

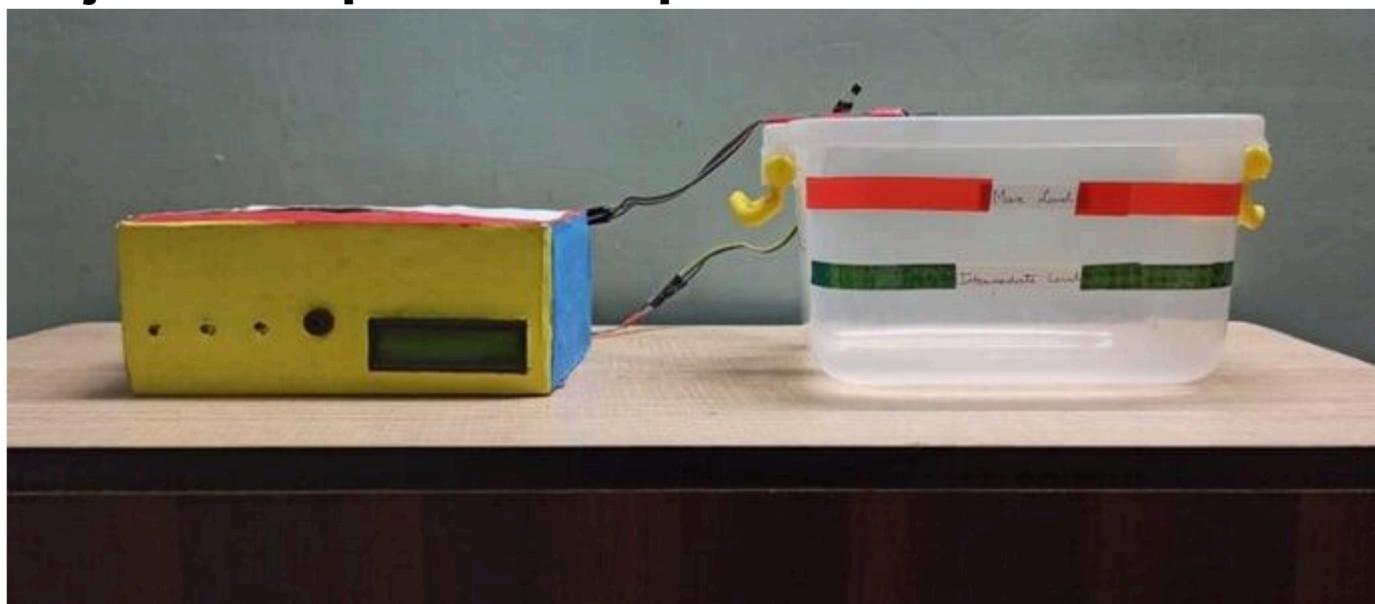
Project Title : IoT Based Flood Monitoring And Alerting System

Problem statement:

Despite advancements in technology and weather forecasting, there remains a critical need for a comprehensive and highly effective flood monitoring system to address the increasing frequency and severity of flooding events around the world. The current flood monitoring systems often lack real-time accuracy and the ability to provide timely warnings, resulting in significant human and economic losses. There is an urgent need for an innovative and integrated flood monitoring system that can offer precise flood prediction, early warning, and data-driven decision support to minimize the impact of floods on communities, infrastructure, and the environment.

BY - VISHNUVARADHAN.G

Project development and explanation :



As we all know that Flood is one of the major well known Natural Disasters. When water level suddenly rises in dams, river beds etc. A lot of Destruction happens at surrounding places. It causes a huge amount of loss to our environment and living beings as well. So in these cases, it is very important to get emergency alerts of the water level situation in different conditions in the river bed.

The purpose of this project is to sense the water level in river beds and check if they are in normal condition. If they reach beyond the limit, then it alerts people through LED signals and buzzer sound. Also it alerts people through SMS and Emails alerts when the water level reaches beyond the limit.

Excited? Let's get started.

Things used in this project

Hardware components -

1. Bolt-IoT wifi module
2. Arduino uno
3. Breadboard- 400 tie points
4. 5mm LED:(Green, Red, Orange) and Buzzer
5. 16×2 LCD Display

6. LM35 Temperature Sensor
7. HC-SR04 Ultrasonic Sensor
8. Some Jumper Wires
 1. Male to Female Jumper Wires- 15 pcs
 2. Male to Male Jumper Wires- 10 pcs
 3. Female to Female Jumper Wires- 5 pcs
9. 9v Battery and Snap Connector
10. USB Cable Type B

Software components -

1. [Arduino IDE](#)
2. [Python 3.7 IDLE](#)
3. [Bolt IoT Cloud](#)
4. [Bolt IoT Android App](#)
5. [Twillo SMS Messaging API](#)
6. [Mailgun EMAIL Messaging API](#)

