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Home automation using smart mirror

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Abstract
In the recent years, the demand for IoT platform has increased due to rising requirement of internet enabled devices and rising need of internet connectivity. In this paper, we propose an IOT based smart mirror which represents the development of a unique application which integrates interactive services of information and offered through a user interface on the surface of a mirror. The framework will offer basic services, like the presentation of personalized weather data, time, date, news feeds and will incorporate some additional functionality, like lights ON/OFF, daily routine remainders, casting of mobile applications on mirror screen and also to find the lost phone. We are using Raspberry pi as main component along with Google assistant and IFTTT (IF This Then That).

Keywords: IOT internet of things, home automation, raspberry pi, voice recognition, Google assistant

Introduction
Smart Mirror was inspired by a voice controlled life automa-tion hub, most commonly powered by the Raspberry Pi more devices that we found while browsing the DIY (Do It Yourself) section in a popular website called Smart Mirror By Evan Cohen [9]. The device has a display with a web page that shows time and weather information and it looks very futuristic. We liked that project a lot and we thought we could improve on it by adding some means of interaction to the device. This inspired us to begin this project and develop a Smart Mirror. The project has a very broad scope covering some current popular topics in the IT sector such as the Internet of Things and home automation.
Our lifestyle has evolved in such a way that optimizing time is the most important thing. Mirrors, for example, provide a large surface ideal for displaying information and to interacting with it. Most of the people have mirrors at home so the concept of a smart mirror is that you can interact with it and it is attractive and has been fantasized in many futuristic movies. The main purpose was just not to make it look cool or futuristic butto help disabled or older people and children which may or may not have the ability to manually use the home appliances using voice navigation. The goal of the smart mirror is to focus in reducing the time needed in a users daily routine and provide a merger of user and technology that becomes an enhancement. The interesting feature in our project is that we will be able cast videos/photos on the surface of mirror and user will be able to find his/her lost phone with the help of mirror.
In this system we will be also focusing on home automation. we can make small model of home automation showing how it works through Smart Mirror. However it would be very easy to write an application to turn ON and OFF the lights using voice commands. This example is just the tip of the iceberg as there are new connected devices emerging every day that could interact with the mirror. The additional features of our project is Remainder setting, Casting of videos, photos from mobile to screen of mirror, voice based news and finding lost phone.
The hardware requirements for this project is the usual two- way mirror, display and Raspberry Pi setup but with a USB microphone to support voice commands, amplification circuit and speakers. Every functions works totally on voice ensuring that the user can use it while multitasking with other things making it more useful in busy conditions. The voice recogni-tion is done using Google speech recognition engine ensuring the most accurate recognition experienced which makes it user compatible and ease of access with less chances

As this system can be totally reprogrammed according to the user needs, so due to reduced complexity (Python programming language) and powerful open source forum (Raspberry pi forum) to make it affordable even after the installment of the smart mirror or after sales. Using the GPIO pins of the raspberry pi, IFTTT (If This Then That) and Relay module, you can control many electronics circuit and appliances and control them from anywhere.

The key/main contributions of this paper are as follows:

1. To design and develop voice based smart mirror system.
2. To provide real time global information.
3. To provide an interactive environment through surface of mirror.

The rest of the paper is organized as follows: Section 2 deals with the related work and background of smart mirror. Section 3 describes the proposed work related to smart mirror. Section 4 describes the experimental setup of proposed system, result and analysis based on the test cases performed. Finally section 5 deals with conclusion and future work.

