ED GROUP - 12 A

FINAL REPORT

Automatic Water Cut-off System

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Debesh Maheshwari (B21AI012)

MOTIVATION

Our project is designed for solving a serious problem which is there all around the world....
Wastage of Water

Every day there is a large amount of water being wasted and one of the main sources of such wastage is not turning the water supply off once storage tanks have been filled up. This problem mainly happens because once the tanks get filled there is no way to see it until the water starts to overflow .

We have designed a device which will help in preventing the overflow of water from water tanks

PROBLEM STATEMENT

The overhead water tanks start overflowing once they are filled . If the motor is not switched off immediately this leads to unnecessary wastage of water and electricity. Our device will help to tackle this problem by automatically cutting off the power supply of the motor once they are filled upto a certain depth in the tank. Moreover our app will provide real time depth data to our users.

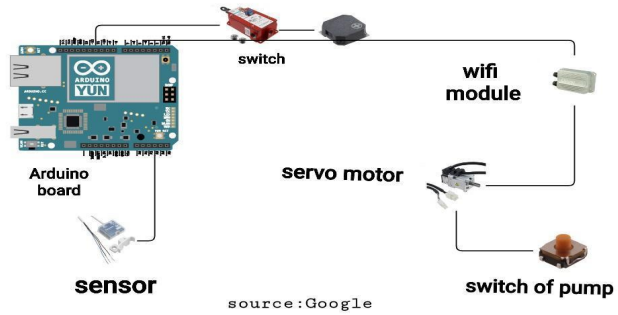
WORK DESCRIPTION

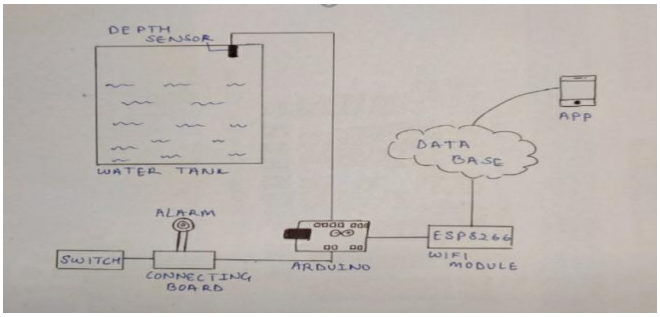
We will set up our device inside the tank on the upper portion of it.The water level sensor will detect the water level and keep the user updated using the app by giving the real time info about level of water.

When water motor will be turned on and water level in tank will increase and about to reach at a particular distance from the sensor ,the Arduino board will transfer signal to the alarm and the wifi module.The alarm will ring via app in the form of a alert sound message for 1 min so that the user will switch off the water motor and prevent overflowing.

But in case the user is not available at that time or failed to switch it off,the wifi module will transfer signal to the servo motor which will be near the switch of water motor,and the servo motor after getting the signal will operate and turn off the switch in order to stop the water supply.

FLOW CHART





ANALYSIS OF DESIGN

For designing this project, we have used a variety of physical components and some of them are as follows :

1. **An arduino board :**

It is the brain of our project.It takes information from the water level sensor and transmits it to the Wifi module and alarm.

2. **A water flow sensor :**

It will detect the level of water in the tank.

3. **A servo motor :**

It will switch off the water motor automatically in case it is not switched off manually.

4. **An esp wifi module :**

It will transfer signal from the arduino board to the database and the servo motor.

A variety of software components were also used and some of them are as follows:

1.**MIT app inventor:**

It was used in making the app which will notify the user about the water level of the tank.

2.**Firebase:**

It acts as an intermediate between the arduino and app.

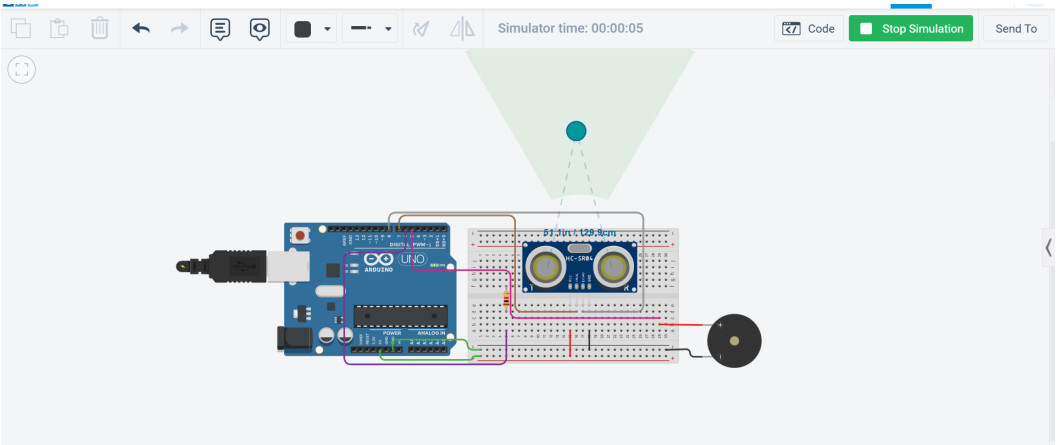
3. **Tinkercad:**

We used this to design our device digitally to see if it is working properly.