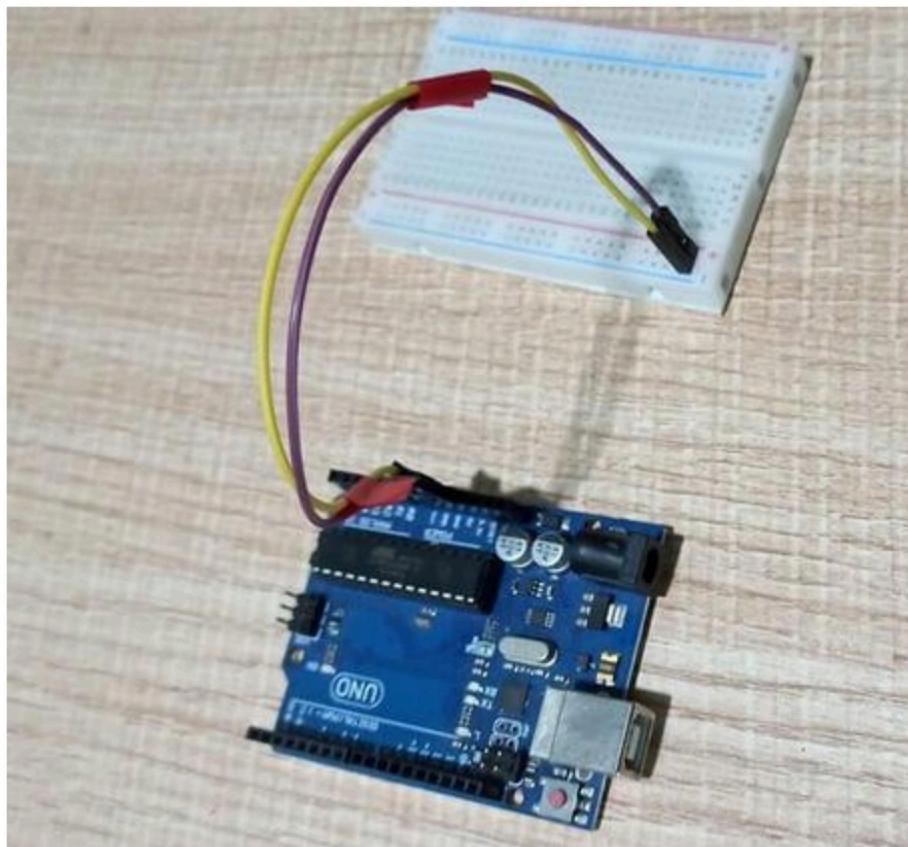
Hand tools and fabrication machines

1. Electrical Tape
2. Green Cello Tape

Hardware Setup

For Building this project we first configure the hardware connections. Then later on moving to the software part.

Step 1: Connecting 5v and GND of Arduino to the Breadboard for power connection to other components.



Step 2: Connecting LED's

For Green LED:

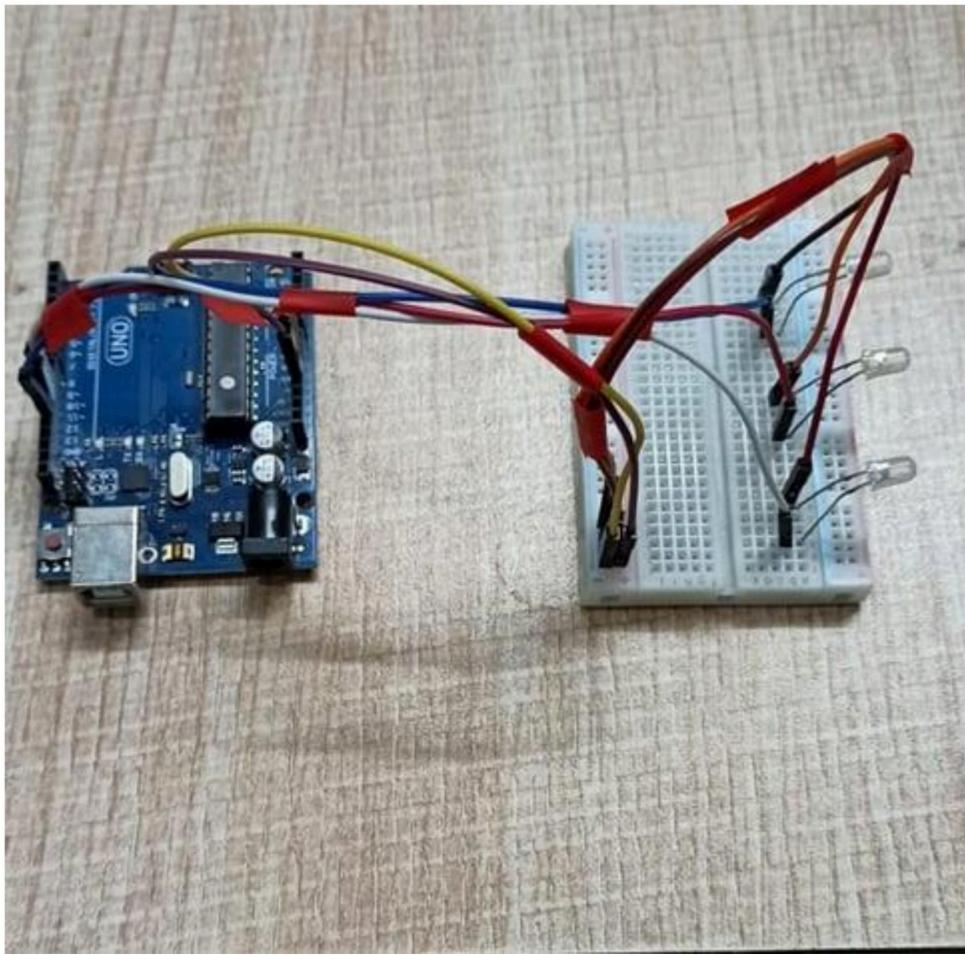
- VCC of Green Colour LED to Digital Pin '10' of the Arduino.
- GND of Green Colour LED to the GND of Arduino.

