CCIOT PROJECT

TEAM NUMBER – 11

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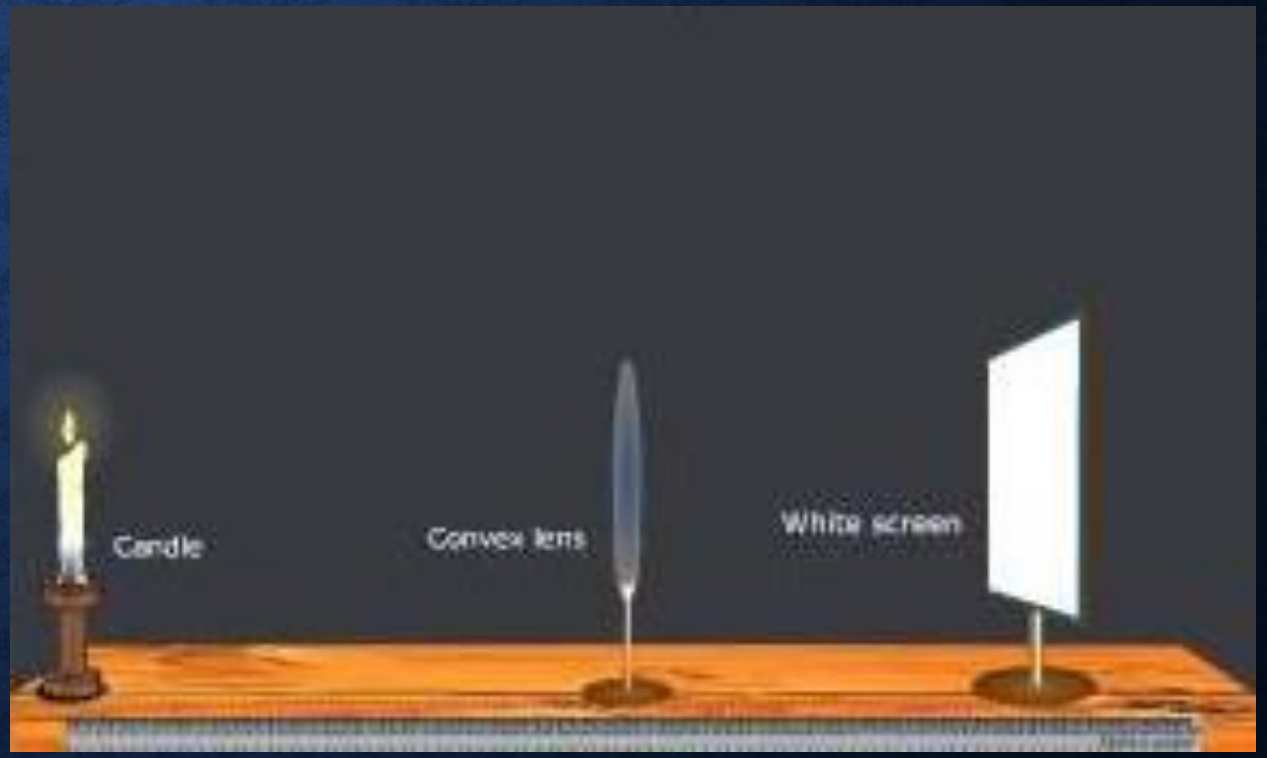
