# CCIoT  PROJECT

Vanishing Rod

Team 3 - idIoTs

# OBJECTIVE

- A vanishing rod experiment, like the one we are performing, tries to capture the essence of the idea of refraction by immersing an object in a liquid which has comparable refractive index.

- The aim of the experiment is to demonstrate the concept of refraction and show that materials can be made 'invisible' by removing reflection.

- Here the immersion of elements is to be controlled remotely.

# PHYSICS OF THE EXPERIMENT

This works on the principle that whatever we see around us is due to the light getting reflected from the object and reaching our eyes.

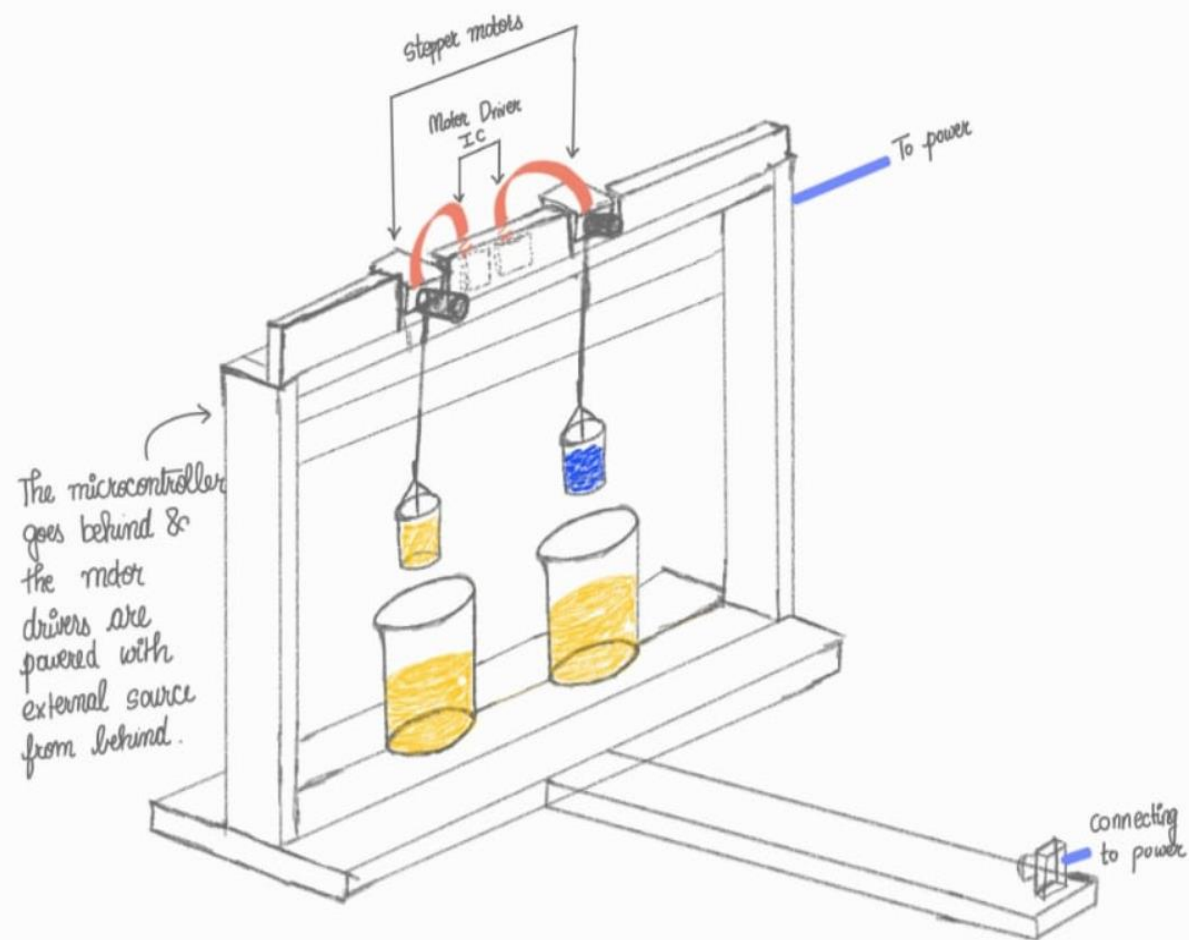If reflection from an object is removed, it becomes invisible to the eye.