Background Related Work

IOT is known for its advantage that can help simplify people's everyday routine. Hence, the Yusri *et al.* [1] describes smart mirror with voice based home automation and web based user interface. Limitation of the system is that it does not support remainder setting and voice based news feeds. Gold *et al.* [2] describes a smart mirror with additional capability of displaying multimedia data, such as text, images, and videos. This device allows users to access and interact with contextual information, such as weather data, seamlessly as part of their daily routine. Limitation of the system is that it does not pro- vide home automation. Hossain *et al*. [3] describes the design and development of a futuristic smart mirror that represents an unobtrusive interface for the ambient home environment. The mirror provides a natural means of interaction through which the residents can control the household smart appliances and access personalized services. limitation of the system are that it does not support remainder setting and voiced based news feeds. Kafi *et al*. [4] describes smart mirror with facial recognition and speech recognition and can able to display weather, calendar and news-feeds. Limitation of the system is that it does not provide home automation. Dr. P.A. Vijaya *et al.* [5] describes the design and implementation of smart mirror capable of displaying time, weather, newsfeeds, daily schedule, weight tracking and switch is provided to control lights and window. Limitation of the system is that it does not support voice recognition. Vorawitsurawathana *et al.* [6] describes home automation with voice command and mirror control. It can control lights and curtain. Limitation is curtain can only be completely closed or opened. Athira S *et al.* [7] describes smart mirror with home automation. It is capable of displaying time, weather, news-feeds, calendar and controls lights, door, Music player via voice commands. Blimitation of the system are that it does not support remainder setting and voiced based news feeds. D.K. Mittali *et al.* [8] describes smart mirror with voice recognition and also supports human gesture. It also capable of booking Uber rides. Limitation of the system is that it does not support home automation. N. K Sharma *et al.* [9] suggests and modified genetic algorithm that helps in saving energy as well as reducing the wastage of resources. The limitations with this work is that the algorithm only considers the energy consumption of the CPU and not other networking devices such as routers and switches at the cloud data center.

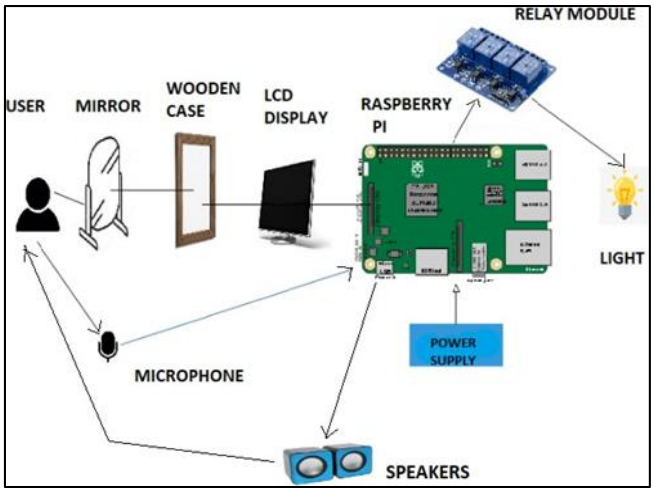

Fig 1: Component Diagram

Proposed Work

Fig 1 shows the Component diagram of smart mirror. The wooden case is nothing but collection of all the components. Mirror is attached to the front side of wooden case and LCD display is at the back side of the wooden case. Raspberry pi, Relay module, speakers, Microphone, Amplification circuit, Bulb is integrated and placed at the back side of the LCD display. Display module is added to make mirror interactive. When we give some command at that time the microphone will capture the command send it to Google assistant. Then Google assistant will process the command and according to that operation will perform. The processed signal is passed from raspberry pi to relay module and relay module will turn ON/OFF light by using its channels. Speakers are connected to raspberry pi and provides audio to user. Power supply is used to power up raspberry pi.

Algorithm 1: Home Automation System
Input: vc [] list, IFTTT [] list
Output: Lights ON/OFF. Initialization: STATE pwr ← 1, rw [], STATE s ← 0, STATE relay ← 0, i

1. While (pwr)
2. for STATE I ← 1
3. STATE s ← 1
4. provide voice command vc[i] from vc[]
5. rw[i]=vc[i] //mic fetch command and store in raw. out. raw file
6. provide rwi to google assistant
7. if(rwi == IFTTT[])
8. relay = 1
9. else
10. relay = 0

Algorithm 1 describes procedure for voice based home automation. To start process Turn ON the power supply then turn ON the switch to wake up the smart mirror. Now give voice command to Turn ON/OFF the lights. This command will be fetched by Mic and will be stored it temporary in raw out. raw file. Via Google assistant command will go to IFTTT (If this, then that) that it will compare command with

the available phrases. If match found, then Relay will get data in '0' and '1'. If '1', then light will turn ON and If '0', then light will turn OFF.

Algorithm 2: Voice based News Feeds Initialize = State *pwr* ← 1, rw, STATE *s* ← 0, State *speaker*←0
Input: Voice command.
Output: provides audio via speakers.
1. while (pwr)
2. for STATE *i* 1←
3. STATE *s* 1←
4. provide voice command vci, from vc
5. provide vci to google assistant through mic
6. google assistant will approach to radio broadcast station
7. if (vci)
8. speaker¡-1 speaker will provide audio

Algorithm 2 describes procedure to display voice based News Feeds. First Give voice command for news you want to know. Mic will receive the command and will forward it to Google Assistant. Then Google assistant will approach to radio broadcast station and Broadcast track will be played.

