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CERTIFICATE

This is to certify that Mr. Vyankatesh S. Sahu, Mr. Madhav P. Laddha, Ms. Anjali S. Bajaj, Ms. Jagruti S. Pawar, Ms. Pooja P. Wagare has satisfactorily completed the seminar work towards the Bachelor of Engineering Degree of Sant Gadge Baba Amravati University, Amravati, in Information Technology discipline on the topic entitled "Smart mirror using raspberry pi", during the academic year 2020-21 under my supervision and guidance.

Date:

Prof. A.R. Bhuyar   **Dr. V. S. Gulhane**

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Principal

Acknowledgement

A moment of pause, to express a deep gratitude to several individuals, without whom this seminar could not have been completed. We feel immense pleasure to express deep sense of gratitude and indebtedness to our guide **Prof.A.R. Bhuyar** , for constant encouragement and noble guidance.

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ABSTRACT

Internet of Things (IoT) is a concept where an object having the ability to transfer data over a network without the need for human interaction to human or human to computer. IoT is known for its advantage that can help simplify people's everyday routine. Hence, the researcher comes with a proposed system called Smart Mirror. It is a concept of smart home-based Internet of Things (IoT). This system allows users to access information and also control the lights in the house. Relevant information can be traced such as time and date, weather, warning, traffic, and location map. In today's society, information is available to us at a glance through our phones, our laptops, our desktops, and more. But an extra level of interaction is required in order to access the information. As technology grows, technology should grow further and further away from the traditional style of interaction with devices. In the past, information was relayed through paper, then through computers, and in today's day and age, through our phones and multiple other mediums. Technology should become more integrated into our lives - more seamless and more invisible. We hope to push the envelope further, into the future. We propose a new simple way of connecting with your morning newspaper. We present our idea, the Smart Mirror, information at a glance. Our system aims to deliver your information quickly and comfortably, with a new modern aesthetic. While modern appliances require input through modules such as keyboards or touch screen, we hope to follow a model that can function purely on voice and gesture. We seek to deliver your information during your morning routine and throughout the day, when taking out your phone is not always possible. This will cater to a larger audience base, as the average consumer nowadays hopes to accomplish tasks with minimal active interaction with their adopted technology.

This seminar depicts the design and development of smart mirror that represents an elegant interface for glancing information and also used for various day to day updates. A smart mirror is a system that functions as mirror with additional capability of displaying date, time, current temperature, weather details. To design a smart mirror that receives online news and display it using Internet of things (IoT) circuitry and to provide user a best mirroring experience

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1. INTRODUCTION

In this world everyone needs a comfort life. Modern man has invented different technology for his purpose. In today's world, people need to be connected and they are willing to access the information easily. Whether it is through the television or internet, people need to be informed and in touch with the current affairs happening around the world. The Internet of Things means interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data. The Internet of Things with its enormous growth widens its applications to the living environment of the people by changing a home to smart home. Smart home is a connected home that connects all type of digital devices to communicate each other through the internet.

1.1 THE PROBLEM

In our rapidly developing world, information is always right at your fingertips - on your phone, on your computer, maybe even on your watch. Staying connected with new information is both important for entertainment and daily life. With such a variety of options, there is difficulty in following all of your data streams. Often, during your day, you may end up in a position where it is inconvenient, or even impossible, to take out your phone or computer and check the newest update. You cannot commit to a slower interaction. You need a display to glance at, with the information you need ready to go. However, aesthetics are just as important as displaying information. Keeping an extra computer in your bathroom or hall would be inconvenient, and would not fit well with the look of a modern room. A sleek, simple display, easy for an average consumer, is a necessity in today's world.

1.2 OTHER SOLUTION

There are several products in the market that attempt to be your attractive hub of daily information. The Amazon Echo and the upcoming Google Home present themselves as a small speaker that can relay information through sound. You can request news or music, fulfilling your

