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USE OF DIGITAL TECHNOLOGY IN MICRO IRRIGATION SYSTEM IN ORDER TO INCREASE THE WATER USE EFFICENCY IN IRRIGATION SECTOR .

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Abstract— Automatic irrigation system is a modern method of irrigating the vegetable, fruit fields, farms, gardens and land scraping areas as against the conventional method, which uses large number of men- hours and uncontrolled water quantity. The main purpose of the project work is to apply water to the plants automatically, by sensing the soil condition. For sensing the soil condition, weather it is dry or wet, two copper electrodes are used as soil sensors for two fields and output of these sensors are fed to the microcontroller. The output of microcontroller is used to drive the relay to operate or control the pumping motor to the field whose soil is dry. This is electrically controlled equipment, when the soil is found to be dry; automatically the controller moves the pumping motor to that particular field and energizes the relay to activate the water pumping motor and supply water to the field or plants.

Keywords—Arduinocontroller/Atemga328pcontroller, L239D"H"Bridge, servomotors, DC motors, Relay, Powersupply.

I. INTRODUCTION

In India agriculture is the most important occupation of the people. More than 60% of our total population depends for their subsistence on agriculture. After independence due to various development projects introduced in the field of agriculture, production of food grains has been continuously increasing. The entire Indian economy is depending on agriculture. Any fluctuation in agriculture income will directly affect the India's national income. In this regard, a thought is given to develop an Automatic Plant irrigation System designed with micro-controller. In this project work lot of importance is given for the drip irrigation, such that by sensing the soil moisture, water supply can be controlled automatically. For this purpose, relay is used, to energizing the pumping motor to supply water to the plants. The relay is energized automatically when the soil is dry, similarly the relay can be closed automatically when the soil is in wet condition. For sensing the soil condition copper electrodes are used. In this project work, micro-controller chip is playing a major role, the controller used in this project is ATMEGA 328 Arduino controller. Nowadays with the advancement of technology in the field of micro-controllers, all the activities in our day-to-day living have become part of information technology and we find micro-controllers in each and every application. Thus, the trend is directing towards controller-based project works. However, in this project work, the basic signal processing of information gathering from the soil condition, is done with analog circuit, for this purpose copper electrodes are used for the condition.

1.ATMEGA 328P CONTROLLER

The atmega controller is a low power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture.it achieves throughput within 1MIPS per MHz's. It enhances the power consumption by taking the throughput analysis. The Atmel AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

2.L239D"H"BRIDGE

H-bridge is made with the help of transistors and MOSFET's. rather of being cheap, they only increase the size of the design board, which is sometimes not required so using a small 16 pin IC ispreferred for this purpose. L293D is having two 'H' Bridges inside, so that we can drive two DC motors simultaneously. H Bridge is also known as "full Bridge". Here, in the H bridge there are 4 switching elements are present at the corners and the motors forms a cross bar at center. The switches are turned on in pairs, either high left and lower right, or lower left and high right, but never both switches on the same "side" of the bridge. If bothswitches on one side of a bridge are turned on it creates a short circuit between the battery plus and battery minus terminals. If the bridge is sufficiently powerful it willabsorb that load and your batteries will simply drain quickly.

To power the motor, turn on two switches that are diagonally opposed. The current flows and the motor begin to turn in a "positive" direction. Switch off these two switches and switch on other two switches diagonally in other direction then the motor starts rotating in opposite direction. Actually, it is quite simple, the trickypart comes in when we decide what to use for switches. Anything that can carry a current will work, from four SPST switches, one DPDT switch, relays, transistors, to enhancement mode power MOSFET's. One more topic in the basic theory section is quadrants. If each switch can be controlled independently then we can do some interesting things with the bridge,some folks call such a bridge a "four quadrant device" (4QD). If we built it out of asingle DPDT relay, we can really only control forward or reverse.

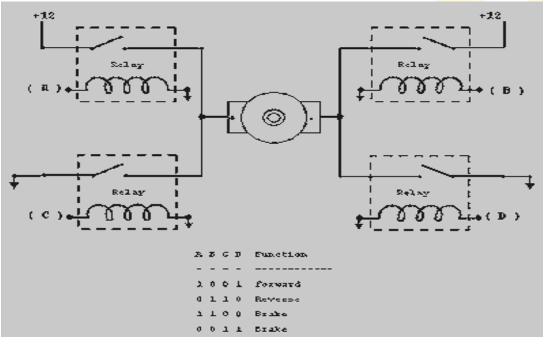


Fig a) a simple H- bridge circuit using relays.

3. DC MOTORS

At the most basic level, electric motors exist to convert electrical energy into mechanical energy. DC motors are configured in many types and sizes, including brushless, servo, and gear motor types. A motor consists of a rotor and a permanent magnetic field stator. The magnetic field is maintained using either permanent magnets or electromagnetic windings. DC motors are most commonly used in variable speed and torque applications. Every DC motor has six basic parts -- axle, rotor (a.k.a., armature), stator, commutator, field magnets, and brushes. In most common DC motors, the externalmagnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or morepermanent magnet pole pieces. The rotor (together with the axle and attached commutator) rotates with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator.The above diagram shows a common motor layout -- with the rotor inside the stator(field) magnets.

