1. Hardware Setup

To begin, ensure you have the following hardware components:

- **Raspberry Pi**: Any model that supports GPIO pins and can run the latest version of Raspberry Pi OS.
- **Camera Module**: A PiCamera module is necessary for image capturing.
- **Servo Motor**: Used for moving the camera to adjust focus.
- **Breadboard and jumper wires**: For connecting the servo motor to the Raspberry Pi.
- **Power Supply**: Suitable for the Raspberry Pi and peripherals.

Connections:

- Connect the camera module to the CSI port of the Raspberry Pi.
- Connect the servo motor to one of the GPIO pins (e.g., GPIO 11 as mentioned in your script).

2. Software Setup

Before running the script, you'll need to install various software components and libraries:

Operating System:

- **Install Raspberry Pi OS**: Download the latest version from the Raspberry Pi website and flash it onto an SD card using software like Raspberry Pi Imager.

Python and Libraries:

- **Python**: Ensure Python is installed. Raspberry Pi OS typically comes with Python pre-installed.
- **OpenCV and PiCamera**: You will need OpenCV for image processing and the `picamera2` library for controlling the PiCamera module.

```
bash
Copy code
sudo apt update
sudo apt install python3-opencv
pip3 install picamera2
```

GPIO Library:

- **RPi.GPIO**: This is used to control GPIO pins. It's often pre-installed, but you can reinstall or update it:

```
bash
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pip3 install RPi.GPIO
```

3. Enable Interfaces

Through the Raspberry Pi Configuration settings:

- **Enable Camera**: Go to Preferences > Raspberry Pi Configuration > Interfaces, and enable the camera.
- **Enable SSH** (optional): If you need remote access to the Raspberry Pi.

4. Testing Hardware:

- **Test the Camera**: Check if the camera is working with a simple capture test using the `picamera2` library.
- **Test the Servo Motor**: Run a basic script to see if the servo reacts correctly.

5. Code Deployment

- **Transfer Your Script**: Use SCP or a USB drive to transfer your script to the Raspberry Pi.
- **Run the Script**: Navigate to the directory containing your script and run it with Python3.

```
bash
Copy code
python3 your_script_name.py
```

6. Troubleshooting

- Ensure all connections are secure.
- Check the terminal output for any error messages that can help in diagnosing issues with the script or hardware.