Smart Mirror Using Raspberry Pi Model 3 B

Anukul Dixit [1], Krishanu Das [2], Ronak Harish Patil [3], J. Sivapriya [4]
[1, 2, 3, 4] Computer Science and Engineering, SRM Institute of Science and Technology, Ramapuram, Chennai, India

Abstract With the never-ending invention of the new technologies there is no limit to making the devices smarter than they exist in today's world. The reflecting surfaces like mirror provides the user an interactive environment and more personalized feeling along with the display of the information. This paper shows us how to design and develop an interactive smart mirror using Raspberry Pi 3 Model B+. Features like facial recognition helps in the smart unlocking process and features like voice recognition and touch sensitivity makes the user experience easy, better and more interactive. The mirror provides various basic amenities like weather, news, maps, daily schedule and much more.

Keywords – Raspberry Pi 3 Model B+, Facial Recognition, Voice Recognition, Touch Sensitive.

1. INTRODUCTION

The internet has become an integral part of every person's life and with the evolution of Internet of Things more and more devices are getting interconnected for sharing data with each other. The internet is connecting the real world and the virtual world. The Smart Mirror is another product of Internet of Things which provides the user a whole new interactive environment for receiving information related to the daily tasks and daily happenings around the world. As an advance feature the mirror serve as digital control of the basic home automation systems. The Mirror is designed to be suitable for various environments such as malls, homes, railway stations, airports as well as hospitals. The modules and digital design can be edited in a customized manner according to the user and the application of the smart mirror.

The main goal of the project is to enhance the user experience of receiving information as well as to provide only relevant information in a user or application customized form. Smart Mirror makes the use of digital devices less, while being presented with more. The users at home can schedule their next day according to their convenience, users at the airports can see the timetables, while users at the malls can check the different digital versions of the outfits in the smart mirror. The Smart Mirror brings evolution to the way the information is presented to us in everyday life

2. RELATED WORK

All the related works that have been done by other researchers that are related to the current research problem should be summarized in this section. Times New Roman font with size 10 must be used in this section. Sub topic should be written as given below:

- Review on IOT Technologies
- The intelligent mirror
- The design and development of a smart mirror
- Magic mirror

2.1 Review on IOT Technologies

It explains the different concepts of IOT of communications. Here IOT has been described with different perspectives. This is because of the two words "Internet" and "Things". Internet is basically combination of different networks and things consists of objects with generic content. When these words are combined it advances in a new ICT world. The applications of IOT are grouped in three Domains i.e., Supply Chain Management, Healthcare, Disaster Alert and recovery. It was concluded that the paper provides complete review of compatible technologies.

2.2 The intelligent mirror

It was designed for the home of Internet of Things. It used raspberry pi as the host controller and STM32F030C8T6 microcontroller as the core control chip. It was concluded that the system by raspberry pi is joined through Wi-fi and get information about weather updates from API network interface specified dressing time, index, date and extra data, and then the information is displayed on the plasma screen.

2.3 The design and development of a smart mirror

It has a face recognition system for security and smart unlocking process. The information is shown on an LED monitor enclosed in a wooden frame and covered with a sheet of reflective one-way mirror. It aims at providing a system that detects face using OpenCV. The mirror will recognize users face and it will get processed with raspberry pi. The users face will be stored in database. It was concluded that the smart mirror is introduced to provide an ambient environment between internet and users, which would help the user in their daily activities.

2.4 Magic mirror

It presents the design and implementation of multimedia mirror system. It performs a simple syndication to capture data about peripherals and network connections. The user can activate it through verbal commands. It detects user's feelings based on image and speech recognition features to select the proper

speech or music to alter the user's mood. It concludes that the project integrates internet data, speech and image processing, and features of a reflective glass to implement a smart home.

3. PORPOSED MODELLING

The specifications of the smart mirror took inspiration from the people's daily activities and the daily usage of the devices. Mirror integrated every feature that a user would expect in a modern device. Figure 1. is a schematic representation of the proposed Smart Mirror.

