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Smart Sensor based Irrigation System using Internet of Things

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ABSTRACT

The smart irrigation system is an automatic irrigation system which is used in the agricultural field. It is very use full for the farmers in checking the moisture level in the soil. If the moisture level in the soil is low it send an alert message automatically and turns on the water motor to flow the water for that soil until the moisture level is sufficient in that soil and automatically turns off the water motor. It helps the farmers in yielding good crop and maintaining good soil. This irrigation system will prevent flowing of excess water during rainfall and spot the damage cause to the crop and soil.

keywords : Arduino UNO, water motor**,** soil moisture sensor, automatic system **,** No intervention of humans.

1. Introduction

At present scenario, the irrigation is doing in a manual procedure. By smart irrigation we can use water in a sufficient way so that the water cannot get wasted. The smart irrigation system will work based on the sensors. when the moisture level in the soil is decreased it will send a signal to arduino and accordingly it will irrigate the crops. There is no presence of humans all the time in the fields. The arduino will provide function of calculation of pH value in the soil. If we design and code without any mistakes, it is very cost effective and is very use full to the farmers in the agricultural fields. The water will given as per the requirement to the crop by checking the moisture level in the soil so that the water conservation will also happen too. It makes that there is a need to develop smart systems that will prevent water wastage without bringing pressure on farmers. Over the past years, farmers started using computers and software systems to organize their financial data and keep track of their transactions with third parties and also monitor their crops more effectively.

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2. Embedded System

Embedded means something that is attached to other It is a special computer system. It is design to perform the simple functions with the real time examples. It is a part of both including hardware and software designed for some functions. A general purpose computer such as a personal computer can perform different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use. It has real time operating system that helps to run a system automatically by scheduling as per plan given. It has rules and regulation in the program. so embedded system is a Microcontroller based, software driven, reliable, real-time control system. since the embedded system is used for specific tasks, design engineers can optimize it by reducing the size and cost of the product or increasing the reliability and performance.

