Automatic Irrigation System

Group Members

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Project Overview

Automated irrigation system provides the solution for watering the lawn and the garden automatically even in the absence of human. No individual presence is needed for watering as the system is automated considering one or more of the various parameters available for irrigation scheduling such as soil moisture measurement, evapotranspiration estimates, leaf water potential canopy temperature etc. This saves the greenery of the lawn and provides proper amount of water needed in the garden. Soil moisture based irrigation system, timer based irrigation system, drip irrigation, sprinkle irrigation etc are the types of the automated irrigation system available. At this phase soil moisture based technology has been chosen. In this project, the system is controlled by using the soil moisture measuring sensor which controls the flow of water. Main components required are soil moisture sensor, control circuit, gate valve, pumping unit, timer, power supply and programming guidance.

Following are the main objectives of this project:

Primary Target

• Irrigate the field automatically when it is dry.

This is done using a moisture sensor. A conductive sensor is placed into the soil which senses the moisture level of the soil and sends feedback to the microcontroller if the soil is dry which eventually activates the relay and the pump to irrigate the soil.

Secondary target

• Amount of water could be controlled.

Controlling amount of water would be an advantage since it encourages energy saving and reduces the possibility of overwatering a plant. This secondary target has been fulfilled by using delay of certain time in the program.

• Adding display to show the status of the soil.

Adding display to show the level of moisture in the soil would be an added advantage but could be complex because of the resolution and type of sensor that has been used in this project.

Technical Description:

There are various parameter that can control the automatic irrigation system for instance soil moisture measurement, evapotranspiration estimates, leaf water potential canopy temperature etc. And this project includes the device working on the principle of soil moisture measurement thus using soil moisture measurement sensor.

This sensor works on the basis of the flow of current from its one electrode to another and measuring the resistance between them. So, simply when the soil is dry current can’t pass through the soil building no connection between its two electrodes that activates the pump for watering and when the soil is moist then the current can pass through soil from one electrode to another and that stops the pump from pumping the water. Amount of water can be controlled by using the measured resistance value for example when soil is sufficiently moist the resistance is low and the resistance value increases with the decrease in moisture. So pump activating resistance point can be set high for a plant that needs less water and vice-versa although some research is needed to find out the corresponding equivalent resistance value to the soil moisture level needed by the plant.

Schematic drawing

Figure below shows the schematic diagram of the system.
The circuit diagram of the system is as shown:

Project Plan

A rough plan of the project was made in the beginning of the project. A clear view of the project was achieved which helped to move forward with the project.

Schedule

Total time period of the project was estimated to be 2.5 months starting from the 28th January 2014. Preliminary schedule was as follows:

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<th>8</th>
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## Components and Budget

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<td>Pannu Kiviluoma</td>
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</table>

**Programming**

Arduino microcontroller was used to control all the system. Program was written to control the system as mentioned in technical description when explaining how the system works. Some complications was faced during the programming as we were not expert in programming but we managed to make the system working.

The code used to control relay Using Teensy ++ 2.0is as follows:

```c
#define RELAY_ON 1
#define RELAY_OFF 0
#define trans_S 8
#define trans_R 9
#define inputPin 5

boolean relayState = RELAY_OFF;
unsigned int relayOnTime = 2000;
unsigned int relayDelay = 10000;
int value=0;
int counter=0;
unsigned long int timeStamp;

void setRelayStatus(boolean state)
{
    if(state == RELAY_ON)
    {
        digitalWrite(trans_S, HIGH);
        delay(20);
```
digitalWrite(trans_S, LOW);
}
else if(state == RELAY_OFF)
{
  digitalWrite(trans_R, HIGH);
  delay(20);
  digitalWrite(trans_R, LOW);
}
void setup()
{
  Serial.begin(9600);
  pinMode(inputPin, INPUT_PULLUP);
  pinMode(trans_S, OUTPUT);
  pinMode(trans_R, OUTPUT);
  setRelayStatus(RELAY_OFF);
  timeStamp = millis();
}
void loop()
{
  if(digitalRead(inputPin))
  {
    if(millis() - timeStamp > relayDelay)
    {
      setRelayStatus(RELAY_ON);
      delay(relayOnTime);
      setRelayStatus(RELAY_OFF);
      timeStamp = millis();
    }
  }
}

User Instruction
The system is easy to use. Firstly setup the system as shown in the drawing above. Place the moisture sensor in the soil and manage the water pump so that it will be submersed into the water. As soon as the power is provided to the system it will work automatically. Prototype in action is shown in the figure below. Laptop has been used to supply power to the Arduino which can be replaced by a power adapter.
Future Development

The system worked quite fine but some parts of the secondary aim was left considering the fact of us being not expert in programming. The system built works only on one resistance (default) value measured by the sensor thus moisturizing the field always by the same amount for all the plants. Due to programming complication, different resistance value can’t be set for different plants to provide different level of moisture which can be the future development for the device built.

Conclusion

As a whole, the project can be rated as successful being able to meet the primary target very well and get the device working for the exhibition. During the work, trying the new things and getting failed numerous times taught quite good lessons which will be treasured for professional life. Many new things were learnt during the project, microcontroller programming being the one more notable.