

# Review on Gesture Based Home Automation System

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**Abstract-** Today's world many people are suffering from Physical disabilities and most of the physically disabled patient's dependent on care takers. In extreme cases, the patient may be speech impaired which makes it difficult for him to communicate with others and to express his needs. Providing solution to these inabilities is the prime motive of this proposed work. The physically disabled persons require special assistance from care takers or other persons to lead their normal life and even at home it is not convenient for them to control the home appliances according to their wish. In the modern life, they usually forgot to switch off the lamp after using it can cause electrical waste. This is the one of the major problem facing cities of the world. Because our busy life is a common thing that will happen to waste our electricity. The basic problems faced by disabled people in single day life in their own house to turn ON or OFF the equipment's like lights, fans and difficulty in analyzing switches are observed many times. And the side issue being faced are wasteful use of electricity. The aim in our project is to design smart switch using hand gesture detector for disabled people.

**Keywords-** Appliance, Switch, Lamp, Gesture etc

## I. INTRODUCTION

One of the most recent used in communication system in the present world of technology is Global System for Mobile Communications (GSM). It has become very popular and one of the wireless communication system that is reliable to use. In addition, it is also accessible to be used by people and very user friendly. One of the factors that make this system reliable to use is the cost effective which makes it is affordable to be owned by consumers. People with disabilities, also known as people with disabilities, are an integral part of our society. They are individuals who have various physical, sensory, intellectual, or mental conditions that may affect their daily activities. Although they may face certain challenges and obstacles, they also have the same desires, potential, and dreams as everyone else. It is important for us to understand that disability is a natural part of human diversity. None of us is completely free from the risk or possibility of developing a disability at some point in our lives. Therefore, it is our duty as a society to create an environment that is inclusive, supportive, and provides fair

opportunities for all individuals, regardless of their physical or mental abilities. Through an inclusive approach, we can ensure that people with disabilities have equal access to education, employment, health services, and participation in social life. They have the same right to be valued, heard, and respected as productive and meaningful members of our community. An inclusive approach also involves removing barriers that may exist in the physical environment, communication, and culture. By applying universal design and paying attention to individual needs, we can create greater accessibility for everyone. This not only benefits people with disabilities, but also benefits the entire community, because when no one is left behind, we all grow together.

## 1.2 Background Research

In the world, the statistics state that there are around ten billion people who are either blind, deaf or dumb. One of the challenging tasks is to have a mode of communication between a disabled person and a normal person. So, it becomes an essential task to establish a mode of communication with them. For dumb, deaf and blind people sign language is the best possible way to communicate. It uses patterns, gestures instead of sound to elaborate on their information. It involves the usage of different body parts for sign language such as palm, bending of fingers and hand, arms or body, facial expressions and lip-patterns for conveying the messages. technology has the power to transform lives and create inclusive solutions for everyone. One such innovation is the smart switch with hand gesture recognition, designed specifically to empower and assist individuals with disabilities. This groundbreaking device utilizes cutting-edge technology to enable individuals with limited mobility or physical impairments to control their surroundings effortlessly. The smart switch with hand gesture recognition revolutionizes the way people interact with their environment by eliminating the need for traditional physical switches or buttons. It harnesses the power of hand gestures to activate and control various devices and appliances, providing a new level of independence and convenience for individuals with disabilities.

## 1.3 Problem Statement

- Can save electricity from being wasted.

- Various application can be controlled by smart phone.
- Disabled people can live independently.
- Making it easier for people with disabilities to control the switch through a smart phone.

#### 1.4 Research Objectives

There are several objectives that have been outlined in making this system. First, the system need to be developed with several circuit and IoT configuration. Other than that, this project 2 objective is to test the functionality of the system after it is developed. Lastly, the objective for this system is to verify the performance of the developed system. More specifically the principle objective of this research are:

- To design a smart switch for home application.
- To design a smart switch through wireless control.
- To develop application for controlling.