Algorithm 3: Casting photos, videos from mobile to smart mirror:
Input: Play/Pause/Stop Videos/photos on Rapicast (APP)
Output: Videos/Photos will be displayed.
Open VNC (Virtual Network Computing). Write a code to configure Raspberry Pi with Raspicast Application. After configuration, add IP address of Raspberry Pi in Raspicast Application. To cast videos, open youtube. Play video and share it via cast option. It will redirect to Raspicast Application. Click on Play option to cast it on mirror. User can Play, Pause and change videos via phone. To turn off the casting, click on Stop.

Algorithm 4: finding missing phone
Input: vc [] list
Output: Phone will ring.
Initialization: STATE *pwr*←1, rw [], State *s* 0, ← State *Speaker* 0, ← i, STATE *mobile* ← 0
1. while (pwr)
2. for State *I* ← 1
3. State *s* ← 1
4. provide voice command vc[i] from vc[]
5. rw [i] = vc [i]//mic fetch command and store in raw. Out. raw file
6. provide rwi to google assistant 7.if (googleacc)
7. mobile=1 9.else 10.mobile=0

Algorithm 4 describes procedure for finding lost phone. To find lost phone give voice command as I lost my phone. Google assistant will ask you want me to ring your phone? Then give voice command saying yes. Mic will receive the command and give it to Google assistant. Google assistant will ring the phone in which the existing Google account is active. To cut the call, press lock button of phone.

Test Case	Expected Result	Actual Result(1)	Actual Result(2)
Working Status of system	• Running properly	Success	Success
Working of Speaker	• Speaker volume is at moderate level.	Fail	Success
Configure Voice	• Setting up of speech recognition	Success	Success
Mic Testing	• Receives accurate command	Success	Success

Fig 2: Test Cases based on System sustainability

Experimental Setup, Result and Analysis
We have used Python as a programming language. Python is a high-level, interpreted and general-purpose dynamic programming language that focuses on code readability. The syntax in Python helps the programmers to do coding in fewer steps as compared to Java or C++. Linux is used as a base operating system as it is a open source environment and secure. With base as a linux, we have installed Raspbian (Operating System) for programing Raspberry Pi. Node JS is used to display information on LCD Display. As the inbuilt audio jack of Raspberry pi gives very low volume for speaker, we have added one amplification circuit to enhance the volume. We have used IFTTT for home automation. IFTTT (If this, then that) is a free Web-based service to create chains of simple con- ditional statements, called applets. For casting videos/photos, Node js coding is used to configure Raspberry pi with Raspi- cast (APP). We have used VNC (Virtual network computing) to work on Raspberry Pi. Virtual network computing (VNC) is a type of remote-control software that makes it possible to control another computer over a network connection.

The procedure for implementing Smart Mirror is realized in the following steps
1. The idea and the mirror.
2. The monitor
3. Installing and configuration of raspberry pi
4. Configuration of interface(VNC)
5. Installing Programming language (Python).

6. Downloading and setting up of Google assistant on raspberry pi
7. Hardware installation and configuration
8. The casing

Test Case	Expected Result	Actual Result(1)	Actual Result(2)
Control Lights	• Lights turn ON/OFF	Success	Success
Display Information	• Displays accurate date , time & weather	Fail	Success
Remainder Setting	• Gives proper notification	Fail	Success
Casting Videos/Photos	• Able to cast videos/photos from mobile	Success	Success
Call feature	• Rings mobile phone when user gives the command	Success	Success

Fig 3: Test Cases based on Services provided

FEATURES	MICROSOFT'S MAGIC MIRROR	APPLE MIRROR-RAFAEL DYMEK	NUOVO SMART MIRROR	SMART MIRROR
Platform	Windows 10	iOS 10	Android	Raspberry Pi 3
Voice Recognition	✓	✘	✘	✓
Touch Screen	✘	✓	✘	✘
Gestures	✘	✘	✘	✘
Weather	✓	✓	✓	✓
Map	✓	✓	✓	✘
Music Support	✓	✓	✓	✘
Video Support	✓	✘	✓	✘
Social Networking	✓	✓	✓	✘
To find lost phone	✘	✘	✘	✓
Casting Videos and photos from Phone	✘	✘	✘	✓

Fig 4: Comparison with other systems

Fig. 2 describes the test cases which are performed to check sustainability of the system. It includes system test-ing, evaluation criteria include Working Status of system, Working of Speaker, Configure Voice, Mic Testing. Testing is done twice. When first testing is performed, one test case is failed. After second testing, results are improved.

