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"Gesture Controlled Home Automation Using CNN"

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I. INTRODUCTION

Recently the scope for gestures has been increased for interaction with consumer electronics and mobile devices. The home automation system is to create a system that can control home appliances using Gesture-based method. Disabled or old aged people who can't walk require an effortless way of accessing things around them which must be served systematically and efficiently. This idea integrates automation with technology. Traditional home automation systems are not suitable for aging populations or disable persons. It's for those who cannot perform basic activities efficiently. Home automation systems are used to control home appliances through remote control. Web-based automation and gesture-based automation provides an advantage to those people who are physically unable for efficiently performing the day-to-day activities. Gestures are a type of communication which is nonverbal and are conveyed with the help of body parts like hands, legs, face, arms etc. Gesture recognition is a process in which gestures made by the user are recognised and are used to control various appliances. The motive of this project is to develop a system to control the devices like fans, lights, etc by using hand gestures and applaud patterns given by the user. The hand gesture recognition is done by using of an android app.

The application uses laptop camera to read the hand gesture made by the user and will send the image to a computer that uses the input gesture to automate various home appliances. The computer consist of a application which is based on CNN. The CNN is used for to recognize the received input gesture from the android application. After recognising the input hand gesture a result is generated and it is communicated with the arduino microcontroller board to turn ON or OFF the required home appliance. A personcan make numerous gestures at a time. As humans through vision perceive human gestures and for computer we need a camera, it is a subject of great interest for computer vision researchers such as performing an action based on gestures of the person. CNNs are a type of deep learning algorithm often applied in image recognition, making them suitable for tasks involving visual data in smart home applications. Gesture control could involve recognizing and responding to gestures, expressions, or other visual cues within the home environment.

II. AIM & OBJECTIVES OF THE PROJECT

AIM:

The aim is to design a Home Automation model using the android application is designed for providing ease of control of home appliances to the people, especially elderly or those who are physically unable for efficiently performing the day-to-day activities. As technology is rising more advancements are made in making the life of these people easier by providing methods easy to monitor and manage.

OBJECTIVES:

The objective of hand gesture-based home automation using Convolutional Neural Networks (CNN) are:

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- To enable users to control various home devices and systems through recognized hand gestures.
- CNNs analyze image data from cameras to identify specific hand gestures, triggering corresponding actions such as turning lights on/off, adjusting thermostat settings, or controlling other smart home devices.
- It offers a hands-free and intuitive interface for home automation, enhancing user convenience and accessibility.
- To overcome situations where normal cabling is difficult or financially impractical.
- It can be used in home applications system where short-distance communication is required.
- Suitable for physically impaired people to operate the devices within the home.
- To provide comfort and convenience for common users as well, especially in the home system

