

Smart Mirror: Google Assistant Enabled Mirror

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Abstract

In recent years the focus has been shifted to automating the activities of daily life. The day to day life of man has become very fast and is incomplete without technology. In this digital era of the world IOT and Surface computing are definitely part of every human life thus combining these two domains we re-present the design and development of an interactive Smart Mirror with abilities of home automation, Google Assistant. The framework will offer basic services, like the presentation of personalized weather, date and time, Email. Only an authorized person will be able to access all the mentioned features of the Smart Mirror. User will be interacting Google Assistant to carry out various tasks like turning lights ON/OFF controlling the fan etc.

Index Terms: Home Automation, Smart Mirror, Google Assistant.

1. Introduction

Man has spent thousands of years perfecting the interior. More and more practices have been carried out to make it attractive and comfortable over the years. To make this happen we have re-introduced the concept of Smart Mirror as Surface Computing which incorporates Home Automation.

In the past decade, Home Automation using the emerging IOT technologies has become an attraction for many people. Numerous devices that perform multiple functions have been introduced. All these devices have certain physical properties and occupy extra space in household, to overcome this problem, we needed surface computing capabilities with combination of IOT. In our daily life, in rush of the morning, every day we check date, time, weather, today's agenda etc. Daily people spend at least 5 minutes of their time in the morning looking in the mirror. Everyone needs to manage their time efficiently. We present a Smart Mirror that provides basic information about time, date and agenda and can provide Home Automation.

2. Literature Survey

We have researched the domain of smart mirrors and we have adapted some of the features of existing systems. In recent years researchers have tried to combine functionality of multimedia devices such as music player, video player etc. It showed customized personal information such as weather, time and news. The system was based on the fact that it would require human presence which should be detected by Passive Infrared Sensor (PIR) to activate mirror's full functionality. Researchers have used an Arduino as a controller alongside the Raspberry Pi. To implement the speech recognition, API named Jasper has been used. Several smart mirror implementations provided multi-user environment and have used RFID tags for authentication purposes. These kind of smart-mirrors were used to promote wellness and healthier lifestyles in work environment. In this system fitness trackers were used to provide personalized health information through the mirror. Speech is the selected method for interacting with the mirror and get access to specific features. It has been enabled through Snowboy keyword detection engine, which is the service that supports the Amazon's Alexa distribution for Raspberry.

Few smart mirror consists a mobile application that lets users remotely access the functionalities provided by the system. Application provided a profile to multiple users along with the choices of selecting from all the available functionalities. Some attempts included microcontrollers such as STM32F030C8T6 and Speech Synthesis chip SYN6288 for better communication. As per the paper "Smart Mirror for Ambient Home Environment" by Multimedia Communication Research Laboratory University of Ottawa, by authors "Pradeep K Atrey and Abdul Motaleben" personalized user profile can be made

available for accessing the personal information about that particular individual. This helps in maintaining multiuser functionality with great compatibility. This also helps in achieving system interactivity with users.

The researchers also had customized the Smart Mirror through a Facial Recognition Authentication and personalized news recommendation. The process of face recognition begins with the capture of the image by means of a camera, this image needs to be pre-processed to improve the contrast. Generally, an image is a collection of pixels, whose value is given according to the intensity that is analyzed from the upper left pixel to lower right pixel. The intensity value is distributed over the entire image using histogram equalization technique. News Recommendation has become an essential part in day-to-day life especially handling large amount of information available on internet. The recommendation system have proven to be an important way for people to discover information, products and services based on more conventional queries. In order to implement this functionality we use the EmguCV libraries.