Fig. 3 describes the test cases which are performed to check whether the each service provided by the mirror is functioning properly or not. It includes Control Lights, Dis- play Information, Voice based news, Remainder Setting, Casting Videos/Photos, Call feature. When first testing is performed, two test cases are failed. After second testing, results are improved

Fig. 4 describes the comparison with the other smart mirror. It includes Microsoft's Magic Mirror, Apple Mirror-Rafael DYMEK, Nuovo Smart Mirror. As per the comparison given in the table, Microsoft's magic mirror is better as compared to other smart mirrors. But the limitation is it does not have features like finding lost phone and casting Videos/Photos from mobile and it is expensive.

Fig. 5 describes the graphical comparison of smart mirrors. It includes Perseus smart mirror and 3D fitness tracker smart mirror. As compared to other mirrors, smart mirror have more features and it is cost efficient.

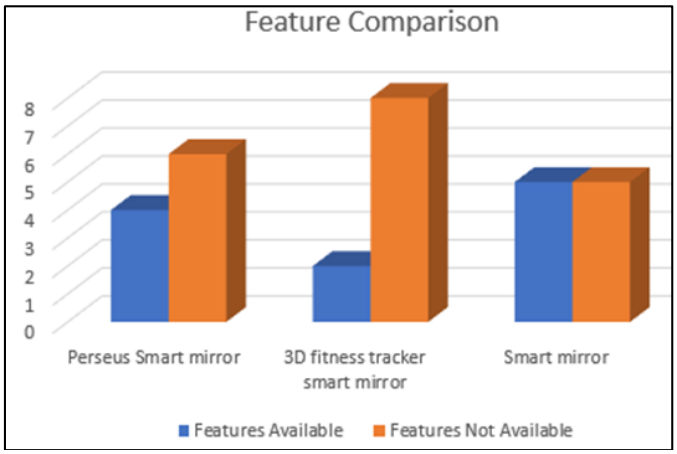

Fig 5: Feature comparison

Fig 6: Real time based information

Conclusion and Future Work

Smart Mirror have great potential to enhance Users experience of accessing and interacting with information. This system is very useful for physically challenged people, old people and children. Most importantly everyone can easily access this system easily even while doing their daily chorus. This will help them to become independent and to experience luxurious life. The future scope of the project will be voice authentica-tion, authentication of user by adding camera module in smart mirror, controlling smart mirror with hand gestures.

References

1. Muhammad Muizzudeen, Shahreen Kasim, Rohayanti Hassan. Smart Mirror for Smart Life, Faculty of Computing, Universiti Teknologi Malaysia, 2017.
2. Derrick Gold, David Sollinger, Indratmo. Smart Reflect: A Modular Smart Mirror Application Platform, Mac Ewan University Edmonton, Alberta T5J 4S2, 2016.
3. Anwar M, Hossain, Pradeep K Atrey, Abdulmotaleb El Sad-dik. Smart Mirror For Ambient Home Environ, Ment, Multimedia Communications Research

Laboratory University of Ottawa 800 King Edward, Ottawa, Ontario, Canada, 2007.
4. Kafi, Alam Hossain. Artificially Intelligent Smart Mirror using Raspberry Pi, BRAC University Dhaka, Bangladesh, 2018.
5. Dr. PA Vijaya, Nitin Awasthi. Design And Implementa-Tion Of Smart Mirror As A Personal Assistant Using, 2018.
6. Raspberry PI. Bnmit Bengaluru, India. Vorawitsurawathana, Chuang, Ratanapan, Phienthrakul. Home Automation with Voice and Mirror Control, Mahidol University International College Nakorn Pathom, Thailand, 2018.
7. Athira S, Francis, Raphel, Sachin NS, Porinchu Ms. Seenia Fran-cis Smart Mirror: A Novel Framework for Interactive Display Thrissur, India.
8. Mittal DK, Verma V, Rastogi R. A Comparative Study and New Model for Smart Mirror, Galgotias University, Greater Noida, India, 2017.
9. NK Sharma, GRM Reddy, A Novel Energy Efficient Resource Allocation Using Hybrid Approach of Genetic DVFS with Bin Packing, Fifth International Conference on Communication Systems and Network Technologies, Gwalior, 2015, 111-115. https://github.com/evancohen/smart-mirror