ADVANCED IoT IRRIGATION SYSTEM

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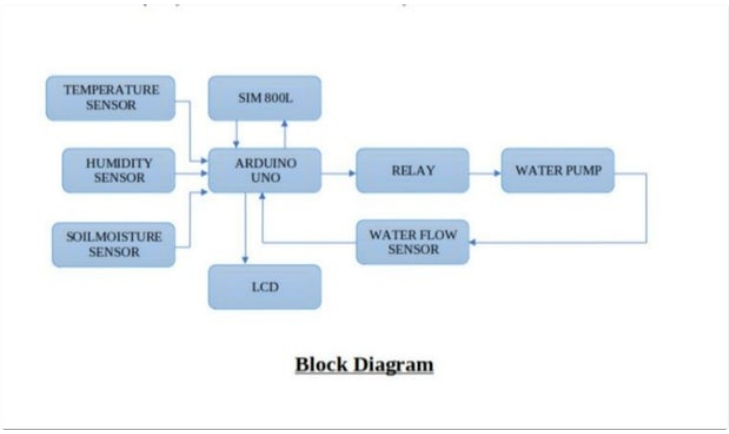
Step 1:

In daily operation related to watering the plants are the most important cultural practice and the most labor-intensive task. No matter whichever weather it is, either too hot and cold or too dry and wet it is very crucial to control the amount of water reaches to the plants. So, it will be effective to use an idea of automatic plant watering system which waters plants when they need it. An important aspect of this project is that: “when and how much of water”. This method is employed to monitor the soil moisture level continuously and to decide whether watering is needed or not, and how much water is needed in plant’s soil. In its most basic form, system is programmed in such a way that soil moisture sensor which senses the moisture level from the plant at particular instance of time, if moisture level of the sensor is less than the specified value of threshold which is predefined according to the particular plant than the desired amount of water is supplied to plant till it’s moisture level reaches to the predefined threshold value. System involves humidity and temperature sensor which keep tracks the current atmosphere of the system and has an influence when watering happens. Solenoid valve will control the water flow in the system, when Arduino reads value from moisture sensor it triggers the solenoid valve according to the desired condition. . In addition, system reports its current states and sends the reminder message about watering plants and gets SMS from the recipient. All this notification can be done by using SIM 800L.

Step 2: Framework Diagram

This system requires an Arduino UNO which acts as controller and server of the whole system. In This Plant irrigation System, Soil Moisture Sensor checks the moisture level in the soil and if moisture level is low then Arduino switches On a water pump to provide water to the plant. Water pump gets automatically off when system finds enough moisture in the soil. Whenever system switched On or off the pump, a message is sent to the user via GSM module, updating the status of water pump and soil moisture. This system is very useful in Farms, gardens, home etc. This system is completely automated and there is no need for any human intervention.



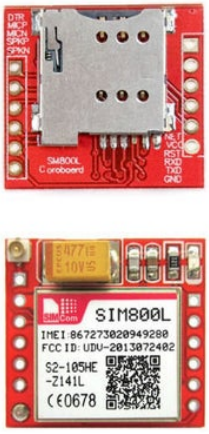
Block Diagram

Step 3: Hardware Used : Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

Step 4: SIM 800L

SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity.



Step 5: Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

Step 6: Temperature and Humidity Sensor

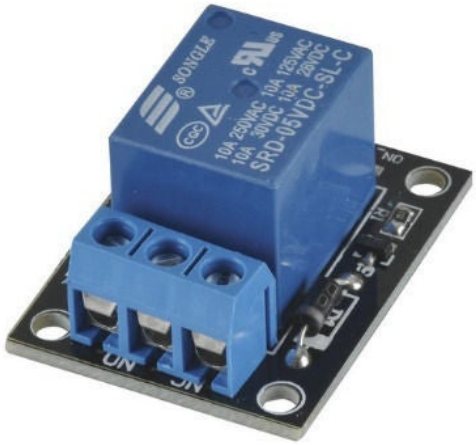
The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It’s fairly simple to use, but requires careful timing to grab data.

Step 7: Water Flow Sensor

Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signal. This one is suitable to detect flow in water dispenser.

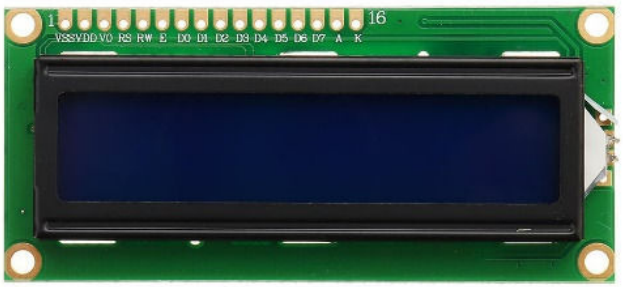
Step 8: Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.