need to obtain media content in a hands-free manner. However, not all data is suitable for conveyance by voice. Both designs lack the key ability to convey information visually. Asking for the morning traffic can give you a time estimate, but it barely comes close to a detailed map with your route information. Having the news read to you is convenient, but many prefer reading the news at their own pace. A smart display would be a product that would be able to answer all of these concerns, while staying smoothly modern. The Nest thermostat has a small display for information. However, it is not intended for interaction. The interface can be clunky, and not something an average consumer would interact with on a day-to-day basis. The recently Kick-started Perseus hides a screen and computer behind a two-way mirror. This allows users to interact with the mirrors applications via touch 1 screen, voice, and camera controls. Perseus, however, is a finished product, and does not allow user hardware customization. It claims to have an available API and third party applications, but currently, there is little to no information or documentation on this matter. With months to go before its delivery, the success of this product remains uncertain. A few Do-It-Yourself (DIY) alternatives are also currently available. Both the Mirror-Mirror and Smart-Mirror projects provide an application to display information on a monitor behind a mirror. However, these require legwork on the user end, as not all users are willing to manually construct the project from scratch. Manual configuration and tinkering with modules can be a tedious and difficult process.

1.3 OUR SOLUTION

Our solution is an open platform for discrete display development. We offer an aesthetically pleasing mirror, with a hidden smart display underneath. With a generic display, the mirror can be built to any size so the information can be both in your face while showing you your face. Our product differs from the competition with an easy-to-use interface that is both simple for the average user and open for the advanced developer. A sleek display gives all levels of users a modern hub of technology for their personal daily interaction, one which both displays visually all the information you could need or want, and operates with a simple interaction that you could fit into your daily routine. By creating a platform open to modification, developers will also be add new functionality at their own pace. This will allow our display to be a tailorable and adaptable platform. A web application provides the interface that the user sees and interacts with.

An online configurator will relieve the frustration and difficulty of personalizing your information, as well as allow streamlined development of new modules. Powered by a small computer, the smart mirror will have great potential for expansion by developers. As an open platform, consumers and developers will be able to easily build, adapt, and hack their smart mirror to fit their own needs. Our product will be a step in the future of IoT using smart mirror.

2. LITERATURE SURVEY

In 2003 Phillips unveiled their Mirror TV that was built using the same principles that of smart mirrors. Their product was a normal TV that was put behind a two way mirror so that the TV would appear as a mirror when turned on and as TV when turned on. They also had an option to have the mirror be larger than the TV. A usage example presented by Phillips was to have the children watch cartoons while brushing their teeth at the same time. Later in 2005 Phillips announced their research project MyHeart that built upon the idea of an informative mirror. While their original Mirror TV was simply a TV that also functioned as a mirror, the project would integrate a display to showcase various medical statistics. However this project required on-body electronics to collect and analyze the data. The mirror itself simply served as an informative display.[1]

James Law Cyber tecture developed a commercially sold smart mirror in 2011. This mirror is more in line with the smart mirror we've come to know today. The product consists of 32"LCD-display covered by a 37" two way mirror.[2] The display can show weather forecasts, stream internet, TV, the current time and various widgets. The smart mirror has numerous input methods such as remote controller, smartphone app and onscreen virtual keyboard.[3]

Paper by Franco Chiarugietal (2013) discusses the motivation and rationale behind the project. Their idea was to extract quantitative features official expressions related to stress, anxiety and fatigue and use those features to quantify an individual's well-being. The features would be extracted from data collected from multisensory devices.[4] The data would be collected in the form of videos, images, 3D face scans and breath samples. The project is first and foremost a research project to digitalize semeiotics - the physical signs produced by diseases - from facial images. At the 2014 International Consumer Electronics Show (CES) Toshiba showcased their smart mirror concept. It utilized gesture control as an input method. Toshiba showcased their smart mirror in different home environments. Their idea was that the smart mirror would be customized for purpose it would serve in each room. The bathroom smart mirror would show information such as weather forecast and a personal fitness monitor.[5]

In 2016 Microsoft released detail on the smart mirror they have been working on. Their intention does not seem to be to create a commercial smart mirror to sell to consumers, but rather they unveiled all the details on how to build one and made all the code publicly available at a git hub repository[6].

Rather than selling a finished product consumers have the option to assemble their own mirror as a do-it-yourself project.

Daniel Bessereretal (2016) created a smart mirror for adding interactive fitness exercises to a person's morning routine. Their project utilizes the Microsoft Kinectv2 for tracking gestures and a Wii Balance Board for presence detection.[7]

Chidambaram Sethukkara et al. (2016) created an intelligent mirror that identifies users based on facial recognition, recognizes emotions, record health parameters.[8]

and gives clothing advise. Their paper does not go in-depth on any of its subjects, but rather try to unite the ideas under the concept of an intelligent mirror.[9]

In 2017 a company called New Kinpo Group launched their take on the smart mirror called Hi-Mirror. This smart mirror has a camera to specifically monitor your skin health. The mirror will scan your skin and give you metric to tell you what to improve.[10] The mirror uses facial recognition to log a user's skin firmness, texture, clarity, brightness and health on day to day basis.

