SMART HOME SURVEILLANCE SYSTEM

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Abstract:

The work is mainly proposed to provide home security to homeowners in a city. A fully remotely controlled surveillance of the home is going to be the future. Everyone is worried about the security of the home when they are not at home; also they want to be sure that the children or old ones are safe. In the world of the Internet of Things(IoT) when we have all the technologies to revolutionize our life, it's a great idea to develop a system that can be controlled and monitored from anywhere. There are many types of good security systems and cameras out there for home security. Still, they are much more expensive so today we will build a low-cost simple Raspberry Pi-based Intruder Alert System, which not only alerts you through an email but also sends a picture of the person coming outside your house when it detects any. Additionally, they can also control their appliances remotely from the website provided and alerts for fire and gas leak accidents are also present.

I. INTRODUCTION

The conventional method of door opening with the help of the key and lock is not reliable in the present day. But a face is undeniably connected to its owner. It cannot be borrowed stolen or easily forged. Face recognition technology may solve this home security problem since a face is undeniably connected to its owner.

Many cases of fire and gas leaks have been reported in past decades due to the absence of owners of their houses. To avoid such a disastrous situation, an automatic system is designed to give the owners alerts as and when it occurs. Using nothing but the sound of your voice, you can play music, search the Web, dim the lights to create to-do and shopping lists, shop online, get instant weather reports, and control popular smart-home products—all while your smartphone stays in your pocket also these appliances can be remotely controlled.

II. LITERATURE REVIEW

Face alignment is the process of identifying key landmarks in a detected face. For our work, we used the method by Kazemi and Sullivan, which uses an ensemble of regression trees to estimate the shape from an initial configuration. Specifically, they used a cascade of regressors, where each one predicts an update vector from the image and the current shape estimate.

In our industry today, machine or deep learning is mostly used for video analytics, but we expect the technology will be an important component in many different applications and products in the future. Over time, it will become a common tool for software engineers and will be included in many different environments and devices. But, again, its application will be driven by the most compelling use cases, not by the technology itself. There is a temptation in the surveillance and security sector to over-promise in relation to new technologies.

OpenCV (Open source computer vision) is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage and then Itseez (which was later acquired by Intel). The library is cross-platform and free for use under the open-source BSD license. We have used open cv library classifiers for the face detection functionality of our system explained here. The classifier used is the frontal face, it allows the detection of human faces in real-time. We are using Raspberry Pi as Controller because programming in Python is easier and more efficient as compared to any language processor plus Raspi has its own virtual desktop with lots of features which makes working with Raspi easier.

