Design of Automatic plant irrigation system using Arduino Board

Introduction:

In present days, in the field of agriculture farmers are facing major problems in watering their crops. It's because they don't have proper idea about the availability of the power. Even if it is available, they need to pump water and wait until the field is properly watered, which compels them to stop doing other activities – which are also important for them, and thus they loss their precious time and efforts. But there is a solution – an automatic plant irrigation system not only helps farmers but also others for watering their gardens as well.

This automatic irrigation system senses the moisture content of the soil and automatically switches the pump when the power is on. A proper usage of irrigation system is very important because the main reason is the shortage of land reserved water due to lack of rain, unplanned use of water as a result large amounts of water goes waste. For this reason, we use this automatic plant watering system, and this system is very useful in all climatic conditions.

This project is Automatic plant irrigation system using Arduino Board, which automatically waters the plants. The system works when power supply is switched on and it stops working when power supply is switched off. Potentiometer is used as sensor to check the dryness and wetness of soil. When the reading in potentiometer is low it indicates dry soil, as a result the dc motor runs and the plant gets watered and high reading indicates wet soil, the dc motor stops running and as a result it stops watering. Switch on the water pump to provide water to the plant. Water pump gets automatically switched off when system finds enough moisture in the soil.

Block diagram:

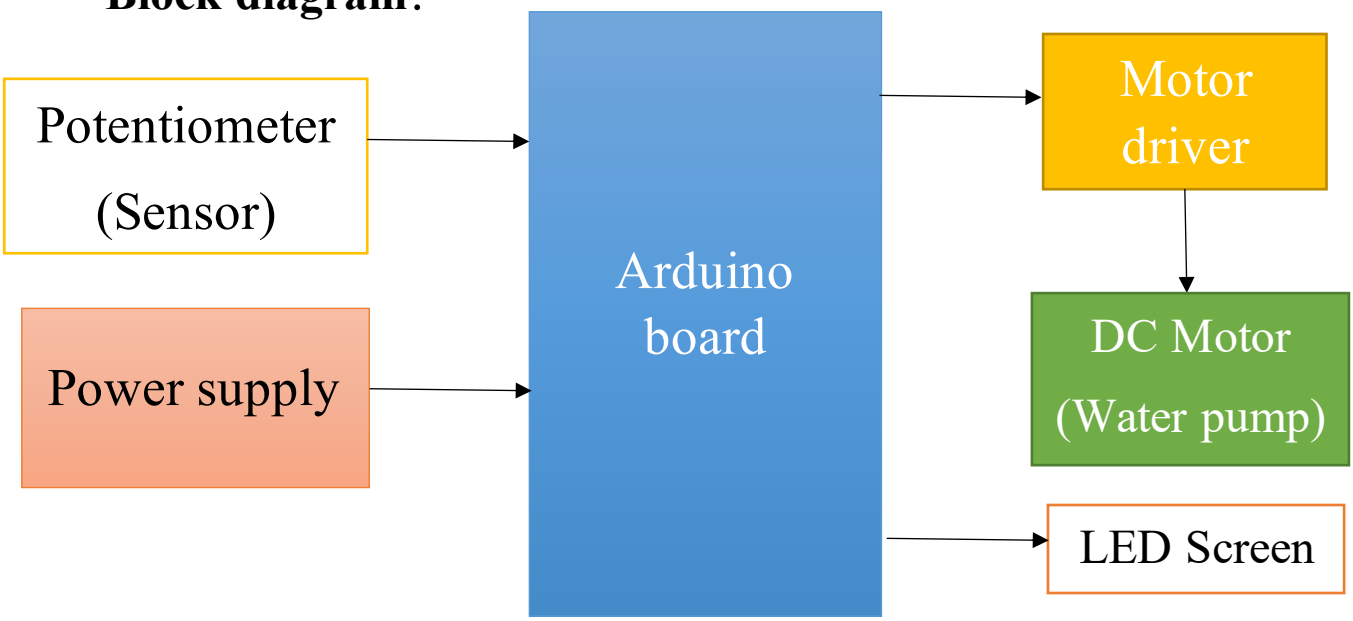

Figure 1: Plant irrigation system

Figure 1 represents the block diagram of proposed irrigation system. It consists of 5 main building blocks.