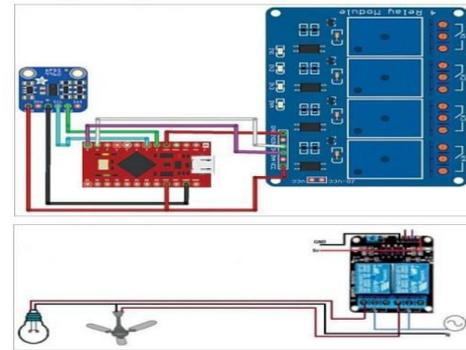
## II. LITERATURE REVIEW

A literature review is a piece of academic writing demonstrating knowledge and understanding of the academic literature on a specific topic placed in context. A literature review also includes a critical evaluation of the material; this is why it is called a literature review rather than a literature report. It is a process of reviewing the literature, as well as a form of writing. Smart Switch using hand gesture detector for disabled people a project that utility and convenience for disabled people at home. As we know, hand gesture has been made by many people. So, we took the idea from home automation and applied some of it in my project. To illustrate the difference between reporting and reviewing, think about television or film review articles. These articles include content such as a brief synopsis or the key points of the film or programmer plus the critic's own evaluation. Similarly, the two main objectives of a literature review are firstly the content covering existing research, theories and evidence, and secondly your own critical evaluation and discussion of this content

#### 2.2 Developing of Smart Switch With Hand Gesture For Disabled People Using Arduino And Oled

The smart switch includes a sensor that can detect hand movements and translate them into commands for controlling lights, fans, and various other home appliances. When you move your hand from down to up direction in front of the sensor, as shown in Figure, light will switch on and at the same time an up arrow will be displayed on the OLED. If

you move your hand from up to down position, the light will switch off and 5 a down arrow will be displayed on the OLED. Similarly, when you move your hand from left to right in front of the sensor, the fan will switch on and a left arrow symbol will be displayed on the OLED. If you move your hand from right to left, the fan will switch off and a right arrow will be displayed on the OLED.



**Fig. 1 Developing of Smart Switch with Hand Gesture for Disabled People Using Arduino and Oled.**

#### 2.3 Smart Home Design for Disabled People based on Neural Networks

Smart Home system design has the characteristic of automatic control of different areas of the house. Pre- defined timers may be set, according to the users need and throughout adaptive learning, to switch ON/OFF lights, AC, coffee machine, music, TV and all other devices. Also, user defined timers are possible to provide the users with a feeling of control over their house.

#### 2.4 Gesture Controlled Contactless Switch for Home

To avoid the risk of contracting Covid19, it is important not to touch surfaces including switches, doorknobs, and keys that have been frequently used by other people. This project is for a contactless switch that works with hand gestures

#### 2.5 Smart Lighting Prototypes for Deaf Disabled People

People with reduced hearing cannot hear a fire alarm or bell sound when someone comes to their house. This study aims to design a smart light system to provide information to deaf people through lamps. The study methods used are research, analysis and design, as well as implementation of designed tools. The result is to provide information to people who have hearing disabilities to the sound they cannot hear.

#### 2.6 Smart Home Applications for disabled Persons

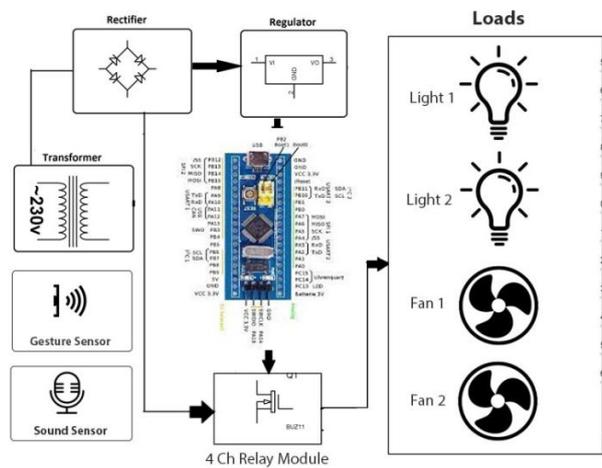
Facing problems like wastage of time and fuel finding free space around the parking ground when we need to park our car which requires a good amount of lighting and anyone can park anywhere that sometime causes damage to the vehicles while moving out or in the parking lot.