The studies in [1] and [2] propose Machine Learning algorithms to detect face effectively and with high accuracy. The studies in [4], [5], and [6] demonstrate the different applications and techniques that can be employed while programming the Raspberry Pi, the steps to integrate it with sensors, and to design a complete automation system for the home. Also, role of ML and ESPs [7-70] are becoming important in recent applications, recognition and control.
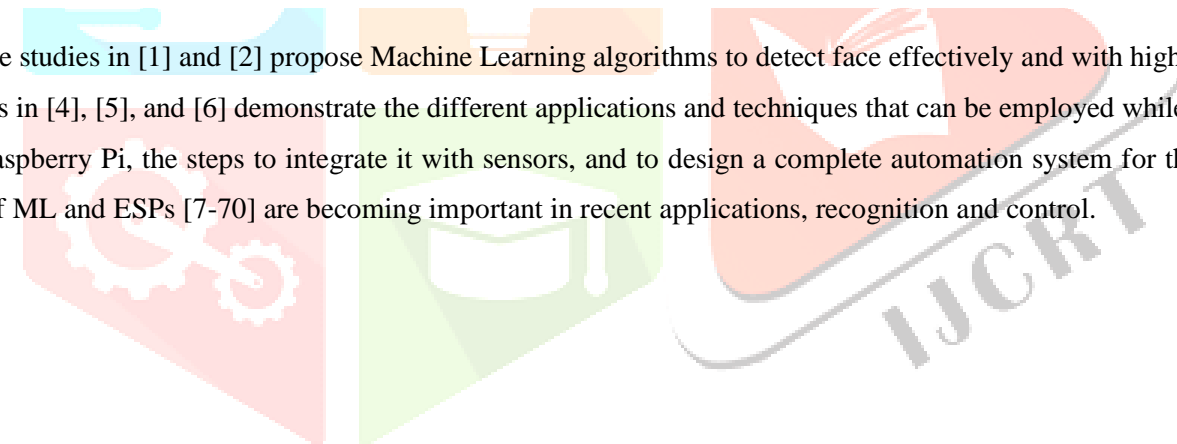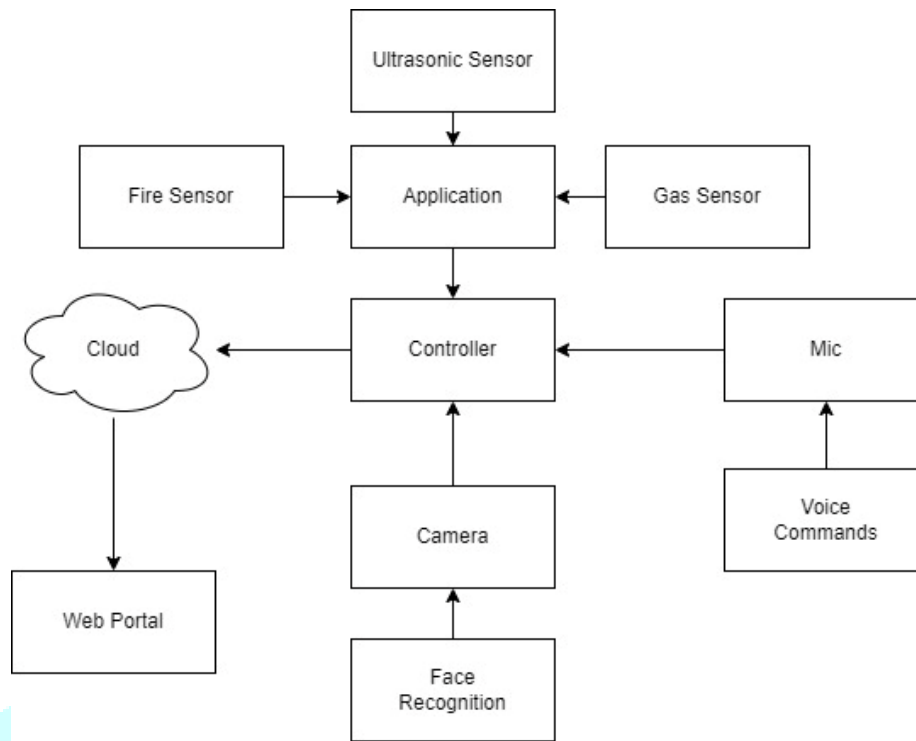
III. FLOW CHART

Fig.1. Flow Chart of system working

1. Controller: The controller here used is Raspberry Pi 3, with features Wifi module, 4 USB Port,1GB RAM.

2. Web Portal: Design of Web Portal for users and giving them an unique id so that they can control the main door of the house and the electronic appliances present in their house.

3. Camera: Using a 5MP Omnivision 5647 Raspberry Pi camera module for face detection and live video streaming in front of the house door.

4. Fire sensors: To detect any accidental fire inside the house.

5. Proximity Sensor: We have used an ultrasonic sensor as a proximity sensor. In the absences of owner when the door is locked, if the owner forgets to close the window an alert will be sent to the owner.

IV. IMPLEMENTATION

All the sensors like gas sensor, fire sensor, ultrasonic sensor and py cam are interface with Raspberry Pi controller. Using which complete system is monitored. The controller also runs as a server, which is created usng Flask.

Flask is a web application framework written in Python. It is developed by Armin Ronacher, who leads an international group of Python enthusiasts named Pocco. Flask is based on the Werkzeug WSGI toolkit and Jinja2 template engine. Both are Pocco based systems. A web application often requires a static file such as a javascript file or a CSS file supporting the display of a web page. Usually, the web server is configured to serve them for you, but during the development, these files are served from static folder in your package or next to your module and it will be available at /static on the application. A special endpoint 'static' is used to generate URL for static files. We have used flask to Create a local server on our controller, and to feed content to our front end using static rendering.

To create an user friendly website we have used Html, javascript for giving it an attractive look we have used CSS for styling.We have used 'on click 'function for buttons . When the user clicks this buttons, a signal is sent to controller using API, which in turn changed the state of LED's which signified different types of appliances at home.
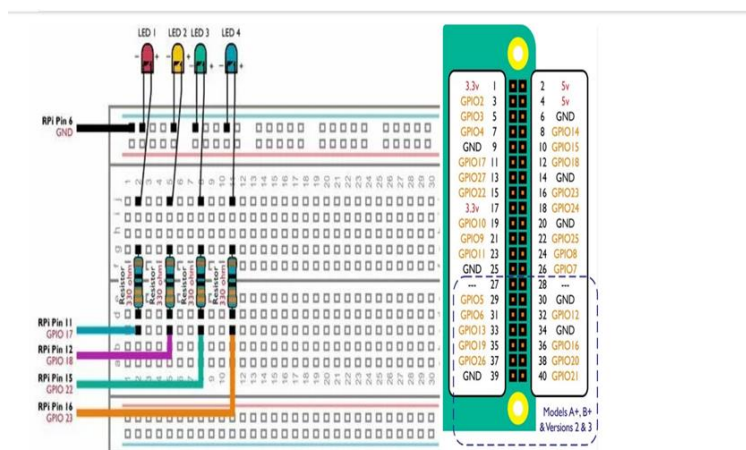