3. PROPOSED WORK

The proposed system is to design an interactive futuristic smart mirror using Raspberry Pi. In the proposed system, the ability of the system to recognize intruder or thief and provide details of the same. Interactive computing, with wirelessly connected embedded devices that are being used in various day–to–day activities .Based on this technology, many devices/products are now emerging and with this intelligence it is providing comfortable, secure and convenient personal services everywhere. The project aims at creating a smart system for users where it detects intruder or thief using thief detection module and interact with the people using alexa. And it can also be used as information system by displaying news feeds, weather forecast, calendar, etc.

3.1 Working of Smart mirror

There are three components of a smart mirror: a two-way mirror, a display, and a computer device. Let's look at each part and how they run the smart mirror.

Two-Way Mirror: A normal mirror has a film behind the glass that reflects 100% of incoming light. This means when you look at a mirror, you see your reflection. A two-way mirror reflects light from one direction, but allows light to pass through from the other direction.

You've probably seen two-way mirrors in the movies in police interrogation rooms. Smart mirrors use two-way mirrors to allow the light from the display to pass through the mirror.

Display: behind the two-way mirror sits a monitor screen/TV/tablet. This is used to display any information or modules for your smart mirror. The display can be the same size as the mirror, or it can be smaller than the mirror.

Throughout this site you'll see different sized displays used in smart mirrors.

Computer: something has to run the content you see on your smart mirror. A small computer device such as a Raspberry Pi is more than enough to power a smart mirror.
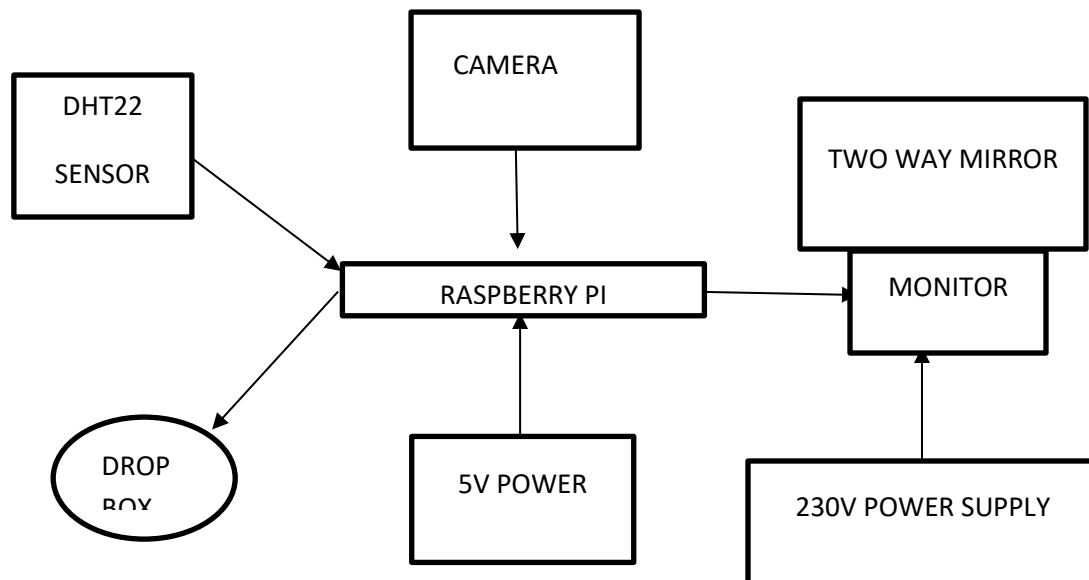
The type of computer device you need depends on what you want your smart mirror to do.

A. Smart Mirror As A Mirror

We can see our view as we can see it in a natural mirror while looking and grooming with the help of one way mirror with high concentration of aluminum content.

**B. Smart Mirror as Security System**

When there is nobody in home it can be switched into security system by using VNC viewer to detect human presence. When someone enters into room ,PIR sensor will detect the movement of the person when he passes by the mirror and capture the image and stores it in the drop box .Also informs the owner by updating captured image in the drop-box ,by this way smart mirror system can also be used as a security system.