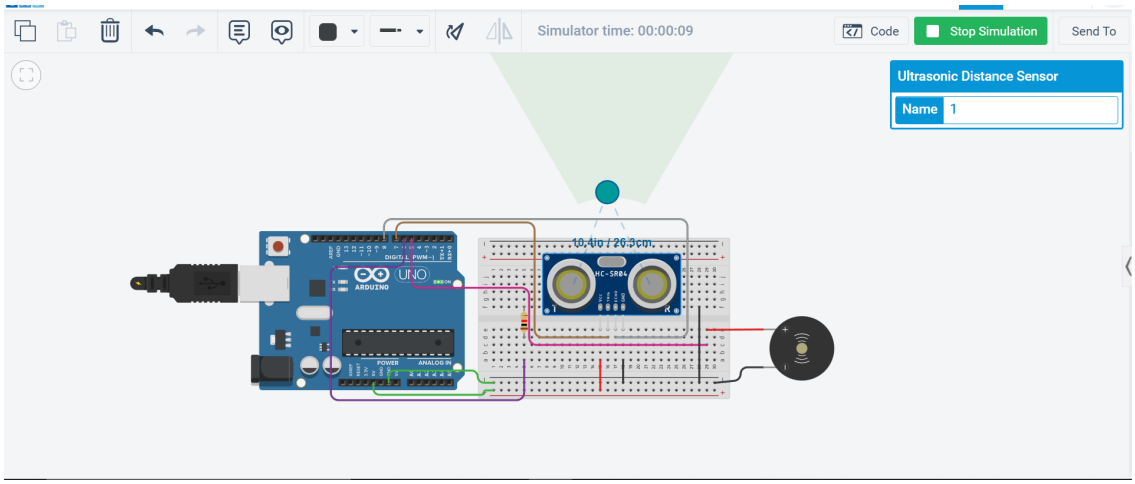
MODELING AND SIMULATION

We have done extensive research as well as simulation work for this project. This includes finding appropriate design for our project to make the connections in the best possible manner to enhance efficiency and to keep the complexity of the circuit as minimal as possible. For this we tried a variety of models on online Computer Aided Design (CAD) software like Tinker cad.

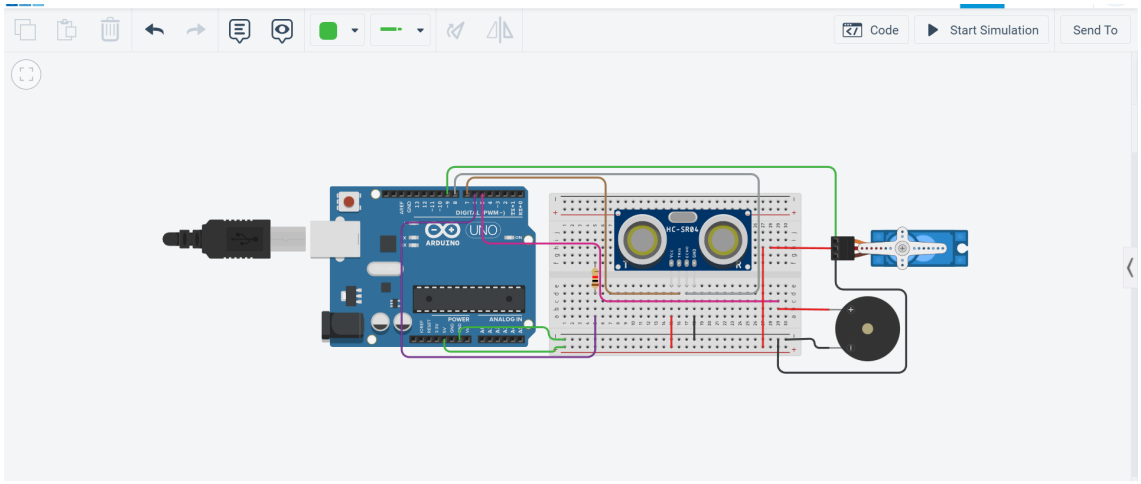
We faced a problem in calibrating the threshold distance from the ultrasonic sensor which we resolved by using Tinker cad. We also used Tinker cad to check and test run our Arduino code before using it in the actual Arduino board which minimized the risk of any error.



As the water level is away from the specified threshold value, Buzzer is off



In this picture the water level is closer than the threshold value which causes the buzzer to sound and Arduino instructs the servo motor to toggle and switch off the switch to cut off the power to the motor.



DIMENSIONING AND MATERIAL SELECTION

Here we have used an Arduino **Uno Board with an ATmega328 chip** as it is one of the most efficient microcontroller boards.

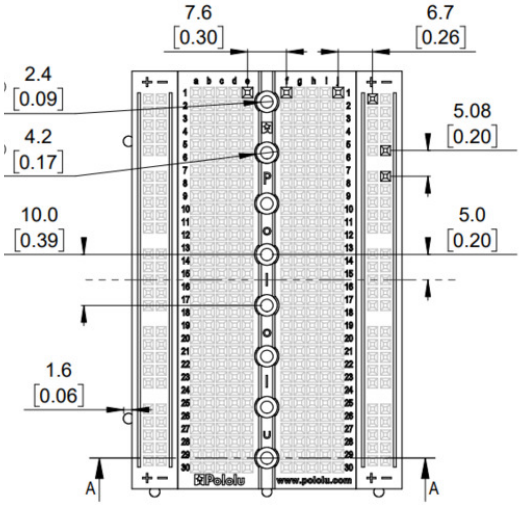
For the sensor we have used an ultrasonic sensor with manual filling option of depth threshold.

