Appliance control using Gestures

Context:

I have made a small working prototype of a gesture-based appliance control system using computer vision and Arduino nano. For prototyping stage I've used my pc for processing, but any micro-processor-based board can be used (e.g., Raspberry Pi) with an external webcam (or PiCam) to shrink the size of the project.

Working:

It uses OpenCV and mediapipe library for real-time hand land mark detection from the webcam and based on that it returns the co-ordinates of the hand landmarks. Once the co-ordinates are obtained, some mathematical algorithms are applied to check how many fingers are raised (by that gesture is detected) and that number is stored in a variable. With the help of pyserial library it is passed to the Arduino serially, now with this information Arduino is programmed to perform certain tasks based on the information obtained from the python script. I used small LEDs for the demonstration, but AC appliances can also be controlled by the use of relay.

Applications:

As discussed earlier, this can be used in a smart home to control AC appliances with just hand gestures, control the speed of the fan, control volume, control brightness of the lights, or even open/close the door stopper through gestures (with the use of servo motor), this can be very helpful for old age people who have limited mobility. To avoid false detections different algorithms can be applied and programmed so that it only works if a certain gesture is made.

Prototype:

This is a link and QR code to the working video of the prototype,

Code:

This is a link and QR code to the code used in this project,

Future Scope:

I am planning to integrate this with RF module and make multiple nodes so that by sitting in a single room appliances of entire house can be controlled and its range can be increased.