1. Arduino Uno board: It consists of AT mega 328 microcontroller along with I/O pins. It provides the necessary control action based on the application.
2. Power supply: A power supply is an electronic circuit that converts the voltage of an alternating current (AC) into a direct current (DC) voltage.
3. DC Motor: It is a bipolar motor, which rotates in both directions i.e. clockwise and anticlockwise. It converts the direct current into the mechanical work.
4. Motor Driver: A motor driver is a small current amplifier whose function is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.
5. Potentiometer: It is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. It acts as humidity sensor.

Circuit diagram:

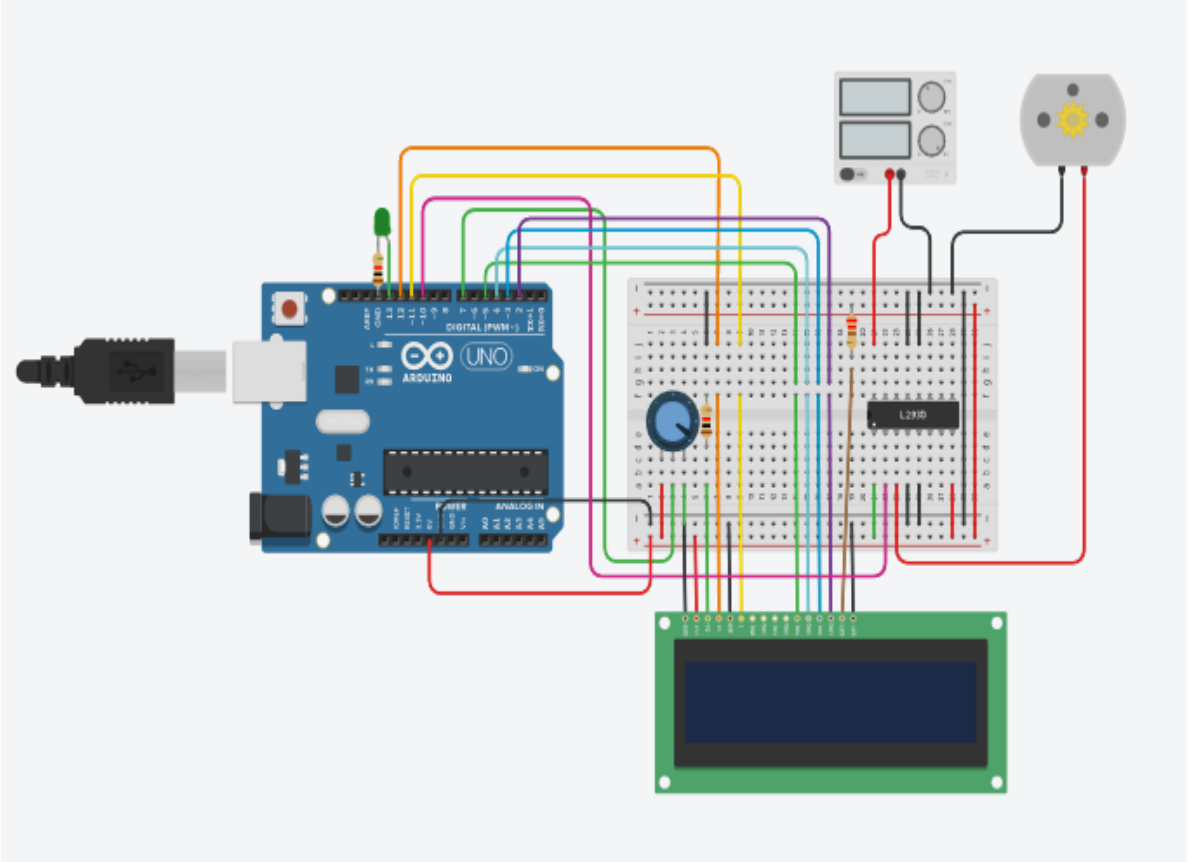

Figure2: Circuit diagram of plant irrigation system

Designing of the circuit:

