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Implemetaion of Magic Mirror for Home Automation

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ABSTRACT (Center, Font-11, Bold)

It is a human behavior to watch ourselves in mirror at least once before starts our daily routine. Itpsychologically brings confidence among people by observing their looks and their attire suitable for particular occasion. Magic Mirror is an application which developed using Raspberry Pie and embeds computer screen in a mirror. It is absolutely a futuristic technology.

The Raspberry Pie works in background and controls all data displayed on mirror. Mirror is designed in a way which able to display daily news, weather forecasting and many more day-to-day updates. The mirror is further programmed to enhance its ability to work as artificial intelligence (AI) framework. It enables all home appliances to work and monitored with commands of human voice.The system developed uses HDMI to connect Raspberry Pie to monitor. It also contains inbuilt Wi-Fi and Bluetooth interfaces to remotely operate various task like playing music, videos and many more. The proposed system is highly secured and authenticated. It works only after the recognition of authorized user stand in front of mirror. Customized data is also displayed on mirror only after proper authentication.

The paper focuses on complete design and implementation of magic mirror for home automation along with exciting features. It works on authenticated voice commands and displays customized real time data as per user's demand.

Keyword: ***- Raspberry Pi-3 B+, two-way mirror, home automation, voice commands***

1. INTRODUCTION

Today's world is the world of information and communication technology. Peoples want to be connected to each other and agar to access information on single click. Lifestyle of people is changed drastically, and time managements come out as important thing. Apart from busy schedule, they want to be in touch with current affairs, day-to-day happenings around the world. On other hand, people happily spare 20-30 minutes on average in front of the mirror to look themselves. To utilize the time, an intelligent proposal is to turn mirror to magic mirror. The idea is to enable mirror to control household appliances [1]. It will save precious time of people such that when they are in front of mirror, they can visualize, control and monitor day-to-day activities. One can embed various features to the magic mirror, integration of household appliances and items using ICT to improve their overall efficiency, increase utility.

A Magic Mirror developed in such a way, comes under the category of the internet of things (IOT) [1][2]. The Internet of Things (IOT), embeds sensors, software and other technologies connect in the network of physical objects and exchange information over the internet as and when required [2].

Thus, The Magic Mirror is another high-tech mirror that may replace traditional dressing rooms specifically in some retail establishments of apparel sales [3][4]. This interactive Magic Mirror also termed as a Smart Mirror when implements using IoT technology which embeds various electronic device with a mirror. The scope of such magic mirror is not only limited at home but it exceeds to commercial purpose too. Its use is twofold; at home it is use to

display date, time, weather forecasting, trending news, etc., whereas it is also used to carried out brushing and bathing related activities. As commercial stage, it can be used to replace mirrors at strategic locations like boutiques, shopees etc. It is used to showcase information such as price tags, similar products, and sizes. It also finds similar applications in offices, salons, hospitals etc [4].

2. BACKGROUND OF THE SYSTEM

A good hardware system works on real time data. The magic mirror is developed with the use of raspberry pi [1][2]. In India there are very less no. of companies which are using the Magic Mirror. But this system is designed to show the different activities. Along with these activities, system needs to be interfaced with some hardware and software so that new data can be generated using existing one. Overall cost of system is very high. Hence, attempt is tried to develop cost effective system which provides proposed features.

The developed system is user friendly, interactive and works on the user input. But it may find difficultly in identifying gestures. All features are work automatically with less human interaction. New functionalities can be easily added to system to expand it usability. Software part can be created as an installer or can be bundled it as a Linux distribution. It can easily install on any Raspberry Pi device. One can make changes as per the requirement to make it multifunctioning. The supporting UI app has an ability to easily change settings for the mirror. Once polished, the software can be converted as open source. As far as hardware part is concerned, the glass panel needs to be replaced by reflective one [2][5].

