

MAGIC MIRROR USING RASPBERRY PI

Mrs.Lavanya Vemulapalli¹, K.Bhavya², M.Ribka³, V.Ramya⁴,
G.Sushanth Bikky Joseph⁵,G.Rajkumar⁶, ¹Assistant Professor
, ^{2,3,4,5,6}Students,

Dept. Of Computer Science & Engineering, Dhanekula Institute of Engineering
and Technology, A.P , India.

Abstract — Intelligent mirrors, which continue the work today and will take its place in the future technology, provide both mirror and computer aided information services to its users. Microcontroller cards which are present in raspberry pi, are connected to the internet and take information from the internet and show this information on the places located on the mirror. The developing intelligent magic mirror includes the weather details, time and location information, current event details, user information taken from web services using Raspberry Pi 3 microcontroller card. Some devices or things can be controlled by voice commands through microphone on the magic mirror. A smart mirror displays applications so that you can check the weather, local news, etc. while you are getting ready in the morning. The mirror exactly thinks like human in a smart way. This magic mirror aims to reduce or save the user time to check their pc, tablet or Smartphone for the information they required in their daily morning or night routine. This magic mirror contains a micro-controller called Raspberry Pi which behaves like a human brain which is considered as a brain of the interactive system. In magic mirror we use python scripts for mirror software and also for personal assistant. For making this personal assistant a Google account is required. Using the Google Assistant, the Google function and Google skills using skill kit will be created. Once the function is set up, the function can be accessed using a command line after the software is installed. An 18” LED Monitor will be placed below a high quality one-way mirror and the model will be held in a wooden frame. We will build a separate personal assistant that will be able to recognize voice commands and perform speech to text operations. The personal assistance is named GOOGLE. There is a huge scope for this project and AI is much needed today.

Keywords — Raspberry pi ,node.js, javascript, python, google assistant, speech recognition.

INTRODUCTION

Everyone wants to live comfortably in this world. In today's situation people require connectivity and easy access to information. Every individual wants to keep informed about global events through the internet or television. The internet of things (IOT) is a concept which refers to the internet connecting computed devices embedded with ordinary things that enables the transfer of data. The continuous growth of the internet of things expands its applications like transforming a house into a smart house and developing it into smart cities. A smart home or smart city is the one that connected to internet and enables the communication of smart gadgets. Our way of living has change to the point where the basic objective is to increase our time. Internet of Things (iot) is a concept that is used to describe "technologies, systems, and design principles associated with the emerging wave of Internet-connected things that are based on the physical environment". It refers to a network of uniquely identifiable things (objects) and their virtual representations in an Internet-like structure, which are able to collect and exchange data and are remotely controlled across existing network infrastructure. It comprises of major components including sensing function, heterogeneous access, information processing, security, privacy, and applications and services.

According to the International Telecommunication Union (2013), the concept Internet of Things (iot) is defined as a global structure for society that enables Internet service to connect to physical matter based on information and communication technologies available. IOT came into existence with a broad perspective and it quite brings a huge implication of technology in society. Along with the developing technology, several information can be found easily and the Magic Mirror, Smart Home has been widespread increasingly. The magic Mirror system which is implemented based on the concept of Internet of Things (iot) specifically to allow people to manage and control home appliances through voice commands. Generally managing the home appliances is identified as big problem for many people. Every day we have too many things to do in home like daunting chores. For example if we make a list regarding things to do daily in home and we lost it because of misplaced the list and another example, everyone leading a busy life nowadays and forgotten the daily activities like switching off the lights and fans in room which leads to power wastage so to deal with this situation we are implementing a smart device called magic mirror using internet of things to manage home appliances and to perform some other activities such providing information through network and control all electrical appliances with network by following user voice commands and using the sensor it recognize the the voice of user to receive commands and to respond to users requirement.

A goal for building a magic mirror is to use a high quality one-way mirror, a lcd monitor, a frame to hold mirror and monitor and a sensor to activate the magic mirror and raspberry pi to provide information using internet, and a google assistant framework is used to develop the user interface for controlling the display information and some basic parts like microphone and speaker are used to recognize the voice of the user to receive instructions and respond to users needs with help of information provided by raspberry pi. Magic mirrors are developed when a conventional mirror is transformed into an interactive information display item with unique interaction capabilities. Because we use mirrors on a daily basis, they are a perfect example of a natural interface.

