Facial Recognition Robot with Home Automation

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Abstract:
The paper proposes Home Automation which can be a residential extension of building automation and involves the control and automation of lighting, air-con, appliances, and security. The proposed implementation of the system is for monitoring and controlling the home appliances using Face Detection and Speech Recognition technique and bit of Robotics. We are establishing the communication with electronic devices through face detection with the help of PI cam, raspberry pi platform. Basically, we are controlling home appliances using raspberry pi as a platform. face recognition is done using a local binary pattern(LBP); once the person is authorized he/she can have access to control whereas home appliances like lights, fans, and other Home appliances using Voice Command. We are also adding extra Feature interactive assistance which will track the head movement of the person vertically. If the Person's face isn't found or not recognized we've added additional security features like Passcode to get access to the Voice Command.

Keywords: Face Detection, Face Recognition, Raspberry pi, LBP, home automation, Robot.

I. INTRODUCTION:
Home automation is nothing but a system that controls all electrical appliances present in a home or office. Home automation for the older and disabled will offer raised quality of life for persons. Users can monitor and manage their home gate, various appliances and switch on/off the T.V with none human intervention this technique are often utilized in several places like banks, labs, and another sophisticated automated system, which reduced the hazards of unauthorized entry. The major objective of this project is to scale back manpower. It's an interactive robot i.e. it can communicate with humans and performs the task given by the user. The robot is additionally able to detect the face and recognize face recognition is completed employing a local binary pattern(LBP), LBP system has 80% of accuracy when it's tested using real-time images, Person should stand in front of the camera, a camera will recognize the face and compares with the faces stored database in raspberry pi; once the person is permitted he/she can have access to regulate whereas home appliances like lights, fan and other Home appliances using Voice Command We also are adding an additional Feature interactive assistance(Robot Face) which is able to track the head movement of the person vertically. If the Person's face isn't found or not recognized we've added security feature like Passcode to urge access to the Voice Command.

2. LITERATURE SURVEY:
Varieties of other latest technologies available are RFID card technologies, biometric protected systems, OTP based, cryptography-based, and lots of more, each system is applicable for various application zones depending upon their technology usage. Also, some systems use some of these techniques for security, yet they don’t provide a complete security system as there's only single-factor authentication. Though large numbers of researchers have already addressed the problems of the house automation system and also proposed Home automation techniques, quite a few are done on face recognition which features an excellent scope in eliminating these problems.

The following papers have been referred for implementing this project


3. EXISTING SYSTEM
Face Recognition and Voice Command is long researched Technology which is now beingused in our daily lives. There are several systems for voice command using which we can command the computer or the robot to do a certain process by just using our speech. The systems like Alexa and Google Mini are similar system. The problem in such a system is that it has less security and only works on voice command so it will accept any command coming from a similar voice. It can’t recognize who is an authorized person
4. PROPOSED SYSTEM:

Our Proposed system is designed in such a way to overcome the drawbacks and disadvantages of the existing system. Our Proposed system provides more reliability and security. The primary objective of the proposed system is to design a cost-effective and open-source home automation system that can be generalized for various home and outdoor environments. It is an interactive robot i.e. it can communicate with humans and performs the task given by the user. The robot is also able to detect the face and recognize face recognition is done using a local binary pattern (LBP). LBP system has 80% of accuracy when it is tested using real-time images.

5. SYSTEM ARCHITECTURE:

![System Architecture Diagram]

6. HARDWARE COMPONENTS:

**RASPBERRY PI 3 MODEL B:**
Raspberry Pi is a credit-card sized minor computer. It’s a small PC which carries all the functionality that are delivered by a desktop PC. The Raspberry Pi has a Broadcom BCM 2836 a System on chip (SoC), 900MHz processor with quad-core ARM Cortex A7 Video Core IV GPU and with 1 GB of RAM. It uses an SD card for booting and data storage. The RPi has an Ethernet port for network connection, USB port for connecting exterior USB devices, micro USB slot for power supply, HDMI port to connect to display and General Purpose Input Output (GPIO) pins to connect to other hardware devices.

**RASPBERRY PI CAMERA:**
It is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance projects. It is commonly used in surveillance drones since the payload of camera is very less. Apart from these modules Pi can also use normal USB webcams that are used along with computer.

**POWER SUPPLY:**
A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another.

**USB MICROPHONE:**
This is a tiny USB Microphone that computer. No microphone on your computer? No problem - just plug this incredibly small microphone into a USB port and add microphone functionality. No need to install any extra software.

**SERVO MOTOR:**
servomotor can be called as a rotary actuator or linear actuator. It is used for the precise control of linear or angular position, velocity and acceleration. It has of a suitable motor connected to a sensor for position feedback.

**DC MOTOR:**
A DC motor is rotary electrical machine which converts the electrical current into mechanical movement. It requires dc
voltage source for its operation. They can be of any type as electrical and electromagnetically

7. METHODOLOGY:

Our Proposed system provides more reliability and security. The primary objective of the proposed system is to design a cost-effective and open-source home automation system that can be generalized for various home and outdoor environments. It is an interactive robot i.e. it can communicate with humans and performs the task given by the user. Steps involved in proposed system are discussed in detail.

1. The interactive assistance (Robot Face) which will track head movement of the person vertically.

2. The person should stand in front of the camera. A camera will recognize the faces using Local Binary Pattern and compares with the faces stored database in Raspberry Pi.

3. Once the person is authorized he/she can have access to control whereas home appliances like lights, fan and other Home appliances using Voice Command.

4. If the Person face isn’t found or not recognized he get access to voice command by entering the passcode.

HOW FACE RECOGNITION WORKS

The captured image will undergo image processing for face recognition, Local Binary Pattern (LBP) has been implemented using Python and OpenCV. Face recognition considers both shape and texture information to represent face images based on Local Binary Patterns. Steps involved in LBP algorithm are as follow:

I. Crop face (using face detector) and align the face images in order.

II. Convert all images into the same size.

III. Fix the dimension of the cell size where the LBP will be calculated.

IV. Run an LBP algorithm on the face images. Concatenate LBPs extracted from the image to form a unique face feature vector.

V. The feature vector for each face image can be used to recognize the person in the face image. This feature vector forms an efficient representation of the face and is used to estimate similarities between images.

8. RESULTS

Figure 8.1. face recognition Robot with Home automation system

Figure 8.2. Recognized Face
FUTURE ENHANCEMENT:

There are several extensions which can be done to make the project even better in future. We can add Stereo Camera to add the depth feature which will allow the robot to understand the distance from one object just by seeing. We can add microphone array using which the robot can identify the direction from which voice is coming from. We can make the whole robot movable so that it can move here and there and even follow people around if needed.

CONCLUSION:

This paper gives a detailed implement “Facial Recognition Robot with Home Automation” which is a low-cost home automation system and easy to install and configure which is highly Secured. It is very helpful to physically challenge people for controlling the electrical appliances using voice command.

REFERENCES


[5]. Shaik Anwar, D. Kishore, “IoT based Home security system with alert and door access control using SmartPhone”, December 2016, IJERT.

[6].https://www.raspberrypi.org/

[7].https://github.com/ssp4all/faceRecognition


[9].https://www.wired.com/2014/07/hacking-home-alarms