IOT Based Smart Mirror Using Credit Card Sized Single Board Computer

Anand P. Pant[1], Durgesh S. Naik[2], Tejashri P. Dandgawhal[3], Sumati R. Patil[4], Jagdish Y. Kapadnis

[1] *Student, Department. Of Computer Engineering, P.V.G.'s COE, Nashik, Maharashtra, INDIA*
anandpant@gmail.com
[2] *Student, Department. Of Computer Engineering, P.V.G.'s COE, Nashik, Maharashtra, INDIA*
durgeshnaik9766@gmail.com
[3]*Student, Department. Of Computer Engineering, P.V.G.'s COE, Nashik, Maharashtra, INDIA*
tejashri19dandgawhal@gmail.com
[4]*Student, Department. Of Computer Engineering, P.V.G.'s COE, Nashik, Maharashtra, INDIA*
sumati.patil555@gmail.com
[5]*Professor, Department. Of Computer Engineering, P.V.G.'s COE, Nashik, Maharashtra, INDIA*
jagdishkapadnis@gmail.com

ABSTRACT

When a guest is about to depart from your house. They stop to check their appearance in an antique looking mirror mounted near the front door. Suddenly, they appear to see additional information such as Date and time, weather, news etc. besides their reflection. We first mount a flat-screen liquid crystal display (LCD) or LED. Next, acquire a piece of special glass that acts as a two-way mirror. If we place this special glass over a black surface it will appear to be a normal mirror; if there's a light source behind the glass, however, then that light will pass through. So the idea is to take the glass, mount it in an antique picture frame, and hang it on the wall covering our LCD/LED screen. We will be Attaching a credit sized single board computer probably raspberry pi 3 with the LCD / LED screen, and running our smart mirror application on it. Our team will be using a USB microphone with the Raspberry pi-3 to interact with it. Smart mirror will be the future of how we customize ourselves., like if ever we wanted to buy new clothes in a mall instead of trying it on,we can virtually see it on smart mirror, here the smart mirror uses Augmented reality technology to virtually show how will we look on that dress. Smart mirrors will have wide area of applications in shopping malls, hospitals, schools etc.

Keyword: *- Credit sized board computer, USB Microphone, Augmented Reality technology, two-way mirror.*

1. INTRODUCTION

Effective time management is one of the most important factors for success and productivity in a person's day-to day life. With the increasing integration of technology in our lives, maintaining an efficient schedule has become both easier and more difficult. Keeping up to date with appointments news, social media, and other things is made easier through technology such as tablets, PCs, and smart phones yet also provide distractions that can interrupt anyone routine. Technology has become another task in the day that time must be allotted for. In the finite time of the day, technology needs to be designed to work within our schedule and not be an extra piece to it. The key to effective time management involving technology is multitasking. Anyone in the business or academic world would agree that every second counts in the day. A smart mirror tends to display useful information such as time, date,

weather, news and rss feeds and some other details. We have achieved this through a two-way mirror panel, a LED display, a raspberry pi and a desktop application to display the information on the screen. The possibility of the information to display on the mirror though is endless so the functionality of our device is quite flexible.

2. FUNCTIONAL DESCRIPTION

2.1 Raspberry Pi

Raspberry pi is a series of credit compact Linux based computers designed in UK. Their main goal was to promote the knowledge of application of computer science to students. The Raspberry pi is compact, mobile and can be used anywhere, anytime.

Fig-1: Raspberry Pi 3 Model B

2.1.1 Processor:

The first generation Raspberry Pi uses the Broadcom BCM2835 SoC is somewhat similar to the chip used in first generation smartphones, which has Video Core IV graphics processing unit, 700MHz ARM1176JZF-S processor, and RAM. It has a L1 cache of 16KB and a L2 cache of 128KB. The L2 cache is used primarily by the Graphics Processing Unit. The Raspberry Pi 2 uses quad-core ARM Cortex-A7, with 256KB shared Level 2 cache. The Raspberry Pi 3 uses a Broadcom BCM2837 System On Chip with 1.2GHz 64-bit quad-core ARM Cortex-A53 processor, with 512KB shared Level 2 cache.