For Orange LED:

- VCC of Orange Colour LED to Digital Pin '11' of the Arduino.
- GND of Orange Colour LED to the GND of Arduino.

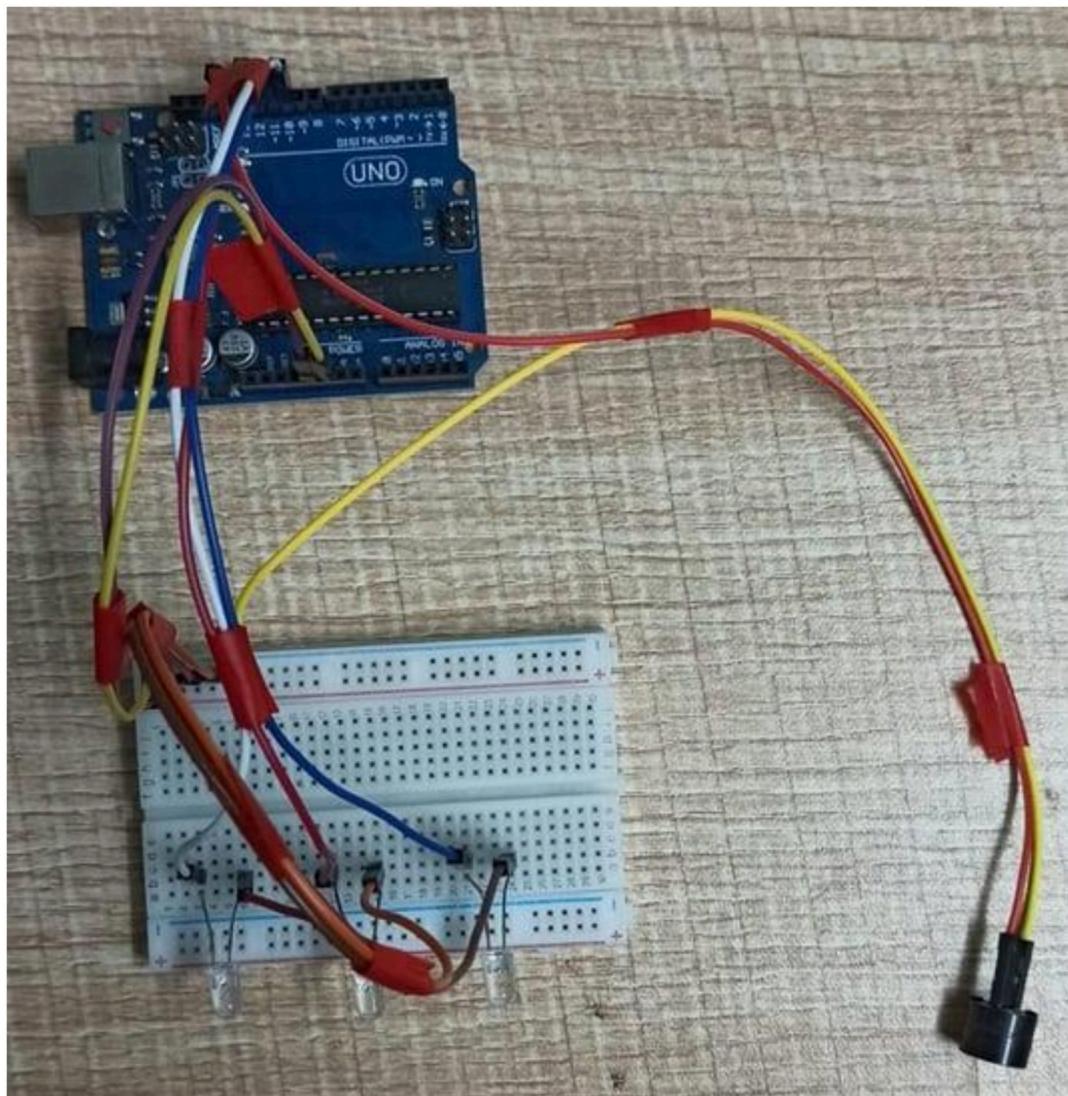
For Red LED:

- VCC of Red Colour LED to Digital Pin '12' of the Arduino.
- GND of Red Colour LED to the GND of Arduino.