Step 9: LCD (Liquid Crystal Display)

LCD stands for Liquid Crystal Display and it allows you to control LCD displays that are compatible with the Hitachi HD44780 driver. There are many of them out there, and you can usually tell them by the 16-pin interface.



Step 10: Water Pump

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps.

Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

Step 11: Advantages

1. Ability to save water and efficiency in delivery of water.

2. Scheduling and connectivity.

(Their schedule are able to be updated from anywhere with internet connections.)

3. Saving Electricity.

(Solar panel is also used to generate electricity in agriculture farms.)

4. Farmer can know about field nature at anytime and anywhere.

Step 12: Applications

1. It can be used in agriculture fields, lawns and as drip irrigation system.

2. It can be used for cultivation process.

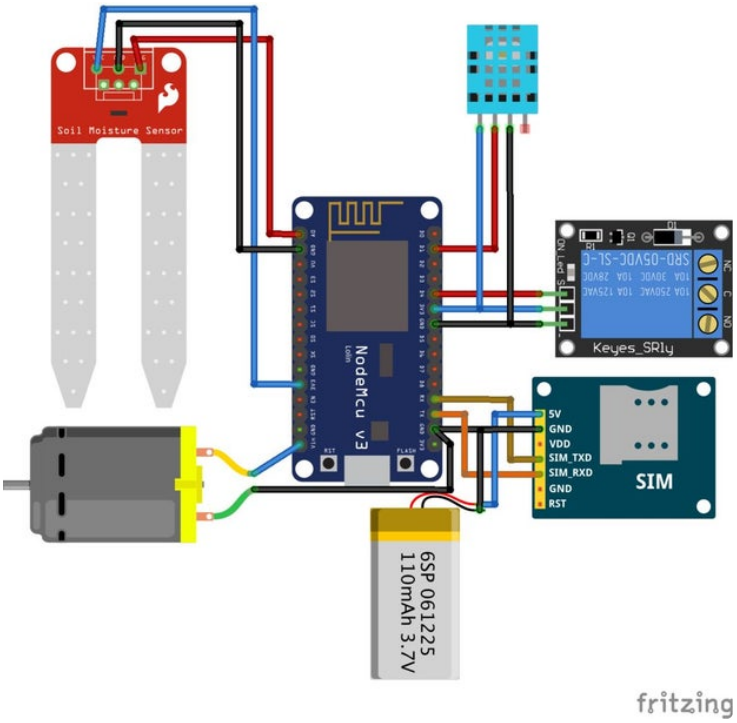
3. It can be used to provide water in nursery planting area.

4. It can be used for wide range of crops as one can customize reference required for different kind of crops.

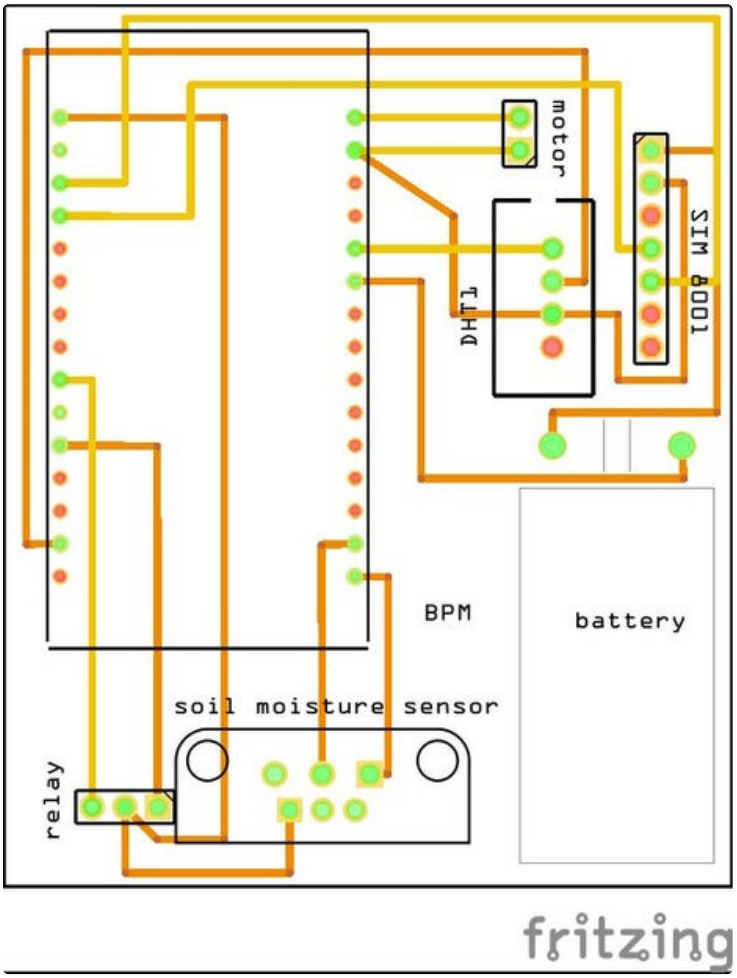
5. It can be used for Pond water management & water transfer.