3. System Architecture and Components

I. Proposed system architecture will make use of components like:

1. PIR sensor: Passive Infrared sensor is used to identify the presence of a person. It will light up the screen on mirror.
2. Raspberry pi: Raspberry pi will work as primary processing unit which will collect, interpret the data obtained from sensors and will perform specified actions.
3. LCD panel: It is the main display of the smart mirror, and one-way mirror is attached in front of the LCD panel. Contents displayed on the LCD panel will provide personalize user information.
4. One-way mirror: It is the mirror in which one side is transparent and other side is reflexive where we can see us. The information that is displayed in the LCD panel can be viewed through the one-way mirror.
5. USB mic: It is used to input commands given to the system.
6. USB Speaker: It is used to provide an audio output. Main objective of the speaker will be to answer queries asked by user, which will be done by Google Assistant.
7. USB Audio Adapter: It is a trade-off of 1 USB port for multiple audio ports, which can include: 3.5mm Output jack. 3.5mm Input jacks.

II. Data Collection and Storage:

This is a real time system, it will fetch data from Internet called as web feeds.

Browsers are used for fetching required data. RSS allows users and applications to access updates to online content in a standardized, computer-readable format.

III. Data Processing Unit: Raspberry pi is used as a primary processing unit which operates using Raspbian operating system. We are using model 3 B, this board contains

- 1GB RAM
- 1.2 GHz ARM Cortex A53
- SoC: Broadcom BCM2837.
- Networking: 10/100 Ethernet, 2.4GHz 802.11n wireless.

- Bluetooth: Bluetooth 4.1 Classic, Bluetooth Low Energy.
- GPIO: 40-pin header, populated.
- GPU: Broadcom VideoCore IV.

1. GUI Creation:

GUI used by the proposed system is Magic Mirror framework by Michael Teew. It is an open source initiative taken to promote creation of customizable magic mirror. Magic Mirror focuses on a modular plugin system and uses Electron as an application wrapper.

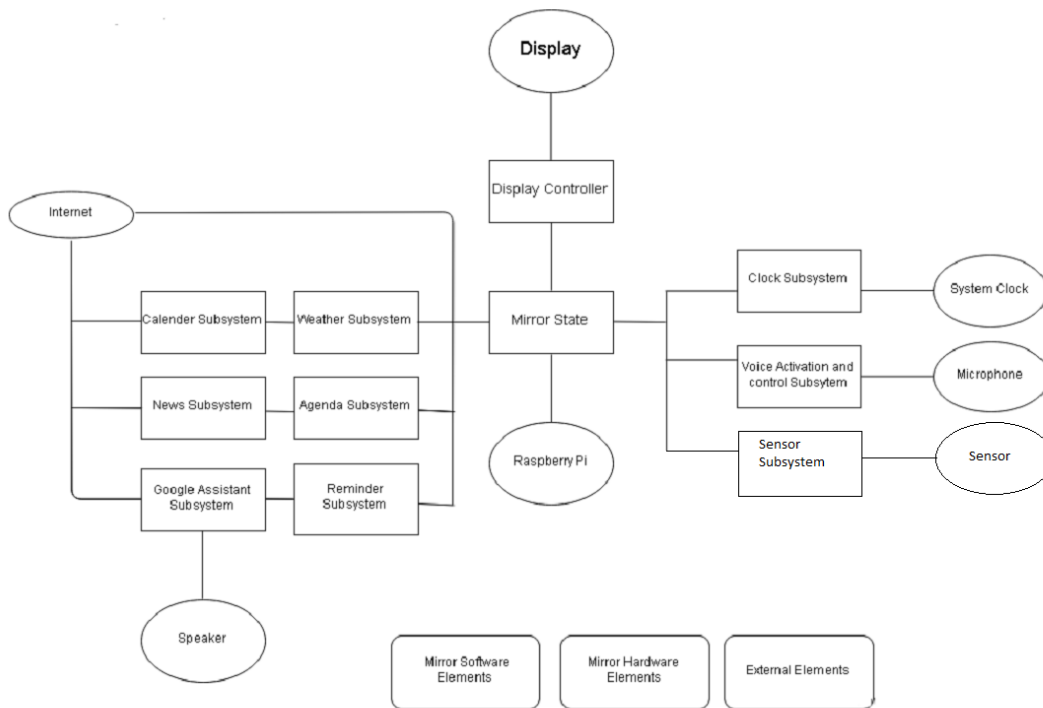


Figure 1: System Architecture

4. Implementation

Smart mirror is implemented in such a way that it displays information retrieved from the internet. Retrieved data includes weather condition, time, calendar, notifications from social media. Procedure to build the smart mirror will include:

1. Mirror
2. Monitor
3. Frame

A regular mirror would not work. The mirror should be one way mirror so it would have reflective properties from one side and another side would be transparent.