2.1.2 Performance

The Raspberry Pi 3, has quad-core Cortex-A53 processor, it is 10 times faster than the Raspberry Pi 1. The task threading and instruction set used in Raspberry Pi 3 is approximately 80% faster than Raspberry Pi 2 in parallelized tasks. Raspberry Pi 2 operates at 700 MHz by default,0.041 GFLOPS was provided by first generation of Raspberry Pi.

2.2.3 RAM

On another Model B boards, 128MB was allocated by default to the GPU, and 128MB for the CPU.The Pi 2 Model and the Pi 3 Model have 1GB of RAM. The Pi Zero and Zero W have 512MB of RAM.

2.1.4 Networking

The other Raspberry Pi Model A, A+ and Pi Zero has no Ethernet capability and are commonly connected to a network USB Ethernet or Wi-Fi adapter. On the Raspberry Pi 3 Model B and Raspberry Pi 2 Model B+ the Ethernet port is provided by USB Ethernet adapter using the SMSC LAN9514 chip. The Raspberry Pi 3 and Pi Zero Wireless are equipped with 2.4 GHz Wi-Fi and Bluetooth adapters.

2.2 Relay Switch

Fig-2: A Two Channel Relay Module

A **relay** is one of the type of electrical switch which uses electromagnet to operate a switch, other methods may also be used. Relays are generally used to control a low-power signal circuit. In earlier days' relays were used as an amplifier for long distance telegraph circuits. We used a Relay module along with Raspberry pi to control electrical appliances such as lights, fans etc.
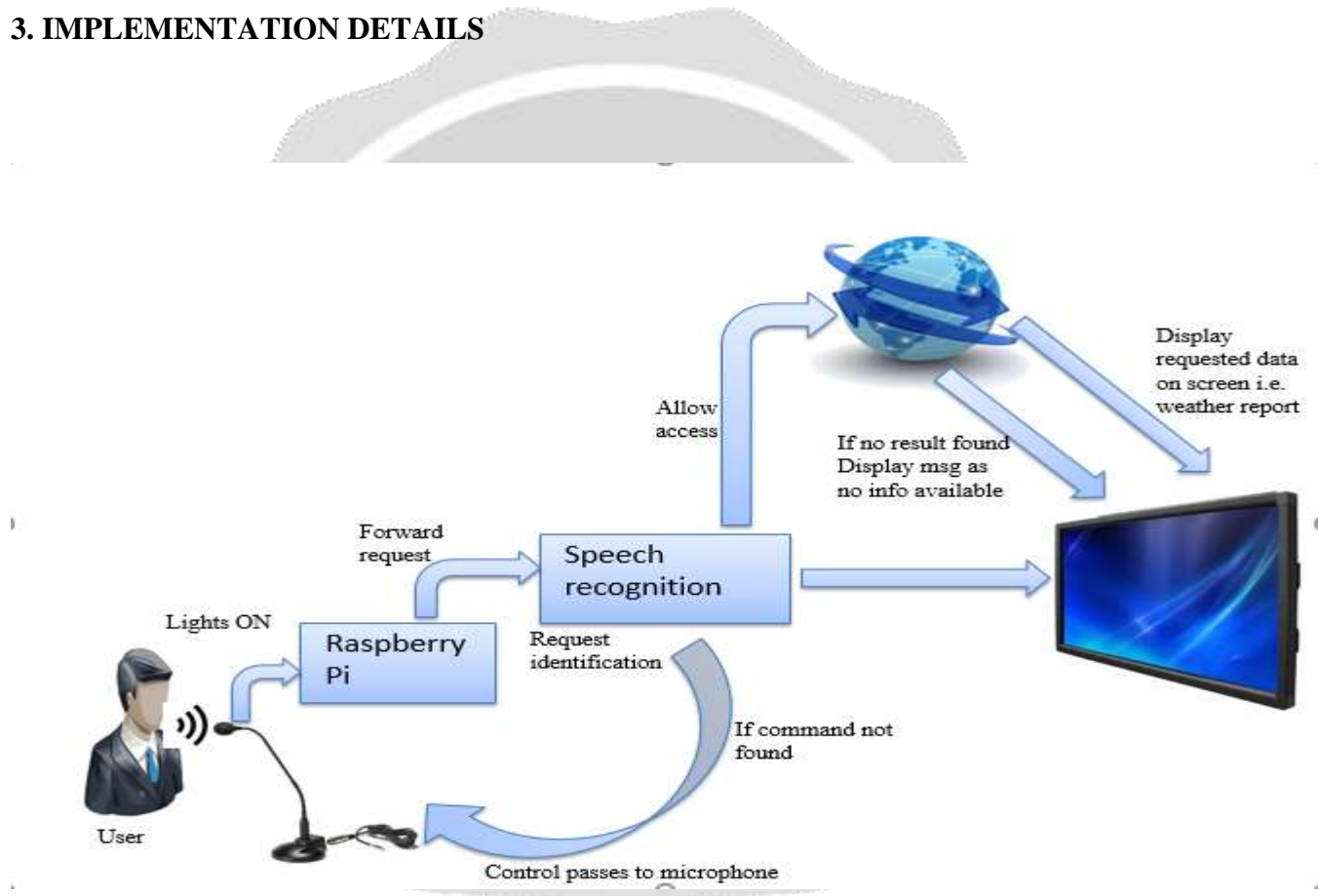
2.3 USB Microphone