3. SYSTEM DESCRIPTION

The main idea of system is to utilize time while standing in front of mirror. People can read the news; get updates of daily affairs even can control home appliances just by replacing mirror with magic mirror. This IOT based magic mirror use in home automation and works according to commands given by authenticated clients [5][6]. The overall system is divided into five subsystems. They are On/Off module, internet module, user interface module, speaker module and display module. The flow and the connectivity of these modules are as shown in the figure 1.

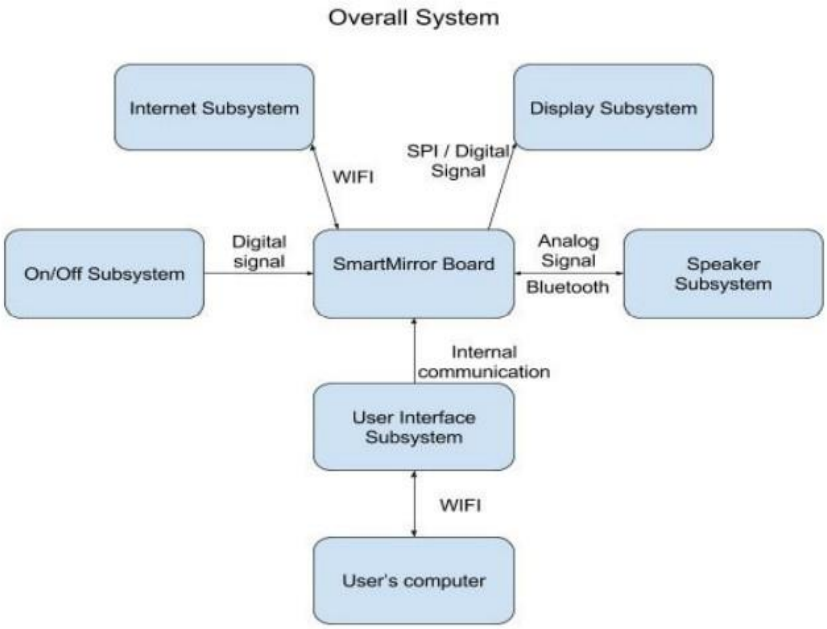

Figure 1: Overall system

The user interface takes user input, determines SSID, verifies password, takes zip code and searches a news source to display the headlines. It first writes search data into non-volatile memory. This stored information is then passes to internet module. It connects with internet using Wi-Fi and analyzes data according to time, weather, and headlines. This parsed data is saved into the respective arrays, which can be further displayed onto the screens by the display module. The On/Off module uses motion sensor to determine, the system's state whether in sleep mode or active mode. The speaker module is connected to via Bluetooth whenever system is turned on.

4. ARCHITECTURE OF THE SYSTEM

In the system, 2-way mirror is main object kept in front of complete setup. It is used for both reflection and transparent purpose. LED display shows the information that is placed behind the mirror. Other physical devices i.e., power cable is used to supply power to all components from Raspberry pi to speaker. It generates audio output when someone watches YouTube videos whereas mouse and keyboard provides input/output commands to the mirror. User can select any function displayed on the screen of the mirror. The whole software code is kept in the SD card which is inserted into Raspberry pi [5][7]. The required data is taken down by raspberry pi using internet connection using wireless (Wi-Fi) connectivity. The system architecture of interactive magic mirror is represented in figure 2.