We had used IoT device i.e. NodeMCU in the circuit diagram and also shown the Printed Circuit Board (PCB) for the same, you can use Arduino UNO as well.

Step 13: Circuit Diagram



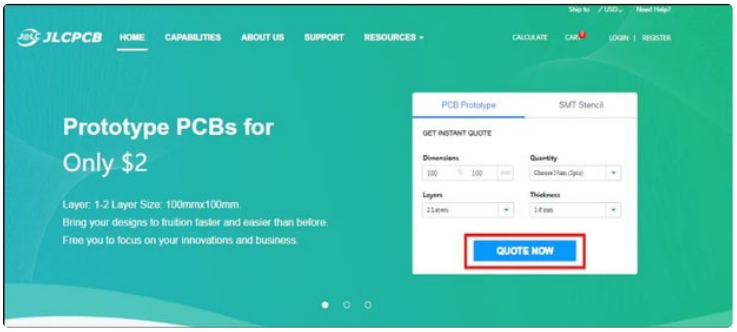
Step 14: PCB Design for ADVANCED IoT IRRIGATION SYSTEM



Step 15: Ordering the PCBs

Now we have got the PCB design and it's time to order the PCB's. For that, you just have to go to JLCPCB.com, and click on "**QUOTE NOW**" button.

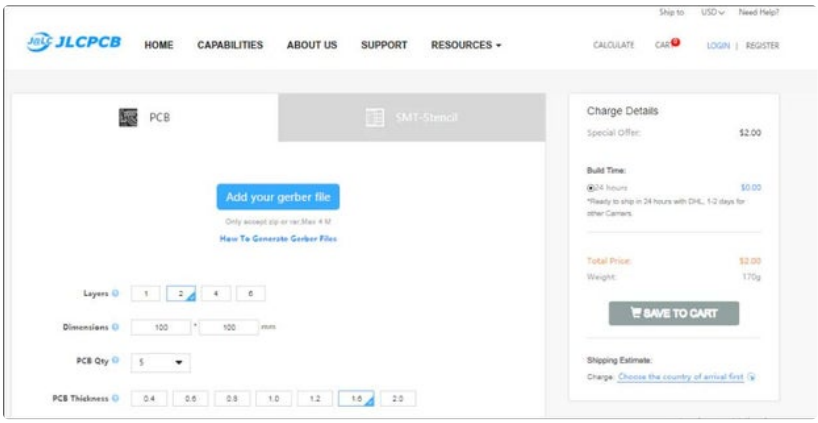
JLCPCB are also sponsor of this project. JLCPCB (ShenzhenJLC Electronics Co., Ltd.), is the largest PCB prototype enterprise in Chinaand a high-tech manufacturer specializing in quick PCB prototype and small-batch PCB production. You can order a minimum of 5 PCBs for just $2.

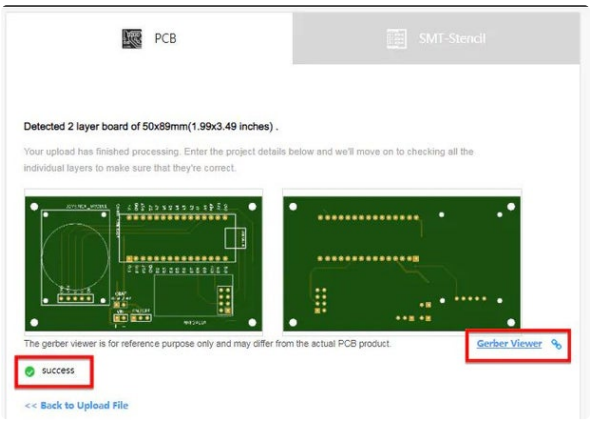


Step 16:

To get the PCB manufactured, upload the **gerber file** you downloaded in the last step. Upload the **.zip** file or you can also drag and drop the **gerber files**.

After uploading the zip file, you'll see a success message at the bottom if the file is successfully uploaded.





Step 17:

You can review the PCB in the Gerber viewer to make sure everything is good. You can view both top and bottom of the PCB.

After making sure our PCB looks good, we can now place the order at a reasonable price. You can order 5 PCBs for just $2 but if it's your first order then you can get **10 PCBs for $2**. To place the order, click on "**SAVE TO CART**" button.

My PCBs took 2 days to get manufactured and arrived within a week using DHL delivery option. PCBs were well packed and the quality was really good.