Thus, when the glass beaker is dipped in oil, it almost becomes invisible when looked through the air, which happens due to the almost identical refractive index of the glass and the oil.
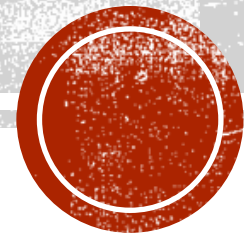
# THE IDEA FOR IMPLEMENTATION

- We have created a setup where a beaker filled with oil which has similar refractive index to that of the glass the beaker is made of, is dipped in a larger beaker containing the same oil.

- When the smaller beaker gets immersed in the oil, due to comparable refractive indices, the smaller beaker vanishes.

- In order to compare the result with some benchmark and to ascertain that it is indeed the working of refraction, we will make an identical setup but replace the oil with regular water. In this case, the beaker won't vanish (because of different refractive indices) .
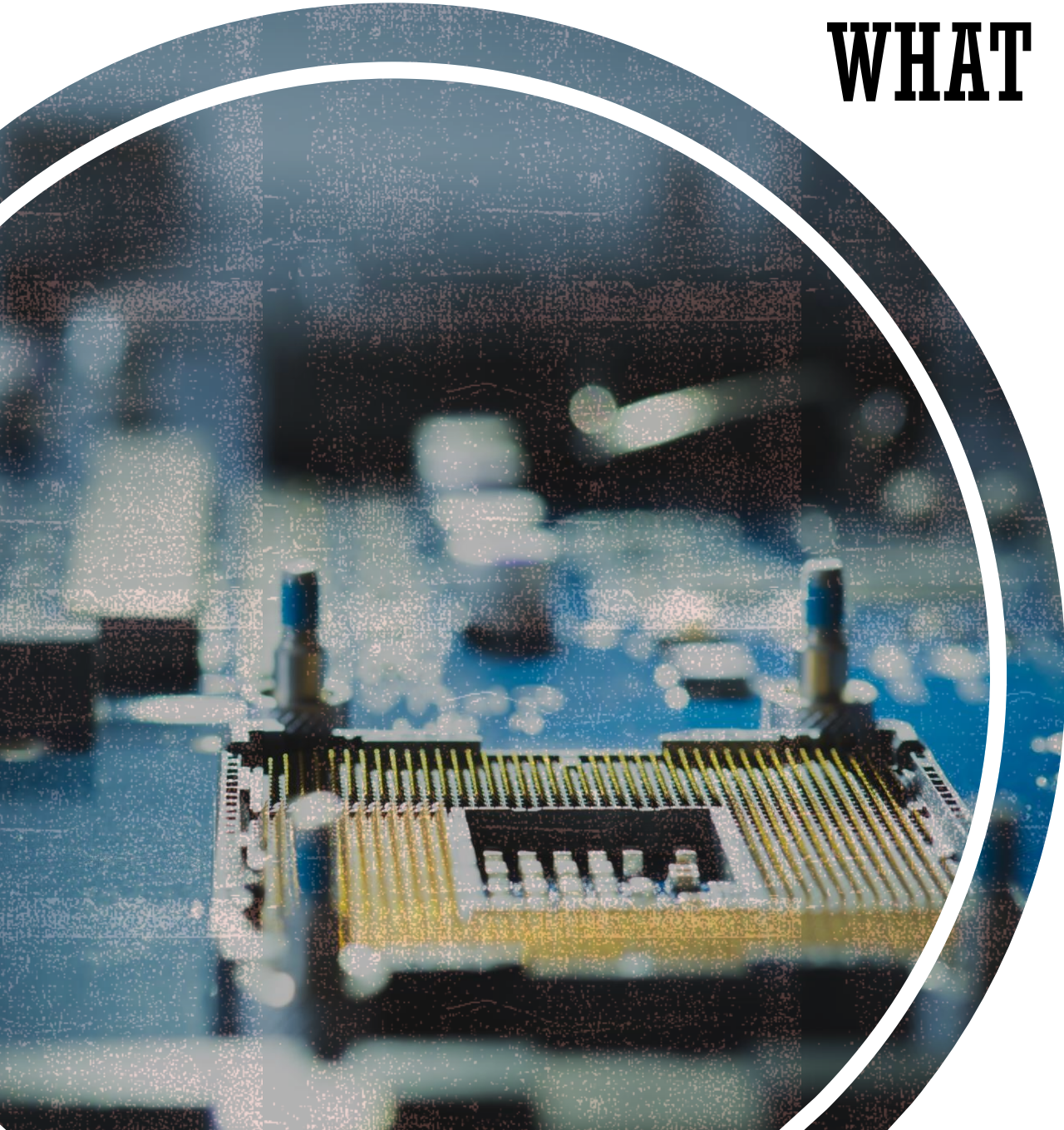
Stepper motors

Motor Driver
IC

To power

The microcontroller goes behind & the motor drivers are powered with external source from behind.