**III. THEORETICAL DESCRIPTION**

Our principle in this approach is quite simple, but we feel most complex projects also have very small solutions. So we have used this sort of guideline. This project can be explained in form of stages. First, the detection process will be done where gesture detection will happen. Before the detection it checks for proximity values whether an object comes near it if any object comes to it then it starts detection. After detection it starts the recognition process after this it will extract values from the experiment. Those values will be validated by the controller and it will perform the final task i.e, execution. We are using a sensor that is capable of doing multiple tasks in our project. Anyhow the main component in our project is the controller. Our project consists of a single sensor which is used for detection purpose. We are using the common but most novel approach. This model will detect and then execution will be done based on commands fashion. In this project, the apds9960 is used to perform the task of detection and recognition. We used this sensor because it can perform multiple tasks. Switches plays major role in controlling multiple devices connected to the hub. Some kind of switches are circuit breakers and circuit maker, it actually connects the particular device to the hub when it is required. Switches permit you to control who approaches different pieces of the organization. Switches allows us to monitor the whole model. The digital values from the sensor will be sent to Aurdino. We are using Aurdino as our controller. Here it will control the whole project. A 5v power supply is connected to Aurdino to work. The controller will send the supply to the respective digital pin. The output voltage of Aurdino is 5v so when we declare digital write HIGH then the whole 5v will be delivered to that pin. Then the appliance which is connected to that pin will be switched on. We are using a relay module to switch. Relay is an mainly used switching purpose in embedded system projects. To operate 230v appliances we require this relay module. By giving zero or five volts it perform switching from normally open to normally close state. We will make the relay connected pin high. The controller will assign different directions to different applications. The sensor can detect 6 directions for each direction respective task will be executed by the controller. There is a display module to display the status of the switch which will help the user to know the status of the switch. We are using a 1.3' OLED display which increases the feasibility of this model. To make the model more feasible we are adding two methods. The

second one is based on IoT here we will create a web page using HTML. Some approaches are using the application but in the addressed application, the user has no tie to install and operate so we are using a web page where no login or installation and awareness is required, just a user who knows to operate a smartphone can use this model with ease. On the web page, we create two buttons for each switch which are denoted by ON and OFF along with that the status of the switch is also displayed

**IV. PROJECT PROCESS**



**Fig. 2 Block Diagram**

**V. HARDWARE DETAILS**

- FAN



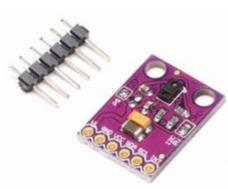
5V DC fan is a compact and low-power device that provides cooling and airflow in various electronic applications. Its size, airflow capacity, bearing type, and noise levels can vary, allowing users to select a fan that suits their specific cooling needs while considering factors such as power consumption and space constraints.

- BULB



The choice of bulb depends on factors such as energy efficiency, brightness, color temperature, and the specific requirements of the lighting application. It's worth noting that there is ongoing development in lighting technology, and newer options like LED bulbs are becoming increasingly popular due to their energy efficiency and long lifespan.

• **Gesture Sensor**



This is the RGB and Gesture Sensor, a small breakout board with a built-in APDS-9960 sensor that offers ambient light and color measuring, proximity detection, and touchless gesture sensing. With this RGB and Gesture Sensor you will be able to control a computer, microcontroller, robot, and more with a simple swipe of your hand! This is, in fact, the same sensor that the Samsung Galaxy S5 uses and is probably one of the best gesture sensors on the market for the price. The APDS-9960 is a serious little piece of hardware with built-in UV and IR blocking filters, four separate diodes sensitive to different directions, and an I2C compatible interface. For your convenience, we have broken out the following pins: VL (optional power to IR LED), GND (Ground), VCC (power to APDS-9960 sensor), SDA (I2C data), SCL (I2C clock), and INT (interrupt). Each APDS-9960 also has a detection range of 4 to 8 inches (10 to 20 cm)

**Features:**

- RGB and Gesture Sensor
- APDS-9960 sensor

**Specifications**

- Model: GY-APDS9960-3.3
- chip: APDS-9960
- Power supply: 3.3v
- Communication: IIC communication protocol
- Size: 20 mm \* 15.3 mm

• **Relay**



- T73 Type Relay (Sugar Cube Relay)
- Coil Voltage: 5V DC
- NC Contact Rating: 10A @ 125V AC / 30V DC
- NO Contact Rating: 10A @ 250V AC
- Model No: JQC-3FC(T73)

This is a 5V 10A T73 Relay. This sugar cube relay has an operating voltage of 5V and has a maximum current capacity of 10A. This makes it most suitable for use in microcontroller-based devices. It is a SPDT Relay. It has 3 output connection terminals, NO, NC, and COM.