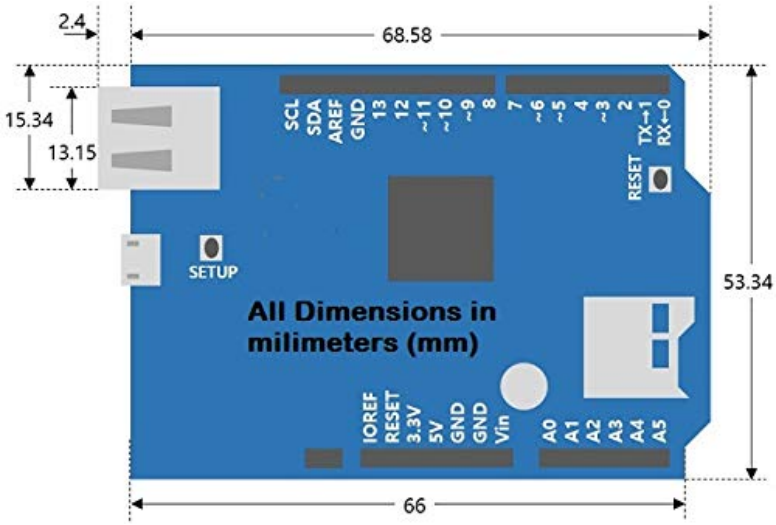
For the alarm part we have used **alarm 95DB**.

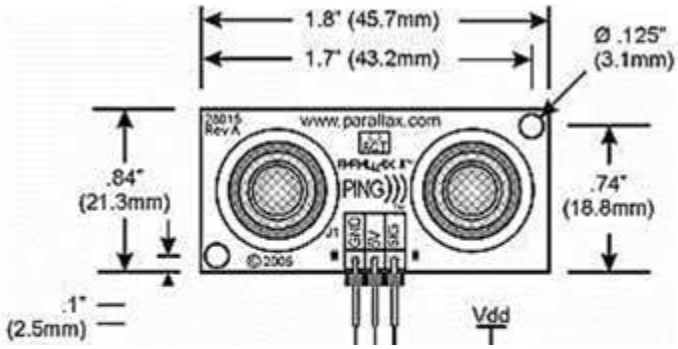
For the Wifi module we have used **ESP-8266**.

For the motor we have used a **servo motor.**

To complete connections we have also used a breadboard.