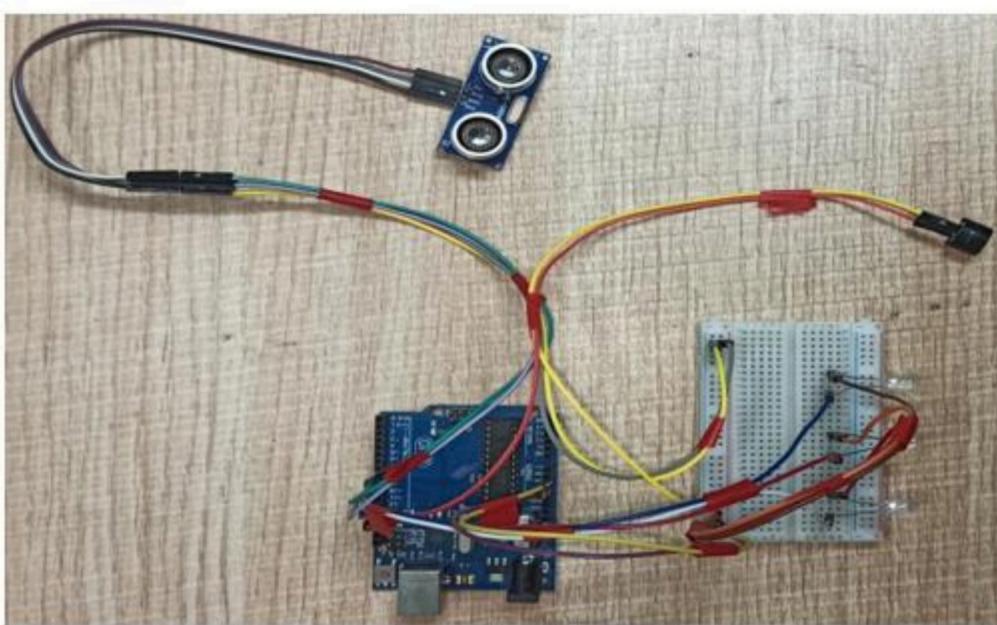
Step 3: Connecting Buzzer

- VCC of Buzzer to Digital Pin '13' of the Arduino.
- GND of Buzzer to the GND of Arduino.



Step 4: Connecting HC-SR04 Ultrasonic Sensor

- VCC of Ultrasonic Sensor to 5v of Arduino.
- GND of Ultrasonic Sensor to GND of Arduino.
- Echo of Ultrasonic Sensor to Digital Pin '8' of Arduino.
- Trig of Ultrasonic Sensor to Digital Pin '9' of Arduino.

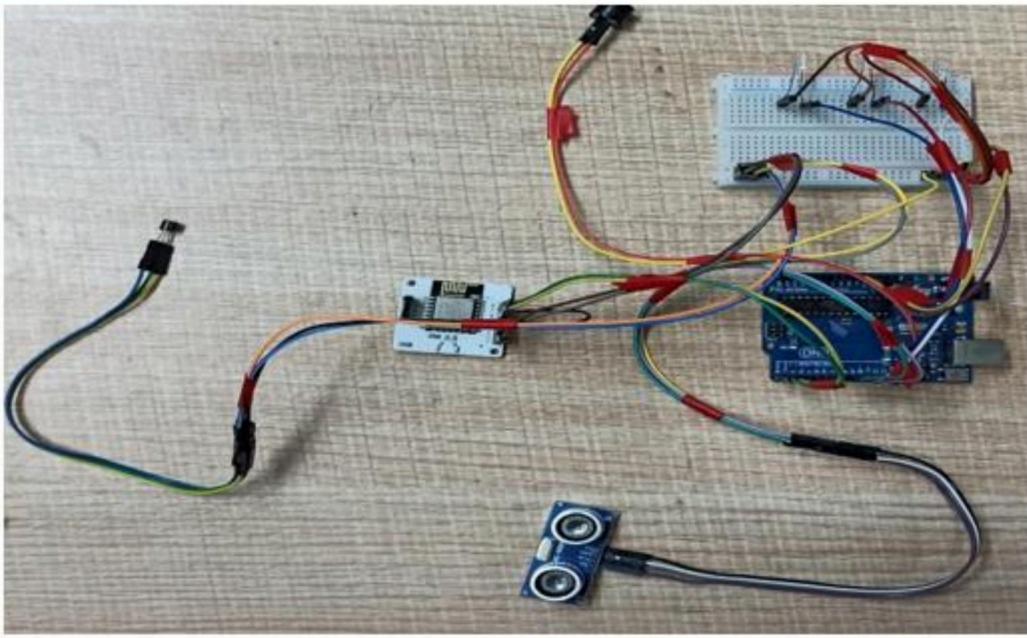


Step 5: Connecting Bolt WiFi Module

- 5v of Bolt WiFi Module to 5v of Arduino.
- GND of Bolt WiFi Module to GND of Arduino.
- TX of Bolt WiFi Module to RX of Arduino.
- RX of Bolt WiFi Module to TX of Arduino.

