Smart Mirror for Home Security Using Raspberry Pi

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Abstract - *This paper presents an innovation that proves how our daily life object such as a mirror can turn into smart gadgets with the aid of modern technology. This innovation presents not only what the technology can offer but how it can turn the user's life into a smart and well-organized routine. The main element of the system is the raspberry pi connected to the wide range of subsystems and powered with the software which can recognize the face and facial expression. The user interface provides control via visual and voice commands, all these features also included built-in security protocols to prevent unauthorized access.*

*Key Words***:** Raspberry Pi, Multimedia of Things, Weather, Two-way Mirror.

1. INTRODUCTION

Many surveys states that "People starts their day by opening the smartphone lock and ends the day by locking the same phone". This shows how much the people have connected the smartphones, people addicted to phone not because of the device can play music or capture a photo, they tend to connect more because the phone connects them with the world provides the real-time update about what's their friends are doing, how the weather is going to change, the mail sent from the office and the meetings they need to attend and also provides entertainment and a space to store personal photos. As the next stage of the revolution the smart-watches come into play, it can be used as an extended feature of smartphone technology because the smart-watches relay on the smartphone for network connectivity and information management. The main use of the smart-watch is health monitoring.

This innovation adds another extended feature for smartphone technology the main goal of the innovation is to manage the notification and streaming the real-time updates in news, weather, and social media. But the difference is that the smart mirror can also be used for security and Surveillance. In recent days the security of the house is getting as much as important as food and water. As our phones and TVs become smarter and smarter every day. It's time for home security to become smart. Because traditional methods are lacking reliability and flexibility.

2. RELATED WORK

In general the smart mirror was built as a next-generation personal assistant device the main function of the device is to remember meetings and events [1], later the same device used for the home automation[2-3]. In the home automation, the system is responsible to monitor and control the home appliances but the device was lacking the security and the build cost was a little higher. To solve the cost and maintenance problem the makers started to use new open-source hardware such as the Raspberry pi to build the device [4-7]. Even the cost problem is solved the device is still vulnerable for the outside attacks and unauthorized access, but this vulnerability can be overcome by adding face detection and secure login features [8].

3. PROPOSED SYSTEM

The build process of the smart mirror has two main parts namely Software and hardware, the most of the software used are well known open source software, hence it is easy to debug the issues which can be raised later. Most of the hardware we use are readily available and easy to program and doesn't need any special devices to dump or upload the firmware.

3.1 HARDWARE

As previously mentioned the Raspberry Pi is the brain of the system, besides, the system is connected to Webcam, Speaker, Microphone and Monitor. The whole assembly is fitted behind the two-way Mirror, other high power appliances are connected via Relays see Fig.1. The reason for using the Raspberry Pi is that it's very easy to connect it to the internet because of the onboard Ethernet port and it occupies very less space. The system is also equipped with a UPS to counter the power cut situations.
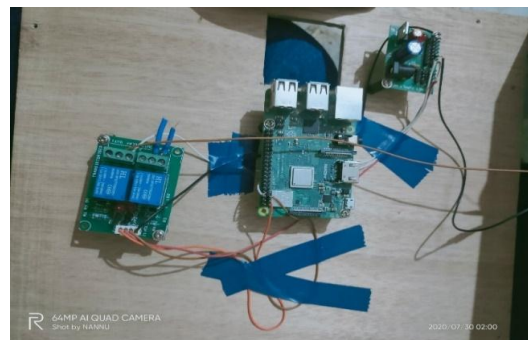

Fig.1. Hardware

3.2 SOFTWARE

The Raspberry pi runs a custom-built Linux OS in it, the Python scripts are used to perform the various task on the

system, the Open CV is used for the function such as capturing the video or a photo and also helps to process them. Most of the software modules are developed using python because of its readability and availability of extensive libraries. The Node JS is used for the server-side programming, the SSH Putty is used for secure login into the system. The E-Speak is used for converting the text to the audio. The OCR feature is added to by using the Tesseract OCR. As the added feature the system is connected to Alexa for voice-assisted controlling of the system and the same can be used to connect the user with the web-based services.

The smart mirror uses various software modules for the various function such as weather module for the weather update, calendar module for the daily meetings updates, a dedicated face Recognition and emotion detection subsystem and it also has voice activation and control subsystem see Fig.2. The main feature of the system is its dedicated face recognition and emotion detection system, it uses "LBPH (Local Binary Patterns Histograms)" which is an efficient method of detecting the face and emotions using histogram function see Fig.3.
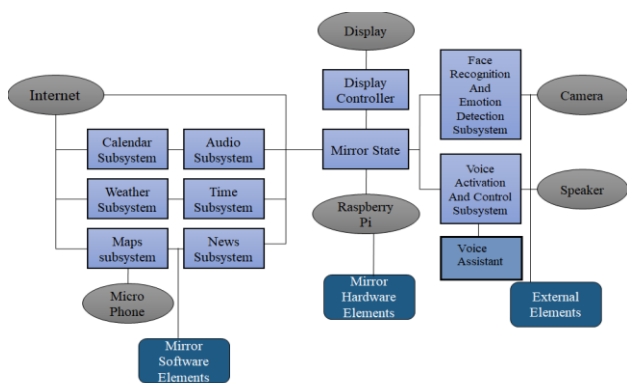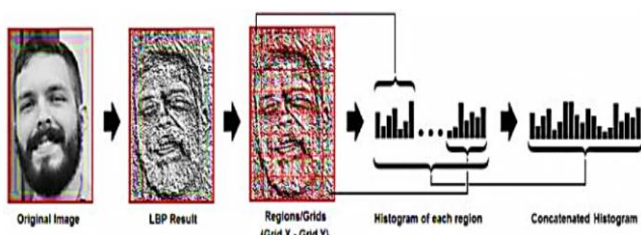

Fig.2. Implementation of Smart Mirror

Fig.3.LBP operation

4. RESULTS

The final built system has lite weight and easy to setup. Its also able to deliver news, weather and calendar update without any due, it also successfully detects and executes the voice commands by the user see Fig.4. The face recognition subsystem successfully detects the registered user and unknown user, and also conduct surveillance whenever a known person enters the house, surveillance initiated when the unregistered person face is recognizer and it continues until the person left the area. The system was tested for a brute-force attack to gain unauthorized access and it was prevented by security measure taken by the system.

Fig.4. Smart Mirror Module

5. CONCLUSION

Smart Mirror which provides natural interaction between home automation and the users. This Smart Mirror can automate the home appliances and it has a more of assistance services. It is easy to install in homes, and it displays some the information like weather as well as news etc..., to the user. In the monitor by imitating the normal mirror interfaces and the LED display. This project can be upgraded to control the Smart Mirror with the touch screen display to a mirror. This system can also be extended by adding the camera module to control the Smart Mirror.

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BIOGRAPHIES

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