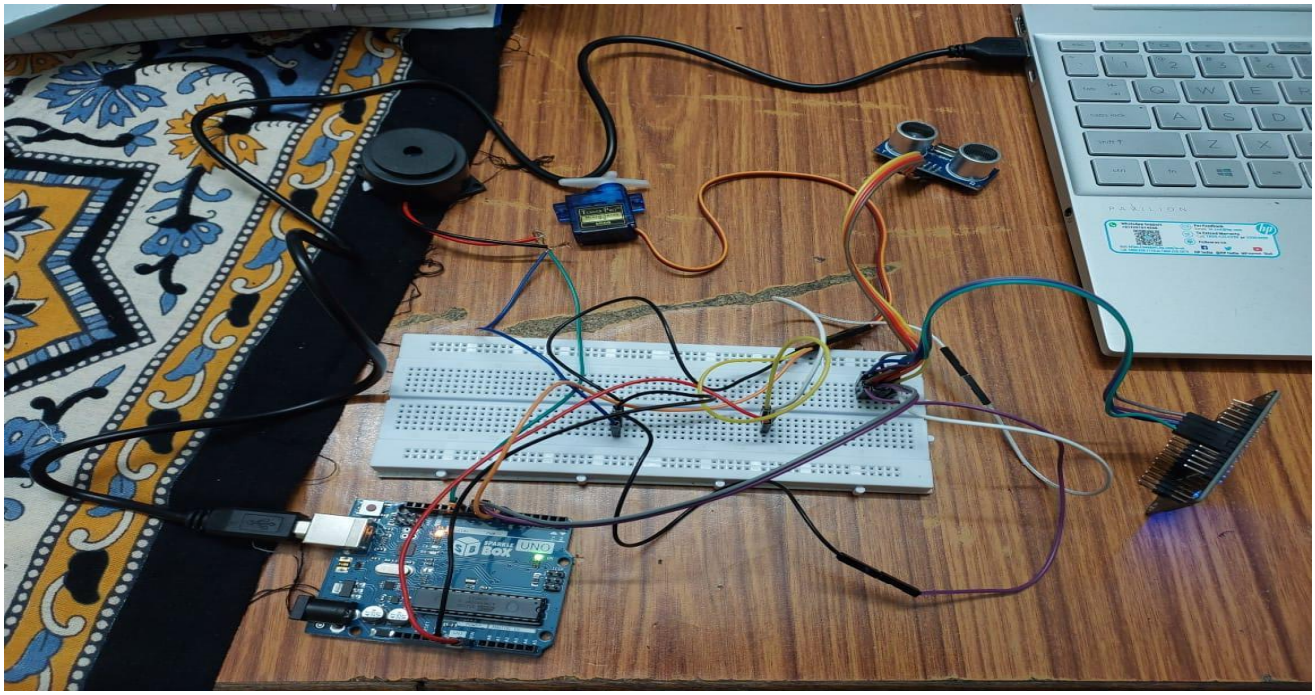


PROTOTYPE AND REFINEMENT

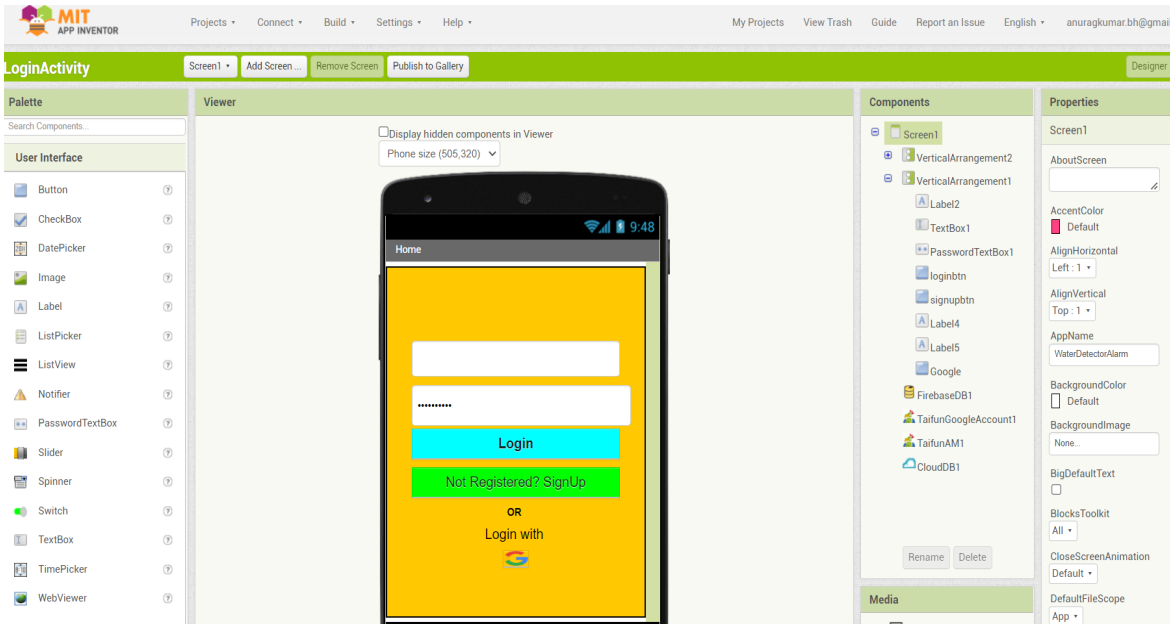
Firstly we started off with dividing the whole project into subparts and tasks:

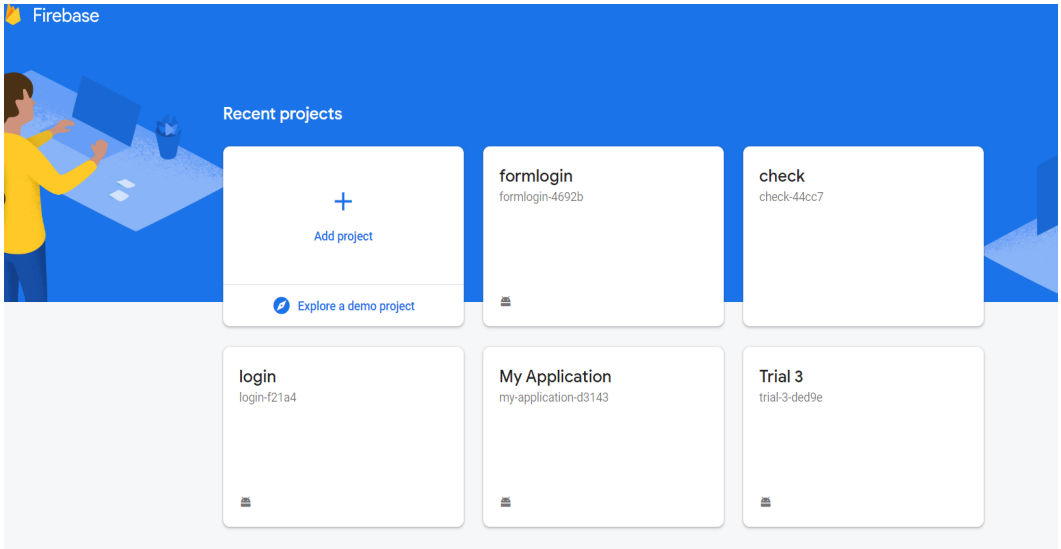
- **Arduino** connection with the **sensor**
- **Arduino** connection with the **alarm**
- **Arduino** connection with the **motor**
- **Arduino** connection with the **wifi module**
- Connection of **wifi module** with **firebase**
- Connection of **firebase** to the **app**
- Development of app

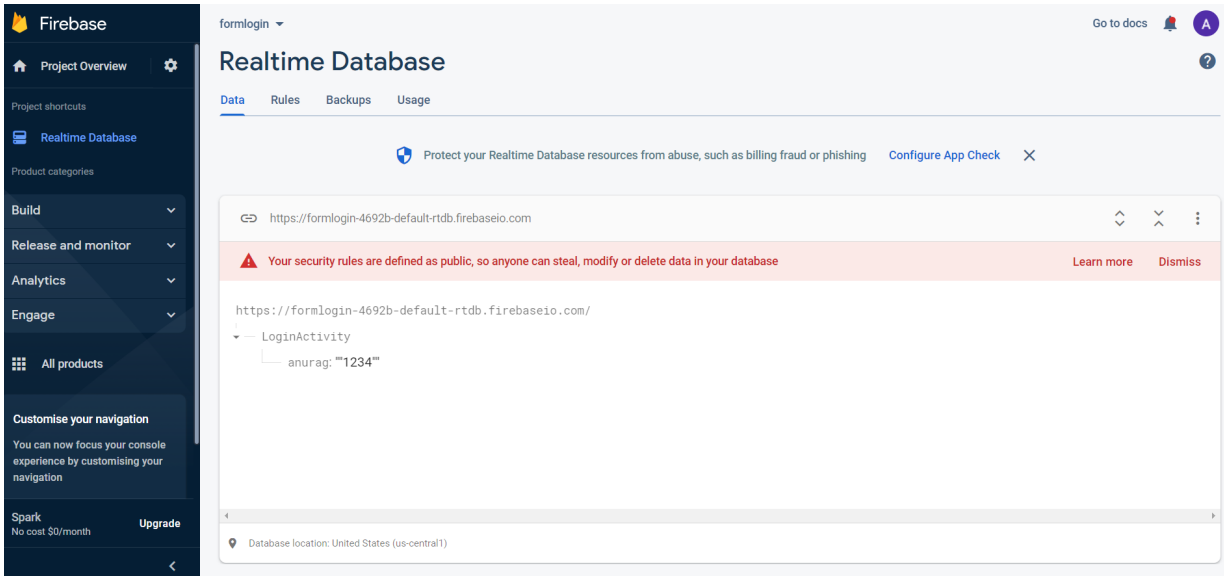
For connections with arduino we first individually connected the components one by one making sure each component was working. After that we integrated all the four components , ultrasonic sensor, alarm,motor and the wifi module together on a breadboard.

