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Smart Mirror: A Glance In To the Future

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ABSTRACT: - In today's modern world, information is available at a glance through different devices such as cell phones, laptops, desktops, and more. However, 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 used to be shared through paper, then through computers, and in the present era, through phones and multiple other mediums. Technology should become more integrated into our lives – seamless and invisible, so that one can push the envelope further, into the future. In this paper, a new and simple way of connecting with the news updates/events is proposed in the form of Smart Mirror. The proposed system aims to deliver the information quickly and comfortably, with a new modern aesthetic. While modern devices require input through different ways, such as keyboards or touch screen, but the proposed system can function purely on voice and gesture, without making use of cell phones. This will cater to a larger audience base, as the average consumer nowadays hopes to accomplish tasks with minimal active interaction with their adaptive technology. This idea can be extrapolated into applications, such as integration with virtual or augmented reality devices like smart watches, smart homes, and smart cities.

KEYWORDS: Smart mirror, IoT, Machine learning, cloud computing.

I. INTRODUCTION.

In today's rapidly developing world, information is always available at fingertips – on phone, on computer, maybe even on smart 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 the course of the day, one may end up in a position where it is inconvenient, or even impossible, to take out phone or computer and check the news updates. 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 todays world. Here smart mirror will come handy [5].Because of the technological advancements, many of the products used today can be connected to the Internet and thus products become smarter. In recent times, smart mirror technology has gained importance in the category of smart products [3, 8]. The smart mirror is a modification over a normal mirror with interconnected smart devices and technologies with embedded intelligence, which offers advanced functionality such as time, news, weather, displaying maps [1]. The smart mirror technology closely followed by the companies is expected to be used not only in the fashion world but also in many areas like image processing etc., in the coming years. The development of intelligent mirror technology can be achieved using Machine Learning, IOT and Cloud computing techniques. This mirror facilitates in developing smart homes, smart cities and provide a unique environment to the users [2,6]. The mirror will resolve the problems that many people experience every day, getting information without the use of smart phone. Before going to bed, the user may want to know whether it will rain the next morning so that they can plan their next day's schedule. This paper is presented in seven sections including introduction

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section. Section II presents the block diagram of the proposed system. System requirement specifications are given in section III. Design of smart mirror is discussed in section IV. Software requirements are presented in section V. Observation and Results are discussed in section VI and finally section VII gives the conclusion.

II. BLOCK DIAGRAM OF THE SYSTEM.

The design of the system as shown in the Figure1 is a combination of a layered architecture based on client-server architecture. The user interacts primarily with the Graphical User Interface (GUI) that is built upon the Operating System (OS) used for the development for our system [4, 7]. Requests made to edit the settings directly, are passed on to underlying OS, which makes the changes in the system. The system itself communicates with remote clients via the Internet. When receiving information for interface modules, the system acts as a client to the web services. In interacting with other smart devices, the system will act as a server for information.

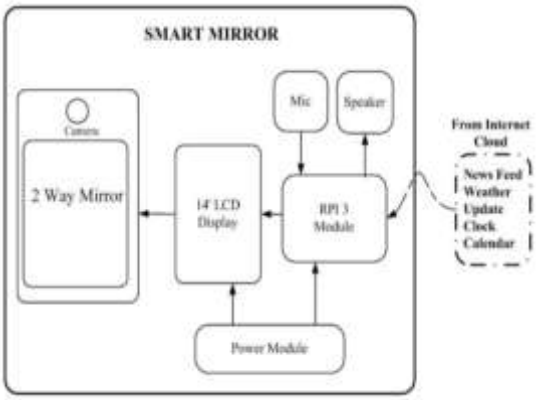

Fig.1 Block diagram of the system.

The application makes use of two main sections - a server and a local client. The server, built using Node.js provides the back end for the project. It hosts a simple web page and opens a web browser directed to that page. The HTML content of the page contains the grid layout for widgets to be placed in. Tied to this web page is the local client, built using JavaScript. The local client communicates with the server and handles all display activities. The client loads and refreshes widgets as needed and provides the primary interface for users. Using IPC, the Node.js server sends commands to the client in order to extend functionality. This can be used to communicate with other IoT devices and display data such as current temperature and other parameters in a house as reported by smart thermostat/sensors.

III. SYSTEM REQUIREMENT SPECIFICATIONS.

Having considered the above requirement the design was initiated, with an objective of meeting optimal level of performance and possible up gradation in future. Smart mirror has been developed using Raspberry Pi based hardware [9, 10].