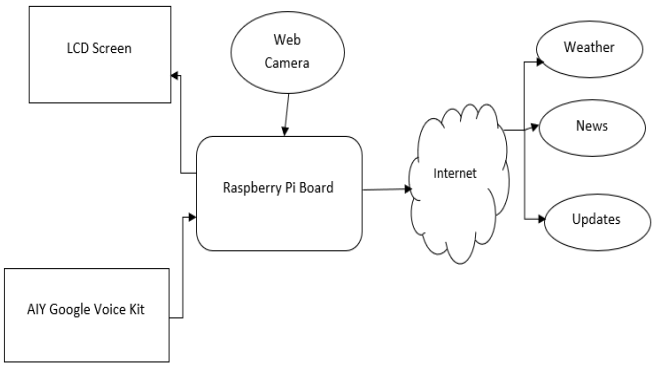

Figure 1. Schematic Diagram of Smart Mirror

The CPU of the Smart Mirror is the Raspberry Pi 3 computer. It comprises of all the software components. It takes the images from the webcam and runs the images through the training model of facial recognition and then save the trained model for the identification of the user. After the identification of the person standing in front of the mirror, the voice command for the user will be unlocked and the user can retrieve the programmed information through voice commands. The information retrieved will be displayed on the mirror.

3.1 Hardware Components Overview

1) Raspberry Pi 3 model B

Raspberry Pi is a small debit-card sized computer manufactured in the U.K. by Raspberry Pi foundation for teaching basic computation to every person interested in computer hardware and programming. It has a Broadcom BCM2837 system on a chip, which includes 4 ARM Cortex-A53 1.2 GHz cores as the processor, 1 GB RAM with VideoCore IV GPU. It uses micro SD card for booting and storage. It includes 2.4 GHz 802.11n Wi-Fi and also Bluetooth 4.1 low energy.

2) Webcam

A USB powered webcam is used for the facial recognition.

3) LCD Screen

An LCD screen is placed behind the two-way mirror to display all the output.

4) AIY Voice Kit

It is a natural language processor kit with the embedded Google Assistant. It helps in interacting with the voice commands.

5) Mirror

A two-way mirror is used for the project. It is not like an ordinary mirror painted by an opaque color. It has the property of being reflective on one side and transparent from the others.

3.2 Software Components Overview

1) OpenCV

Open Source Computer Vision is an open source computer vision and machine learning software library. It was built to accelerate use of machine perception the commercial market and to have a common infrastructure for computer vision. It is a BSD-licensed product. It is a type of real-time vision application. it is written mainly in C++.

2) Raspbian OS

Raspbian is a free Debian optimized operating system for the raspberry pi hardware. It comes with pre-compiled software and over 35,000 packages.

3) Python

Python is a high-level programming language having lots of support and libraries. It is used in the project to control the sensors.

4) NodeJS

It is a JavaScript engine used for the server-side applications.

3.3 Interface Modules

Calendar: display the current date.

Clock: Display the current time according to the time zone.

Weather: Display the current weather conditions and temperature from the OpenWeather API.

News Feed: Displays news headlines from BBC and CNN.

Traffic Updates: Gives the live traffic updates from the city via Google Maps.

YouTube: Gives the video suggestions from the signed in account.

To-Do list: Have sticky notes app to keep track of the to do list.

Search Engine: Helps to search and surf on the internet.

4. RESULTS AND DISCUSSIONS

The final results of the entire projects were very satisfying. The designed Smart mirror can recognize the voice commands. A simple API is provided for the developers to communicate through process using the JavaScript. API uses the Inter

Process Communication (IPC). The booting procedure is carried out by the Raspbian. After the booting the voice recognition system and the socket server gets started. Then it looks for all the installed softwares. The facial recognition feature detects the familiar user faces and unlocks the home screen and display the customized content according to the user.

5. CONCLUSION

We designed a Smart mirror which is futuristic and provides the new way of interaction with the users and the different services provided to the user through different digital devices. The mirror display is provided by a flat LED monitor which displays all the user customized information. Mirror also provides the display of the social media websites, Google maps and videos via YouTube. The designed model provides an extendable framework which can provide more functionality to the user. Google AIY Voice Kit provides the additional voice recognition feature. Integrating the Webcam and the training model for the facial recognition helps in providing user an extra feature.

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