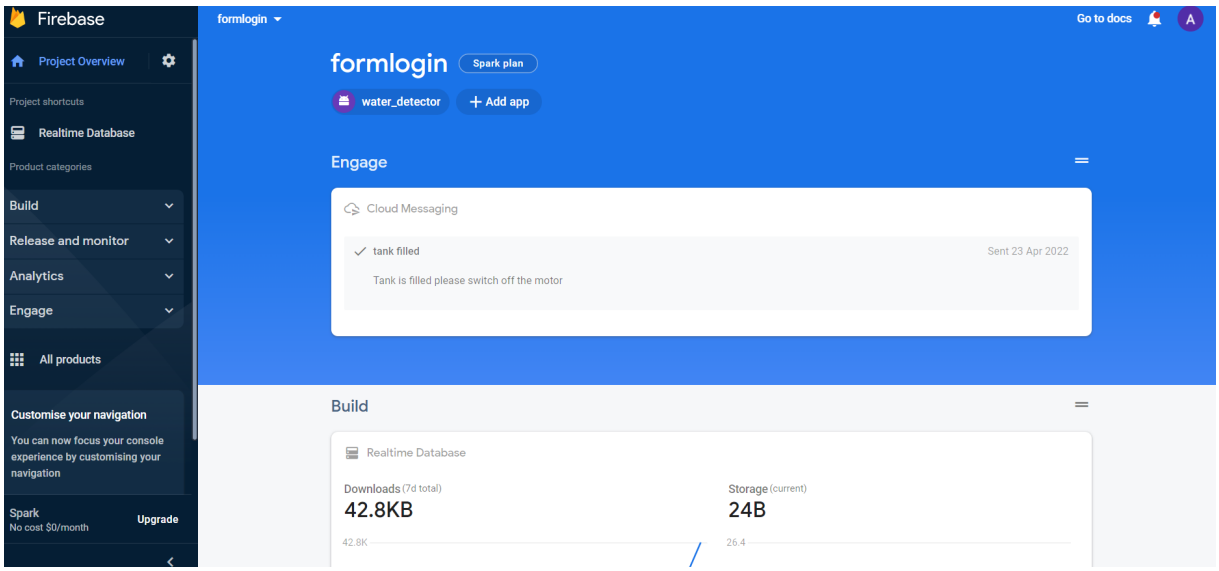


Then we moved on to the development of the app, where we developed the app using MIT app inventor where we built a notification page and a login/signup page.
Then we connected the app to firebase.






Firebase
Project Overview
Project shortcuts
Realtime Database
Product categories
Build
Release and monitor
Analytics
Engage
All products
Customise your navigation
You can now focus your console experience by customising your navigation
Spark
No cost $0/month
Upgrade
formlogin
Go to docs
A
Realtime Database
Data
Rules
Backups
Usage
Protect your Realtime Database resources from abuse, such as billing fraud or phishing
Configure App Check
https://formlogin-4692b-default-rtdb.firebaseio.com
Your security rules are defined as public, so anyone can steal, modify or delete data in your database
Learn more
Dismiss
https://formlogin-4692b-default-rtdb.firebaseio.com/
LoginActivity
anurag: ""1234""
Database location: United States (us-central1)


Firebase
Project Overview
Project shortcuts
Realtime Database
Product categories
Build
Release and monitor
Analytics
Engage
All products
Customise your navigation
You can now focus your console experience by customising your navigation
Spark
No cost $0/month
Upgrade
formlogin
Go to docs
A
formlogin
Spark plan
water_detector
Add app
Engage
Cloud Messaging
tank filled
Sent 23 Apr 2022
Tank is filled please switch off the motor
Build
Realtime Database
Downloads (7d total)
42.8KB
Storage (current)
24B
42.8K
26.4