Connecting to power

# SETUP DIAGRAM

# WHAT IS THE IOT COMPONENT?

▪ In order to make this experiment a part of the Remote Triggered Lab (RTL) theme of the project, we have included some IoT implements in the project which are:

- ▪ Two 5 V stepper motors which will move the smaller beakers in and out the larger ones.
- ▪ A Node MCU microcontroller which will control the stepper motors with the help of ULN2003AN driver IC.
- ▪ A dashboard interface on the IoT platform Blynk which will allow us to control the setup remotely and wirelessly via a Wi-Fi module inbuilt in the Node MCU.
- ▪ An ESP-32 camera module which will stream the experiment live in order to see the vanishing without physical presence of the experimenter.

# DASHBOARD

** The video is seen here in the streaming window**

idIoTs

DIRECTION

This button sets the direction of motion

Going down ↓

CONTROL

This button moves & stops the beakers

OFF
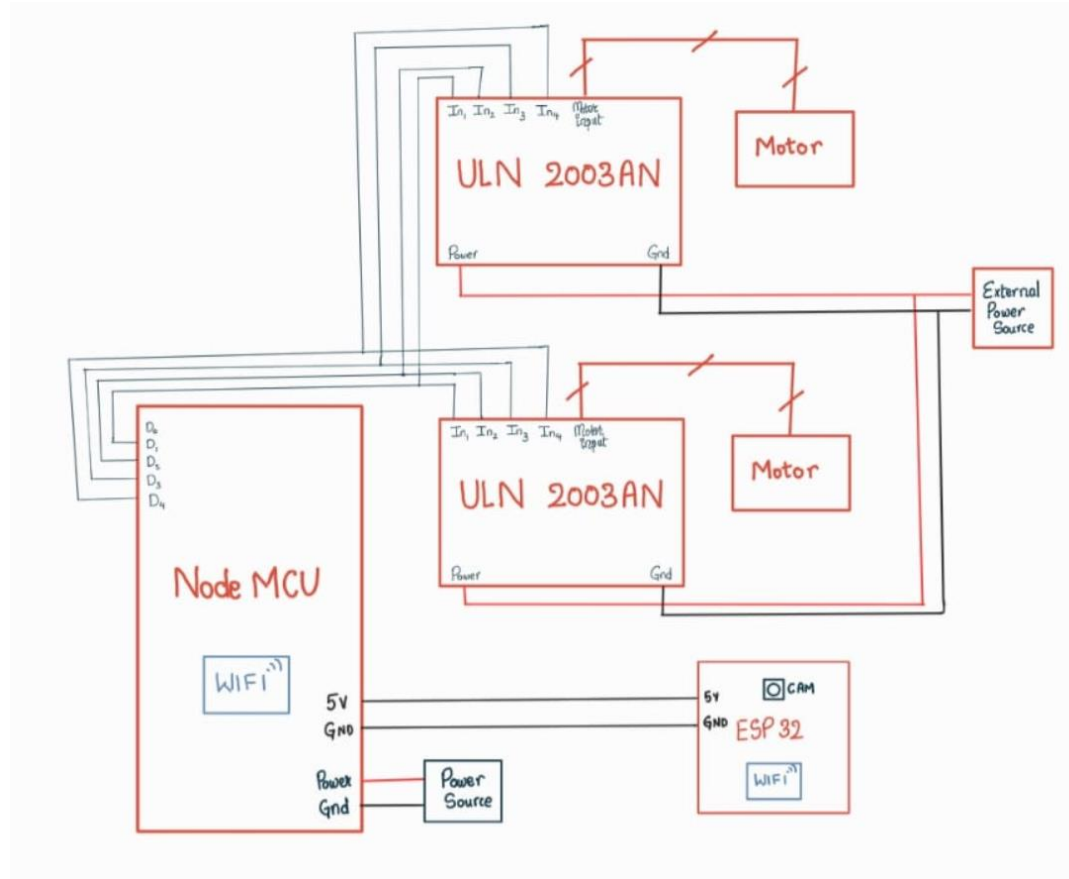
BUZZER

OFF

This is test buzzer

10:41    25%

# BLOCK DIAGRAM OF THE SETUP
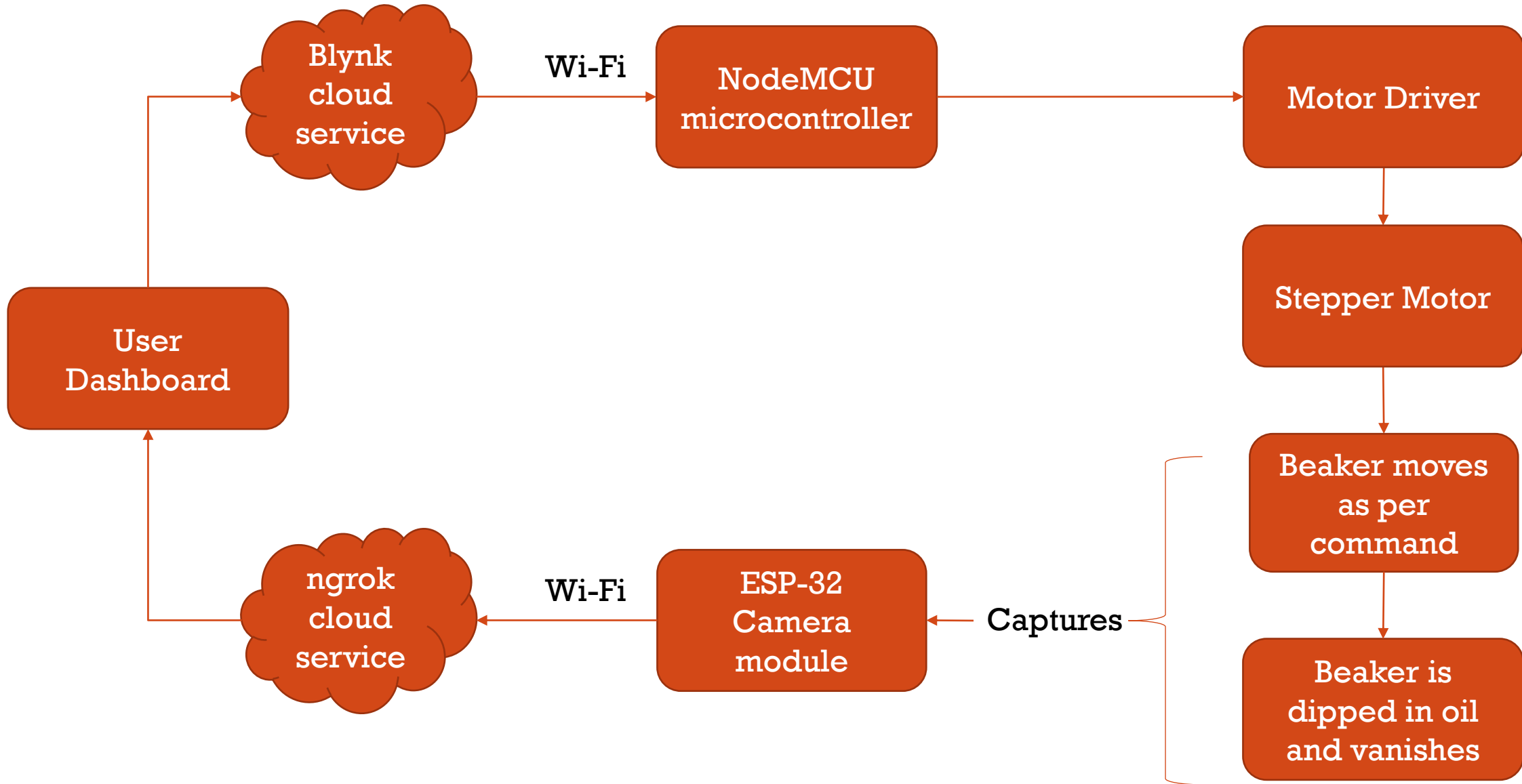
CIRCUIT DIAGRAM OF THE CIRCUIT
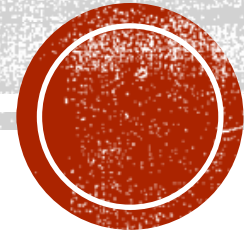
x and y are Boolean variables

is y = 0 ?

No

is x = 0 ?