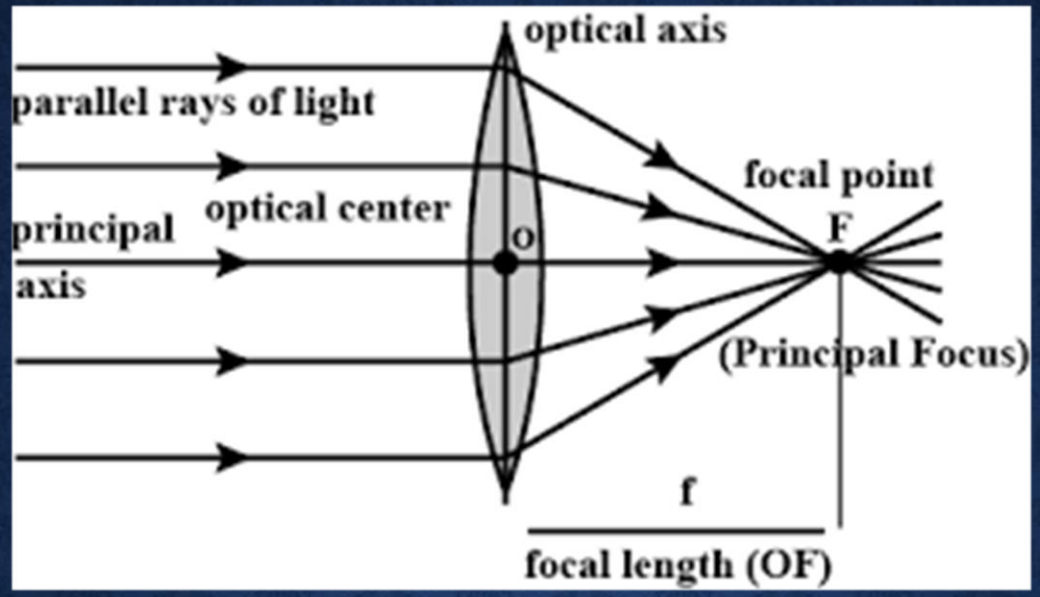
CALCULATION OF FOCAL LENGTH OF SPHERICAL LENS