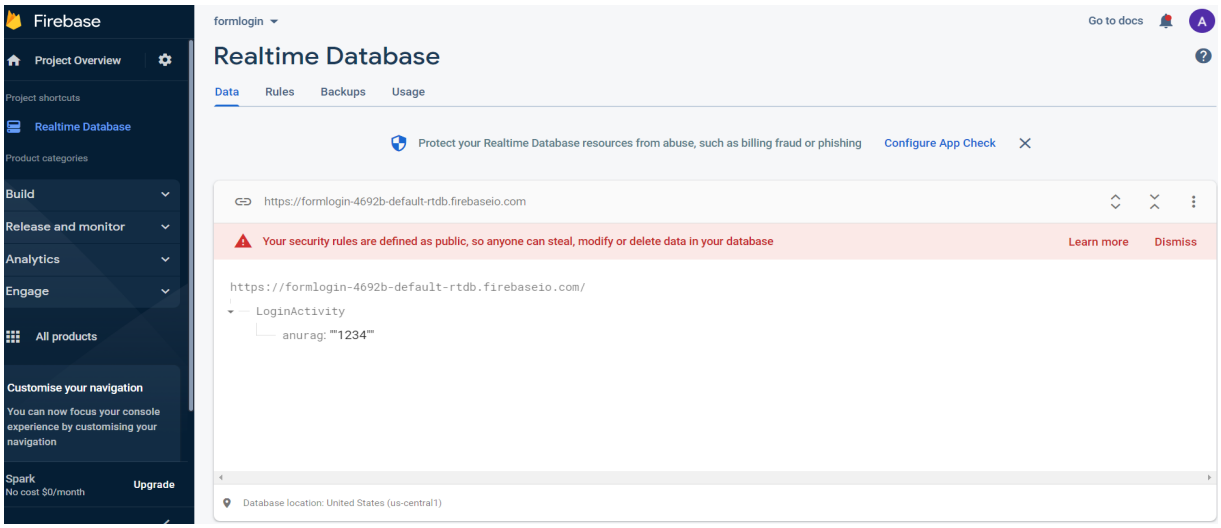
INTEGRATING ELECTRICAL AND MECHANICAL ELEMENTS

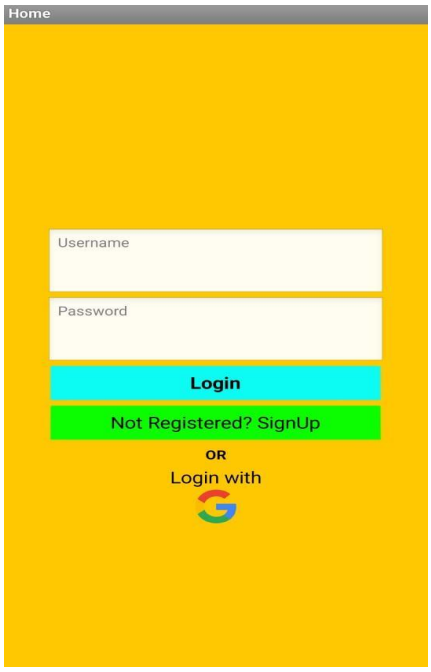
Actually our product does not contain any mechanical components, we had integrated application/software to the electrical components. In order to integrate the app with electrical components we had used a wifi module and firebase. These both act as intermediate for integration.

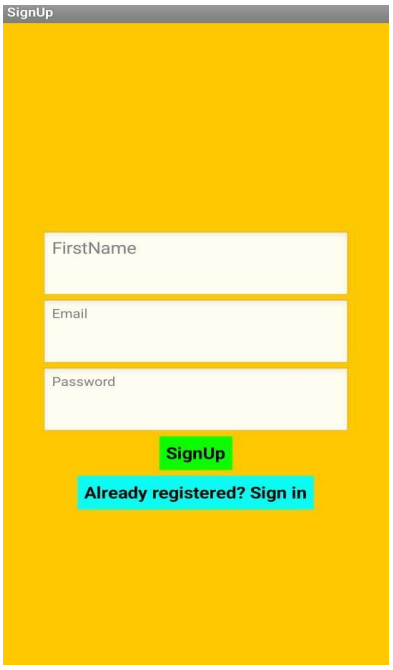
First we had made a connection of the wifi module in the breadboard then in the arduino IDE we had written code to integrate with firebase . Here we had installed the driver to make the integration.