No

Yes

move
down

move
up
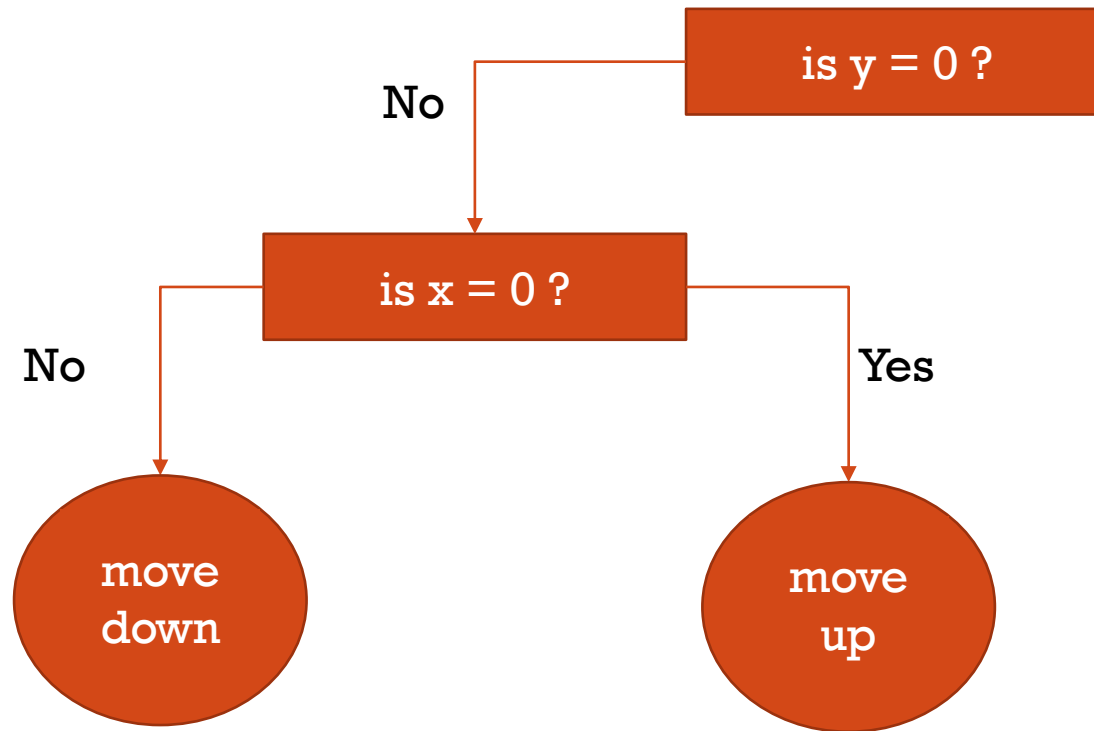
FLOW
CHART OF
THE CODE

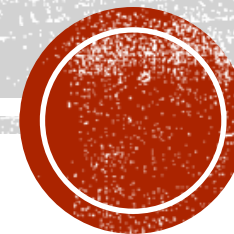y enables motion and x controls direction

## CHALLENGES WE FACED AND OVERCAME

- Learning how to program the NodeMCU and how to use the Wi-Fi module to connect to the online dashboard.

- After connecting the motors to the setup, we found that the motors were not able to lift even an empty beaker, let alone one filled with liquid. We thought that the motors were not strong enough and considered ordering NEMA-17 stepper motors, but we realized that for the motor to lift a load, it needs power (both voltage and current) not just voltage. From this, we concluded that the 9 V batteries were not able to provide the 240 mA current that the motors needed. So, we got a 12 V, 2 A battery eliminator to power the motors and that fixed the issue.

- The laptop wasn't giving enough power when it's in battery saver mode
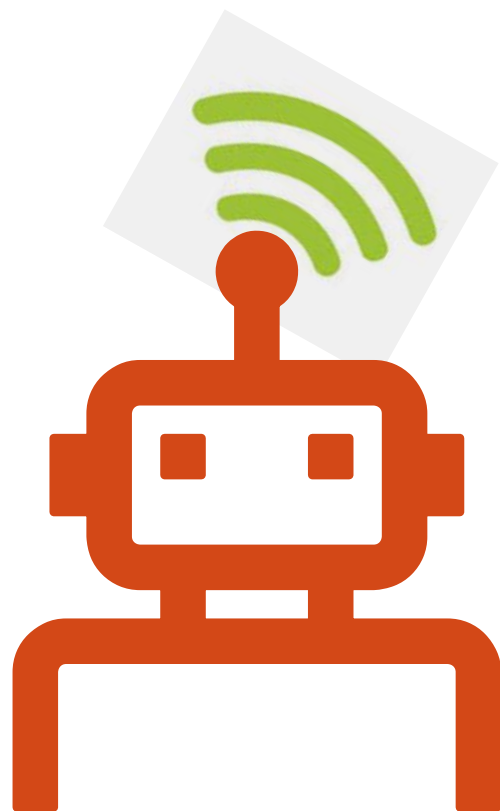
# DEMO OF CONDUCTING THE EXPERIMENT REMOTELY

# LINK TO THE PRESENTATION VIDEO

- https://youtu.be/BzJ9PgdNv30