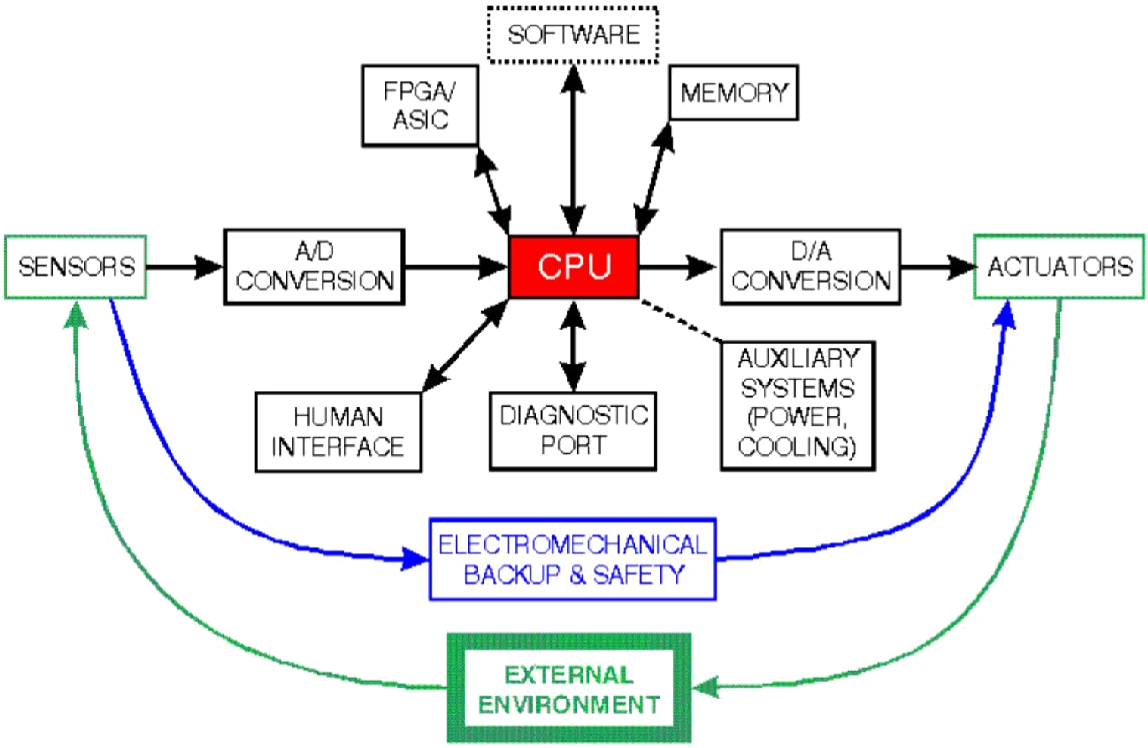

Figure1. Block Diagram of Typical Embedded System

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3. Relay

The relay is an electrical main voltage switch. It can be turn on and off at times of require. There are many types of modules like two, four and eight chambers. The relay is able to handle high power when required to control electric motor or other loads called contractors. sometimes coils are used to protect electric circuits from overloads. In relation of main voltages, the relay has three main connections like a normal pin, closed pin and normal pin. There will be no contact between normal pin and normally open pin. There is a connection between common pin and closed pin. The connection is must and should between common pin and closed pin even whether the relay switch is in off condition. When we on the relay, the circuit opens and there will be no power supply to the load. The GND of the relay goes to ground. IN 1relay port connected to the arduino digital pic and check the first channel of the relay.

Figure 2. Relay

4. Moisture sensor

The moisture or humidity sensor is used to measure the water content in that particular soil. It has been widely used in agricultural purpose, irrigation and also in the botanical gardens. The current required for this is less that 20ma, the ground moisture operating voltage level is 5v. The sensor is a analog type sensor and operate between 10 and 20c. In soil the dielectric

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permittivity is a function of water content. The sensor calculates the water level in entire soil. The moisture sensor is used to measure the loss of moisture due to evaporation by sun and

plants. The hardware and software used in moisture sensor is arduino IDE, humidity sensor software and arduino uno board. The soil moisture is brings conntect to Vcc of Auduino Uno and GND soil moisture and interconnected sensor arduino Uno and last door of A0 sensor is connected to 0 arduino analog board.

```
Int sensorpin=A0;
Pin for potentiometer
Sensor value int=0;
Coming from the sensor
Void setup()
{
Serial begin(9600);
}
Void loop()
{
Sensor value=analogue read (sensorpin);
Read the sensor value;
Delay(1000);
Serial.print("sensor=");
Serial.printin(sensor value);
}
```


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Figure 3. **Soil Moisture Sensor**

5. Temperature Sensor

According to the type of sensors, Thermistors such are as DHT11, the DHT22 and the AM2315 are most utilized type of temperature sensors. The DHT11 and DHT22 are less in cost sensors. The AM2315 was high price with advantages of high range (−40 °C to 125 °C) has high accuracy (±0.1 °C). Semiconductor based integrated circuit temperature sensors like LM35 and DS18B20 and band gap is proportional to the absolute temperature sensors, SH10 and SH11 are the most utilized temperature sensors. The SH10 and SH11 sensors provides both the temperature and the relative humidity readings. Therefore, compared to DHT11 they will present better temperature ranges and accuracy. They are similar to the DHT22 in terms of temperature ranges, accuracy and cost. The TMP36 (Analog Devices) is a temperature sensor comprised of a diode and the EE160 is a resistive temperature detector sensor. The FM-KW and the BME250 are of an unknown type sensors.

