

GESTURE Based HOME AUTOMATION

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Abstract—With the rapid evolution in technology, home automation systems have a high popularity and huge demand. A Home Automation System gives an approach to all household devices and appliances. However, existing innovations in this domain operate mainly on voice. This paper presents a system that relies on hand gestures to control household devices and appliances. A glove with sensors and Arduino Microcontroller works as the central hub. Carrying out gestures while wearing the glove executes various tasks.

Keywords- *Gesture, Home Automation, Flex Sensors.*

I. INTRODUCTION

Gestures play a very vital role in daily communication. Gestures are also becoming an increasingly popular form of user computer interaction. This paper presents how a flex bend sensor-based home automation system works, the limitations of this glove interface, and how we can optimise the performance of such a glove interface. The most important use of this method is to control various appliances using hand movements and gestures. This will act as a remote control for handling all the electronic devices and appliances in a house. However, this will be achieved through hand gestures rather than switches. Every gesture is uniquely interpreted, and the task is performed accordingly. Hence, the system promotes ease to use and provides efficiency to the household. Hand gestures can be detected by a controller that contains accelerometers & flex to sense tilting and acceleration of gestures. The detected and recognised hand gestures are used as the command signals for controlling various devices and appliances. This technology is suitably used for home automation in a cost-effective manner and efficient. Furthermore, this system will help disabled people to control their appliances hassle-free.

II. MOTIVATION

In today's era where everything is moving towards Voice Assistants, we believe that they're a hassle over convenience. Voice-based systems need high precision for accurate results and can sometimes be complex for the elderly. This project is essential for the necessities of the incapacitated people. Gesture Controlled automation is highly appropriate for deaf-dumb and old aged people who cannot speak loud and clearly and is easy to use than input-output voice assistants.

III. LITERATURE SURVEY

Home Automation is used to control and manage home appliances remotely or automatically. As a result, automation increases productivity, efficient use of devices and enhances safety. As a reference, we can see the various works by other authors and researchers who have focused on Gesture-based Home Automation.

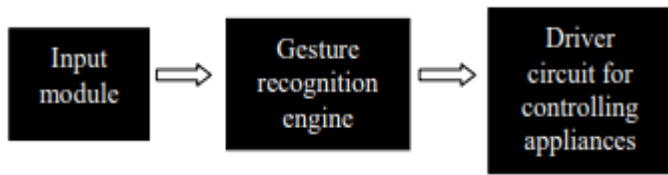
A system is proposed in [1], which manages appliances and monitors the activities of specially-abled remotely. Furthermore, the system which is presented accurately recognises the corresponding gestures and executes the desired function.

The paper [2] has proposed a new dataset for the analysis community in user gesture recognition by embedding an accelerometer and gyroscope and many other sensors with an economical IoT device.

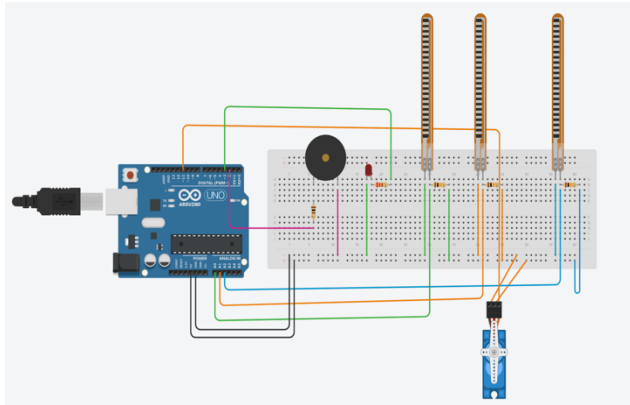
[3] Hand Gesture Recognition System used to control intelligent home machines utilising hand developments utilising Hidden Markov Model Algorithm and Microsoft Kinect Sensor.

The system in [4] takes the gesture as an input using an android application and Raspberry Pi for analysing and undergoing respective actions.

This paper [5] puts forward hand gesture-based home devices based on hand gesture recognition using pose estimation.



IV. PROPOSED MODEL



The peripherals which are used for our project is mentioned below,

Arduino Uno:

The Arduino Uno is a microcontroller unit. The board has twenty pins, of which fourteen are digital I/O pins, and six are analog I/O pins. Arduino IDE can be programmed using a USB cable powered by a laptop or a 9-volt battery. It also has a flash memory of 32 KB.

Flex Sensor:

Flex sensors are sensing element that reverts the resistance depending upon the amount of bend action on the sensors which mainly deals with edge movement assessment. The outcome of a flex sensor is that when we kink a sensor, the respective sensor produces a resistive output signal, which is associated with the bend radius of the flex sensor element. Therefore, when the curve is nominally smaller, the output will be accordingly higher.



The higher the change in the deviation (flexion) of the flex sensor, the higher the variance in resistance takes place. A potentiometer is used to evaluate the corresponding resistance changes. It is fed to the Analog to Digital Converter, which converts these values into equivalent digital values and provides them to the Radio Frequency module through which it is transmitted accordingly.

Personal computer:

The personal computer (PC) is a relatively large computer structured for an individual user.

