International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

SMART MIRROR USING RASPBERRY PI

Dr. Mrs. P. U. CHATI
Guide, Department of Electronics & Telecommunication,
Priyadarshini College of Engineering, Nagpur, India

Harshak Dandhare
student, Department of Electronics & Telecommunication,
Priyadarshini College of Engineering, Nagpur, India
harshakdhandhare@gmail.com

Vishal Vaidya
student, Department of Electronics & Telecommunication,
Priyadarshini College of Engineering, Nagpur, India
vishalbvaidya274@gmail.com

Nilesh Wanjari
student, Department of Electronics & Telecommunication,
Priyadarshini College of Engineering, Nagpur, India
Wanjarinilesh3@gmail.com

Adesh Wahile
student, Department of Electronics & Telecommunication,
Priyadarshini College of Engineering, Nagpur, India
adeshwahile@gmail.com

Abstract - *The project shows the design of a smart device-Smart Mirror. The smart mirror here is mainly for home environment. These smart mirrors are not widely used due to cost or high requirements of hardware. The proposed smart mirror will be operated by Raspberry Pi and will be connected by real world through internet. The smart mirror will consist Raspberry-Pi, LED monitor, speakers, microphone with two-way mirror and acrylic glass. With the help of voice recognition API the mirror will communicate with the user through voice commands and responds them accordingly. The mirror will highlight some basic amenities like time, local news, weather, etc. The mirror will also perform some advance function such as Home Automation using Smart Mirror. This mirror with artificial intelligence will provide an extraordinary experience to the user.*

1. INTRODUCTION

Heterogeneous computing devices with wireless connectivity which embeds everyday objects are being used in different activities are providing a whole new experience. The interactive computing, voice technologies, artificial intelligence are providing ease in life in very secure and convenient way. In every house there is a mirror and we look at the mirror everyday and find out how we look. 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. This mirror will help in developing smart homes and provide a unique environment to the users.

2. LITERATURE REVIEW

In this paper, an intelligent mirror based on raspberry pi is designed for the home of Internet of things. The intelligent mirror is made of raspberry pi as the host controller. In working condition, the system by raspberry pi is connected to the network through WIFI, and obtain information about the weather forecast from the API network interface specified dressing index, time, date and other information, and then through the information displayed on the plasma display. The user can interact with the mirror, such as asking the mirror the weather, news, time, the mirror can automatically obtain the corresponding information network and broadcast. The designed intelligent mirror has the advantages of small size, simple operation, low cost, and has broad application prospects. The disadvantage of this kind of mirror that it won't support gesture control so as to make the mirror more interactive.[6]

Lakshami N M, Chandana M S and Ishwarya P proposed a smart mirror system that represents an elegant interface for glancing information and also used for thief detection in a home environment. 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 an online news and display it using Internet of Things (IoT) circuitry and to detect thief when nobody is in home.[11]

This paper mainly focuses on the connectivity and the enhancements that will take place between the mirror and the internet. There are this micro-controller cards on-board, these systems, which can connect to the internet and take data from the internet, can show this information on the places located on the mirror. In the study, the developed intelligent mirror system includes the weather information, time and location information, current event information, user information, and camera image taken from web services using Raspberry Pi 3 micro-controller card. Some equipment can be controlled by voice commands via the microphone on the smart mirror.

M. M. Yusri et al. created Smart Mirror system which 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. The system applies Sonus technology as a medium of interaction between people and systems. So, users need to provide instructions to the system orally to acquire the system's response. Sonus is a speech to text library that can quickly and easily add a VUI (Voice User Interface) to any hardware or software project. With this Smart Mirror system, users can manage their daily activities at ease as well as solving many problems in managing some house chores.[3]

Vaibhav Khanna, Vash Vardhan, Dhruv Nair and Preeti Pannu proposed the interactive mirror with proper embedded intelligence for offering enhanced features such as weather of the city, latest updates of news and headlines and local time corresponding to the location. The Smart Mirror would help in developing smart houses with embedded artificial intelligence, as well as finding its applications in industries. Ambient Artificial Intelligence (AmI) is technology used in proposed smart mirror.

O. Gomez-Carmona and D. represents the design and implementation of a multi-user smart mirror system conceived to promote wellness and healthier lifestyles in the work environment through persuasive strategies. The interactive mirror recognizes different users through their personal corporate ID card, which allows them to have access to their personalized user-interface. The smart mirror provides workplace's indoor environmental conditions (thermal, humidity and light), personal physical exercise data obtained from wearable devices and general purpose information (e.g. weather and daily news). Additionally, motivational advice related to physical performance is supplied through request by applying speech-based recognition techniques.[4]

In this project, the development of Smart Reflect took place - a software platform for developing smart mirror applications. The main features of Smart Reflect are threefold: (1) It is modular, lightweight, and extensible; (2) It allows developers to sidestep the sand-boxed environment created by web browsers; and (3) It supports plugins written in any programming languages. These improvements alleviate the hardware and software limitations inherent with the use of web browsers as a primary scriptable display method. In this paper, they described the design and implementation of Smart Reflect and compare it with other similar platforms.

