

## **Home Automation Using Hand Gesture Recognition**

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### **ABSTRACT**

Automation is the new trend, and it is the future of mankind. The quantity of tasks that must be done in a short period of time is so huge that human intervention is not possible. Automation is an integral part when it comes to fields like Data Science and Data Analytics. Home Automation is a major subdivision under automation and makes our lives way easier. We propose a system that automates low power consuming appliances at home with the help of simple hand gestures. The proposed system will be of great help to the old aged members who find it extremely difficult to operate such appliances.

**Keywords:** Arduino, APDS-9960, Gesture Sensor, Gesture Recognition, Home Automation.

### **I. INTRODUCTION**

In general, the old, aged members find it difficult to operate electrical devices at home. There might be multiple switches on the switchboard, and they will have a hard time figuring out which switch is mapped to the desired appliance. Also, if the house has multiple floors, it will be very tedious for them to climb up the stairs to turn on the device. This is where the proposed model will be helpful. We can connect multiple devices to the model irrespective of where the device is in the home. The device will be controlled via simple hand gestures. The gestures are extremely simple, and the users need not invest time in memorizing the gesture. Also from one fixed location, we can control any device. Thus, the proposed system will be a one stop destination for all the household problems faced by the old, aged members.

### **II. HEADINGS**

This paper contains 6 Sections and a few sub-sections in which the proposed model/system have been explained in detail. The sections are named as follows:

1. Introduction
2. Headings
3. Construction and Proposed Methodology

Construction

Algorithm

Complete Working

4. Figures and Tables
5. Conclusion
6. Acknowledgements

Future Scope

### III. CONSTRUCTION AND PROPOSED METHODOLOGY

#### **Construction-**

- (a) LCD - A 16\*2 LCD display will be used. It is used to show or display the device of our choice.
- (b) Gesture Sensor - The APDS-9960 is an advanced gesture sensor used in mobile phones to detect hand gestures. Here the sensor will be used to detect the hand gesture. The sensor has 6 pins and the pins are connected to the respective points. Refer Figure 1.
- (c) Relay - Also 12V 2A Relays are used here. They are just used to control the AC appliances. They are connected to the Arduino with the help of BC547 transistor.
- (d) Toggle-Switches - We are using a tactile switch here to turn the system ON or OFF. The toggle switch is connected to the pin 7 of the Arduino.
- (e) Power-Supply - There are 2 major components in this circuit: The Arduino and the LCD module which needs 5V regulated DC power each. Also, we have 4 relays which need 12V regulated DC supply. The AC mains will provide the input power. The input supply will be stepped down using a step-down transformer and we will be using a full-bridge rectifier to rectify the output. Next, we will be using 7812 and 7805 IC's to regulate the input to 5V and 12V respectively.

#### **Algorithm**

##### **m -Steps**

1. Click on the Toggle Button to turn button to turn ON the device.
2. The welcome message will be visible on the LCD and we can make our choice. Device 1 will be connected by default.
3. Hover our hand over the sensor either in left to right or right to left manner to toggle between the devices.
4. Hover our hand along the vertical axis to turn ON or OFF the device.
5. If we move our hand towards the sensor, all the devices will be turned ON. Repeat the

process and all the devices will be turned OFF.

### Complete Working -

- By providing power supply to the circuit, Arduino board loads the libraries required for the process. Out of all required libraries, the Spark fun library controls the gesture sensor operation which helps the user to initialize the system automation. By default, all the appliances are turned OFF by sending an active low signal/logic at the required pins of Arduino. LCD starts to display the list of appliances in a list format by using earlier messages. Now user can move or hover the finger in front of the gesture sensor. By moving the finger upwards, selected appliance is turned OFF and by moving downwards, appliance is turned ON, and the appliances are controlled by the logics generated by Arduino pin connecting to the relay.
- The Spark fun library uses a gesture method called readGesture() which detects the gestures made by the finger moving left, right, upwards, downwards, near and far, the values of the variables in the method can be changed accordingly. The status of the selected appliance can be traced by using the status of the variables in the method. Primary feature of the libraries is proximity detection which controls all the appliances.