Liquid Crystal Display (LCD):

Microcontrollers are most often interfaced with the LCD display. The options of the digital display are intrinsic controllers. It has a 1/16 duty cycle, and it conjointly has 5x8 dots with the cursor.

Transmitter:

A set of devices used to produce trans-electromagnetic waves that carry the message or specifically the radio and television signals. Firstly, the modulated signal is conveyed to the LC filter section. Then, after filtering, the Radio Frequency modulated signal is transmitted by the antenna.

Relays:

Relay is a switch that is operated electrically and mechanically. The relay consists of electromagnets as well as the exposure set. The changing mechanism in a relay is performed with the assistance of an electromagnet.



The primary function of the relay occurs in places where only a low power signal can be used to control the model. It is also used in areas where you can only use a signal to control many circuits in which the application and relays have begun. They are also used variedly in telegraphy.

Buzzer:

A buzzer is an electronic audio device that makes a sound. Usually powered by a DC voltage, they can be divided into piezoelectric buzzers and electromagnetic buzzers. They also have many different designs and uses and can make different sounds according to them!

Servo Motor:



A Servo motor is a rotational device or a motor that can precisely manage the angular position, acceleration, and velocity. It has specific functions that regular motors do not comprise. Therefore, it uses a traditional electric motor and associates it with the corresponding sensor for position response.

V. WORKING

In this case, the input signal "detects" the appropriate input signal, bending the respective finger. When the specific finger is bent, the bend sensor linked with the finger will immediately alter the resistance value. The output value of this resistor is conveyed to the microcontroller. The code written by the processor verifies whether the sensor exceeds the minimum resistance output value.

Arduino Uno frequently takes data from the flex sensor and ensures to record its output value. If the flex sensor is deformed at any instant of time, Arduino can measure the corresponding resistance change. It is using conditional statements in the microcontroller code (Arduino IDE).

In the penultimate step, we use LEDs to connect to different digital I/Os on the Arduino. These pins can be controlled by an inbuilt function known as `digitalWrite()`. By using this inbuilt function, it can be used to turn on or off any LED. Likewise, Arduino can handle any other device connected to the digital pin in the same way.

A program written with a microcontroller contains some conditional statements or instructions.

After releasing the flex sensor, the LED turns off. We can also do this for various combinations of appliances. Since we can take the help of the flex sensor to turn on/off the LED, when the various flexible sensors vary the resistance, we can turn on/off multiple appliances. By using different combinations, we can connect multiple devices, audio, LED, etc., so that the application of this project is extensively efficient and is possibly used in numerous or varied applications that require gesture control.

VI. RESULT

The system is based on gestures and uses its rapid functionality and easy access to provide a stable system. Automation of simple tasks, such as opening/closing doors and windows, which regulates the velocity of the fan, on / off, etc., is done correctly. The data entry is also possible for the use of different devices in the database. The system is robust, efficient and precise and allows easy access to control and the monitoring of appliances. The configuration and installation of new devices are possible and easy.

VII. CONCLUSION

We have presented our work on gesture-controlled home automation which is devised with Flex sensor incorporation. This system also provides the reinforced and user-friendly mechanism in PowerPoint presentation slider movements, gadget control by this, and manages complete control within the environment. This is accomplished by using cutting-edge communication protocols which have been supervised and documented with specifically programmed computers. Advantages are flexibility and veracity, which can be helpful for the disabled too.

This project can be made more advanced by using raspberry pi and using image processing libraries such as OpenCV to detect various hand gestures; it will not be limited to gloves.

References

- [1] S. Kshirsagar, S. Sachdev, N. Singh, A. Tiwari and S. Sahu, "IoT Enabled Gesture-Controlled Home Automation for Disabled and Elderly," *2020 Fourth International Conference on Computing Methodologies and Communication (ICCMC)*, Erode, India, 2020, pp. 821-826, doi: 10.1109/ICCMC48092.2020.ICCMC-000152.
- [2] T. Le, T. Tran and C. Pham, "The Internet-of-Things based hand gestures using wearable sensors for human-machine interaction," *2019 International Conference on Multimedia Analysis and Pattern Recognition (MAPR)*, Ho Chi Minh City, Vietnam, 2019, pp. 1-6, doi: 10.1109/MAPR.2019.8743542.
- [3] S. Nigam, M. Shamoan, S. Dhasmana and T. Choudhury, "A Complete Study of Methodology of Hand Gesture Recognition System for Smart Homes," *2019 International ConfContemporaryntemporary Computing and Informatics (IC3I)*, Singapore, 2019, pp. 289-294, doi: 10.1109/IC3I46837.2019.9055608.
- [4] N. Kheratkar, S. Bhavani, A. Jarali, A. Pathak and S. Kumbhar, "Gesture Controlled Home Automation using CNN," *2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS)*, Madurai, India, 2020, pp. 620-626, doi: 10.1109/ICICCS48265.2020.9121058.
- [5] Y. Muranaka, M. Al-Sada and T. Nakajima, "A Home Appliance Control System with Hand Gesture based on Pose Estimation," *2020 IEEE 9th Global Conference on Consumer Electronics (GCCE)*, Kobe, Japan, 2020, pp. 752-755, doi: 10.1109/GCCE50665.2020.9291877.