Chidambaram Sethukkarasi et al. (2016) created an intelligent mirror which identifies the user using facial recognition technique and provides services such as recognizing emotions, progress representation of measured health parameters, height identification, identify garments, suggest garments with suitable color, and reminds important events. 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.[8]

In 2016 Microsoft released details 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 GitHub repository. Rather than selling a finished product consumers have the option to assemble their own mirror as a do-it-yourself project. Their information was the same as adding the basic features to the smart mirror and make it interactive and helpful for the user.[9]

At the 2014 International Consumer Electronics Show (CES) Toshiba showcased their smart mirror concept. Toshiba showcased their smart mirror in different home environments. Their idea was that the smart mirror would be customized for the purpose it would serve in each room. The bathroom smart mirror would show information such as weather forecast and a personal fitness monitor. Technique used: It utilized gesture control as an input method.[10]

3. PROPOSED SYSTEM

Block Diagram of Smart Mirror Smart mirror is a Raspberry Pi (low powered minicomputer) based display when connected to the internet it picks and displays the necessary information in the presence of the user. In the proposed system, Raspberry Pi 3 B+ is used which contains 1 GB SDRAM, runs on Linux platform and needs 700mA. A single sided mirror is placed on the LCD screen which acts as a regular mirror when there is no light behind it or act as a glass window where information is displayed. Only when the user stands in front of the mirror the customized information will be displayed. In order to retrieve updated data from the web sources various data feeds can be used such as RSS feed.

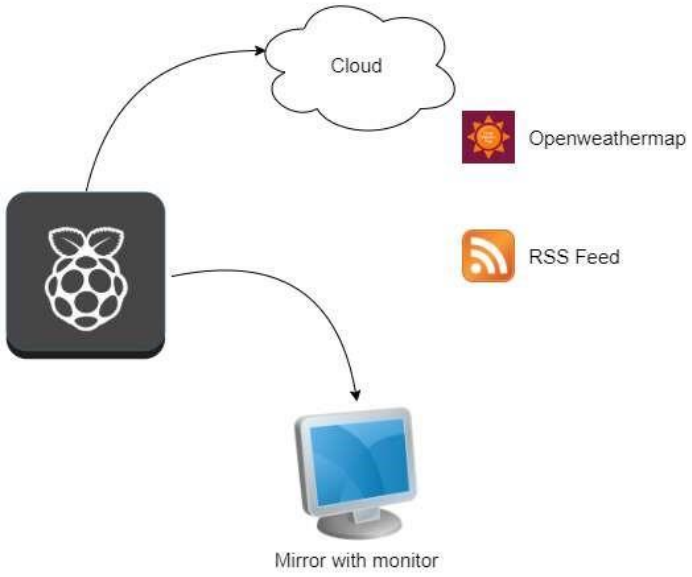


Fig -1: Architecture of a Smart Mirror

The personal schedule of events and the updated weather reports can be obtained by using Google Calendar API and Weather API. For displaying these useful information Tkinter, a standard library GUI python module is used.[9] **3.1**

Implementation

We plan to design and develop such kind of futuristic smart mirror which provides a whole new experience to the user with the flavor of AmI. Our proposed smart mirror consists of a two-way mirror, acrylic glass, monitor (LED), Raspberry Pi, Raspberry Modules, sensors. A wooden frame will be prepared with LED attached behind the glass with all the sensors and the raspberry pi. The power supply is attached to the raspberry pi which will power the LED monitor and the sensors. Once the mirror is activated, it will connect to the docker which contains all API and software needed to run the mirror. This will require internet access which will be provided by the Wi-Fi module (LAN can be also used) on the raspberry pi.

The virtual layout that will be prepared using HTML and CSS will be displayed on the mirror when it is turned on and will show calendar, weather and news headlines. The docker will contain the API of Alexa (virtual voice assistant from Amazon) that will respond to the user's voice. The mirror will perform facial recognition which will be helpful for real time image zoom in and out. This will be one with help of OpenCV and some java programming.