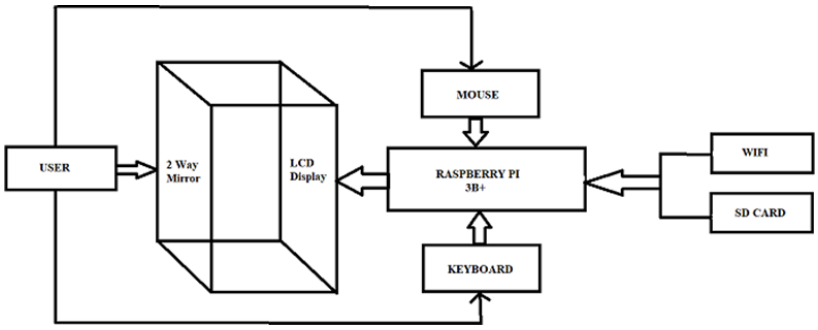

Figure 2: System Architecture

The system is developed to display following data on the screen of magic mirror,

- **Real-time Date and Time** –it takes date and time from the server and displays it to the user.
- **Real-time Weather display-** It fetches the present weather forecast based on current location and displays the temperature, humidity and other parameters in pictorial manner. It also shows written description of the current weather. It helps peoples to chalk out a plan of day. The open weatherMapAPI with the location set as Awka, Nigeria is used for the purpose.
- **Real-time News and Times-Of-India Display**- It takes news headlines using RSS feed. Scrolling through news headlines can be controlled by news feed notifications to the model. Times-Of-India-Feed module displays news headlines based on an RSS feed from Times of India website.
- **Compliment Display**- This functionality displays a random compliment.

5. SYSTEM DEVELOPMENT

System requires wooden frame for support. The figure 3 shows frame which is made of wood. It acts a case to support a mirror and protect other components. It also uses to frame the glass and provides a way to hand mirror on wall.

Figure 3: **Frame and support**

System uses computer monitor as output device which is used to display information in either pictorial or text form. A monitor embeds a visual display, some circuitry and a power supply in it. They are connected to the computer using VGA, Digital Visual Interface (DVI), HDMI, Display Port, USB-C, or other exclusive connectors and signals.

In order to write a code Arduino Software IDE is used. Once develop a code it is uploaded to board with poor or no internet connection. The IDE is compatible with any Arduino board. There are two versions of the Arduino IDE are available in market, IDE1.x.x and IDE2.x. The IDE2.x is a recent release which is faster and more powerful to the than IDE 1.x.x. It also provides coding and debugging facility and has more responsive interface [5][6].

The system further uses open source modular magic mirror platform [7] MagicMirror². It provides growing list of installable modules which helps to convert your regular mirror into your personal assistant.

6. IMPLEMENTATION

Magic Mirror provides interactive interface for various kinds of modules. Whenever the system is turned ON, Raspberry pi takes it to the Raspbian environment when command "cdMagicMirror" is run. Alternatively "npmrun start" command is used to turn ON the system.[6] It displays time, date and corresponding location, news feed and headlines on the screen. The data is continuously updated time-to-time. Figure 4,5,6,7 and 8 displays screen shots of various displays on the screen