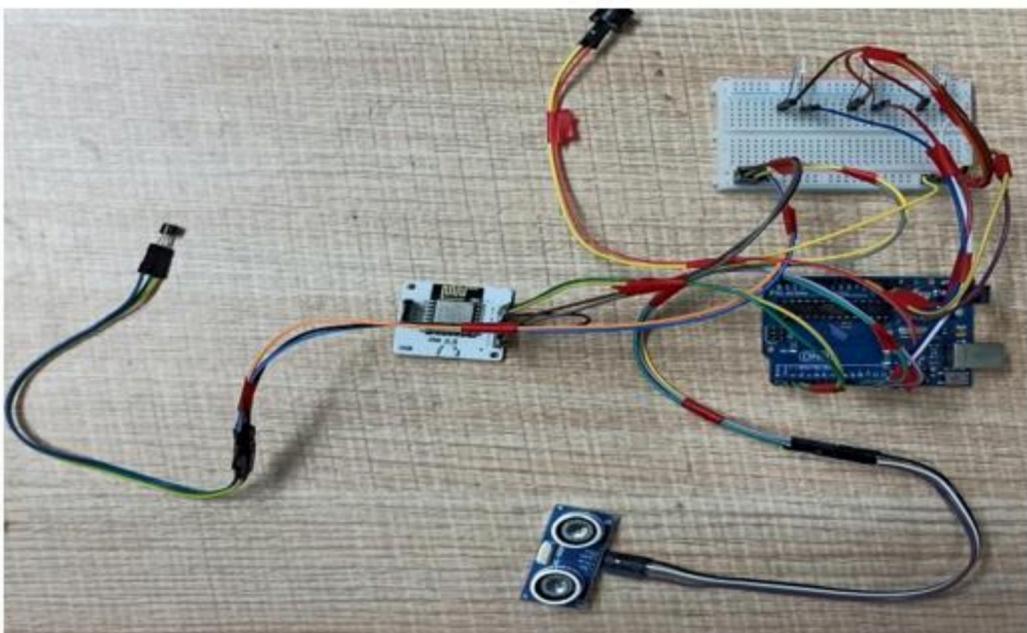
Step 6: Connecting LM35 Temperature Sensor

- VCC of LM35 to 5v of Bolt WiFi Module.
- Output Pin of LM35 to Pin 'Ao' of Bolt WiFi Module.
- GND of LM35 to GND of Bolt WiFi Module.