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    ┌──────────┐      ┌──────────┐              ┌────────────────┐
    │  DHT22   │      │  CAMERA  │              │ TWO WAY MIRROR │
    │  SENSOR  │      └────┬─────┘              └───────┬────────┘
    └────┬─────┘           │                    ┌───────┴────────┐
         │                 ▼                    │    MONITOR     │
         │          ┌──────────────┐            └───────▲────────┘
         └────────▶ │ RASPBERRY PI │ ──────────▶        │
         ▼          └──────▲───────┘                    │
    ┌─────────┐            │                    ┌────────┴──────────┐
    │  DROP   │     ┌──────┴──────┐             │ 230V POWER SUPPLY │
    │  BOX    │     │  5V POWER   │             └───────────────────┘
    └─────────┘     └─────────────┘
```

C. Smart Mirror as Information System

Time, Date, weather details and news are fetched from online using predefined URL. News is fetched from websites

Like CCN, BBC etc. DHT22 –digital sensor is used to get the humidity and temperature details.DHT22 is connected to GPIO pins of Raspberry Pi board using jumpers.
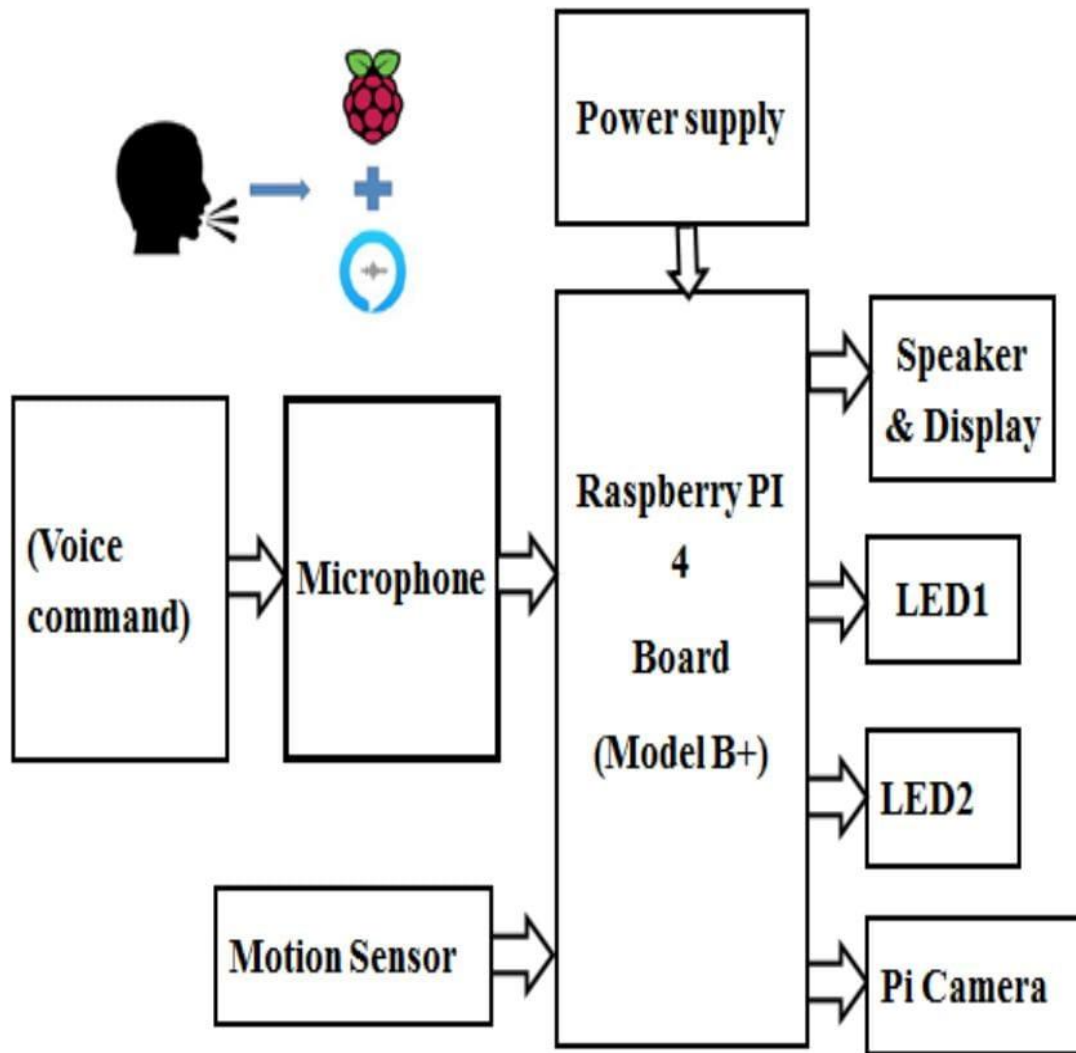
Block Diagram of IoT Based Smart Mirror

Fig.1.2. Block Diagram for Smart Mirror

3.2 ALGORITHMS

Algorithm for Information System

Step 1: Switch on the power supply.

Step 2: Get the date, time, and weather details from predefined from URL.

Step3: Get the news from www.zeenews.com

 Step 4: In code section write down all the compliments to be displayed on mirror.

Step 5: Display it on mirror via LCD monitor

Step6: Switch to thief detection mode using VNC viewer.
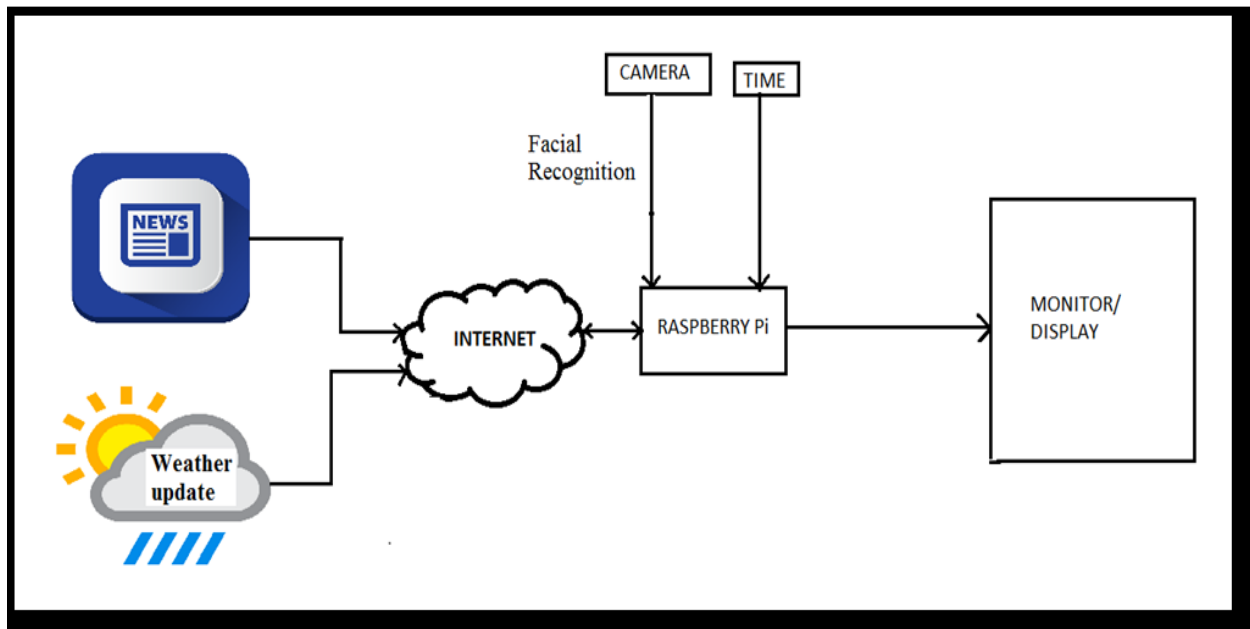
 Step7: Switch off the power supply when it is of no use.

Fig 2. Block Diagram for working of Smart mirror using server

Algorithm for Thief Detection

Step 1: Start

Step 2: Setup the Camera

Step 3: Check whether PIR sensor output is high or low

Step 4: If it is low, go to step 3.

Step 5: If it is high, camera is turned ON.

