

## IOT BASED HOME APPLICATIONS CONTROLING USING VISION AND GESTURE THROUGH RASPBERRY PI

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**Abstract**— Using the Android application, the Home Automation model provides ease of control over home appliances to people, especially elderly people or those who are physically incapable of performing day-to-day activities. More advances in technology are being made to make the lives of these people easier by providing methods that are easy to monitor and manage. Previously, accelerometers have been used, which are fixed on the hand, because they're deemed the best tool for doing this. While these models are accurate, they're not flexible or portable. We're using remote control home automation, and our remote is an Android app. Our system uses the Smartphone camera to input gestures to the gesture recognition model to filter and predict them. Web-based automation communicates directly with raspberry pi to control home appliances. The proposed method, allows users to flexibly and portably control multiple household appliances with simple gestures. With our system, we can automate predefined functions using smart sensors that are managed by a highly cost-effective and efficient Raspberry Pi, which solves the problem of manual labor associated with existing smart home automation systems. This system brings scalability, security and most importantly, ease-of-access to the smart home automation process by adopting a user-friendly Android app.

**Keywords**— *Raspberry pi, hand gestures, web server, gas and fire sensor.*

### 1. INTRODUCTION:

Home automation systems have come a long way in the past. And over time, home automation systems have made people's lives easier in terms of controlling various electrical and mechanical household appliances. Home automation is essentially about automating the control of our home so that it works for us and makes our lives easier while saving energy. This can be as simple as dimming the lights with a remote control or as complex as setting up a network of devices in your home (e.g. thermostat, security system, lighting, and home appliances) that can be programmed with a master controller or even your cell phone from anywhere in the world! By using wireless home automation devices with the latest Z-Wave technology, it is now possible to control every aspect of your home environment without running a single wire. The definition and capabilities of home automation have changed greatly over the

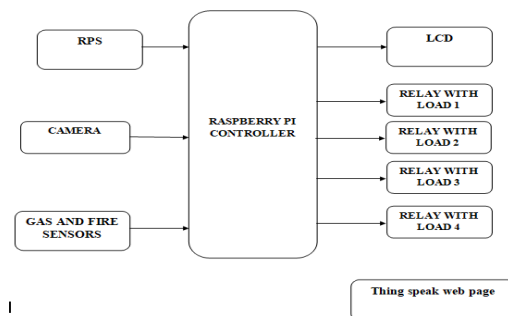


Fig. Proposed System Block Diagram.

years. Three decades ago, when most people were not even thinking about home automation, consumers were promised "the "home of the future" Home automation was known primarily to X10 enthusiasts and was installed by professionals in luxury homes. [1] Today's technology makes it possible to install your own home control systems, and when most people barely thought about home automation, consumers were promised "the "home of the future" Home automation was known primarily to X10 enthusiasts and was installed by professionals in luxury homes. Today's technology makes it easier and more affordable for homeowners to purchase and install their own home control systems and home automation has



finally become a mainstream reality for the average consumer who wants to live in a "smart home."

### OBJECTIVE:

Recently, the scope for gestures in interaction with consumer electronics and mobile devices has expanded. The goal of the home automation system is to create a system that can control home appliances using either of the two assigned methods: -

1. Gesture control
2. Web-based.

Disabled or elderly people who can no longer walk need effortless access to things around them, which must be operated systematically and efficiently. This idea integrates automation with technology. Traditional home automation systems are not suitable for elderly or disabled people. They are designed for those who cannot perform basic activities efficiently. Home automation systems are used to control household appliances via a remote control (smartphone). Web-based automation and gesture-based automation offer an advantage to people who are physically unable to perform daily activities efficiently. Many gesture tracking technologies, which primarily include gloves with sensors or gloves with special functions.

### 2. RELATED STUDY:

Among the many benefits of today's home automation solutions are: Security, energy savings, money savings, convenience and control. It can also improve the daily lives of seniors and the disabled by providing voice control and security features. Beyond what has been said in the area of demand response in smart grids, there are numerous techniques in recent work that have been used for home energy management and task scheduling. Although these techniques are mainly based on deterministic and/or meta-heuristic methods, they have failed to consider user convenience and comfort as competing objectives in their optimization problems. [1] To the best of our knowledge, none of the previous research has considered a detailed optimization problem that considers energy conservation and convenience as objectives of a realistic smart home energy management system. Therefore, in this paper, we propose to develop a home automation system based on

various gestures and wireless sensors, which will prove to be an efficient method to control various electrical devices in the room. The rest of the paper is organized as follows. Section [1] explains the previous developments in the field of home automation. Section [2] gives details about the preliminary authentication part proposed in our system. Section [3] describes the gesture recognition part. Section [4] gives details about the general system design. Section [5] describes the Arduino peripherals. Section [6] contains the conclusions. The main contributions of this paper can be summarized as follows.