Potentiometer consists of 3 pins. Terminal 1 and 2 are connected to 5V and GND pins of Arduino board as shown in figure 2. Wiper is connected to pin 7. Power supply is connected to the breadboard. Negative terminal of dc motor is connected to power rail and positive terminal is connected to motor driver. Make the connections to motor driver as shown in

figure. Make the connections to LED screen and Arduino board as shown in the figure. An LED bulb to Arduino board.

If the reading in the potentiometer is less, then this indicates that the soil is dry and the dc motor start running to pump water to the plants. If the reading in the potentiometer is more, then this indicates that the soil is wet and the dc motor stops running.

Stimulation:

I have performed the simulation on Tinker cad online platform with Arduino board. The online simulation link is given below:

https://www.tinkercad.com/things/2wFdmhwYpJX-automatic-plant-irrigation-system-project

Results and Analysis:

The simulation results are shown in figures below:

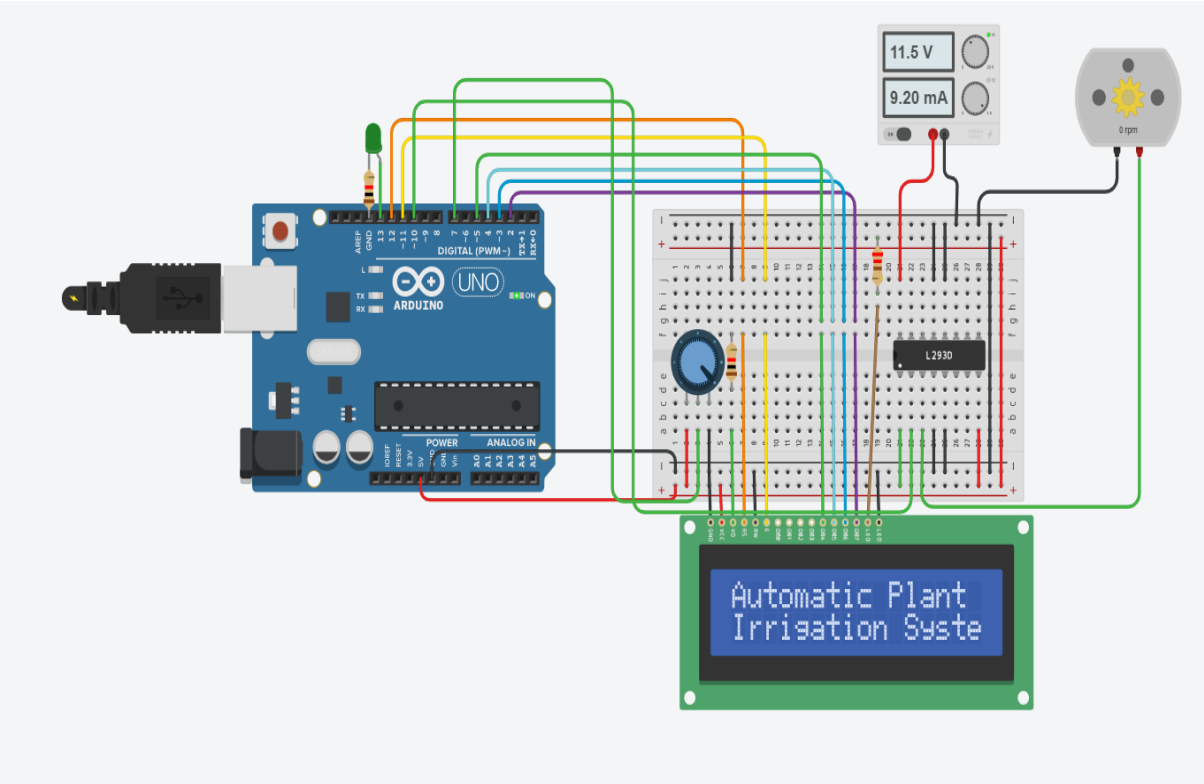

Figure 3: When stimulation is started, system gets switched on and it displays automatic plant irrigation system on screen