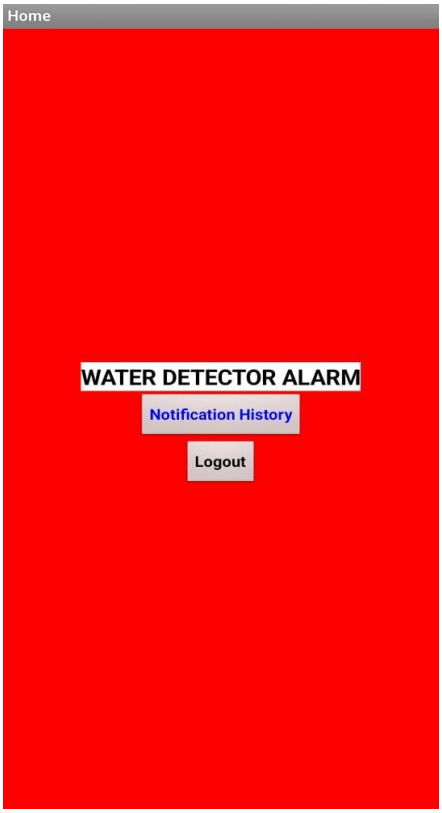
FirebaseDemo_ESP8266

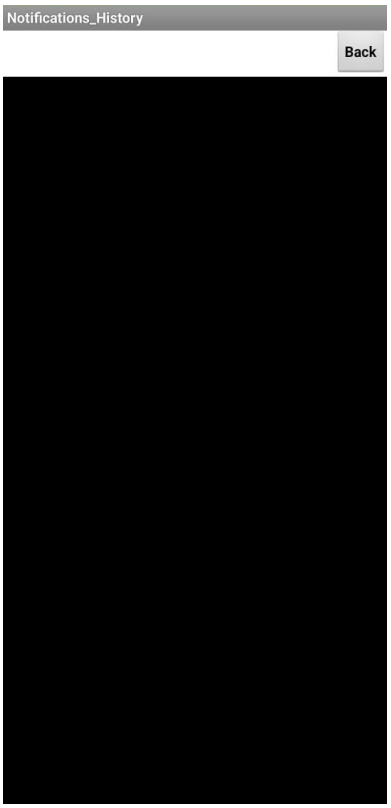
```
#include <ESP8266WiFi.h>
#include <FirebaseArduino.h>

#define FIREBASE_AUTH "ERkfBMKHECdU40vaK3ooszAky46FqkcQcRflaSoi"
#define FIREBASE_HOST "check-44cc7-default-rtdb.firebaseio.com"
#define WIFI_SSID "ESP8266"
#define WIFI_PASSWORD "password"

String values,sensor_data;

void setup() {
  //Initializes the serial connection at 9600 get sensor data from arduino.
   Serial.begin(9600);

  delay(1000);

  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);

  }

  Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH);
```



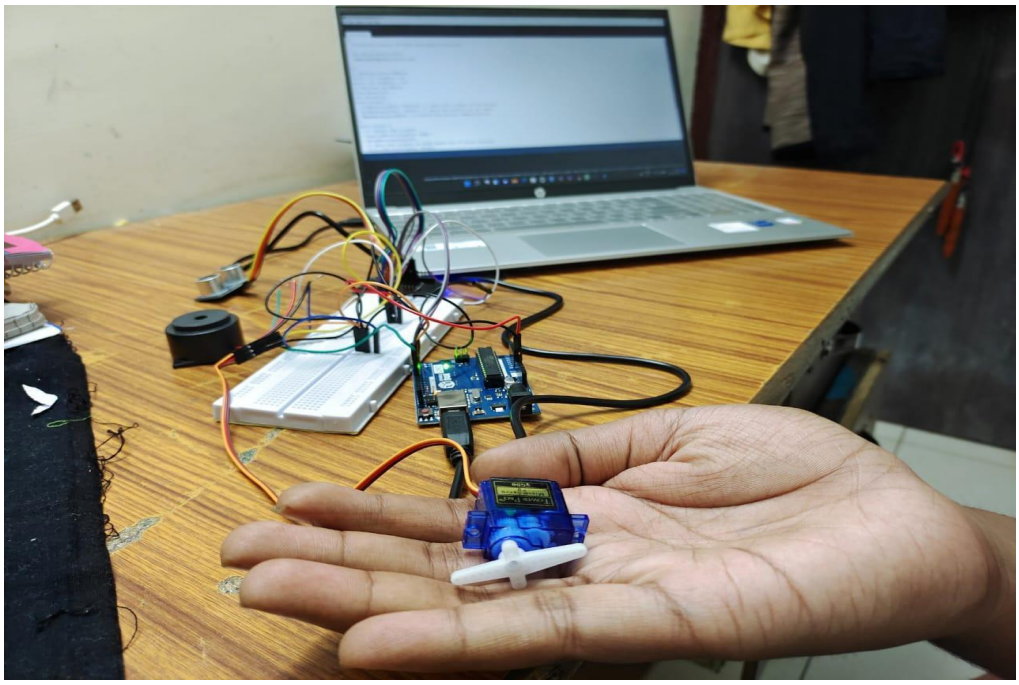

Home
Username
Password
Login
Not Registered? SignUp
OR
Login with


SignUp
FirstName
Email
Password
SignUp
Already registered? Sign in

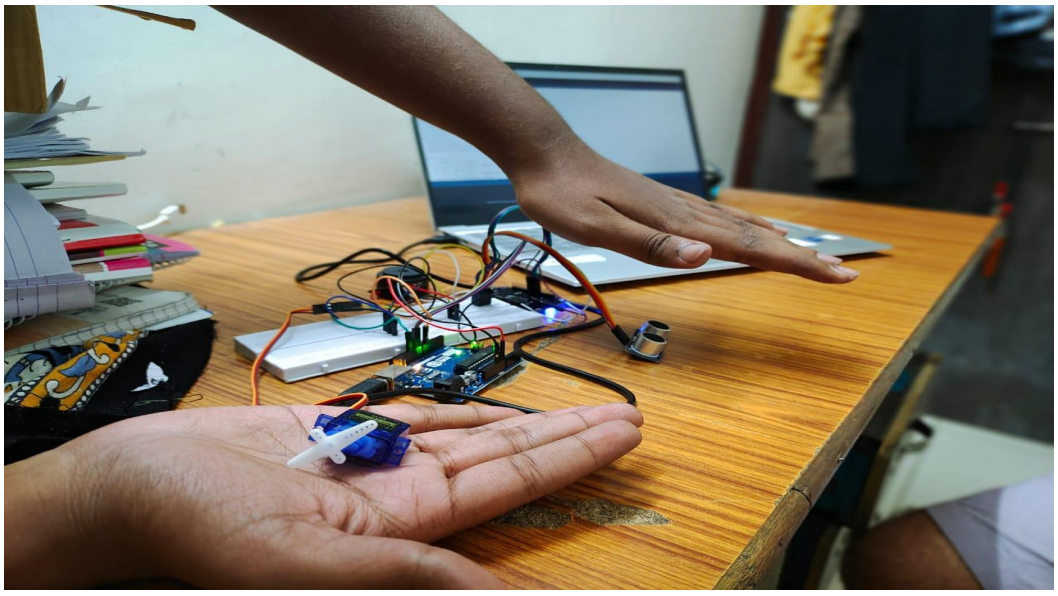

Home
WATER DETECTOR ALARM
Notification History
Logout


Notifications_History
Back

DEMONSTRATING OF THE FINAL DESIGN



Motor stationary as the ultrasonic sensor is measuring distance more than the set value



Motor rotated as the sensor is sensing distance less than the set value

Video link of the demonstration:https://drive.google.com/file/d/1XOM8v33MNwyCGVZoO8-Cq1fxMTlKIrtZ/view?usp=sharing

CONTRIBUTION OF EACH TEAM MEMBER

Anurag Kumar Bharti (B21CS012) :

I was tasked with the responsibility of app development .The responsibility gave me a chance to explore more about tech.I am very grateful to take this opportunity.