- Objective: To approximate the focal length of Spherical Lenses/Mirrors by observing the sharpness of the image on the screen.
- In the project, we built a setup where we have a lens and a movable screen and by changing the distance between them, we can calculate the focal length of the optical lens.



PHYSICS OF THE EXPERIMENT

- In this experiment a convex lens has been used.
- The convex lens is a lens that converges rays of light that convey parallel to its principle axis which is relatively thick across the middle and thin at the lower and upper edges.
- The focus is the point, or plane, at which light rays from infinity converge after passing through a lens and travelling a distance of one focal length.
- The distance of the principal focus from the optical centre of a lens is called its focal length.



To measure the focal length, the object is placed at infinity. So the rays are coming parallel to the principle axis.

If u is the object distance, v is the image distance and f is the focal length then the lens equation is as follows:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Now as u = ∞, $\frac{1}{u} \to 0$

So the equation becomes,

$$\frac{1}{f} = \frac{1}{v} \Rightarrow v = f$$

So the image will form at the focus.

MAIN COMPONENTS USED

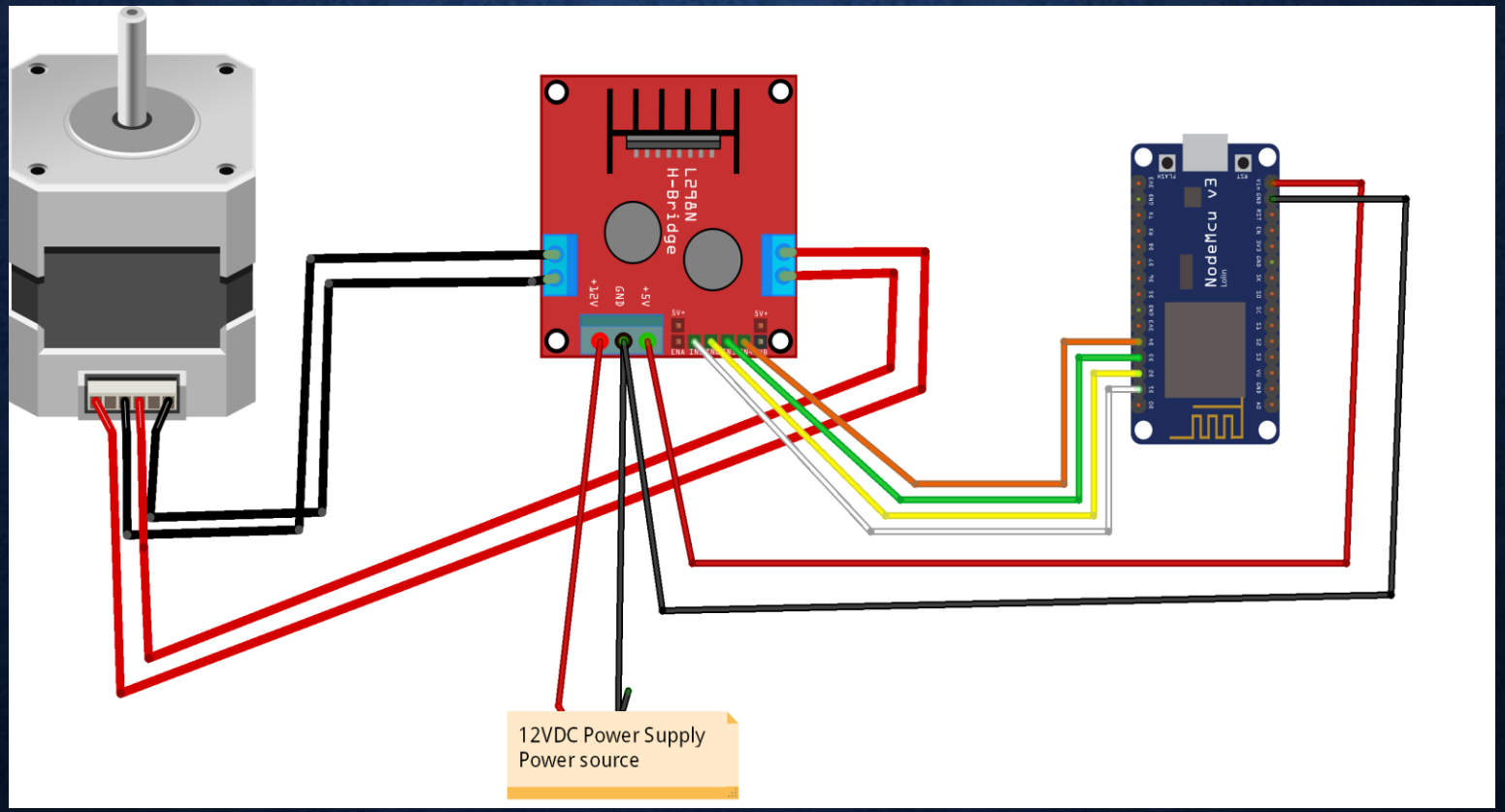
ESP8266: This is used for networking, data processing . This helps us to connect to wifi It is the heart of our setup

ESP32: An ESP-32 camera module is used to view the screen which helps the remote operator to check whether the image is clear or not