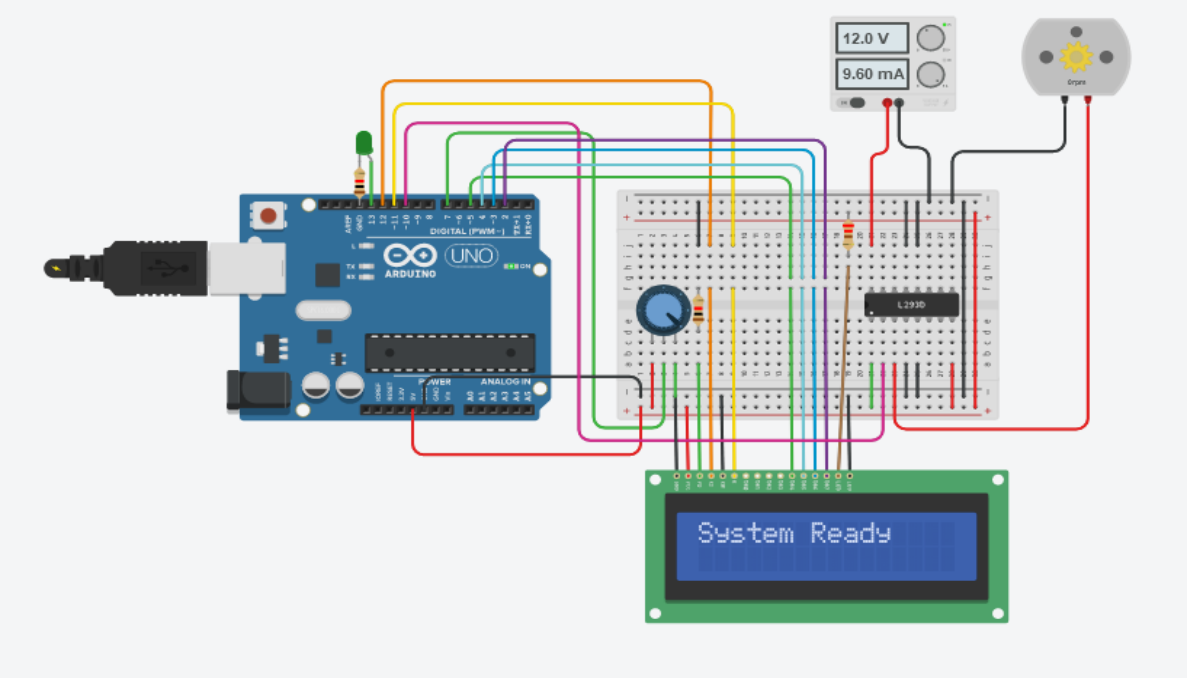

Figure 4: Once the system is ready it displays system raedy on screen

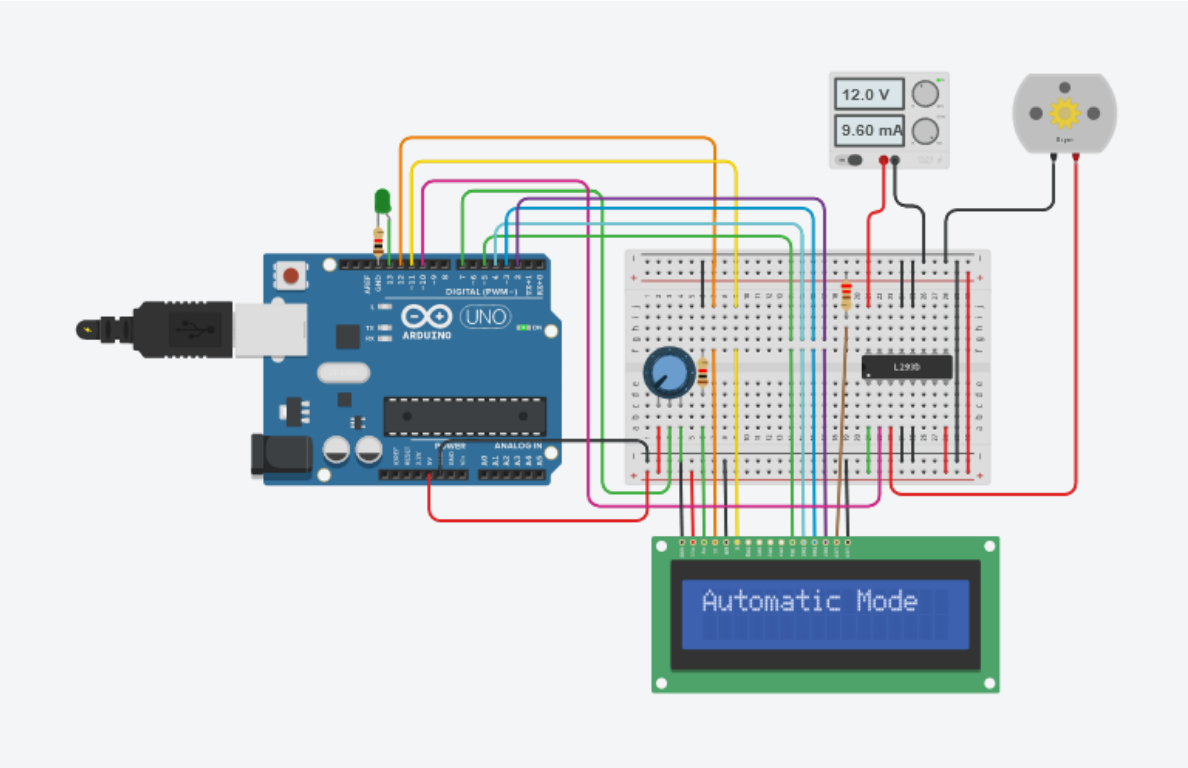

Figure 5: Now the automatic mode begins

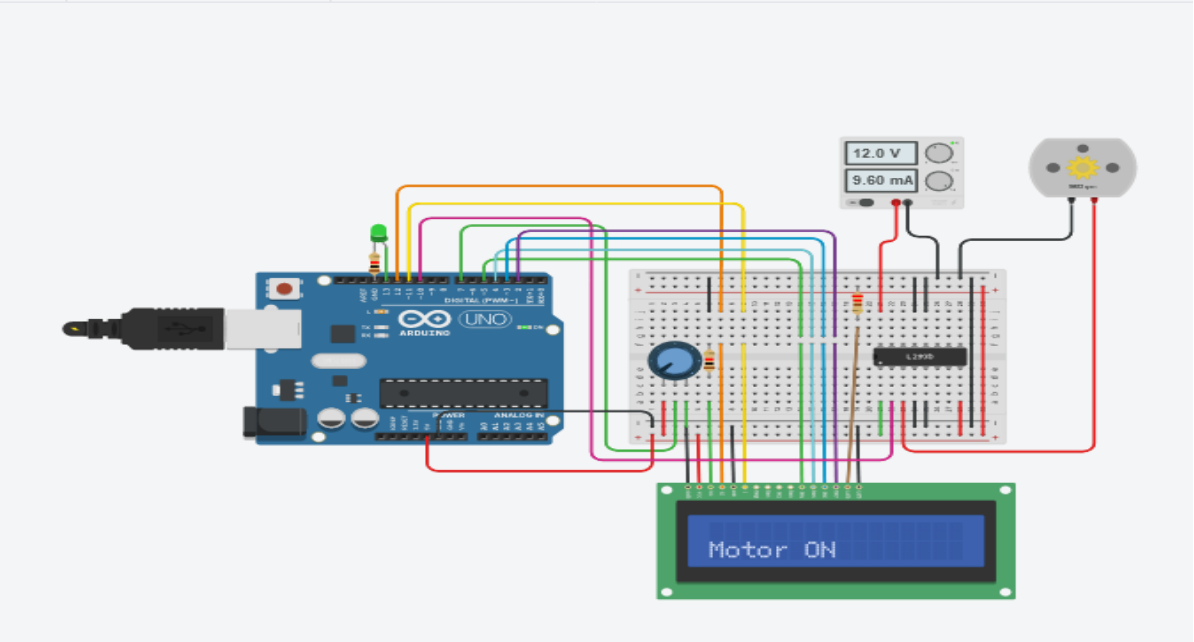

Figure 6: The potentiometer reading is changed to low; the bulb starts glowing and the dc motor starts running and it displays motor on screen