Figure 4: Date-Time Functionality of Magic Mirror

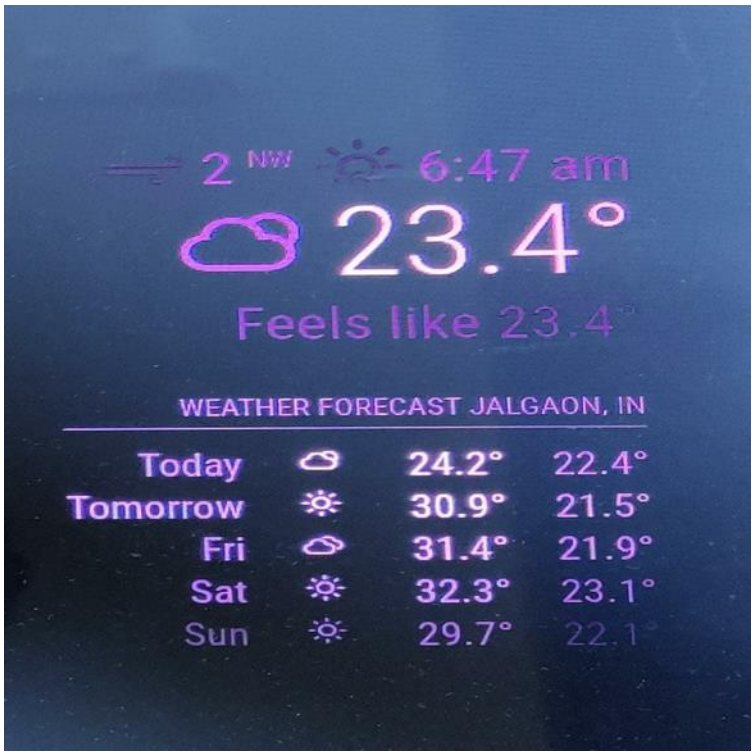

Figure 5: Weather Functionality of the Magic Mirror

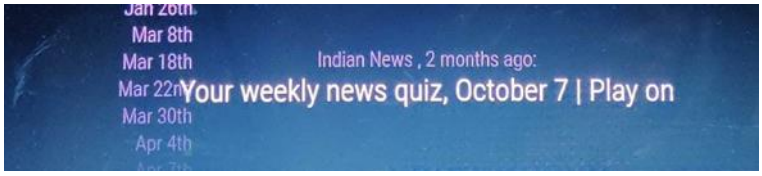

Figure 6: News and Times-Of-India Functionality of the Magic Mirror

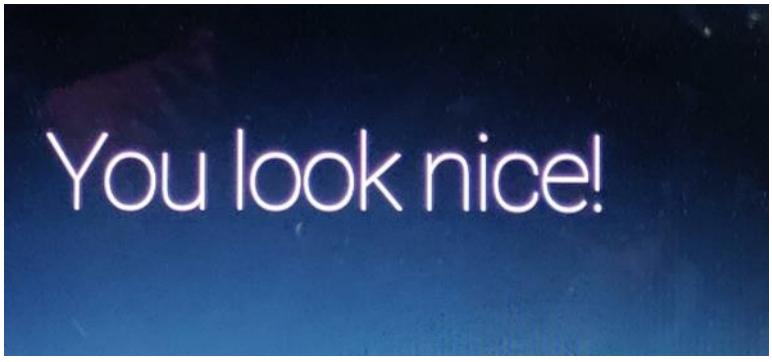

Figure 7: Compliment Functionality of the Magic Mirror

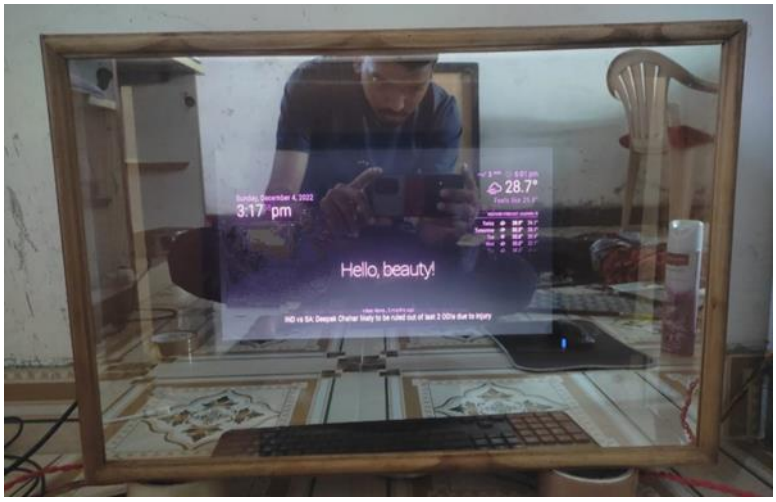

Figure 8: Complete display of screen

7. CONCLUSION

The Magic Mirror with multiple features provides an enhanced mirror experience. By displaying information in multiple frame, user remains up to date with time, weather, and news headlines at the start of the his/her day. There are many alternative technologies are used to develop magic mirror and are also available in the market. But the approach suggested here focuses on cost effective, interactive and flexible system. Due to simple approach and effective user interface, it is easy to setup the mirror to display data as per users' requirement.

One can extends functionality of magic mirror as a home control platform. It is futuristic system through which one can interact and control various services at home using easy-to-use mirror interface. The main thing is, mirror works both ways normal mirror and magic mirror, displaying daily notifications to only authorized user. Its user friendly, and personalized user interface make it suitable for many applications including college, home, offices etc. Thus, system developed is featured with many functionalities can access only after proper authentication of users resulted in personalized systems.

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