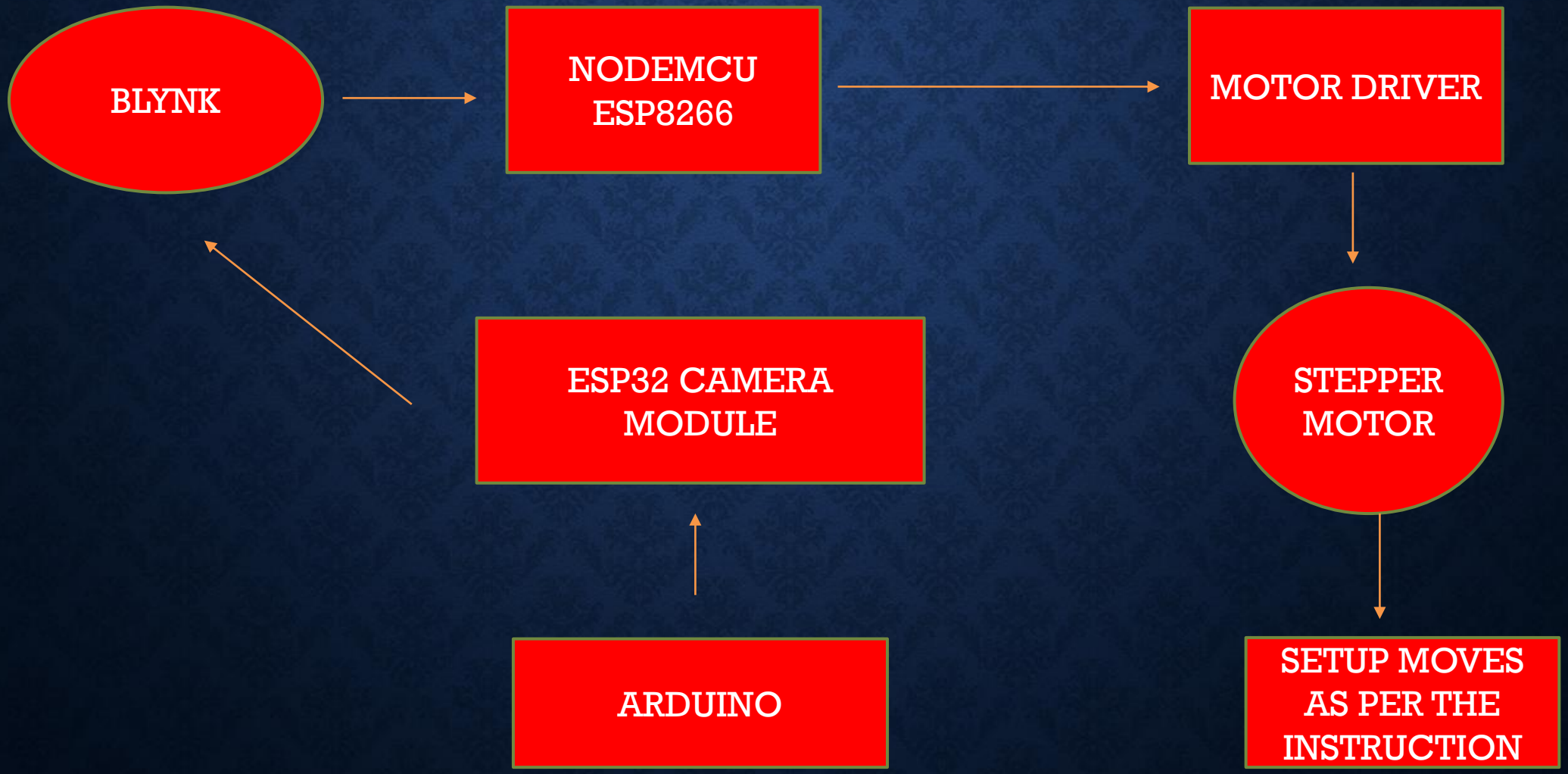
MOTOR DRIVER: Motor driver drives the stepper motor by taking inputs from NODEMCU

STEPPER MOTOR: Stepper motors, due to their high pole count, offer precision drive control for motion control applications. It is used to drive the screen to and fro.