Fig.2. Interfacing of LED's with the controller

The above diagram shows the interfacing of LED's with the controller. Picam was interfaced with controller, which was continuously monitoring the door, and would send an alert mail, if a face is detected. This was achieved using multi threading and OpenCV library. Mail was sent to users using an SMTP mail server.

For detection of fire and intrusion, fire sensor and ultrasonic sensors was used respectively, and based on there outputs alerts were triggered accordingly.
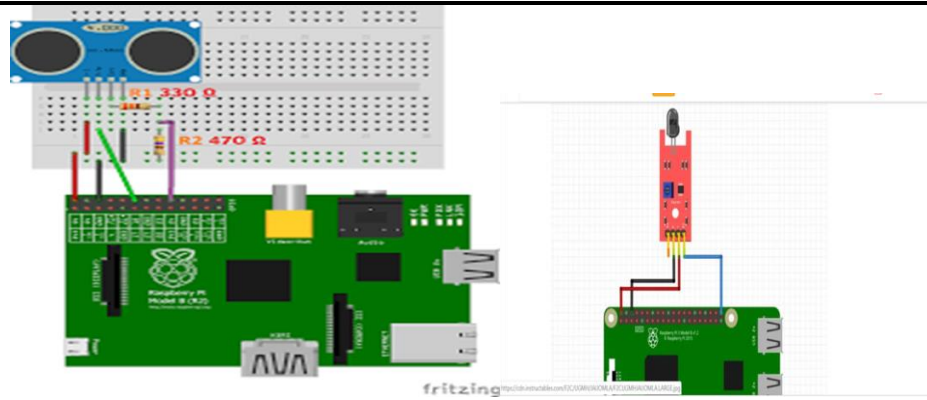
Fig.3. Interfacing ultrasonic sensor and fire sensor with controller

The above images are of interfacing ultrasonic sensor and fire sensor with controller. This type of sensor is established across the hall of the house,just opposite to the window. This ultrasonic sensor detect the window screen and tell whether the window is open or not. And this logic is used to detect intrusion in house.

For the home automation part, all the appliances present in home can be controlled in 3 ways, manual, voice operated, and remotely controlled. For voice operated, an external mic was interfaced with the controller and using the running server, the commands were sent to Google Assistant Cloud using API's and in turn codes were returned which were used to control the states of the appliance. The Home Assistant Cloud aims to provide the highest level of security and privacy while bridging the gap between your local Home Assistant instance and services on the cloud. In case of remotely operated, the home owners can control the appliance from our website and they can control their home appliances, from being present anywhere in the world, this is useful in cases when there are kids at home.

V. RESULTS

The face was detected successfully, and alert mail was sent to the house owner with the image of the guest, also the sensors used for intruder detection was accurate in detection, and the live feed of the camera could also be monitored by the owners with minimal lag. The other alert systems like the fire and gas detection systems also worked fine.

The User Interface of the application (Web or Android) allows the user to communicate with the Raspberry Pi over the internet. The end user gives the command of turning ON or OFF the specific appliance by pressing the ON/OFF button in the application, or the appliances could be controlled using voice commands too.

VI. CONCLUSION

The prime objective of our this work is to use Smartphones to control home appliances effectively. This work is based on the Raspberry pi, Android platform Java and PHP. These platforms are Free Open Source Software. So the overall implementation cost is low and can be easily configured. The user can easily interact with the android phone/tablet. The user can send commands using an android application. The data are analyzed by the application and are sent over a network. The Raspberry pi acts as a server, analyses the data and activates the GPIO (General Purpose Input Output) Pins. The GPIO Pins are connected to the relay switch which activated the required home appliances. In this way, the automation process

is carried out. This is a simple prototype. Using this as a reference further it can be expanded to many other programs. A low cost smart surveillance system with complete automation was successfully implemented.

VII. ACKNOWLEDGMENT

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