Fig-3: A Logitech C270 USB Cam and Microphone

A USB **microphone**, also known as USB **mic**. It is a device that converts sound into an electrical signal. Microphones are used in many applications such as smart phones, sound recorders, telephones, hearing aids, radio and television broadcasting, and also in computers for recording voice, speech recognition, Voice Over IP.

3. IMPLEMENTATION DETAILS

Fig-4: Implementation Details

The smart mirror was designed by combining different purchased items like Raspberry pi, relay switch, USB microphone and LED Display. Each of these components provides unessential function in the overall experience. For the High Definition Display, the smart mirror project planned to use a 22.2-inch screen. Cost will play a factor in choosing a screen. We made the decision to use 1080p for our smart mirror application. The decision involved a choice between LED, LCD and Plasma. The screen is behind a two-way mirror that is glued to the screen. For the mirror to be able to reflect the screen behind it must not emit any light thus being dark. For the mirror to project the image behind it the screen must be very bright. So the screen we chose in turn must be very bright when the picture is shown and also while it is still on it must be very dark when needed. We start of by installing clean copy of Raspbian Jessie with pixel OS without using noobs on our raspberry-pi3.The architecture of smart mirror is pretty simple, the user interacts with the smart mirror device using a USB microphone and gives commands like lights ON. The device will continuously listen for commands. Once the speech recognizer recognizes the hot word It turn on

the light ON or turns the lights OFF. The information from the Internet like weather or news is displayed on the screen.