RELATED WORK

Michael Teeuw [1] was the first person to set up a smart mirror and introductory to use a raspberry pi for this function. The first smart mirror blog was proposed in the year 2014, since it was a very latest product it gains a lot of attention. This mirror is built on raspberry pi 2 and uses a monitor to view. It displayed climate and time importing these from various modules which were linked to real time websites. It was just an information panel which didn't have the ability to contact with the mirror. A module-based interface was made and on displayed climate, news,time or daily comic strips.

In 2003 Phillip discover the Mirror TV that was developed using the same principles 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 had an option to have the mirror would be larger than the TV. A usage part presented by Phillips was to have the kids watch cartoons while brushing their teeth at the same time.

Biljana Cvetkoska, Ninoslav Marina,Dijana Capeska Bogatinoska, "Smart Mirror E-health Authority – Posture Analyze"[3], Presented as, Many different kinds of smart assistants and technologies, such as virtual assistants, smart phones, and wearables, existed today with the goal of coordinating and optimizing people's daily activities all over the world. The primary target of smart assistants is on basic human needs, such as browsing, scheduling, navigating, and other comparable tasks. However, few intelligent assistants are concerned with human health in general. The idea to make use of a smart mirror to detect health issues is the topic of this paper. Here we are presenting the smart mirror for heath which consists of a smart mirror having its own algorithm and behaves like a smart assistant. Face recognition identification, posture problem detection, and good posture advice are used in this suggested paradigm, which is followed by preventive healthcare proposal. The program analyzes the posture and body changes over time after identifying the person's posture. The analysis results better our assumptions, with the tested individual's upright posture improving at a significant rate. The assessment results, which improved with each subsequent individual study, demonstrate the benefit of the proposed smart algorithm.

To improve learning, smart mirrors can be used to expose different academic information. By exposure the data on the mirror, it will make it simple for users to access the information. This product is connected to the administrator device; it can create and change the data. Approval will correspond to various time slots [4].

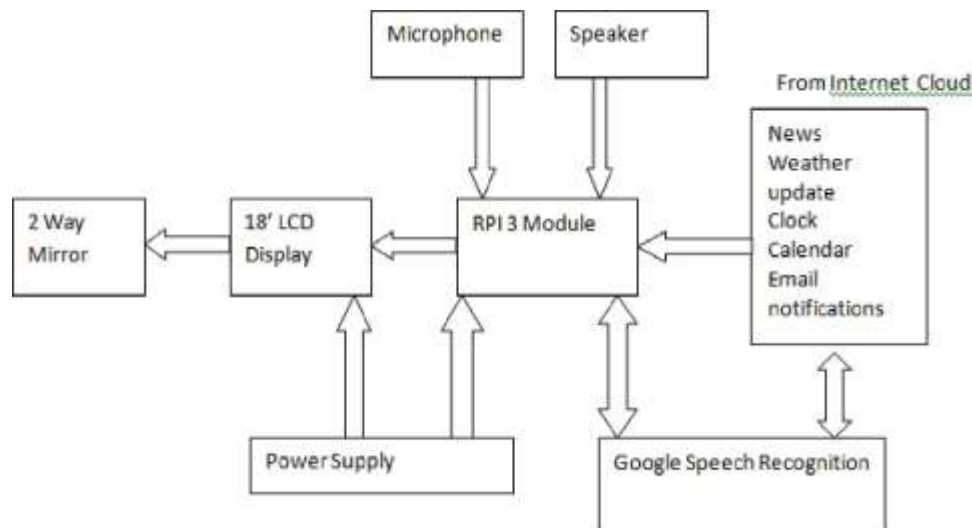
Hannah Mittelstaedt [5] made a home mirror. It was posted on the reddit website. The mirror used a Smartphone as the display screen. Since it was an android tablet so looks of android were used to display time, weather, date and reminders. The software made use of android appliances but can be converted easily as it is open source. Anyone can change it and develop a new variant.Home Mirror is a kind of smart mirror that is simple to set up than other mirrors as it need just two main elements, any android mobile phone or a tablet and a mirror. However, this too need of any kind of understanding or interaction.

