)

9. CONCLUSIONS

- The Automated Drip Irrigation System by Using Wireless Sensor Network proves to be a real time feedback control system which monitors and controls all the activities of drip irrigation system efficiently.
- The present proposal is a model to modernize the agriculture industries at a mass scale with optimum expenditure. This system can also transfer fertilizer and the other agricultural chemicals (calcium, sodium, ammonium, zinc) to the field with adding new sensors and valves.
- Using this system, one can save manpower, as well as water to improve production and ultimately profit.

10. Future Scope

1. The whole system can be designed by using controllers and embedded system for providing a wireless automation solution.
2. This system can also supply fertilizer and the other agricultural chemicals like calcium, sodium, ammonium, zinc to the field with adding new sensors and valves
3. The speech control system can be further extending to other devices and appliances for user friendliness for blind people.
4. We can also add cameras at various positions and get a live video output on internet.

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