### IV. FIGURES AND TABLES

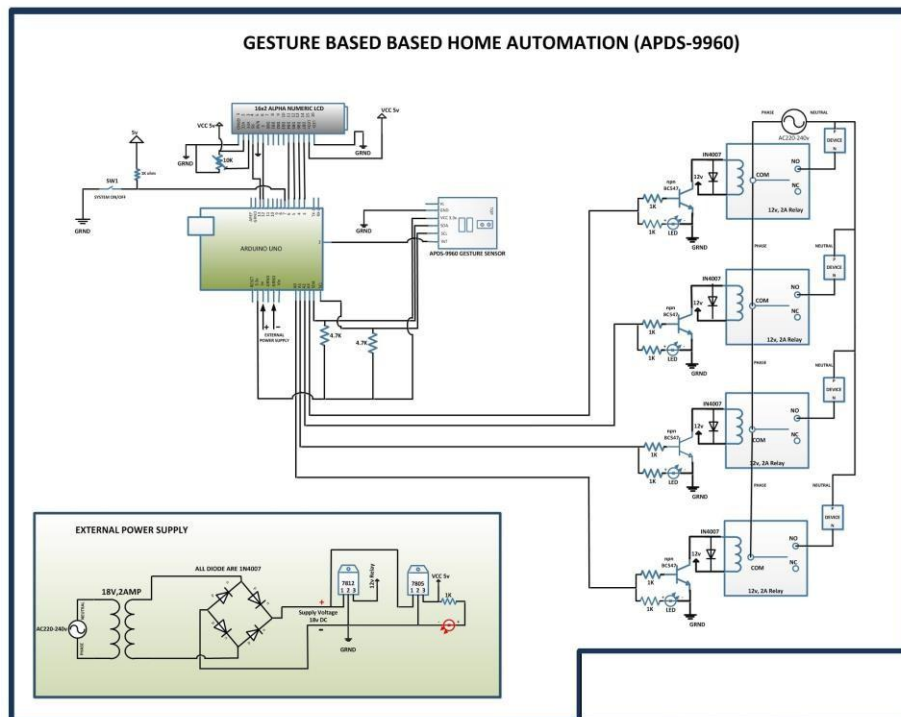
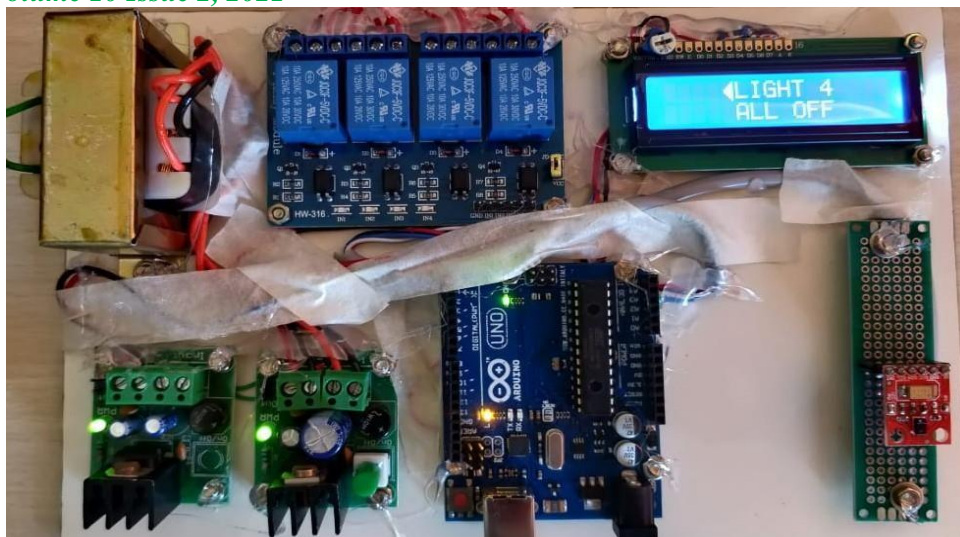


Fig 1: Circuit Diagram



**Fig 2: Final Output (Working Model)**

## V. CONCLUSION

- This system is just a first-generation prototype model. Keeping in mind the hardships faced by the old-aged members, we devised this system to cater to their needs. Just by hovering over the sensor in the horizontal axis, we can select the device. Moving along the vertical axis can turn the device ON or OFF. This system can control any device irrespective of where it is in the house. Thus, from one fixed location we can control any device.
- The growth of home automation has been exponential in the last decade. The advancements in this field have made our lives easier. This system is just a minor addition to this vast field of automation. The system is still in its early stages. With proper improvements this system will be a boon to millions.

## VI. ACKNOWLEDGEMENTS

- Final Output: Refer Figure 2.
- The output model is working perfectly and available for commercial use.
- As described earlier when we move our hand in the horizontal axis, we can toggle between the devices. We can select any device as we desire.
- Hovering our hand in the vertical axis will turn the device ON or OFF.
- Moving our palm into the sensor will turn ON all the devices at once. If we repeat the activity, all the devices will be turned OFF at once.

## **6.1 Future-Scope:**

### 1) Limitations

- Proposed model or system can be heavy.
- The system can support up to a maximum of only 4 devices.
- As the distance between the device and the processor increases, the overhead wiring costs increases.
- If the sensor fails, the entire setup won't work.

### 2) Future-Works

By overcoming the limitations mentioned above:

- Model size can be reduced by enhanced industry support and advanced engineering. The entire setup can be mounted inside a small container.
- To add more devices, more relays must be attached. That will not be a feasible solution as it increases the size of the setup. This is something which needs to be explored.
- Wireless communication is the future. We need not perform wiring but connect the devices wireless to the hub with the help of Bluetooth module.
- To prevent the failure of the sensor, an additional sensor can be attached. As and when the primary sensor fails, the secondary takes over.
- All these will improve the efficiency of the model.

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