A LITERATURE SURVEY ON IOT BASED MAGICAL REFLECTOR USING RASPBERRY PI4

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ABSTRACT

This project describes the design and development of a futuristic mirror that offers simplified and customizable services to the home environment. The mirror interface provides users with the versatility needed for better management and integration of daily tasks. On a par with therecent advances in the Internet of Things standards and applications, the mirror is designed to enable residents to control the household smart appliances and access personalized services.

The objective of building a Smart mirror is to help save time by helping people enabling

them to update with features like Daily News, Weather Forecast, Mail notifications, Phone

Connectivity and many more.

The goal is to develop a cost-effective intelligent mirror that do much more than a regular

mirror and its suitable for home and business needs and has a broad application prospect.

INTRODUCTION

Overview

Everyone knows what a mirror is. It is an object found in most people's homes. In mirrors we see our reflections. But what happens when you combine the idea of a mirror with technology? What possibilities are there and how smart could a mirror be? The device was to go beyond an ordinary mirror, to have a screen inside that you would be able to interact with by using voice commands, hand gestures and smartphones or other devices. Multimedia is a very broad area and I

like every aspect of it so it was difficult to choose a specific area and I had many ideas. However, a smart mirror is a great combination of many things we have studied: web technologies, electronics, UI design, etc.

The smart mirror is a popular project among DIY enthusiasts and it usually consists of a one-way mirror with a screen attached to it that displays a static web page.it needs a suitable one-way mirror and a computer screen, as well as some sensors to physically interact with the device. To obtain the final result it requires many different technologies.

The device was to look like a regular mirror but would have a screen inside and you would be able to interact with it using voice commands, hand gestures and smart phone. The operating system would support running apps and would provide a simple API for third -party developers to create their own apps for the Smart Mirror. The main features the Smart Mirror would have would be showing basic weather and time information, being able to add alarms, reminders or notes in a similar way we stick post-it notes on a fridge. We would also be able to play music in some way and see pictures through Instagram, for example. The software needed to be designed to be modular and responsive in order to fit different hardware. The project has a very broad scope covering some current popular topics in the IT sector such as the Internet of Things, Maker culture and home automation.

As an example of what a smart mirror can do, this is what mine displays when I walk into my bathroom:

Current day, date and time

- Current weather and forecast for the week

- Satire news feed headlines

- My Google calendars

A smart mirror can easily be customized to include whatever information you want. There are many people online building custom modules and code to get smart mirrors to do different things.

OBJECTIVES

The goal of the smart mirror is to provide an access point for a person to receive all the information that could affect how they plan for the day. For getting news updates   and weather updates, a person will always have to switch on the television which is time consuming. To get rid of these problems, the concept of smart mirror is introduced. All the necessary information like weather and news can be accessed from one location. The problem of a secured user authentication technique can also be corrected by this system. Through the use of LCD displays and a one way mirror, weather, time and date, news, and other useful information programmable through the smart mirror app would be available at a glance.

Problem System

The major problem of any existing mirror is displaying just the object in front of it or just the human face without having to interact with them. This project is developed with the intention that people spend quality time in front of the mirror.

Existing System

Smart Mirrors are developed mostly for the purpose to display time, date, and weather forecast. Some also contains To-Do lists, traffic information, and notifications. Later, it got upgraded with music player and voice recognition. Thus, it can be personalized as per the requirements.