6. Connection and working

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The connections required to the arduino based smart irrigation system is the power supply, the relay module, microcontroller, soil moisture sensor, humidity of the soil, plant in the pot, the water pump , water source. In the first cable of 3 bridges connected to the soil moisture sensor, 3 jumper cables, one is connected to the GND, other connected to the VCC and the last one connected to the A0 port. The another part of jumper cables connected to the Arduino board, i.e. the VCC of the bridge cable is connected to Arduino 5v, the GND connected to the GND and the ground moisture sensor port A0 is connected to

the analog port 0 of Arduino board. These are the connections between soil moisture sensor and the Arduino board. Therefore, the connection between the relay and the Arduino board has been established. The GND port of the relay goes to ground. The first IN port is connected to the Arduino digital pin and this connection controls the first relay channel. When we connect a battery to the relay, it supplies supply to the load. There is a connection between the common pin and the NC pin even when relay is switched off. After connecting the equipment, the main operation begins. The measurement of soil moisture is carried out by sensor that sends the information and parameters relating to the soil moisture to the microcontroller that controls the pump. If the soil moisture levels fall below a certain value, the microcontroller will sends the signals to the relay module, which then drives a pump and a certain amount of water is delivered to the system. Once the water has been delivered to the system, the water pump is automatically shut down.

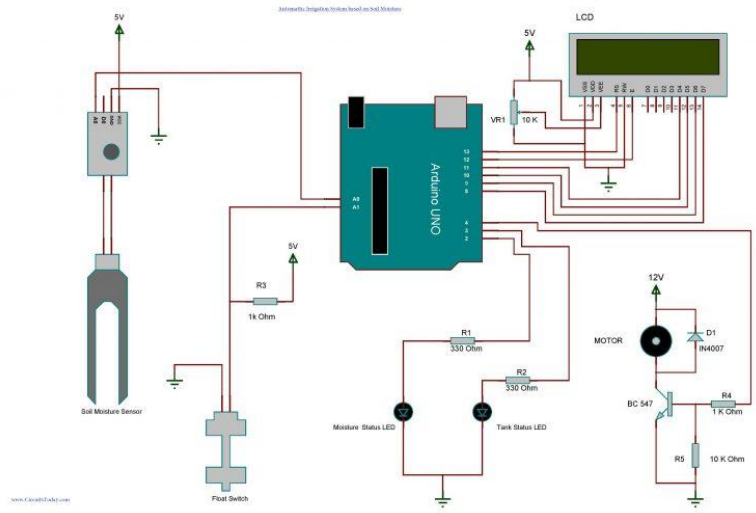

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Figure 4. Smart Irrigation System

7. Calculation of data

We observed that the water requirement level is high when we irrigate the crop manually. But when we use the sensors, we will able save 300ml of water and can save about in only 21 seconds. The efficiency of irrigation system will greater when we use pump sensor due to the reduction in the water loss. In the Arduino based sensor system, the extra water does not go to the store because the engine will get switches off when the quantity of water will get flourished. Here we can assume that when we put sensor on ground, the dryness value is at 669 and irrigation started as a dry value higher than the maximum dry level. After irrigating for 1 minute and it satisfied the demand, the engine stopped automatically, a few seconds later the plant environment was become dry and the drought was 420, the engine restarted and irrigation stopped automatically and a constant value has to given to that.

Conclusion

Thus our project will creates an awareness about the usage of automation in agricultural field. The manual irrigation can be reduced by irrigating the agricultural fields automatically.it reduces the stress and work for the farmers. It also reduces the wastage of water flow. From data we conclude that irrigation process is done better as than the before to yield the proper production done before and usage of water level is limited how much that system needed only. Due to the regular updates to the server we can get proper knowledge to the system can work perfectly for indefinite time period, even in certain abnormal circumstances and increase the production rate also. It will also reduce the human factor, energy, and power. Due to server updates farmers can know about crop field nature and everything at anywhere $\pi r2 = 0.045$ m2 Thus our project creates an awareness about the automation in agricultural field. Here the manual intervention can be reduced by irrigating

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the plants automatically and the whole information about the agricultural field can be viewed in android application.

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