4. MODULES

4.1 Internet Control Panel
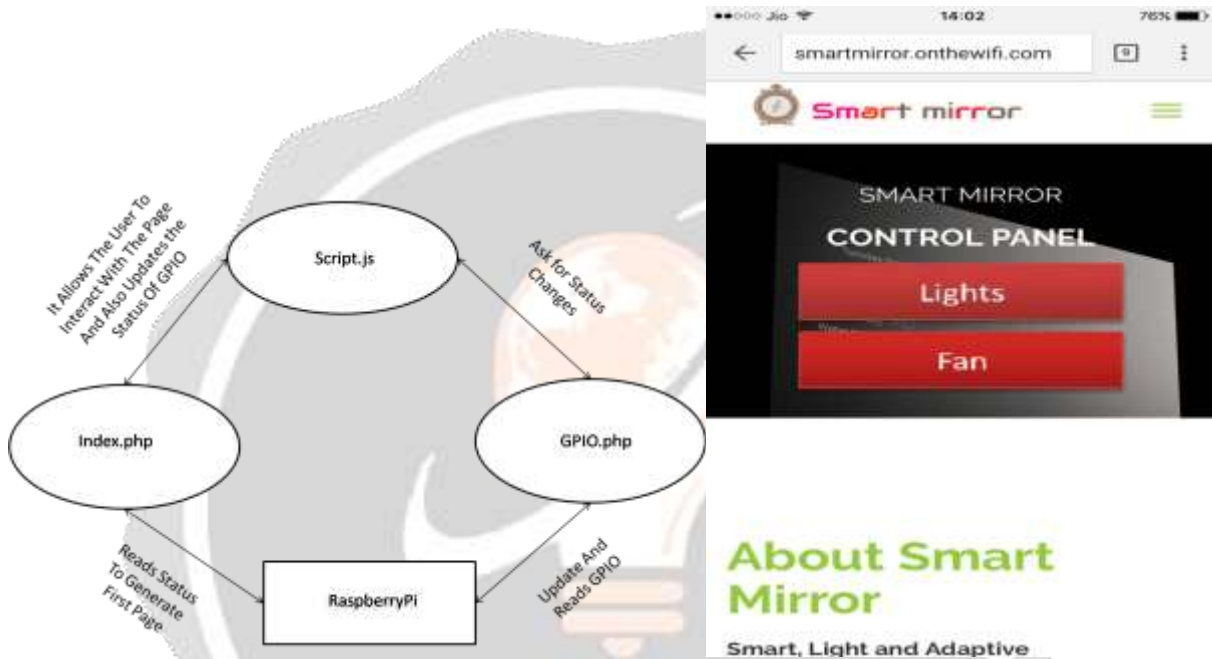
Fig -5: Left: Functioning of the website**,** Right: Smart Mirror Main Control Panel

The lights and the Fan connected to the smart mirror can be accessed anywhere in the world. Which means the user has the capability to switch ON/OFF their home appliances anywhere in the world.

4.2 Voice Commands

The smart mirror can also control electrical appliances through voice commands. The voice command application used in this project makes use of cmu-sphinx library.

Here is some list of voice commands that our device supports: -

- Lights ON
- Lights OFF
- Fan ON
- Fan OFF

4.3 Main App

Fig-7: Main Smart Mirror App

The main application makes use of nodejs which is hosted on the local server. The electron wrapper is a software framework which is used by nodejs for GUI applications. The electron wrapper provokes the chromium web browser to launch the application.

4.3.1 News

The news module makes use of feed parser libraries to fetch current news from the web. The news fetched from the Internet is in RSS (Rich Site Summary) format i.e it uses a family of standard web feed formats to publish information frequently like news headlines, blog entries etc. An RSS document generally consists of and metadata and summarized text.

4.3.2 Calendar

The calendar module makes use of certain nodejs library to display the calendar on the screen. There are certain calendar API's on the web to get current upcoming events such as Google calendar. The calendar module fetches calendar from the Internet in .ics format.

4.3.3 Weather

The weather module makes use of weather API from well-known websites such as Open Weather Map, which gives access to current weather, forecast, historical weather. The API returns the data in either JSON or XML format.

5. APPLICATIONS

- Smart mirrors can have wide range of applications from being your personal room assistant like controlling the amount of light coming in the room, switching on your lights or making it dimmer, controlling the temperature regulation of the room.
- Kiosk in airports showing you flight times.
- Used in shopping malls to show you variety of accessories such as clothes, cosmetics, spectacles virtually without having to physically try it.

6. CONCLUSION AND FUTURE WORK

Thus smart mirror is a flexible device for people who are busy, for example A busy businessman can view information such as news, weather, calendar, reminders and time while shaving without having to look into other devices.

In the future, Smart mirror can predict diseases by just looking at the mirror.

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