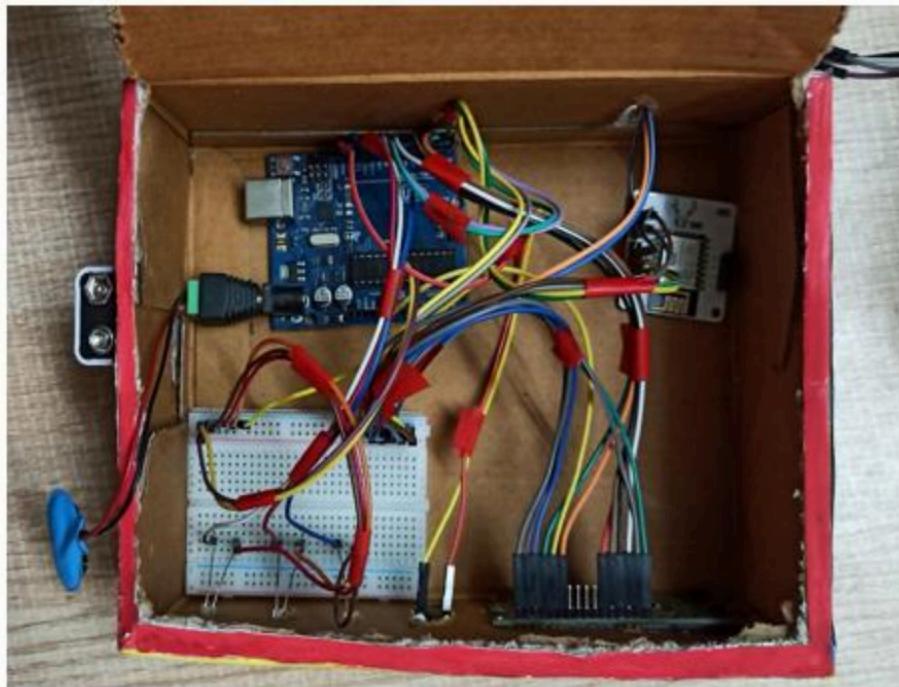


Step 7: Connecting 16×2 LCD Display

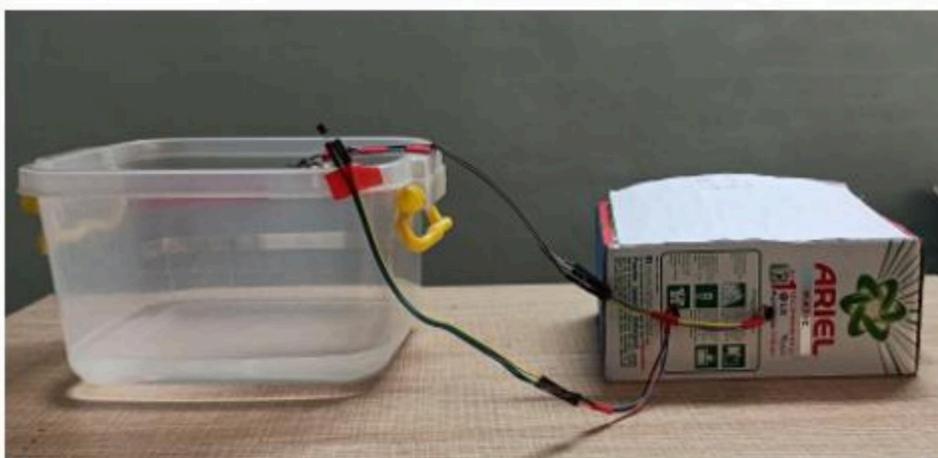
- Pin 1,3,5,16 of 16×2 LCD to GND of Arduino.
- Pin 2,15 of 16×2 LCD to 5v of Arduino.
- Pin 4 of 16×2 LCD to Digital Pin '2' of Arduino.
- Pin 6 of 16×2 LCD to Digital Pin '3' of Arduino.
- Pin 11 of 16×2 LCD to Digital Pin '4' of Arduino.
- Pin 12 of 16×2 LCD to Digital Pin '5' of Arduino.
- Pin 13 of 16×2 LCD to Digital Pin '6' of Arduino.
- Pin 14 of 16×2 LCD to Digital Pin '7' of Arduino.



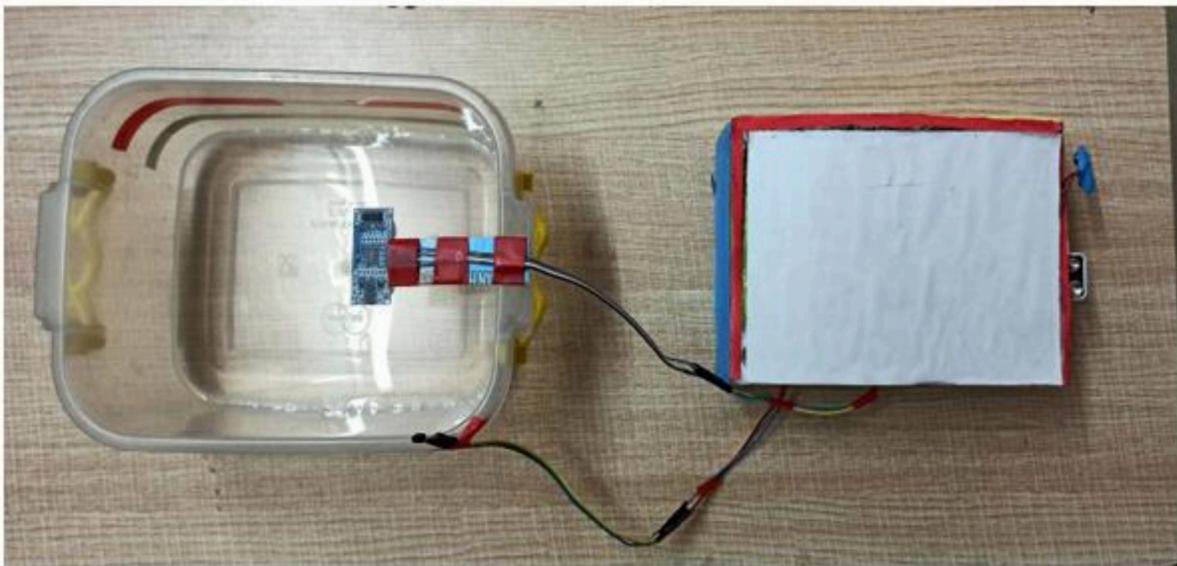
After doing the hardware connection put all the hardware components in one box.



Also attach LM35 Temperature Sensor on the side of the container.



Also attach Ultrasonic sensor on the top of the container.