PROPOSED METHOD

The proposed system is a magic mirror using raspberry pi which provides both mirror and computer aided information services to its users. Main goal is to implement the home automation. Microcontroller cards which are present in raspberry pi, are connected to the internet and take information from the internet can show this information on the places located on the mirror. The developed intelligent mirror system includes the weather information, time and location information, current event information, user information taken from web services using Raspberry Pi 3 microcontroller card. Some devices or things can be controlled by voice commands through microphone on the magic mirror. In magic mirror we use python scripts for mirror software and also for personal assistant. For making this personal assistant a Google account is required. Using the Google Assistant, the Google function and Google skills using skill kit will be created. Magic mirror provides the features using third party APIs.

The Magic Mirror can be installed using automatic installers or manually. In this paper we develop the magic mirror by installing manually.

Architectural design:



Methodology:

We plan to develop and design the smart mirror which provides a new experience to the user while using the mirror. Our proposed magic mirror consists of a high quality one-way mirror, lcd monitor, raspberry pi, sensors, raspberry pi modules , cables and connectors.

A wooden frame is used to cover the hardware attached to the mirror. we attach monitor and raspberry

pi , microphone,speaker and sensor behind the mirror.the power supply is attached to the raspberry pi which is used to power the monitor and sensors.

We use the sensor to activate the mirror and once the mirror is activated it connects to docker which contains api and required software to run the magic mirror.this also requires internet access provided by wifi module in the raspberry pi.

The layout which is displayed on the magic mirror is prepared using xml and javascript when the mirror is activated and it shows the information of weather,calendar , new headlines,radio and daily schedule of the user.it contains the api of MMM- voice assistant to respond to user voice commands.

This magic mirror implements home automation which means it controls all the smart devices present in home through voice commands.

In this magic mirror we use the software called node.js to develop the application along with use of languages like python and javascript as server side languages.the proposed magic mirror performs the advanced features than existing systems using different sensors and by using advanced hardware.

the proposed magic mirror performs these activities:

1. A high quality one-way mirror displays the user real time image along with user interface to perform activities.
- 2.once the user appears in front of the mirror , the magic mirror is activated using the sensor and displays the information of weather,time,news,radio etc.
3. make conversion with google assistant(sdk version)
- 4.control your cpu.
- 5.open youtube links.
- 6.open links discovered by assistant.
- 7.watch your photo album
- 8.control the volume of your mirror
- 9.control the screen(with/without pi sensor or relay)
- 10.control your internet access
- 11.control spotify player and play music on mirror. 12.play your preferred song from usb key or local files
13. watch the videos by accessing youtube.

14. With the help of uber api we can book a ride on uber with a mirror.
15. the mirror is synced with smart devices in the home which leads to home automation

Hardware required:

1.Raspberry pi 3B+ :

The raspberry pi compute module 3+ is a range of DDR2-SODIMM mechanically compatible system on modules containing processor,memory,eMMC flash and supporting power circuitry.these modules allow a designer to leverage the raspberry pi hardware and software stack in their own custom systems and from factors.raspberry pi used in magic mirror to provide information through internet and it controls the whole application.

2.Sd memory card:

An sd card is a removable memory card that is inserted in raspberry pi to save,store and transfer the data. At Least 16 gb memory card is required to seamlessly undergo the function of a magic mirror.

3.LED monitor:

A monitor is an electronic visual computer display that includes a screen, circuitry and the case in which that circuitry is enclosed. In our case we will need at least a 18'' led monitor to find the ample space for all the modules used in the magic mirror.it presents all the outputs of the entire module without any worry about the space.

4.Connectors:

There are a lot of connectors required in building the magic mirror. Some of them are:

4.1 HDMI cable:

HDMI means high definition multimedia interface, a standard for simultaneously transmitting digital video and audio from a source such as a computer or tv cable box to a computer monitor,tv or projector.in magic mirror it is used to connect raspberry pi to the monitor.

4.2 AUX cable:

Aux(auxiliary input) cables are small , slim wires to transfer sound. You can use them to connect your devices to an amp, home theater system or computer speakers and enjoy flawless music at home or in yours.This is used to connect raspberry pi with speakers.

4.3 Power adapter:

power adapter is used to provide power supply to the whole monitor and the complete magic mirror system.

4.4 Microphone:

a microphone is a device that translates sound vibrations in the air into electronic signals or scribes them to a recording medium.microphone is used for the function of google assistant in our module.

4.5 Speaker:

The basic objective of speakers is to offer audio output for the listener.any output for google

assistant or spotify is provided by using the speakers in a magic mirror.

5.One-way mirror and wooden frame: a one- way mirror is also called a half silvered mirror which is used to display the information to the user and at the same time the user can view the real image . Wooden frame or box is required to hold the monitor and the mirror in place. Also any other additional components that are required for the functioning of the mirror to be kept in place and needs to be held completely hidden.