• **Transistor**

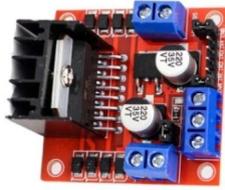


2N2222A is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

**Features:-**

- Advanced process technology
- Low error voltage
- Fast switching speed
- Full-voltage operation
- High power and current handling capability

**L298N motor driver module**



L298N 2A Based Motor Driver is a high power motor driver perfect for driving DC Motors and Stepper Motors. It uses the popular L298 motor driver IC and has an onboard 5V regulator which it can supply to an external circuit. It can control up to 4 DC motors, or 2 DC motors with directional and speed control. This motor driver is perfect for robotics and mechatronics projects and perfect for controlling motors from microcontrollers, switches, relays, etc. Perfect for driving DC and Stepper motors for micro mouse, line following robots, robot arms, etc.

#### Features

- Current Sense for each motor.
  - Heatsink for better performance.
  - Power-On LED indicator.
  - Double H bridge Drive Chip: L298N.
  - Operating Voltage(VDC): 5~35
  - Peak Current (A): 2
  - Continuous Current (A): 0-36mA
  - No. of Channels: 2
  - Over-Current Protection (A): Yes
  - Thermal Protection: Yes
- **Toy Motor**



This is the DC motor, which can be used in any DIY project or in the small toys. With an operating voltage range of 3V-6V this motors can be operated using two AA batteries or with a 5V USB power supply.

- **Arduino Nano**



Nano V3.0 ATmega328P 5V 16MHz CH340 Type-C microcontroller is a small, complete, microcontroller board based on the ATmega328 MCU. It has more or less the same functionality as the Arduino Duemilanove but in a smaller package. It lacks only a DC power jack and uses the more compact USB Type-C connector instead of a standard USB connector. It is compatible with Arduino programs and the Arduino IDE. This version of the Nano uses the CH340G USB interface controller. It can be powered via the USB Type-C connection, a 6-20V unregulated external power supply (pin 30), or a 5V regulated external power supply (pin 27). The power source is automatically selected as the highest voltage source.

#### Features:

- CH340G USB bus converter chip replaces FT232RL
- Operating Voltage(logic level): 5V
- 8 analog input ports: A0 – A7
- 14 Digital input/output ports: TX, RX, D2 – D13
- 6 PWM ports: D3, D5, D6, D9, D10, D11
- 1 pair of TTL level serial transceiver ports: RX / TX
- Uses Atmel Atmega328P-AU MCU with bootloader installed
- Support USB download and Power over Mini-B Mini USB connector
- Recommended input voltage: 7V – 12V DC on pin 30 or 5V on pin 27
- Maximum input voltage limits: 6V – 20V
- Supports ISP download

## VI. WORKING

In the initial stage user's finger needs to be placed close to the sensor to activate the sensor. We have written the code like that, it first checks the proximity then the actual function of the sensor will be activated. The person needs to move the finger, just by spacing about 6cm to 10cm. The sensor will detect the finger and movement of the finger then recognizes the direction of movement then the data is sent to the controlling unit.

Contact switches are today the most common method used for switching off home appliances, lights, fans. Etc. But are they the most efficient way for load switching Well here are some disadvantages for traditional switches:

- Toggle switches are based on physical press hence have a limited lifetime
- One switch can operate only one load hence we need large switchboards

- These switches are not contactless so prone to wear and tear

How about we design a switching system that overcomes all these issues with a more modern yet low cost system. We hereby design a single switch that can operate 4 loads and that too without the user ever needing to touch the switch.