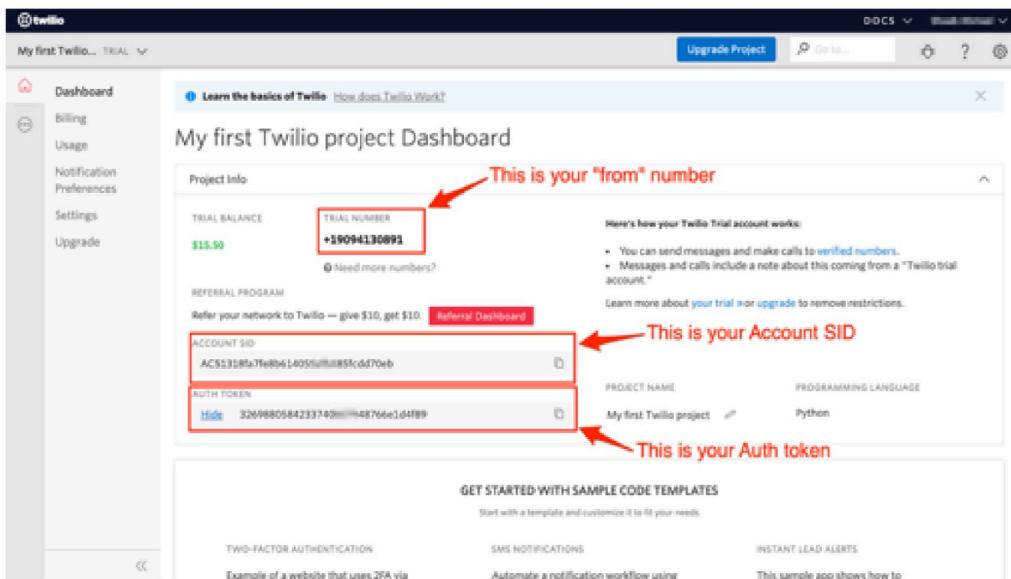
Software Programming

After the successful completion of hardware setup. Now it's the time to do software setup for the project. For that you have to first Download and Install Arduino IDE and Python IDE from the link given above in the software apps and online services section. Also Creating account on various online app services and noting down the important keys and id's. Below all the steps given to create account on online app services and noting down the keys.

Step 1:Creating an account on Twillo and setting up Twillo for sending Sms alerts.

- Visit <https://www.twilio.com/> .
- Create account by clicking sign up, fill required details.
- Confirm your email.
- You will need to authenticate your phone number on which the sms alerts will be notified.
- Enter the code sent to your phone
- When prompted " Do you write code?" Click yes
- Select python as your programming language
- When prompted "What is your target today? "Choose" Twilio as a project.

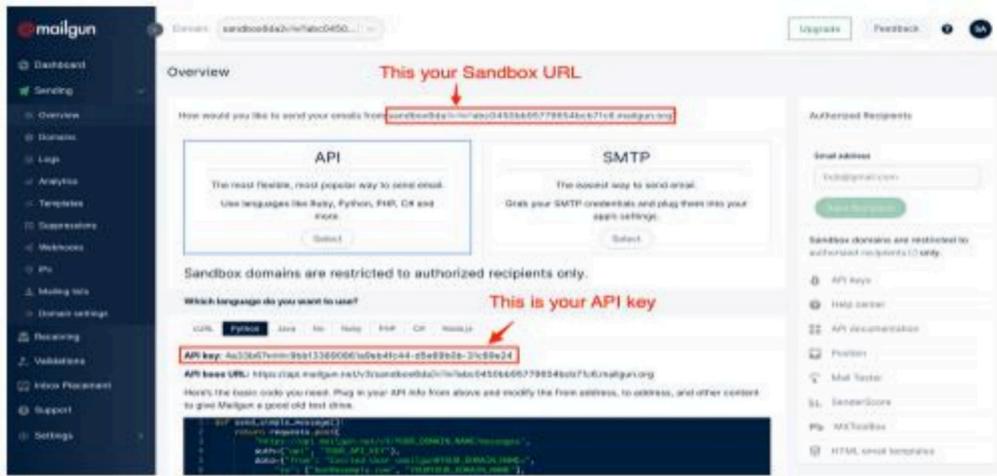
- When prompted “What do you want to do first? “Choose” Send or receive a message.
- My First Twilio Project Dashboard page will open. Now you can Edit your Project as “My Project”.
- Get a trial number and save it somewhere and then choose to use this number.
- You will see the ACCOUNT SID and AUTH TOKEN.
- We will need Account Sid, Auth Token and Trial Number of these so save them somewhere.



Step 2: Creating an account on Mailgun and setting up Mailgun for sending Email alerts.

- Visit <https://www.mailgun.com/>.
- Create an account by clicking on the start sending option and by filling up details.
- Verifying your Account.
- Once you have verified your Email after that you have add your phone number.
- After Entering your number. Click on send activation code. After some time you will receive one OTP. Enter the OTP. Click on Enter.
- After Creating account on Mailgun go to the overview option. Click on API and Click on Python.

- After doing this so you will receive API Key and Sandbox URL. Save this both credentials somewhere you will be further using in this project.



Step 4: Creating an account on Bolt Cloud and Bolt Android App and Link the Bolt Module to Cloud.

- Visit <https://cloud.boltiot.com>.
- Create account using Email-Id and password.(Use the same email which was used to order hardware kit also use same email for app for linking the hardware to cloud.)
- After creating account on cloud. Then Download Bolt Android App from playstore.
- Create a account on the Bolt app with the same email-Id then use the mobile hotspot for linking the Bolt WiFi module to cloud.
- After successful linking of the device to the cloud then go to the cloud website. The Bolt device will show the device as online.
- Go to API section make the API as enable. Copy the API and save somewhere.
- Also copy the Bolt Device Id which is present on Bolt IoT dashboard and save it somewhere.