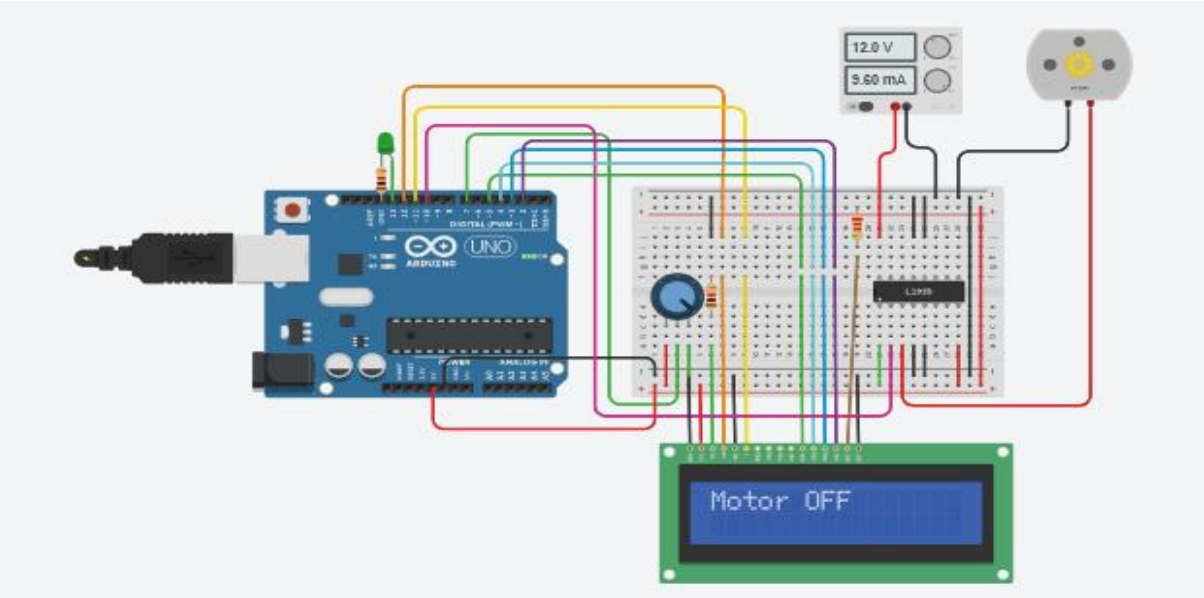

Figure 8: If the reading in potentiometer is changed to high then the motor gets turned off and the bulb stops glowing.

Conclusion:

In this project, I have presented an automatic plant irrigation system that controls the water irrigation according to the requirement of the soil. The microcontroller reads input from all the sensor i.e., potentiometer and based upon the input information it drives the output device DC motors. It triggers the pump (DC motor) and bulb on and off based on the control signal value received from Arduino board. It also displays message on the led screen. Stimulation results showed the effectiveness of proposed system. In future, the hardware model of proposed system can be implemented.