- The first thing to note in this paper is that the home automation system proposed in this paper essentially runs on the various gestures provided by the user, as well as the various sensors implied inside the smart home.
- Secondly, the image processing used in the smart home is basically done by the embedded board "Raspberry pi". The camera connected to the Raspberry Pi captures the image, after which the Raspberry Pi performs image recognition and subsequent action.
- The next step in the system is the control of the electrical devices by gestures, which in turn are controlled by the Raspberry pi.

### 3. PROPOSED SYSTEM:

The proposed system recognises the gestures entered by the user and controls the home appliance. The main objective is to enable blind, deaf and mute people to operate various appliances easily and conveniently. In addition, control methods are needed due to the increasing number of industrial and household devices that need to be controlled. The user's gesture input is captured using an Android application and sent to the Raspberry Pi (which acts as a microcontroller), which then controls the corresponding functions of the devices. The system uses a convolutional neural network algorithm for image classification.

As can be seen from the above block diagram, the entire system includes the Raspberry Pi embedded board. The main board of the Raspberry Pi microcontroller controls both the gesture recognition part and the authentication part for the security part. The gesture recognition part is the most complex part of the project. The project includes the

basic operation of the home automation system based on gestures and a wireless sensor network. Gesture recognition is the most important part that we include in our project, and it is the most important improvement that we made over the previous home automation system design.

#### 4. RESULTS EXPLANATION



As shown in the above diagram we see the all types of hand gestures used in the project. The user shows the hand gesture in front of the camera and then the raspberry pi samples the image of the hand gesture shown by the user with the already stored images of hand gestures stored in the database. If the image of the hand gesture shown by the user matches with any of the image of hand gestures stored in the database then the microcontroller takes the required action involved in controlling the peripherals attached to the microcontroller. The microcontroller takes the exact action according to the exact gesture involved.

|          |           |         |
|----------|-----------|---------|
| FINGER 1 | LIGHT OFF | FAN OFF |
| FINGER 2 | LIGHT ON  | FAN OFF |
| FINGER 3 | LIGHT OFF | FAN ON  |
| FINGER 4 | LIGHT OFF | FAN OFF |



**Fig. Input hand finger 1 with camera.**

As we can see from the above given table there are four gestures that we have included in our project. The four gestures include showing of finger 1, 2, 3, 4. As shown in the table finger 1 indicates switching off of both the light and the fan. Similarly showing of finger 2 indicates switching on of light and switching off of fan.



**Fig. Input hand finger 2 with camera.**

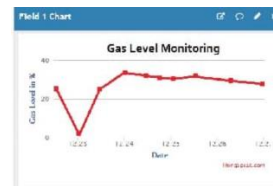
In the same way finger 3 indicates the switching off of the light and switching one of the light. And finally showing of finger 4 indicates the switching off both the light and fan off. Hence in this way all the four fingers signal the switching on and off of the various peripherals attached to the microcontroller.

#### SENSOR DATA UPLOADING IN WEB SERVER:

After assembling our system, the reading of the sensors has been checked. The main program (python language) is executed with the command “python project.py” on the Terminal. The program begins to execute each statement in the code and reads the signals from sensors and produces the outputs depending upon the conditions provided in the code.



**Fig. Fire sensor data uploading.**



**Fig. Gas level monitoring.**

#### 5. CONCLUSION:

In this paper details explains clearly about how the home automation proposed system is being carried out in the project. On the principle of gesture recognition. As mentioned in the management considering energy saving and a previous proposed works on home automation it was basically comfortable lifestyle’. Carried out with implementation of various sensor networks. In those cases



the home automation system though was a discovery in the field of embedded systems but it failed due some or the other efficiency in case of home automation system designs. Hence home appliances control through static new improvements was needed in the field of home automation finger gestures. This came with the integration of gesture recognition in the systems related to home automation. we discussed the latest technology that can help to reduce catastrophic accidents caused by fire. We designed the whole system and evaluated its effectiveness as well as scalability. With the improvement of sensor technology, the system will become more efficient and useful. If this system can be successfully integrated in every factory, then it is hoped that the loss of life and property due to the fire accidents will reduce remarkably and the country's economy will not be stumbled by such tragic accidents.

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