Since we are going to work with Firebase I have started learning java through youtube and referring to a book “Head First Java” and I also explore websites like stack overflow,geeks for geeks etc. and also I am doing coding practice in Hackerrank and I also participated in coding contest in https://www.codechef.com/ and https://leetcode.com/ . Initially, I had started making the app in java language and for sending the alert message we had decided to set it up through push notification. Then we realized that making it via this method will take more time.
So we had switched to mit app inventor because we had limited time to complete our project.
I had consulted with my team members and we had always tried to make our app as best as possible.

At last I am very thankful to this project which gave me a lot of teachings .This project had taught me how to work with and coordinate with our team members

Kartik Sharma (B21CH012) :

My major contribution was connecting all the components one by one to the arduino and testing out if they were compatible and if they were working properly or not. I also helped in deciding

which parts were to be used and also helped in connecting the sensor and the motor together with the arduino and the breadboard and writing the code for the working of the ultrasonic sensor and the motor . I also participated in running simulations on tinkercad before actually making the connections to make sure the circuit we had designed was functioning properly.
I also helped the team whenever we got stuck at a particular step and we worked together to find out the solution.The project gave me a chance to work and collaborate with others and I am very grateful for that.

Chaitanya Ghodmare (B21CI012) :

I have contributed to this project by creating extensive models and helping my team to overcome many calibration problems . By creating effective CAD models I have helped my team to save valuable time by properly calibrating Arduino and ultrasonic sensor . Also I have assisted my teammates in acquiring the best components at minimal cost . I have also worked to come up with the best design for our project to enhance the efficiency of our Model .
Overall it was a memorable experience . I got exposure to various technical fields which will definitely assist me to prosper in my professional career . I got an opportunity to apply many of the various concepts that I learned during my First Year which helped me by enhancing my knowledge and experience .
Thank you

Aryan Himmatlal Prajapati (B21EE012) :

I formed the ideation part of the project and defined workflow. Apart from that my major contribution was in Arduino and database part. I was working on an arduino and wifi module esp8266 communication. Like to send data to the database we need to send values which are captured by the ultrasonic sensor and conversely send values to the arduino inorder to define a limit distance for the ultrasonic sensor so that after water comes to that level, the switch should turn off. There were many difficulties in the task. But upto good extent I was able to do it. For this project to be done I learnt C++ inorder to program arduino and completed a course based

on interfacing with arduino inorder to get insights into communication between sensors, arduino and database.
Course Credentials : https://coursera.org/share/880a8f71285eb6a7667817d49d2ab753
So Our team worked in very good harmony. Almost everyone in the team was complementary to each other. Whenever someone was stuck in some part, others were ready to help. So I am very grateful to work with such people. It was a very good experience for me to work on this project. I got to learn so many things.
Thank You Very Much to Manish Narwaria Sir and Sucharita Dey Ma'am for guiding us to the right direction. Your useful suggestions helped a lot.
Thank You Very Much.
Regards,
Aryan Himmatlal Prajapati
Department of Electrical Engineering
Indian Institute of Technology, Jodhpur

Harsh Vardhan (B21BB012) :

My major work initially was problem identification for which I did a lot research on how to setup the device and what all the components would be needed in the first semester but later I switched to working with Anurag in making of the app and the research behind it and later in connection of the App with the database and assisting and contributing in the physical setup of device and selecting and finding the components of the device at the cheapest price and ordering them.

It was a memorable experience working as a team and sub-teams as we did a lot of research over a span of seven months and it exposed us to a lot of new learnings which would add up to our individual growth as well.

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Aparna Kirti (B21ME012) :

My major contribution to this project was researching over the design of the device and overall setup of the device.In first semester I made a rough flow chart on how we will make the connections between all components of the system and selection of proper component from different types of components by analyzing the quality of it by reading reviews of these components and researching everything about it was also contributed by me.I helped my team in making presentations as well.
In the second semester ,implementing these ideas in real life was so exciting for all of us and also we are happy with the device as we have done everything to make this device run and give proper results.
This project was a big opportunity for me to explore new things and learn new ideas on how to manage problems as we triggered many problems in doing this project but at last we used to find all the solutions.
This project also gave me a chance to collaborate and interact with other teammates and they are really nice and helpful,which made this project even more easier and interesting.

Thank you..!!

Debesh Maheshwari (B21AI012) :

I was given the task of developing an app for the project of water alarm_. This gave me a good opportunity to explore new things based on technology.
For the project I initially installed VSC then started to learn java. After learning java upto a certain extent we practiced it and also started developing for an app but it seemed to be time consuming with not much fruitful results. So we shifted to MIT app inventor which already has some predefined codes. It was easy and less hectic.
Further for connecting to the database we used Firebase powered by google . We also made logos for our app using different logo building websites.
At last we integrated all the developments,modifications and building to form the app.

I learned many things from this project. I learned teamwork , improved communication skills,and learned coding.
Finally, I want to thank all my team members and teachers.