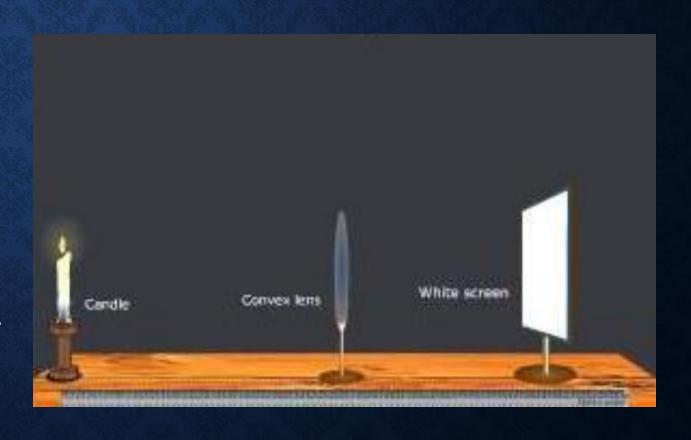
CCIOT PROJECT

TEAM NUMBER – 11

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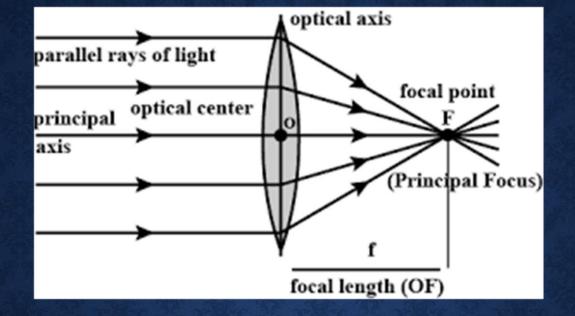
CALCULATION OF FOCAL LENGTH OF SPHERICAL LENS

- 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 $u = \infty$, $\frac{1}{u} \to 0$

So the equation becomes,

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

So the image will form at the focus.

MAIN COMPONENTS USED

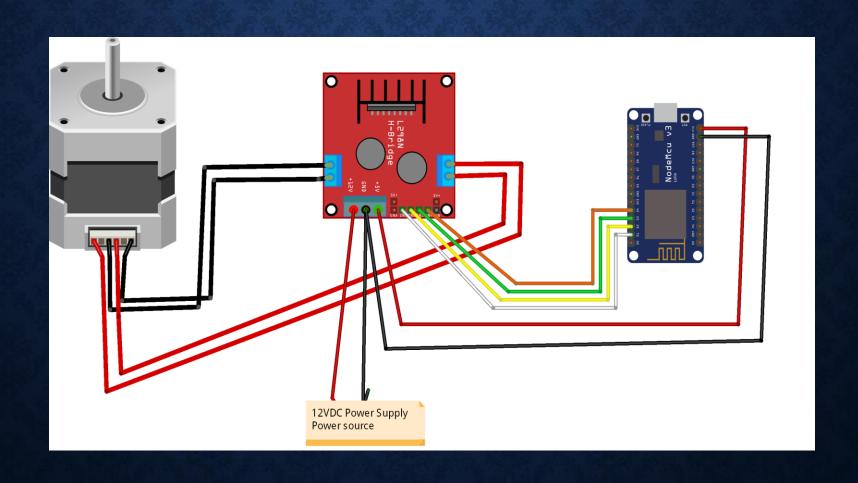
ESP8266: This is used for networking, data processing. This helps us to connect to wifi It is the heart of our setup

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

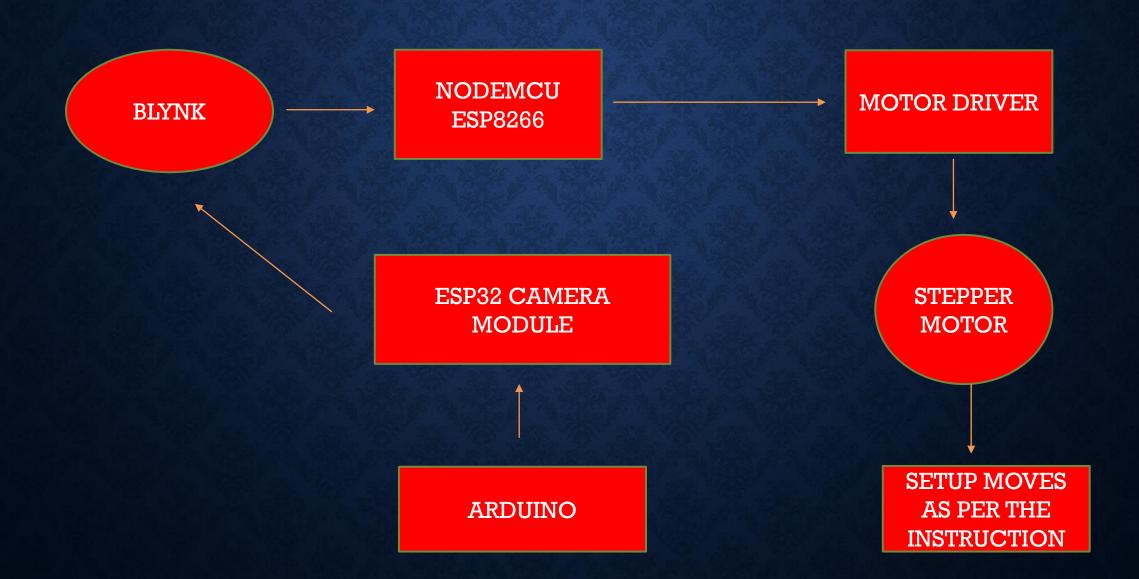
MOTOR DRIVER: Motor driver drives the stepper motor by taking inputs from NODEMCU

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



The variable rotations tells us the number of rotations

FLOWCHART OF THE CODE

CODE

Variable perimeter stores the perimeter of the pulley.



Declare two
variables
Direction
and
rotation.

Functioning of the stepper motor

Calculation of distance



Declare two variables perimeter and sum.



The variable direction tells us the direction to rotate the stepper motor

If direction = 1

If direction = -1

Screen moves forward

Screen moves backward sum = sum + perimeter*rotation

sum = sum - perimeter*rotation

If direction = 1

If direction = -1



Variable sum (Initialized to 0)



Stores the distance of the lens from the screen

my_stepper.step() function

Turns the motor a specific number of steps with the speed we require.

When we get the image to be brightest, the value of sum will be the focal length.

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/VsyLsez8oGo

ENTIRE PRESENTATION

• https://youtu.be/r5U2Ez0abLA