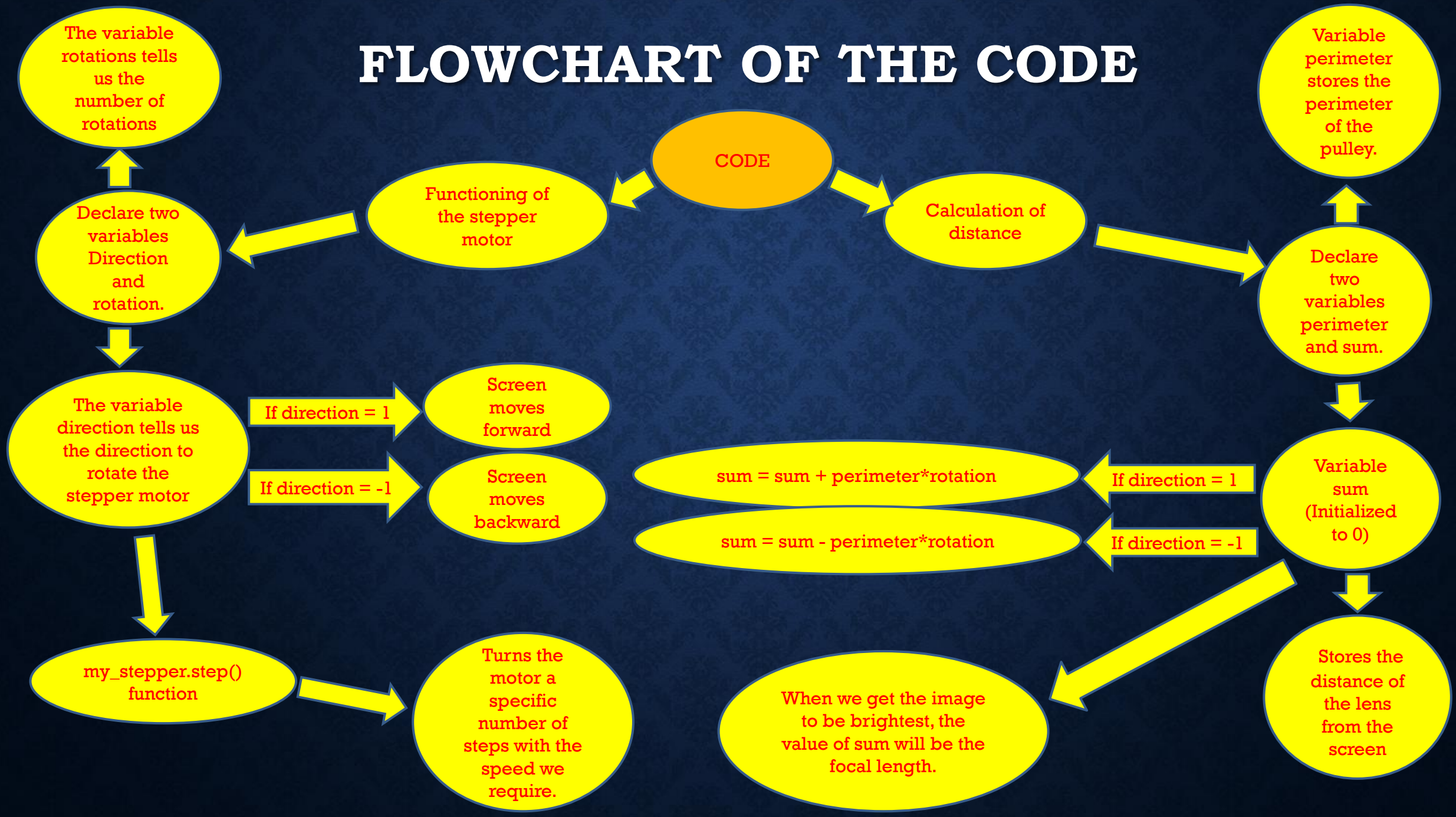
SETUP DIAGRAM



BLOCK DIAGRAM OF THE SETUP



FLOWCHART OF THE CODE



DASHBOARD

- We are using BLYNK for dashboard purpose.
- Blynk is a platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and android device.
- We are using 3 pins in the BLYNK software
- V0,V1,V2
- V0-moves forward
- V1-moves backward
- V2-display's distance between screen and lens.
- A camera module has been used for streaming the brightness of image on the screen.

WORKING DEMO OF CONDUCTING AN ACTUAL EXPERIMENT REMOTELY

https://youtu.be/VsyIsez8oGo

ENTIRE PRESENTATION

- https://youtu.be/r5U2Ez0abLA