Proposed System

The smart mirror consist of a USB microphone, Raspberry pi 4 board, two led strips, pi camera for face detection and speaker and monitor display with two way glass mirror film. LED1 and LED2 is used for indicating purpose. After the word alexa is given to the microphone one led is getting turned ON i.e. listening mode of Alexa and the other led it is getting turned on while speaking or answering mode of alexa. A two way mirror which can function both as reflective and see through mirror is attached to a LED monitor. This provides two major functionalities i.e. mimicking a normal mirror as well as working as a display for real time data updates. Personalized data and information services: Anyone using this mirror will be able to get real time updates of traffic, stocks, news and headlines, date, time, weather updates as well as other reports of our particular interests. User will be able to give voice commands to the mirror using a microphone connected to the Raspberry pi 4. The Magic mirror will display data in

LITERATURE SURVEY

Year: 2019

Author: Mayur Wani

Title: "Real Time Smart Mirror System Using Internet on Things"

In 2017 paper published, this paper have large a range of kinds of modern partners and devices for example remote helpers advanced cell phone and wearable, which have a reason to facilitate and enhanced day to day activity which carry all important activities of human beings. It can used fundamentally around essential human needs, for example perusing, planning, exploring and other comparable exercises. There are very few modern peoples are worried about the human wellbeing in general. In this paper, we center around the likelihood of utilizing a mirror to distinguish medical problems. Another smart wellbeing mirror display is proposed, that comprises of a savvy reflect which chips away at its own calculation and carries on as keen aided. This model is used for confront acknowledgment validation pose issue recognition and appropriate instance direction pursued with recommendations for preventive social insurance. The calculations say difference between individual instances and examine after every time span. The acquired outcomes from the examination fulfilled our desires by enhancing the upstanding instance of the tried individual by impressive rate. The advantage of the proposed calculation is demonstrated by the assessment results, which enhanced with each new individual investigation. This paper shows advanced structure design and use by multiple users which is beneficial for regular life. The technology can be used at workplace to make work easy and time saving. By methods for a RFID pursuer, the intuitive

mirror perceives diverse clients through their own corporate ID card, which enables them to approach their customized UI. The advanced mirror gives working environment's indoor conditions individual physical exercise information acquired from wearable gadgets and broadly useful data (for example climate and day by day news). Moreover, persuasive counsel identified with physical execution is provided through demand by applying discourse based acknowledgment systems. End user can likewise ask the mirror about their positioning position in a reasonable every day that gives social acknowledgment to the most dynamic user. The actualized mirror has been assessed in a one week think about directed in the wild in the working environment premises. The quantitative information assembled all through the investigation, just as the subjective clients' criticism acquired in a post preliminary center gathering, gave promising discoveries to the acknowledgment and accommodation of such an enticing gadget in the workplace. Moreover, important structure bits of knowledge were gotten for future emphases of the keen mirror that empower. In this paper various tasks are been created using number of increasing functionalties. The information get by using internet on things is proper and accurate. Internets on things are created using the ideas. Internet of Things can be used in daily things also. Device is smarter and make user smarter. It shows date, time and recent update about climates. This paper shows technological development which encourages smart home system with interactive interface it can be helpful in business also. The real data in collected through machine information and this information would be transmitted from the device and would be controlled by the Raspberry Pi. The smart mirror is considered as

advanced device which use all the components like Raspberry PI, amplifier, speakers, LED Monitor contain one side glass or sheet. The information like climate, recent updates of news and features and nearby time comparing to the area. Utilizing discourse preparing strategies the smart mirror. Using this user is connected with smart devices. In this paper concept wise it support smart mirror system dace recognition functionality is provided to the data utilize online based benefit correspondence to get information can be access by various APIs offered by sites. Raspberry Pi 3 use with a webcam for face recognition analyses of each region of face the opencv library is used in python for face recognition which calculates face region. The code utilizing Haar Cascade classifier calculation for face region. As of now, UAVs are used to now the target one more functionality UAV is consider for observation which uses Viola Jones calculation to get difference. This paper shows format and use of a voice controlled known as intelligent mirror. It is work as both mirror and smart sound work. It gives time, date, climate and news only. User can use voice processing. There are various functionalities proceed and gives complete information using monitor and camera. User is connected with help of voice processing .This shows multiple functioning .