Step 6: Image is captured and stored on raspberry pi.

Step 7: Check for Wi-Fi connection.

Step 8: If it is connected image is uploaded to drop-box.

Step 9: Notification is updated in drop-box.

4. COMPONENTS

The overall system has two main components - a hardware component and a software component. The hardware model is a 2 way mirror covering a LCD screen, both of which approximately measure 23" diagonally. The LCD screen is connected to a Raspberry Pi 3, although other computing devices may be suitable. The Raspberry Pi 3 has a microphone connected in order to collect audible input. All components are encapsulated within a wooden frame. On the software side, we host a local server that generates web content to be displayed on the screen.

4.1 HARDWARE COMPONENT OVERVIEW

1. Raspberry Pi:

    An SD card inserted into the slot on the board acts as the hard drive for the **Raspberry Pi**. It is a capable little device that enables people of all ages to explore computing.

Raspberry pi

2. Two-way mirror:

    Also known as **two-way** glass, a **two-way mirror** is glass that is reflective on one side and clear on the other, giving the appearance of a **mirror** to those who see the reflection but allowing people on the clear side to see through, as if at a window.

3. LCD panel:

   A **liquid-crystal display** (LCD) is a flat-panel display or other electronically modulated optical device.

4. Microphone:

   Smart Mirror can be easily built by using one way mirror, concealed LED screen and **microphone** to make it interactive.
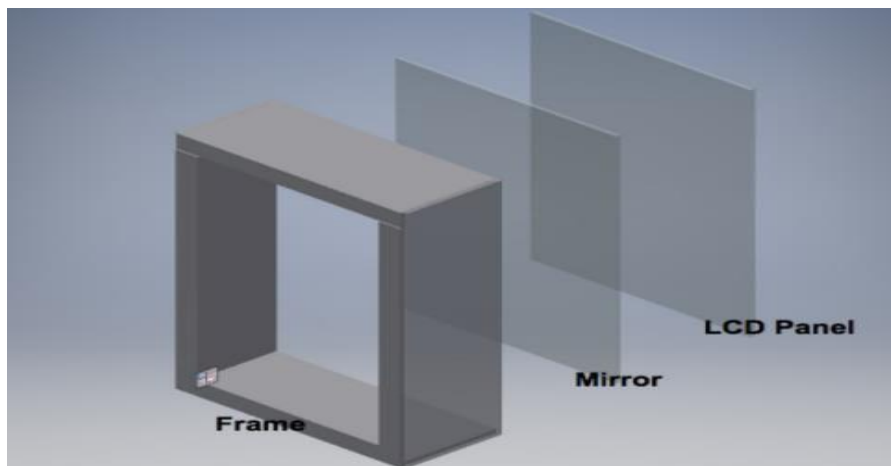
5. Speaker:

   Speaker can be attached to raspberry pi or alexa so that we can interact with Smart mirror or listen to music or audio through our Smart mirror.

6. Wooden Frame:

   To frame the two way mirror and assemble the raspberry pi and other hardware components.

7. Camera:

    capable of monitoring human **within** a coverage range of **camera**.

. **Outer structure of Smart mirror**

HARDWARE DESIGN