Modules:

In magic mirror we use various modules from python for development of application.Python is the primary language in which all the software is built up on.python is used for creation, linking and accessing all the modules that are used in the magic mirror.

Modules used in magic mirror:

1.cloud speech api: the google cloud speech api enables easy integration of google speech recognition technologies into developer applications.the speech api allows you to send audio and receive a text transcription from the service.this is paid api but can be used for free for the magic mirror as it allows a particular number of responses for free daily.

2.MMM-google assistant module: this is the module that is used to create a google assistant inside the magic mirror.this library is supported on hardware such as the raspberry pi.

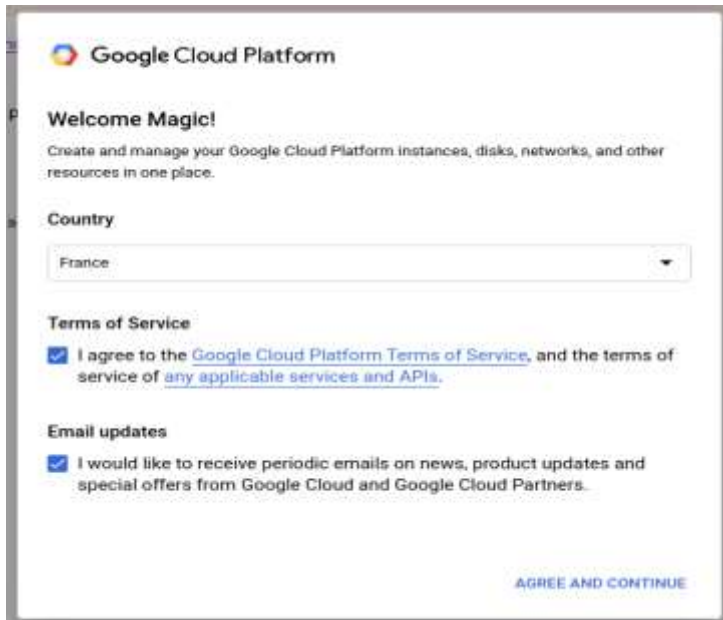
Implementation:

To develop the magic mirror we need to follow the process and here we are explaining the process to implement magic mirror. We are developing magic mirror as web application using APIs and modules in python. Here we are installing the magic mirror manually. We are installing node.js software to implement magic mirror. The magic mirror package manager is a command line interface designed to simplify the installation, removal and maintenance of magic mirror modules. Magic mirror can be deployed using docker.we use sd memory card to store and transfer data in raspberry pi and we use magicmirrorOS instead of downloading the raspbian and place inSD card. It uses an alternative docker setup which allows the direct output on raspberry screen. After setup of magic mirror we have to do Google assistant implementation. To implement Google assistant we use MMM-Google assistant module from python and we need to setup the API credential. To setup the API we use the mail address to login. Then we enable the Google assistant API for this project in cloud platform console. After setup of Google assistant api we need to add extension such as YouTube , spotify.to access the YouTube data we need to activate YouTube api and we set hot word to access the data by voice commands through Google assistant. In the same we need to add extensions such as EXT-spotify and write scripts in python to add hotword for accessing the spotify and to control the spotify with voice commands by Google assistant.

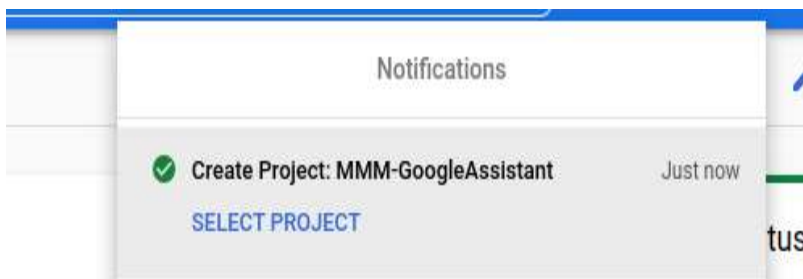
API Credential Setup

Create a project.