Year: 2018

Author: Adokiye Charles Njaka, Na Li, and Lin Li

Title: "Voice Controlled Smart Mirror with Multi Factor Authentication"

In this paper, the authors developed a smart mirror system. For instance, Philips Home Lab created an intelligence personal care system that implemented an Interactive Mirror to provide customized services to the users. The system is capable of displaying TV feeds, monitor the latest weather, and so on. The mirror has an LCD display combined with a mirrored surface and a processor to provide intended services. Another mirror is developed by Sam Ewen and Alpay Kasal at Lit Studios is a touch and gesture functional mirror. Five students at Chalmers University in Sweden designed a HUD mirror. They use3d a two-way mirror to allow the LEDs mounted behind to illuminate the information.

This paperwork includes three primary technologies: Google's "Speech-to-Text, Google's "Custom Search Engine, and Amazon's "Alexa Voice Service (AVS)". The system is supported by two cloud services. Amazon voice service (AVS - Alexa), Amazon Web Services (AWS), and Google custom search engine. Amazon voice service is used to provide the system's voice assistant capabilities in addition to the added Alexa skills. Amazon web services are used to create a queuing system and lambda functions to process special vocal instructions from the voice assistant. Finally, Google custom search is used in creating a customized search engine to provide multimedia content based on voice requests by the user. The advantage of this paper is that re-authentication is enforced if the user is not interacting with the mirror for a while. Therefore, it can defend the system against several traditional threats, such as session hijacking or man-in-middle attack. The future offers endless possibilities for advancement of the prototype. The most notable is the possibility for the user to take the smart mirror display around the entire home. This

can be achieved by connecting the smart mirror to a smart projector that is able to project the smart mirror display on various surfaces (walls, table tops, etc.) around the home. With an added camera and a microphone, the user would be able to access the full features of the smart mirror.

Year: 2019

Author: Muhammad Hamza

Title:" Smart Mirror for Home and Work Environment"

The idea of designing this Smart device is to bring technology in our daily life into a mirror and making it smart. The basic question which arises is that what are the needs that a smart mirror can fulfill? There was always a need of a device which can help people to plan their daily activities while doing their other household activities. Multitasking with technology help us to save time and maintain schedule as time management is an important aspect of life. Smart mirror also acts as a personal assistant such as scheduling appointments, reminding task by fetching information from the user's Google account or any other cloud storage. If a person in the morning wants to check news headlines or weather no one has time to switch on the TV or read the newspaper, if there is a device that can fulfill the needs without requiring any physical efforts, as it can only be imagined the amount of time it will save. Smart mirror aims to display images as well as provides customize information such as current weather, date and local time, news, headlines, personal profiles, emails, messages, social media and notifications. The device also suggests health tips after monitoring health conditions live to the user. To fit the desired concept of health care environment some modules are designed and programmed focusing specially on a multi user environment which allows users to track their daily life activities and access personal information while displaying some basic information. When the LED display of the mirror is switched on, user can also see reflection with the elements on display of mirror. The idea of smart mirror came from the concept which is to make everything smart, this concept is known as Internet of Things (IoT). Smart mirror connected with IoT Platforms provides useful and varieties of information to user and allows users to impalement applications services. An effective and automated environment could be provided to the user as smart homes by the use of smart mirror. For the artificial intelligence in the home environment, advancement in technology and smart appliances plays a major role. The useful applications of smart mirror in daily routines activities such as a person busy in household chore wishes to listen music or play video, it just required a user to give voice command while performing this same actions with any other smart devices such as cellphone would probably take quite more effort and time. The user will be able to view varieties of possible makeup outcomes from different makeup applications, on the display of the smart mirror without effecting the real face. A smart mirror allows users to control smart appliances, it can also be use as the traditional mirror for personal interaction, whereas the mirror is an intelligent and technologically embedded device which provides natural and easy interface for the automated home environment. The smart mirror also performs all the task of Android phone. One of the main features of the smart mirror is voice recognition it can also be

operated and switch on and off by voice. The smart mirror is really helpful for the parents to monitor their children while working at the work place it also enables to look-after their children activities and to keep them on right track by sending notifications, messages, and looking at their To-Do list. These solutions are implemented by designing a smart mirror using Raspberry Pi, basically a smart mirror consist of a uni-directional smart mirror which can be operated through voice command. To make home environment more convenient and smart the entire system communicate through internet.