Hardware Design On the outside, the hardware is encapsulated within a wooden frame. On the front, a two-way mirror is placed in front of a LCD monitor. This way, the system can act as a mirror when not currently in use, while the LCD projects through the mirror when in use.
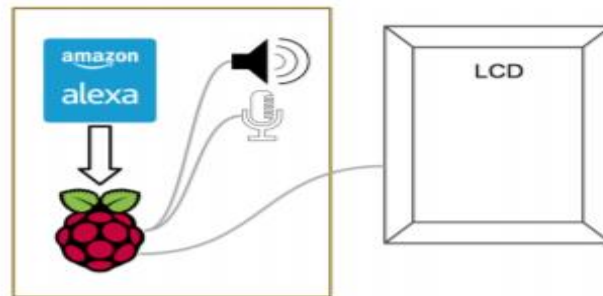
Inner structure

The wooden frame has a bezel on the front which the mirror and LCD panel are pressed against. Cutouts for dowels are added in line with the back of the LCD panel to keep the components snug against the bezel.Inside Behind the LCD panel is the heart of the product, the Raspberry Pi, which is connected to the LCD for visual display. We also have a microphone and speaker attached for audio input and output. The Raspberry Pi runs our software and also allows us to connect to the Internet for web services, such as Amazon's Alexa Voice Service.

3.2 SOFTWARE COMPONENT OVERVIEW

1. Raspbian OS
2. Alexa voice service
3. Magic mirror interface

SOFTWARE DESIGN

The goal of our project is to create an open platform for development, and all software components must fit to that goal. The software is designed to run on many platforms and fit many display types.

4. APPLICATIONS

A smart mirror is a device that functions as a mirror with additional capability of displaying multimedia data, such as text, images, and videos. This device allows users to access and interact with contextual information, such as weather data, seamlessly as part of their daily routine.

Among the application segment, the hospitality and retail smart mirror segment is expected to grow at the highest CAGR during the forecast period. Smart mirrors are often used in the retail sector wherein retailers try to catch the interest of potential clients and encourage them for frequent or regular visits.

It can use in at Office for information purpose. At homes & vehicles as informative gadget.

Home Decor

It can be used in our Drawing room, bed room, bath rooms, or any other place which can enhance the look of your house, and attract people towards it.

Smart-Home