3.1 Hardware Requirements

- LCD display
- Two-way mirror
- Amazon Alexa
- Raspberry Pi
- Wi-Fi adapter

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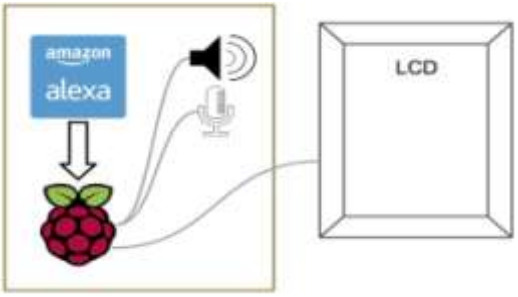

Fig.2 Alexa interfaced with LCD

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[3]. 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. Figure2 shows that the LCD panel is 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.

IV. DESIGN OF SMART MIRROR

- **Raspberry Pi 3** Raspberry Pi 3 is the newest, fastest, and easiest to use. It comes with 1 GB, 2GB, or 4GB of RAM. For most educational purposes and many hobbyist projects, 1GB is enough; for use as a desktop computer, we recommend 2GB.
- It is a low cost, credit card sized computer that plugs into a computer monitor or TV and uses a standard keyboard and mouse. Raspberry Pi Zero and Zero-W are smaller; require less power, so they are useful for portable projects such as robots. It is easier to start a project with Raspberry Pi 3, and to move to Pi Zero when you have a working prototype that a smaller Pi would be useful for.

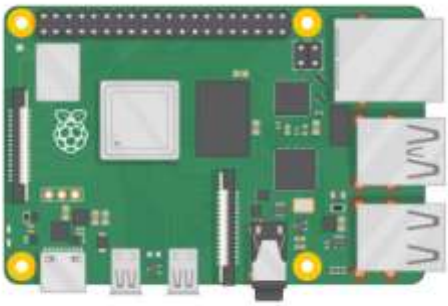

Fig 3.a: Raspberry 3 pi module

Power supply

- To connect to a power socket, all Raspberry Pi models have a USB port (the same found on many mobile phones): either USB-C for Raspberry Pi 4, or micro USB for Raspberry Pi 3, 2 and 1.
- Need a power supply that provides at least 2.5 amps for Raspberry Pi 3.

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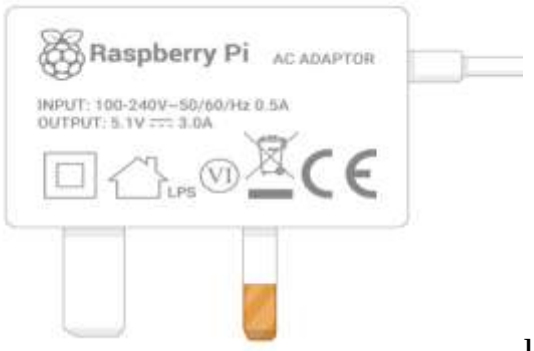

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Fig 3.b: Power supply to raspberry pi

A keyboard and a mouse

- To start using Raspberry Pi, a USB keyboard and a USB mouse are needed.
- Once Pi is setup, Bluetooth keyboard and mouse can be used, but USB keyboard and mouse are needed for the first setup.

A TV or computer screen

- To view the Raspbian desktop environment, a screen is needed along with a cable to link the screen and the Pi. The screen can be a TV or a computer monitor. If the screen has built-in speakers, the Pi can use these to play sound.

A micro-SD card

- Raspberry Pi needs an SD card to store all its files and the Raspbian operating system needs a micro SD card with a capacity of at least 8 GB.

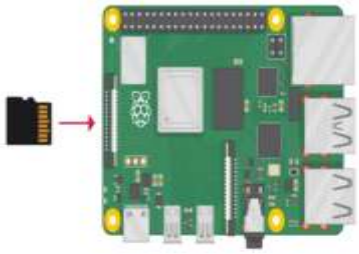

Fig 3.c: Raspberry 3 pi module circuit with micro-SD card

HDMI

- The Raspberry Pi has a HDMI output port that is compatible with the HDMI port of most modern TVs and computer monitors. Many computer monitors may also have DVI or VGA ports.
- **Raspberry Pi 3** have a single full-size HDMI port, which can be connected to a screen using a standard HDMI-to-HDMI cable.