Year: 2018

Author: Ayushman Johri Student, Sana Jafri Student, Noida, Raghav Narain Wahi Student, Dr. Dhiraj Pandey

Title: Smart Mirror: A time-saving and Affordable Assistant

One of the problems faced by people these days is catching up with daily news amidst their busy work schedules. The proposed smart device helps in solving this problem. Smart Mirror is a mirror which allows touch-free user interaction with important information displays in the form of widgets on the screen, while also providing SOS calling and messaging features. The display has mirrorlike reflective properties while still displaying information in typical lighting conditions consisting of fluorescent, incandescent and LED light as fluorescent and incandescent lighting are the most common type of lighting in home and offices, which are the most likely environments for the Smart Mirror to be installed. The device should be presentable as a display piece in a home. The system

makes use of Raspberry Pi and Arduino Uno platforms, interfacing components such as LED Monitor, microphone, speaker, GSM module, ultrasonic proximity sensor, HDMI cable and a reflective sheet. Raspbian OS, Python, Tkinter and Google Assistant SDK were used to integrate the system. The advantage is that Smart Mirror successfully provide an overall efficient experience as a voice controlled automated hub at a cheaper price, enabling more people to gain access to the technology of the future. Newspapers may provide inconvenience in obtaining updated news attributing to the fact that newspapers have static information, i.e. the information cannot be updated and they cannot compete with the speed of conveying information through digital media (usually, newspapers are distributed once a day). The Savvy Smart Mirror, by Electric Mirror, utilizes touch interaction technology with integrated application software support, which is not affordable for consumers. For example, Samsung Display Co., Ltd. has produced a smart mirror which utilizes Intel RealSense technology. This technology is bleeding edge and is not easily procurable or affordable for this implementation, currently.

Year: 2018

Author: Kun Jin, Xibo Deng, Zhi Huang, Shaochang Chen

Title: Design of the Smart Mirror Based on Raspberry Pi

The continuous development of IOT various household appliances have gradually become smart. In 2012, a smart mirror based on Android appeared on the Japan Science and Technology Exhibition. In

addition to displaying daily weather and weight information, it also perceives user's gesture, which is arguably the "originator" of smart mirrors. In August 2017, New York, United States team developed a smart mirror Eve with a fully customizable interactive touch screen, has its own application store, you can use as a smart home control center. According to the practical applications, a kind of smart mirror developed in this paper which is suitable for many kinds of occasions, has the common smart home function and increases the safety factor through face recognition technology. It adopts the Raspberry Pi as the control processing center to meet the multi-purpose realization and signal processing. The smart mirror owns so many modules which includes Raspberry Pi external imaging control, wake up touch, voice conversion, image capture module and built-in portraits recognition processing, voice recognition and other interactive programs in order to realize the function of information display, voice interaction, human perception, intelligent security, entertainment and so on. Although research on smart mirrors has been going on, the penetration rate of smart mirrors is not high. The main problem lies in the high cost, the insufficient pertinence of functions and the low degree of integration between the smart mirrors and the smart home. In order to solve the above problems, the smart mirror based on Raspberry Pi was designed. Its founded on the principle of unidirectional mirror imaging and added the techniques like speech and face recognition. It realized communication and control through the Internet to make intelligent life come true. Overall, the smart mirrors proposed in this paper provides a central platform solution for smart homes in terms of development and applications. Based on this concept and design principles to achieve

"smart mirror" works in the 2017 National College Students Intelligent Internet Innovation Competition won the Nationals Finals Smart Home Group "first prize".