As we are providing inbuilt thief detection system with this smart mirror, it will be easy for you to look out to your home. Which will make your home smart.

Security

Smart mirror is a system that not only works as a normal mirror but also provides Security against intrusion inside the home.

As assistant

While you go through your morning routine you can look at your mirror and see a traffic report, weather forecast for the day, and your day's schedule And many more...

Advantages:

1. The big advantage of a smart mirror is the ability to display useful information like weather, time, calender, meetings scheduled on google calender.

2. You simply look at your smart mirror and the information is there. For example, imagine the mirror in your bathroom is a smart mirror.

3. Smart Mirrors are interactive devices that helps you check updates easily with voice control.

4. You can do things at the same time in the morning like brushing your teeth while catching up on the meeting updates , weather or traffic.

5. you can watch shows while preparing going to work.
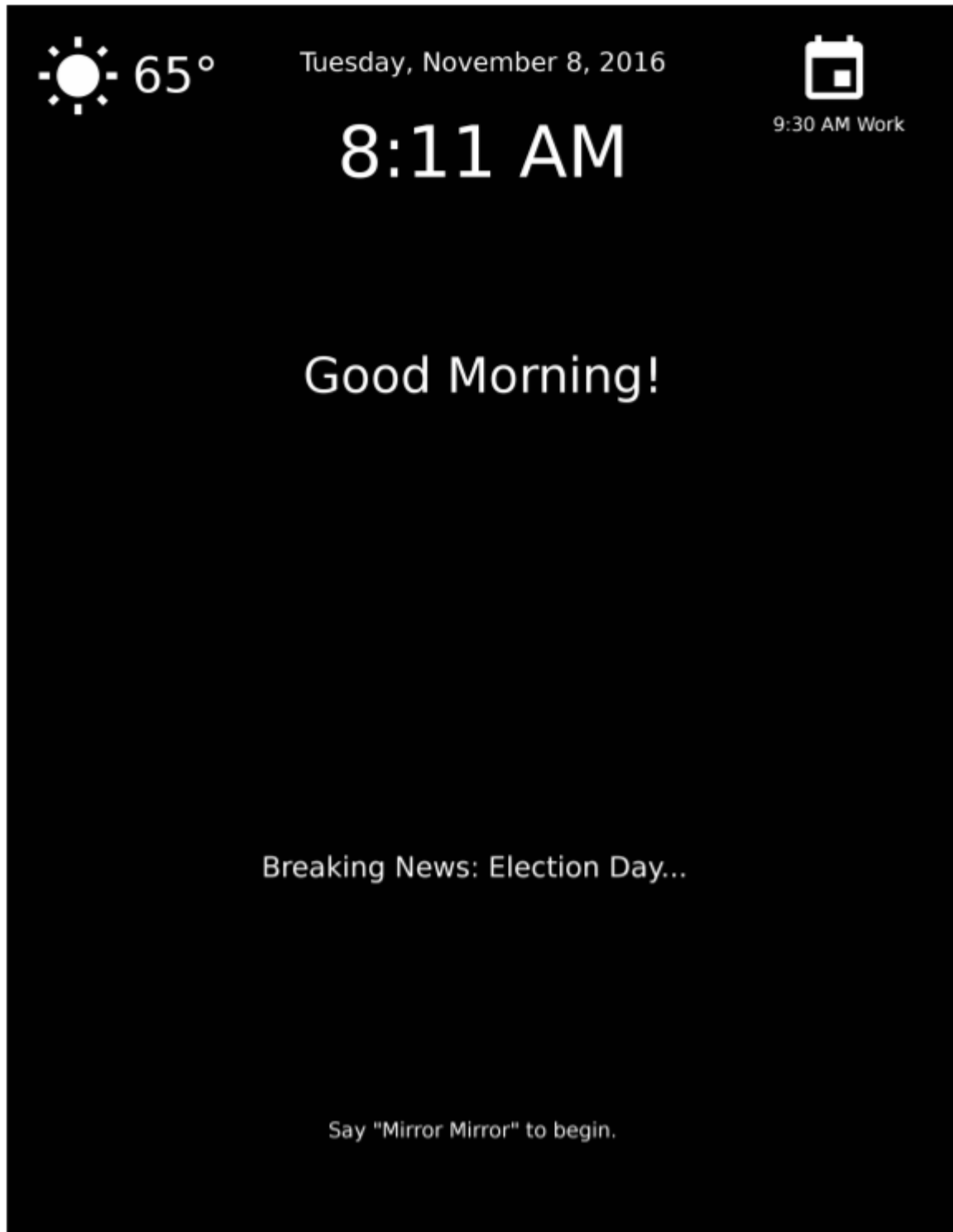
Conceptual model of Smart mirror

5. CONCLUSION

Smart mirrors have great potential to enhance user experience of accessing and interacting with information. Not only do they allow users to see relevant information effortlessly, they can also be integrated as a thief detection system. Our smart mirror saves time and makes it easier to access information. In today's society security is of crucial importance. By keeping this in mind we have integrated a thief detection system into our smart mirror .In future this project can be improved by adding interactive touch screen ,geo-location, Alexa and some more features.

6. REFRENCES

[1] B. Cvetkoska, N. Marina, D. C. Bogatinoska and Z. Mitreski, "Smart mirror E-health assistant — Posture analyze algorithm proposed model for upright posture," IEEE EUROCON 2017 -17th International Conference on Smart Technologies, Ohrid, 2017, pp. 507-512