III. WORKING AND EXPLANATION

5.1 Block diagram of proposed system

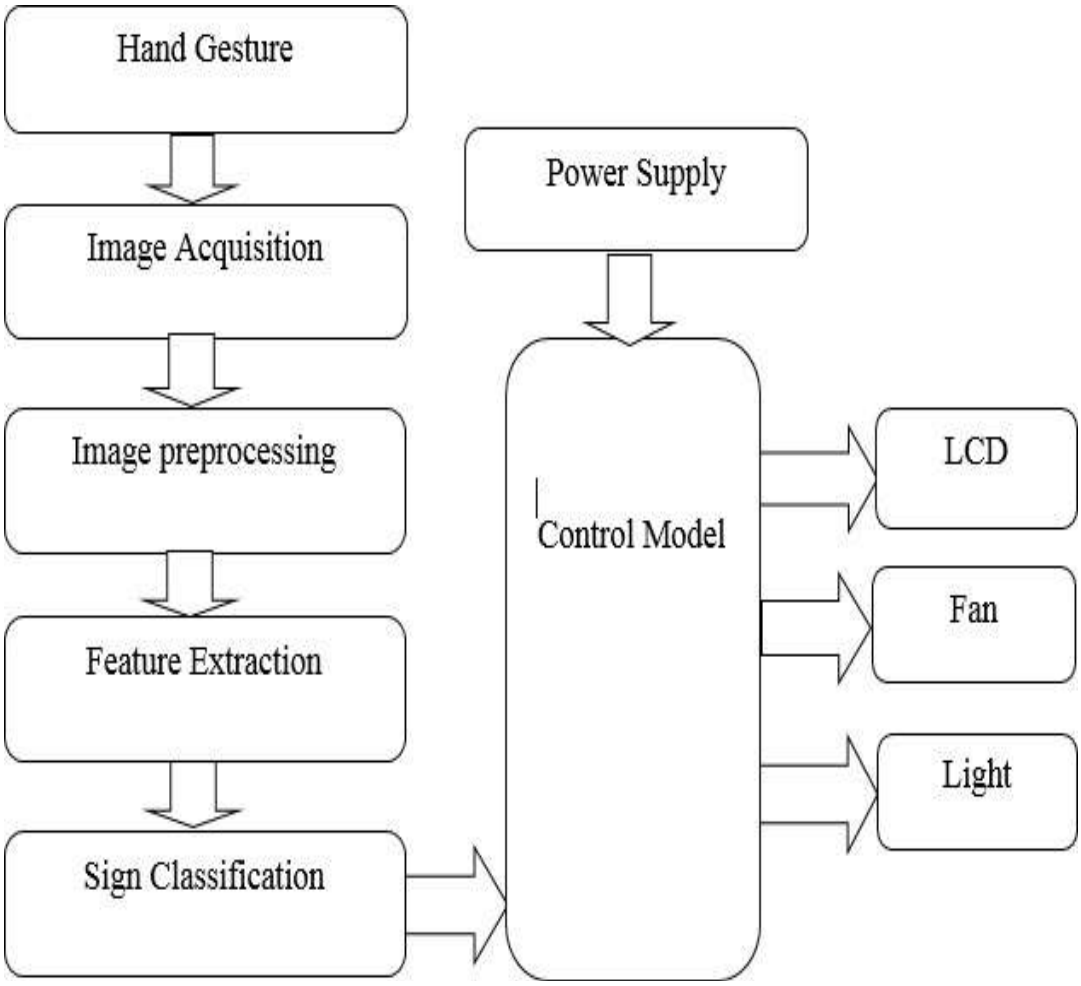

Figure 5.1.1 Model of the block diagram of the proposed system

The Figure 5.1.1 shows the model of the block diagram of the proposed system as a gesture-based home automation system using deep learning algorithm method. It represents the various steps involved in the gesture recognition process along with the hardware components required for the controlling of the home appliances. In this the simulation tool for the processing of gesture images is interfaced with the hardware using USB to serial converter.

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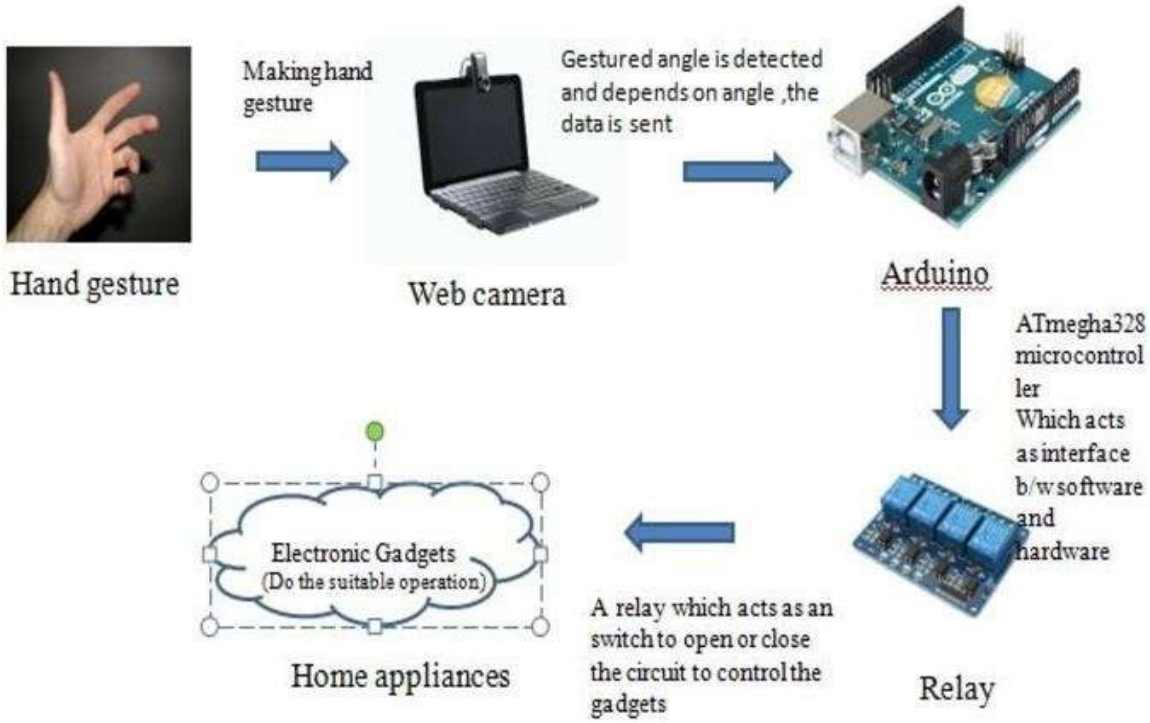

Figure 5.1.2 working of the proposed system

CNN module is trained with different hand gestures for controlling specific appliances. A computer program is developed using python language which is used to train the model based on CNN algorithm. The program will be able to recognize hand gestures by comparing the input with preexisting data set. Once the input hand gesture is showed, it is captured by the web camera and the image is recognized by CNN from the pattern present in the data set. After recognizing the hand gesture the CNN will look for the function which is assigned to that hand gesture and sends a signal carrying assigned function of that gesture to arduino. The arduino decodes the signal recieved from CNN and analyses the task to perform. Arduino sends the received signal to relay module which is assigned to perform the particular task like switching on or off. In the same way the relay module can be used to control various devices using hand gestures.

IV. APPLICATIONS

- **Smart Lighting Control:** Adjusting brightness or color of lights through hand gestures detected by the CNN system.
- **Media Playback:** Gestures to play, pause, or change tracks in audio or video systems.
- **Thermostat Control:** Changing temperature settings through recognized hand movements.
- **Security Systems:** Arm or disarm security systems based on specific gestures.
- **Window Blinds and Curtains:** Controlling the opening and closing of blinds or curtains with gestures.
- **Smart Appliances:** Interacting with smart appliances like ovens, microwaves, or coffee makers through gestures.
- **Home Surveillance:** Using gestures to pan, tilt, or zoom security cameras for better surveillance.
- **Volume Control:** Adjusting the volume of audio systems with hand movements.
- **Home Theater Systems:** Managing various functions of home theater systems, such as changing modes or inputs.
- **Smart Door Access:** Unlocking or locking doors through recognized gestures for enhanced security.

V. CONCLUSION

Hand gesture-based home automation using CNN offers a promising future. With the ability to recognize and classify different hand gestures, it provides a convenient and intuitive way to control smart home devices. The integration of hand gestures with voice commands and the potential for customization and personalization

enhance the user experience. As technology continues to advance, we can expect further innovations such as real-time gesture tracking and integration with AR and VR technologies. Overall, this technology has the potential to revolutionize the way we interact with our smart homes, making it more accessible and convenient for everyone.

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