Year: 2018

Author: R Akshaya, N.Niroshma Raj, S.Gowri

Title: Smart Mirror- Digital Magazine for University Implemented Using Raspberry Pi

This paper tells about the design of smart mirror using Raspberry Pi. The mirror looks like the regular mirror but the difference is it displays weather, temperature, time, and web application for college. It is implemented using peripherals like raspberry pi, LED monitor covered with a two-way acrylic sheet. It can connect to the Internet and can retrieve data from the internet which displays weather report of the particular location. It provide natural interaction between user and the admin. Approach taken to build this platform is similar to MVC (Model-View Controller) Software pattern. Here controller act as admin which receive all requests data and then works with the Model to prepare data needed by the View. The View then makes use of the statistics organized with the aid of the Controller to generate a final presentable response to the students. Future possibilities for this project can lead to a secure driving environment. Less usage of phone. There may be much more advancement and can see it in our smart home. The touchscreen facilities can also be used in future.

Year: 2018

Author: Suzi Seroja Sarnin, Aida Akbar, Wan Norsyafizan W. Mohamad, Azlina Idris, Nani fadzlina Naim, NorsuzilaYa'acob

Title: Maleficent Mirror with ALEXA Voice Services as an Internet of Things Implement Using Raspberry Pi 3 Model B

This project is aimed at addressing the major causes of the community as it is often wasting a lot of time in the mirror when it comes to makeup or spruce up without knowing any information such as weather conditions, time, traffic info and latest news. "Maleficent mirror" is designed to achieve the goal of helping and pleasing an individual in getting information while improving his or her personal appearance. "Maleficent Mirror" comes with ALEXA application which is voice service that is able to answer all user questions. This design is a design that has two-way communication between the user and the mirror itself. Just using the word "ALEXA", this voice service system will analyze questions and instructions from users. Hence, community life and usage will be easier as well as reaching the goal of being a smart and intellectual user in internet usage. The Maleficent mirror works through commands given by the user. The system will START when there is a presence or movement in front of the mirror, the rest of the time it will remain OFF. User gives the command by saying ALEXA and followed by what user wants to ask, then it analyze the command and give the reply back to the user. For ALEXA function speaker 3.5mm stereo and mini microphone stereo being attached with the Raspberry Pi. Dell LCD monitor being used for the screen for "Maleficent Mirror". The system will work

through the SPI that will manage to display the features.

SYSTEM REQUIREMENTS

Functional Requirements

Functional requirements may involve technical details, data manipulation and processing and other specific functionality that define what system is supposed to accomplish.

• Must be able to display information on the screen.

• Must be controlled by something without requiring direct input.

• Must be able to scale to multiple screen sizes.

• System default is in low power sleep mode.

• Must be module based and contain sample default models.

• Must be connected to the web to receive incoming data.

Non Functional Requirements

• The system remembers the username and cant replied to user by name.

• Friendly user interface that works by selecting modules.

• A simpler user interface than a computer.

• The system has good performance for users.

• The system maintains good reliability for uses.
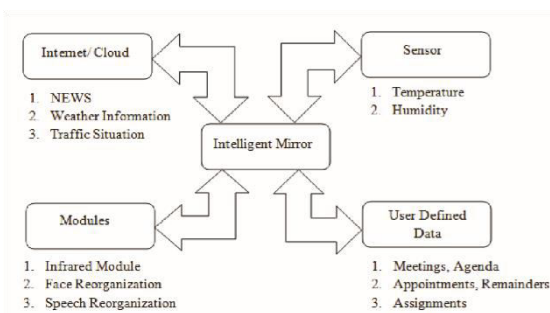
• Display disappear and becomes a mirror.

Hardware requirements

- Raspberry Pi model 3B+
- Web Cam
- One way glass mirror
- Microphone
- LCD Monitor

SoftwareRequirements

. Python

. OpenCV

System Architecture

System Block Diagram of Smart Mirror

Raspberry Pi 3

Raspberry Pi is a combination of two different small computers on a single circuit board. The raspberry Pi 3 has wide application as it is small and portable. Raspberry Pi 3 as the Mini CPU that has an onboard Wi-Fi and bluetooth capability it has a 64 bit Quad Core processor with 1.4 processor 4 USB ports, HDMI ports, camera ports 40 general input output pins and power supply. Raspberry serve as the main component by connecting all the module.