- **Set up for SD card** The SD card that doesn't have the Raspbian operating system on it yet, or if you want to reset your Raspberry Pi, you can easily install Raspbian yourself. To do so, it need a computer that has an SD card port — most laptop and desktop computers have one.
- The Raspbian operating system via NOOBS, Using the NOOBS software is the easiest way to install Raspbian on the SD card.
- A box linking to the NOOBS files.

Click on the box to download

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Fig 3d: Raspbian and Noobs files illustration

Format the SD card

- Anything that's stored on the SD card will be overwritten during formatting. So if the SD card on which you want to install Raspbian currently has any files on it, e.g. from an older version of Raspbian, you may wish to back these files up first to not lose them permanently.
- Visit the SD Association's website and download SD Formatter for Windows or Mac.
- Follow the instructions to install the software.
- Insert your SD card into the computer or laptop's SD card slot.
- In SD Formatter, select your SD card, and the format the card.

Extract NOOBS from the zip archive

Next, you will need to extract the files from the NOOBS zip archive you downloaded from the Raspberry Pi website.

- Find the downloaded archive — by default, it should be in your down loads folder.
- Double-click on it to extract the files, and keep the resulting Explorer/Finder window open.

V. SOFTWARE REQUIREMENTS

The algorithm for smart mirror implementation has been developed using Python programming.

- HTML
- CSS
- Python
- Electron
- GITHUB
- Travis CI
- Feed Parser

Raspberry Pi 3

It maintains the same price point but offers additional processing power, more RAM, and offers onboard bluetooth and Wi-Fi for connectivity. The Raspberry Pi was selected for its ease of use and availability to the hobbyist community. The Raspberry Pi is capable of running several flavors of Linux, all of which should be capable of running our software platform.

HTML Hyper Text Markup Language It is the most basic building block of the web.it defines the meaning and content of the web. They are used for web pages development, Internet Navigation, Responsive UI, Offline Support, and Game Development

CSS (Cascading Style Sheets) It is the language for describing the presentation of web pages, including pages, colors, layout. It describes how HTML elements are to be displayed on screen or in other media. It can control layout of other multiple web pages at once. External style sheets are stored in CSS files.

Electron It allows for the use of standard web technologies to implement at front end. This allowed the use of HTML, CSS, and JavaScript to implement the entirety of the system. Using standard and familiar technologies was important for speed of implementation as well as future users who may wish to modify the system. Using unfamiliar technologies and programming languages would increase the barrier for entry and deter potential users who may not have as much of a technological back ground. Electron package called 'electron-boilerplate.' This package provided a faster start to application development and allows for more integrated testing as well as the potential to build release executables for multiple systems. In order to host the source code and other components of the project, a version control system was necessary.

GitHub It was chosen for its familiarity and compatibility with other technologies. It allowed multiple developers to work on the project at once and keep track of version history. Other users can access the project from GitHub and obtain any version of the project. Because of GitHub's compatibility with other software, we chose to use Travis CI to run tests on our system.

Travis CI On any change in the GitHub repository, it runs all the tests that we have written and reports

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Feed Parser It is a python module for downloading and parsing syndicated feeds. It is easy to use; the module is self-contained in a single file called feedparser.py

VI. OBSERVATIONS/RESULTS.

Figure4 shows the connected hard ware module which was tested.

Figure 4:- Connected Hardware Module

The smart mirror makes use of internet access. The mirror can be turned on in a fraction of second, and information is accessible through voice commands. Below output/data is shown to the user as seen in the figure:

Figure 5:- GUI with the results.

- A welcome message is displayed to the user. According to current time, it is able to greet like Good Morning, Good Afternoon, Good Evening, Good Night.
- Smart mirror displays date and time to the user.
- Smart mirror displays weather information.
- Smart mirror displays latest news updates/headlines.

VII. CONCLUSION.

A proto type smart mirror that provides information such as date, temperature, time, the latest news and headlines as per the current location. It can respond with voice commands, functions, listen user queries, and answer them accordingly. The system is reliable, easy to operate and interactive system. The present work deals with design of a prototype as an efficient and economically viable solution for the development of a smart mirror to reduce user's valuable time in checking their smart phone, tablet, PC for the information they require. The smart mirror provides the information without any effort from the user with the aim of not being a burden to them. The smart mirror does not add complexity for the user, rather acts as an enhancement to the already available common mirrors in most of the modern bathrooms, bedrooms. Further one can extend the scope of this work by designing a mirror that would

act as a personal assistant to both developers and general consumers alike. It can also be extended for home automation.

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