Bolt Device Id

ID: BOLT46	STATUS	PRODUCT	ACTIONS
BOLT46	OFFLINE	Not Linked	

API Key

Generate Key

Enable Disable

X0XXXXXXXXXXXXXX0XXXXX

GENERATE NEW API KEY

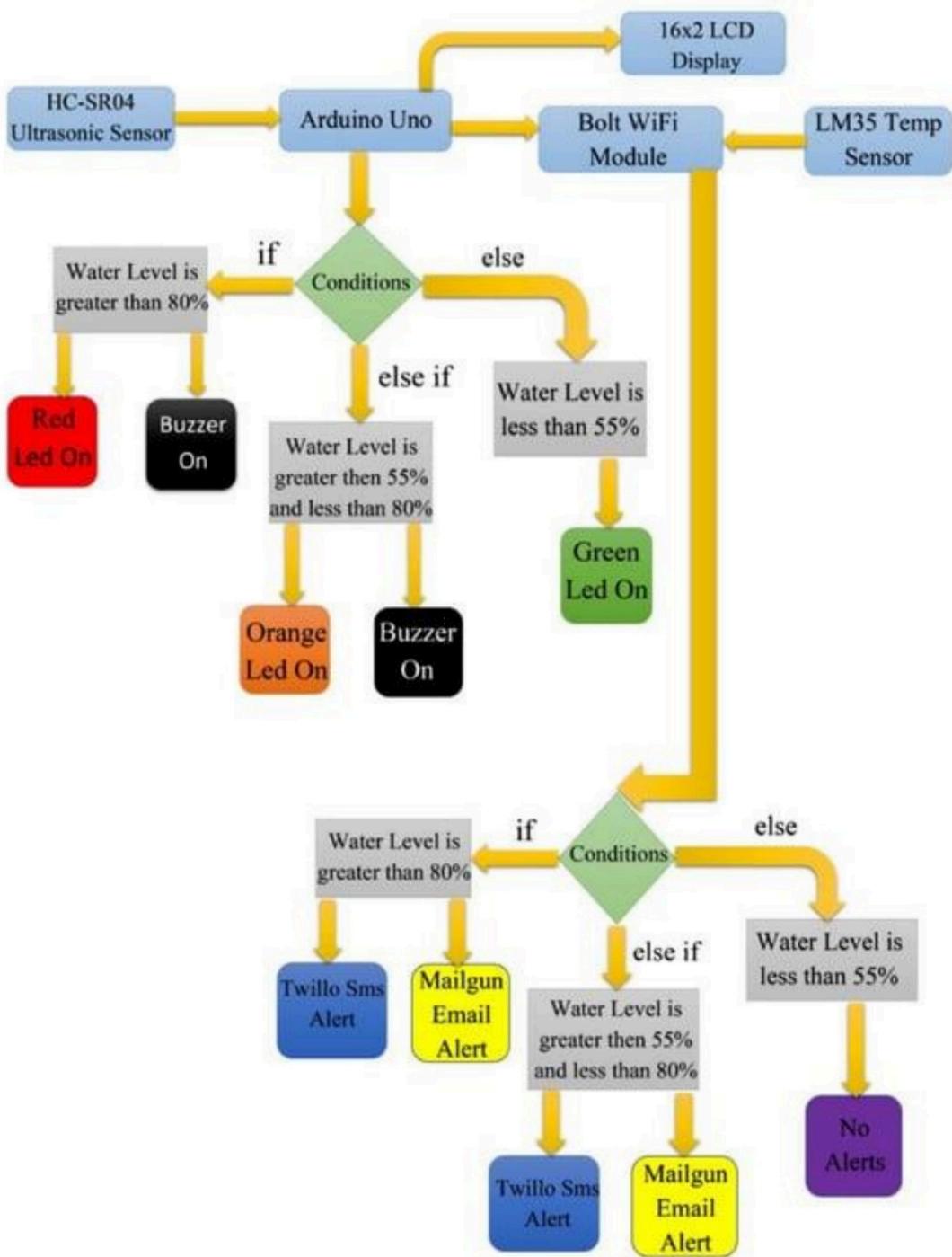
Step 5: Coding

After setting online app services and saving the keys somewhere. Now most important is to write code and allow sensors attached to microcontroller to take specific decisions.

Basically this project contains two editors to write the code. First is Arduino IDE in that we will write the arduino code. Second the Python IDE in that we will write the configuration file and the main code. Also the download link of both the editor can find above in the online app services section.

Step 5.1: Writing the code in the Arduino IDE

- Open the Arduino IDE(Downloaded from the above section).
- Click on new file. Choose the correct file path to save the file. Give appropriate name to the file and add .ino extention to the file and save the file.
- Now the core part of the project is writing code for Arduino Uno. Below this line complete code is given. You can refer the below code.



For doing the practical demonstration. First connect the USB cable type-B to the Laptop's USB slot for power supply. Also simultaneously run the python program(i.e Main.py). Firstly the

ultrasonic sensor will sense the water level in distance and then the arduino program will help to convert it into percentage. Also the sensed water level will be displayed on Lcd display(In Percentage) along with zone/area the water level is present. The full water tank/container is divided into 3 zones i.e Green, Orange and Red. Now lets look into each zone.

- When water level is at Min/Normal level. That resembles 'Green Alert'. This means that water is at normal position and no sign about flood condition. Also green led will glow and it will also show green alert in Lcd display with water level.



- When water level crosses the Intermediate level. That resembles 'Orange Alert'. This means that water has crossed the 55% mark and there can be chances of flood condition at that place. With increase in water level the system sends Sms and Email alerts to the authority or registered user from Twillo and Mailgun Services respectively. Also orange led will glow and buzzer will buzz.

It will also show orange alert in Lcd display.



Also Sms and Email is send to registered user with proper message and current temperature of that place.