Monitor

Monitor is directly connected to Raspberry Pi via HDMI interface providing display as well as voice output.

Web Camera

Web camera feeds or stream its image in real time to go through a computer to a computer network. Unlike an IP Camera which connects using Ethernet over Wi-Fi webcam is generally connected by USB cable similar cable or built into computer hardware such Laptops.

Two Way Mirror

Mirror that is reflective on one side and transparent are the other the perception of one-way transmission is achieved when one side of the mirror is brightly lit and the other side is dark. This allows viewing from this side that is light and but not by the darkened side. A one-way mirror is typically used as an apparently normal mirror in a brightly lit room with dark room on the other side. People on the Brightly Side see their own reflection it looks like a normal mirror. People on the Dark Side see through it looks like a transparent window. the light form the bright room reflected from the mirror back into the room itself is much greater than the light transmitted from the dark room. Both voice and image streams are obtained from the webcam for face recognition the image stream is process for the feast for creation algorithm if the face is identified device is unlocked otherwise access to smart mirror is denied.

Face Recognition

The Local Binary Pattern Histogram and Viola - Jones algorithms performed best. The LBP algorithm achieved a recognition accuracy rate of 93%, and Viola- Jones achieved a detection accuracy of 97.9%. LBP works on splitting an image into neighborhood of pixels and compare the intensity of the center pixel to the surrounding ones. Depending on if the intensity of the center pixel is greater or lower than the surrounding pixels, the pixel in the neighborhood are concatenated to create a binary value encoding of the entire neighborhoods to create histogram representation. The histogram of different images is compared to determine if they contain the same face

.

Voice Recognition

Recognition algorithm implemented and tested on MATLAB dynamic time warping was found to be more accurate and simpler when applied to isolated word recognition while hidden Markov model was more reliable for sentence recognition. The DTW algorithm implemented on MATLAB has an accuracy of 95%.

Data Flow Diagram
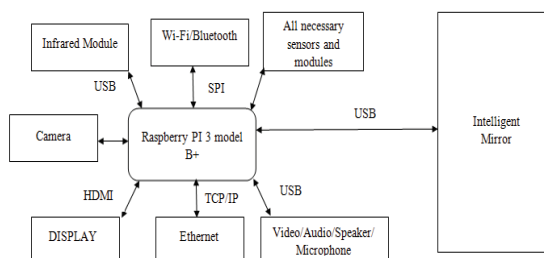
Smart Mirror Data Flow Diagram

UML Diagram

UML Diagram Use case diagrams are usually referred to as behavior diagrams used to describe a set of actions (use cases) that some system or systems (subject) should or can perform in collaboration with one or more external users of the system (actors). Each use case should provide some observable and valuable result to the actors or other stakeholders of the system.

UML specifications also described use case diagram as a specialization of a class diagram, and class diagram is a structure diagram.
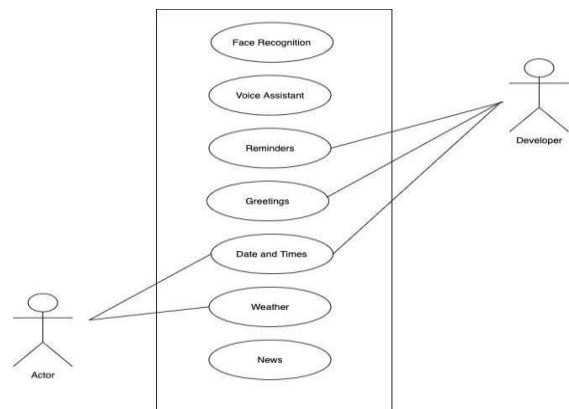
Use Case Diagram of Smart Mirror

User: User will be interacting with the application of the mirror which has developed.