Monitor is placed behind one way mirror and displays the required contents. The monitor is connected to raspberry pi and mounted within the wooden frame.

Frame holds all components together and provides protections from external environment. The wooden frame needs to be measured correctly in have order to fit it perfectly around the mirror.

Google Assistant, can search the Internet, schedule events and alarms, adjust hardware settings on the user's device, and show information from the user's Google account .Home Automation can be provided using Google Assistant SDK .The Assistant can engage in a two-way conversation, using Google's natural language processing algorithm.

Feature of the speech recognition is available in English, among other languages, Assistant gained support for multiple actions triggered by a single vocal shortcut command.

Google Assistant once integrated system will be able to control:

- Light
- Fan or speed of fan
- Air conditioner
- Dishwasher

Smart Mirror:

The core of Smart Mirror contains strong APIs which allows 3rd party to build additional modules. Modules you can use and develop.

The Smart Mirror allows end user to convert his bedroom/bathroom mirror into user's own personal assistant.

Smart Mirror focuses on a modular plugin system and uses Electron as an application wrapper.

5. Installing Hardware

Installing Hardware Installing hardware required the following components

1. The Monitor
2. A Raspberry Pi
3. A HDMI Cable (to connect the Raspberry to the Monitor)
4. A USB to micro USB cable (to power the Raspberry Pi)
5. A power cable to power the monitor
6. A USB Mic
7. Speaker
8. Sound Card
9. Sensors

6. Future Scope

1. All the developed features could be given remote access which means for accessing various functionalities the user does not need to be near the mirror he or she can access the mirror from different locations. The user can be far away from the mirror or house where the mirror is installed, the connected devices to the mirror can be controlled remotely without being present there. Accessing the device remotely can help in controlling the household devices whenever the user is not in home near the mirror which makes it more versatile to use.
2. Addition of Face Recognition can help the mirror to identify the particular individual by which the user can access is own information. By incorporating the Face Recognition security can be

maintained in the means of information. Various users have various demands and taste. In case of unauthorized user try to access the mirror the user can't. This feature helps in achieving high security such as unwanted user in the house can be notified to the user.

- In terms of aesthetics the mirror can be made more thinner which can make it more portable and can be installed wherever needed. For the home automation purpose the device is placed in a home environment where the place taken by the device should be low, it must not occupy most of the space. The device should blend in within the home furniture to make it useful in everyday course.

7. Result Analysis

Results observed are:

- After giving any verbal commands to Google Assistant a transcript is generated.
- The accuracy and response time of the Google Assistant is heavily dependent on speed of Internet connection.
- Modules of Smart Mirror are also dependent on the speed of Internet.
- Without adequate Internet speed the Smart Mirror will not be able to load all modules.
- PIR sensor will not detect any movement from user if the user remains in stationary position.
- PIR sensor will detect any objects or obstacles it will only detect change in movement.

Sr.no	Verbal Commands	Actions Performed
1	Turn on	Turn on the light(s).
2	Turn off	Turn off the light(s).
3	Start	Turn on the fan
4	Stop	Turn off the fan

8. Conclusion

As this paper proposes the functionalities and the applications of the Smart Mirror by incorporating the Surface Computing and IoT paradigm to grant user his personalized information based on needs as well as to control the various devices in the household environment. This happens with the help of Google Assistant by giving the speech command to control or access information. The proposed system also makes use of different sensors to control different household devices.

This intelligent mirror is been designed to allow the user to interact and access the information, which improves the user's experience by personalizing it on individual basis. This multipurpose user friendly functionality helps better management into the daily life by accessing news feeds and daily updates.

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