[2] M. M. Yusri et al., "Smart mirror for smart life," 2017 6th ICT International Student Project Conference (ICT-ISPC), Skudai, 2017, pp. 1-5.

[3] D. Gold, D. Sollinger and Indratmo, "Smart_Reflect: A modular smart mirror application platform," 2016 IEEE 7th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), Vancouver, BC, 2016, pp. 1-7

[4] O. Gomez-Carmona and D. Casado-Mansilla, "SmiWork: An interactive smart mirror platform for workplace health promotion," 2017 2nd International Multidisciplinary Conference on Computer and Energy Science (SpliTech), Split, 2017, pp. 1-6.

[5] S. Athira, F. Francis, R. Raphel, N. S. Sachin, S. Porinchu and S. Francis, "Smart mirror: A novel framework for interactive display," 2016 International Conference on Circuit, Power and Computing Technologies (ICCPCT), Nagercoil, 2016, pp. 1-6.

[6] M. Rodriguez-Martinez et al., "Smart Mirrors: peer-to-peer Web services for publishing electronic documents," 14th International Workshop Research Issues on Data Engineering: Web Services for eCommerce and e-Government Applications, 2004. Proceedings., 2004, pp. 121-128.

[7] Yuan-Chih Yu, S. c. D. You and Dwen-Ren Tsai, "Magic mirror table with social-emotion awareness for the smart home," 2012 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, 2012, pp. 185-186.

[8] Sun Yong.Geng Liqing*,Dan Ke,"Design of Smart Mirror Based On Raspberry-Pi",International Conference on Intelligent Trasnsportation ,Big Data &Smart City,2018.

[9]   R.Akshaya,N.NiroshimaRaj.S.Gowri,"Smart   Mirror-Digital   Magazine   for   University implemented Using Raspberry Pi",International Conference on Emerging Trends and Innovation in Engineering and Technological Research,2018.

[10] Ayushman Johri,Raghav Narain Wahi,Sana Jafri,Dr.Dhiraj Pandey,"Smart Mirror: A time saving and Affordable Assistant",International Conference on Computing Communication and Automation,2018.

[11] Kun Jin,Xibo Deng,Zhi Huang,Shaochang Chen," Design Design of Smart Mirror based on Raspberry Pi",Advanced Information Manangement, Communicates ,Electronic and Automation Control Conference,2018.