The software will be programmed on java and python and Node.js will be used as a server-side language. The proposed smart mirror will perform some advanced features that are discussed in the V section of this report. The proposed smart mirror will perform these tasks:

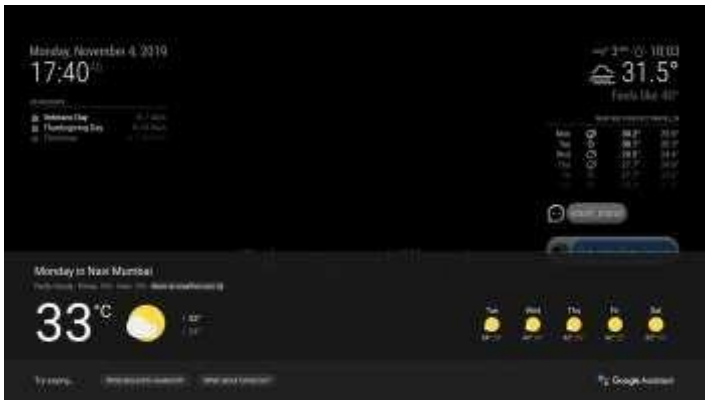
1. A normal two-way mirror and acrylic glass will display real time image.
2. After activation the mirror will display weather, time and news.
3. The mirror will automatically sleep if a person disappears from the front with the help of sensors.

3.2 Project Inputs and Outputs

The input in our smart mirror is mainly through the voice commands that it listens and gives results according to it. The tasks include setting a reminder, appointment, meeting and even uses its assistant to view photos through the mirror, the photos that are synced with the user's smartphone.

Fig -2: Input

The output is generated from the smart mirror in the form of voice as well as text feature. Mainly the output contains the basic features of a smart mirror like weather, time, calendar, holidays etc. The output is also generated through the assistant that we use through voice commands as input. The output and input generated through the smart mirror can also be seen in graph though the analytics feature provided by the assistant.



4. CONCLUSION AND FUTURE SCOPE

4.1 Conclusion

Our system integrated the concept and methodologies that have been implemented in many existing systems a smart mirror system. It is a novel application of creating a smart interacting system. The system is reliable and easy to use, in this interactive system; we have been concentrating on an interactive system for home. There exist many benefits from the smart mirror. A service-oriented architecture has been adapted for the development and deployment of the various services, where the mirror interface, the news feeds all use Web service communication mechanisms. By utilizing sensor, we can reduce the power consumption since the mirror will display information only in the presence of a human.

The future prototype is ripe with potential and probably robust in terms of functionality. It uses voice commands to switch between each views and gestures to interact with content. Rather than confined to a home we can implement the functionality to a glass material. So that it can have a wide range of applications like one can setup this functionality to a glass table, which he used in office. This will help him to know about notifications from many sites at the same time in a single screen. Another application is that this functionality can be setup in public places.

4.2 Future Scope

The scope of this study is to develop an efficient and cost-effective solution for the development of a Smart Mirror to reduce and possibly eliminate the need for the user to make time in their daily morning or nightly routine to check their PC, tablet, or smartphone for the information they need. The mirror will provide the information with little to no effort from the user with the goal of not being a burden that he or she must maintain. The mirror wouldn't be another activity, rather an enhancement to the already common use of mirrors in most modern bathrooms.

The mirror will do the thinking for the user. First, it will turn on and off by itself. Then, it will update with the user's calendar schedule, to-do lists, Twitter, news, and weather. The information wouldn't be thrown in the user's face, but unobtrusively displayed on the edges of the mirror to still allow use of the actual mirror. The mirror provides common information most people check their smartphones or tablets for, such as weather, news, Twitter and schedules. This allows the users to read, think, and plan their day while getting ready in the morning or night.

ACKNOWLEDGEMENT

We are very thankful to our project guide Prof. Aju Palleri, for his valuable support, constant guidance. In spite of his extremely busy schedule, he never failed to take time out for us to help solve our problems and clear our doubts. We would like to take this opportunity to thank our Head of Department, Dr. Satishkumar L. Varma for his heartening, motivation, guidance and support. We would also like to thank Dr. Sandeep M. Joshi, Principal, PCE, New Panvel for his invaluable support and for providing an outstanding academic environment. We acknowledge all the faculties of the Information Technology Department for their advice during various phases of this project work.

REFERENCES

- **Suraj Zende, Bharat Chilwant,Divya Thakur, "Home Automation with Smart Mirror Using Raspberry Pi" JETIR Volume 10,issue 9 PP.b-36-41, 2023.**
- **Bhuvaneswari T, Aishwarya C, B Abhinaya Nalina H D, "Smart Mirror using Raspberry Pi", IRJET ,Vol 8,issue 13 PP.87-91,2020.**
- **Tejas Patil, Atharva Pawar, Sahil Yadav, Aju Paller ,"Research and Analysis of Smart Mirror" IRJET ,Vol 07,issue 02 PP.2609-2612,2020.**
- **Yamini Patil, Mohamed Hafeez, Kaushik Kumar, Rohit Shinde "Review Paper On Smart Mirror" Vol 6,IJARSCT, issue 1, 2021.**