The system is made using a STM32 controller that is used to operate an gesture based switch. It is also integrated with a sound sensor for even faster operation speed and ease of use. The system is used to operate 4 loads at a time using single switch. The controller constantly monitors the gesture sensor for any human gestures. Hand gestures made within 5 – 10 centimeters proximity of the sensor are sensed by the system. As soon as a gesture is sensed the controller operates the relay board to switch On or OFF the respective load as per gesture. Also the user may just clap anywhere near the switch in order to switch ON or OFF all loads at a clap. The system operates loads using relay board in following manner

- Left Swipe >> Light 1 Switching
- Right Swipe >> Light 2 Switching
- Up Swipe >> Fan 1 Switching
- Down Swipe >> Fan 2 Switching
- Clap >> All Loads Switching Together

This allows for an ultra-modern yet space saving, futuristic switching system that may one day replace all traditional switches

## VI. CONCLUSIONS

In summary, based on the results that were attached in the previous section, I discovered that this project fully achieved the three main goals that were mentioned previously, such as being able to develop a project that saves money, manpower, being able to quickly locate the sensor fault, and only the problematic area needs to be drug up in order to check and repair the fault, and allowing authorities to monitor and test issues Application. According to the results and discussion that have been discussed, gyro motion sensor fault detection would make repair work easier and provide the user with accurate results. Because gyro motion sensor is now widely used, in this project, the users can save money, people, and time in maintaining it. Furthermore, using IOT technology, the collected data will be displayed and logged onto the webpage via a Wi-Fi module to accelerate reporting and documentation. On the benefits side, this research can save organizations time, energy, and money. Depending on the chosen approach, appropriate hardware components such as

cameras, sensors, or depth-sensing devices may be required for gesture recognition. These components should be selected based on their compatibility, accuracy, and reliability. Developing the gesture recognition algorithms and software interface is a crucial aspect. Machine learning techniques, such as convolutional neural networks, can be employed to train the system to recognize specific hand gestures accurately. Consider providing options for users to customize gestures based on their comfort and capabilities. This allows individuals to define gestures that are most suitable for their unique physical abilities.

## REFERENCES

- [1] Delgado, A. R., Picking, R., and Grout V. (2006) "Remote-controlled home automation systems with different network technologies", Proceedings of the 6th International Network Conference, University of Plymouth, 357-366.
- [2] Bhattarai, Dherendra, Amit Kumar Singh, Sanjeev Newpaney, and Pawan Pyakurel. "Design and Prototype Implementation of a Renewable Energy-Powered Home with Home Automation System Using Internet of Things (IoT)." In *Advances in Greener Energy Technologies*, pp. 489-504. Springer, Singapore, 2020
- [3] Vikram, N., Harish, K., Nihaal, M., Umesh, R., Shetty, A., & Kumar, A. (2017). "A Low-Cost Home Automation System Using Wi-Fi Based Wireless Sensor Network Incorporating Internet of Things (IoT)". *Advance Computing Conference (IACC)*, 2017 IEEE 7th International, 174-178
- [4] Malik Sikandar, H. K., Aihab K., Erum S. (2009). "SMS Based Wireless Home Appliance Control System (HACS) for Automating Appliances and Security." *Issues in Informing Science and Information Technology*, 6, 887-894.
- [5] Ashraf, I., Umer, M., Majeed, R., Mehmood, A., Aslam, W., Yasir, M. N., & Choi, G. S. (2020). "Home automation using general purpose household electric appliances with Raspberry Pi and commercial smartphone." *PLOS ONE*, 15(9), e0238480. <https://doi.org/10.1371/journal.pone.0238480>
- [6] P., K. (2020). "A Sensor based IoT Monitoring System for Electrical Devices using Blynk framework." *September 2020*, 2(3), 182-187. <https://doi.org/10.36548/jei.2020.3.005>
- [7] Paudyal, P., & Ni, Z. (2019). "Smart home energy optimization with incentives compensation from inconvenience for shifting electric appliances." *International Journal of Electrical Power & Energy Systems*, 109, 652-660. <https://doi.org/10.1016/j.ijepes.2019.02.016>

- [8] Khan, M., Silva, B. N., & Han, K. (2016). "Internet of Things Based Energy Aware Smart Home Control System." *IEEE Access*, 4, 7556–7566.  
<https://doi.org/10.1109/access.2016.262175>