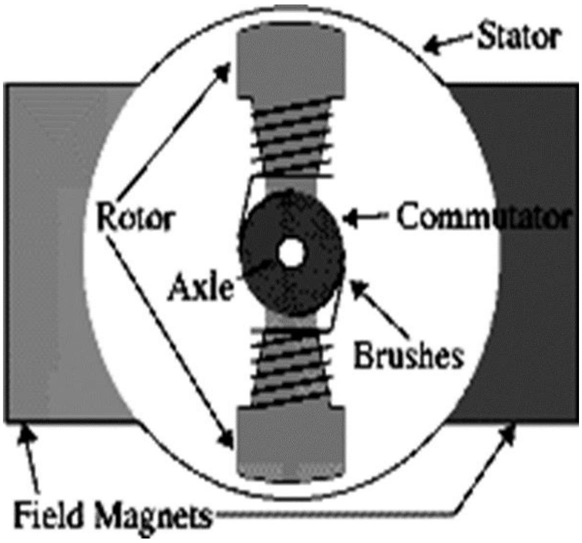


Fig b) A dc motor and their parts.

4. RELAYS

A relay is an electrical switch that opens and closes under the control of another electrical circuit. An electric current through a conductor will produce a magnetic field at right angles to the direction of electron flow. If that conductor is wrapped into a coil shape, the magnetic field produced will be oriented along the length of the coil. Thegreater the current, the greater the strength of the magnetic field, all other factors being equal. The object of a relay is generally to actas a sort of electrical magnifier; that is to say, it enables a comparatively weak current to bring into operation a much stronger current. It also provides complete electrical isolation between the controlling circuit and the controlled circuit.
Relays are extensively used in electronics, electrical engineering and many other fields. A wide variety of relays have been developed to meet the varied requirements of industry. There are relays that are sensitive to conditions of voltage,current, temperature, frequency, or some combination of these conditions. The basicworking of an electromagnetic relay is easy to understand. However, in order to select a relay to perform a particular function efficiently and that too for a long timerequires knowledge of relay characteristics and that of the circuits in which the relayis used.

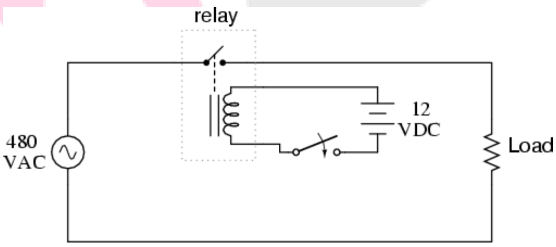


Fig c) A Basic relay circuit

II. WORKING

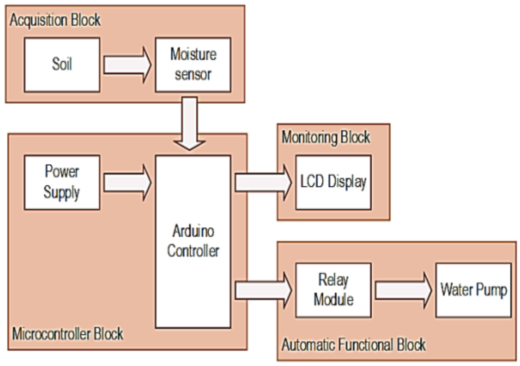
The soil moisture sensor must be check the upper and lower boundaries of the analog value from pin A0 before it is convert to digital value. In Figure 1.4, the code fragment reads the sensor value from the soil moisture sensor. The value is analog value is then converted into digital value either to be used for switching on the water pump or to be displayed on the LCD screen. The code fragment converts the upper bound 400 into 100% and lower bound 900 into 0% respectively in the last statement of the code.

```
void readSensor()

{

sensorvalue=analogRead(A0);
sensorvalue=constrain(sensorvalue,400,900);
soil=map(sensorvalue,400,900,99,0);

}
```

The code fragment in the above figure is mainly for the printing of the percentage that is acquired from soil moisture sensor to determine whether the soil is wet or dry. The value from the sensor also determine whether to switch the water pump on or off. From the code in Figure 1.5, it is shown that when the soil moisture percentage is below 38%, the water pump will be switch on automatically, and the LCD screen will show the water pump status is 'ON'. When the soil moisture percentage reach 47%, the water pump will be switch off automatically, and the LCD screen will show the water pump status is "OFF".

```
Void loop()
{
 Read Sensor ();
 lcd.SetCursor (0,0);
 lcd.print ("Moisture=  ");
  lcd.print("soil");
  lcd.print("%d");
 if (solid is <=38)
    {
     lcd.setCursor(0,1);
    lcd.print("Pump : ON ");
    digitalWrite(WATERPIN,LOW);
     while(soil <= 47)
       {
          readSensor();
          delay(100);
        }
   lcd.setCursor(0,1);
  lcd.print("Pump : OFF");
  digitalWrite(WATERPIN,HIGH);
      }
  }
```

Fig d) Block diagram of the micro-irrigation system



CONCLUSION:

The main purpose of this chapter is to propose an automated irrigation system that water the plant without any human control. The automated irrigation system iimplemented found to be feasible and cost effective for optimizing water resources for agricultural production. Besides the automated irrigation system, the proposed system also provides the monitoring function where users are able to check the soil moisture based on the reading on the LCD display. The proposed system has been designed and tested to function automatically. For future works, the automated irrigation system can be configured to measure the moisture level (water content) according to the moisture requirement of the different plants.

FUTURE SCOPE:

Instead of using atmega/AVR 328P controller we can implement the internet of things, Artificial Intelligence etc…, so that we can check our irrigation system wherever we present and we can look after whenever we want and in future technologies we can further develop these system by using highly advance technologies.

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