Time and Date: it is the module in mirror Which displays time and date by fetching details from Cloud.

**Weather:** to display weather we are using a module from open API weather to get the weather information.

News: news module purchases the current news from the cloud and displays on mirror.

Greetings: greetings are the complimentary messages which displays pre-written texts.

Reminder: reminder is also a module which bit to remind important events that schedule meetings appointments.

Face Detection: with the help of passive Infrared sensor we will detect the motion of the object it recognize the optical and display April written message.

Use case Diagram form camera
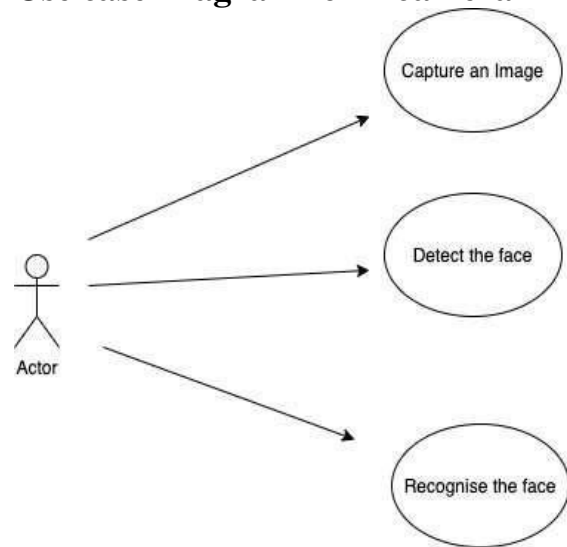
Actor recognized by the camera to interact

When the person come in front of webcam at the back and the face recognition module will be waiting for the person to come in front of the webcam as soon as the person comes in the webcam capture the image and searches for the train image in database if the image matches it will login into the personal account else it just displays the time date and weather updates.

Use case Diagram for Voice
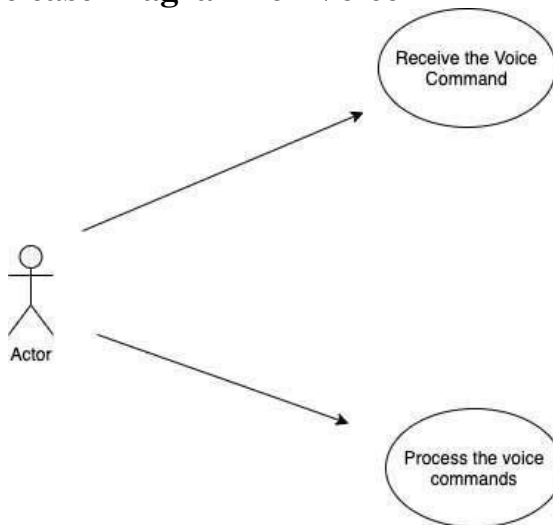
Here we are using the Google Assistant as the voice interaction support so when the people give the voice command as OK Google what's the weather like the information from the internet sources and get the response accordingly this is how voice interaction will work.

POSSIBLE OUTCOMES

The smart mirror which acts as a smart home control platform is a futuristic system that provides users with an easy-to-use mirror interface, allowing users access to customizable services in a highly interactive manner, while performing other tasks simultaneously. The main strengths are that this is a new kind of smart device that people don't see every day and it looks very spectacular. The mirror works both as a normal mirror as well as a mirror showing daily notifications to the authorized user.

There are lots of feeds or notifications that the user can view on the mirror like Facebook, Gmail, news etc. The mirror is also used to display time, weather, date etc. The mirror also acts as a personal assistant as well as displays important notices and is also an enquiry center. The user can interact with the mirror using voice commands.

Smart mirror design has the advantages of small size, simple operation, low cost, high degree of user friendly, personalized user interface and many other advantages which is suitable for many applications like college, home, offices etc. Overall, the proposed smart mirror system incorporates various functionalities to grant users access to personalized information services.

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