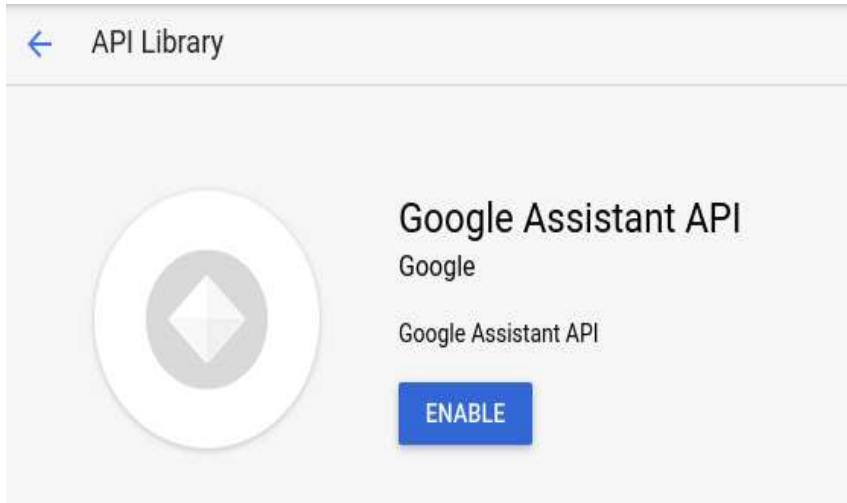
1. Use your current gmail mail address (same like your phone)
2. Connect to Cloud Platform Console
3. Agree and continue



- Open project manager
- Create new project
- Enter your project name and Create
- Your new project is now created!



- Enable GOOGLE ASSSISTANT API



YouTube Extension:

YouTube windows in rest



RESULTS

The user gives the input for our magic mirror by using voice commands that it listens and provide output according to the user commands. the activities include reminders, weather, time, news and entertainment purpose activities. It can also provide basic conversation between user and Google assistant.



The output is generated from the magic mirror in the form of voice as well as text display in mirror. Mainly the mirror display basic features which are automatically display in mirror without using of voice commands and if you want a voice response for basic features we can give voice command and mirror provide response through voice by using speaker which is connected to raspberry pi.



CONCLUSION

the magic mirror designed in this project provides a new experience to society. This application is an advanced technology to provide smart life to everyone. The main advantage is magic mirror act as home automation and it uses a sensor to activate the mirror. Though it has advantages it still has a room for improvement to the development of new features on magic mirror. This proposed system can be easily extended for frameworks such making phonecalls and add face recognition to activate user information but this system is a enhancement for other existing systems.

REFERENCES

- [1] Raspberry Pi. (2019). Magic Mirror - Raspberry Pi. [online] Available at: Micheal Teaw's official website. [Accessed 17 Jan. 2019].
- [2] Project Proposal For Magic Mirror By ChangShuo Feng. Retrieved from ChangShuo Feng,Xukai,ZhongZiye,ZhuHongJi,DaiYanJieZhan,http://www2.ensc.sfu.ca/~whitmore/courses/ensc305/projects/2016/3_prop.pdf
- [3] Biljana Cvetkoskal,Ninoslav Marinal , Dijana Capeska Bogatinoska,Zhanko Mitreskil Smart Mirror E-health Assistant Posture Analyze Algorithm,IEEE EUROCON 2017
- [4] Akshaya, R., Niroshma Raj, N., & Gowri, S. (2018). Smart mirror-digital magazine for university implemented using Raspberry Pi. 2018 International Conference on Emerging Trends and Innovations In Engineering And Technological Research, ICETIETR 2018: 1–4. <https://doi.org/10.1109/ICETIETR.2018.8529005>.

- [5] Smart-mirror.io. (2019). Smart Mirror by evancohen. [online] Available at: <http://smart-mirror.io/> [Accessed 17 Jan. 2019].
- [6] Jane Jose, Raghu Chakravarthy, "Home Automated Smart Mirror".
- [7] Piyush Maheshwari,"Smart Mirror: A Reflective Interface to Maximize Productivity" International Journal of Computer Applications (0975 – 8887) Volume 166 – No.9, ay 2017
- [8] Mohammed Ghazal, Tara Al Hadithy, Yasmina Al Khalil, Muhammad Akmal, and Hassan Hajjdiab ,“A MobileProgrammable Smart Mirror for Ambient IoT Environments,” IEEE, 2017
- [9] IoT based Smart Mirror using Raspberry pi, International Journal for Engineering Research and Technology (IJRET), ISSN 2278-0181, NCESC-2018 Conference Proceedings, Special Issue-2018.
- [10] 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. doi: 10.1109/IEMCON.2016.774627