Voice Controlled Smart Mirror With Raspberry Pi

Prof. Sampada H K[1], Karthik G S[2], Kankshita S[3], Charan C[4], Nihal B S[5]
[1, 2, 3, 4, 5] Dept of Electronics and Communication Engineering
[1, 2, 3, 4, 5] Atria Institute of Technology, Bangalore-91

Abstract- *Internet of Things (IoT) is a concept where an object having the ability to transfer data over a network without the need for human interaction to human or human to computer. A home automation system is a technological solution that enables automating the bulk of electronic, electrical and technology-based tasks within a home. It uses a combination of hardware and software technologies that enable control and management over appliances and devices within a home. Including the IoT technology and home automation we are proposing our model to convert a normal mirror into a Smart Mirror. This will look like a normal mirror with normal function but with an additional function of displaying weather, date & time, public & personal calendar and news. All the above contextual data are extracted from API's. In our model we are using Raspberry pi 3B model with an LED monitor. Adding to all these we are including home automation with voice control. We are using "ALEXA" for controlling home appliances. With monitor we are also using microphones and speaker for an interactive mirror. Apart from alexa we can also use ok Google or Sonus. Once the keyword is detected by the voice controller it is sent to the cloud service for speech recognition. With our Smart Mirror we can provide multimedia services, manage their daily activities, provides opportunity for multitasking and solve problems related in controlling electrical appliances in home. It can also solve problems related to communication and information integration in a family.*

Keywords- ALEXA voice services, Home automation, IoT, Raspberry pi, Web application

I. INTRODUCTION

Everything in this World is becoming Smart. Why not Mirror? There has been a steady and significant growth of use of smart devices in the past decade. This is as a result of the growth of the industry of Internet of Things (IoT) and Home Automation. Each day there are more and more smart devices, vehicles, buildings and other objects, which consist of software and electronics, that are interconnected either by some network or to the Internet. These smart things have the main purpose of collecting and exchanging data.

The constantly increasing usage of smart interconnected devices on a global level, led to a growth of smart homes as smart technology ecosystems, whose purpose is to coordinate and optimize our daily activities. Recently there has been a new development of smart mirrors which became part of the smart homes.

A common approach to building a smart mirror is to use a pane of two-way glass, a monitor, a frame to hold the glass and monitor, and a web browser with JavaScript to provide the software features and drive the display. U This is mainly used for displaying contextual data, organizing daily human routines, entertainment etc.

One of the most important applications of the proposed smart mirror is the ability to control all the electrical appliances at home. This model 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, and latest news. Smart mirror is designed to achieve the goal of helping and pleasing an individual in getting information while improving his or her personal appearance. It displays information to know such as time, weather, public & personal calendar, and news.

Smart 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.

II. LITERATURE SURVEY

[1] The author proposed the ease with which a user can take a glimpse of news, temperature, weather and other information while looking at the mirror. The mirror allows to fetch news online and to display it. The system includes Raspberry Pi 3, a two-way mirror, a monitor to view information, and a temperature sensor interfaced with it.The software which runs on the processor is Raspbian. The intelligent mirror was designed keeping in mind the upcoming home automation condition. The main aim was to reduce the time required in the user's everyday schedule and to make a new innovation. The

user will be able to access application like music, their daily schedule, news, climate, and other personalized information.
[2] The author proposes to design and implement a voice-controlled smart mirror. The device can function both as a mirror and a source of interaction for getting daily updates on weather, news, and can play audio and video files. This device is also used to search for any type of data or information on the internet to enhance our knowledge. It can perform mathematical computations in a very small instant of time. The device consists of Raspberry Pi 3+, a voice assistant and a mirror with a display. The technology used is artificial intelligence, machine learning, Bluetooth, bootstrap, and JavaScript. The device is built to demonstrate the basic application used by a common man and ways to interact with the smart mirror by giving input in the form of voice into the microphone and receiving the output through a speaker. In future, the smart mirror can be upgraded to perform additional capabilities such as to build an entire home automation system with a smart mirror and a number of other applications.

[3] The author proposed that normal mirrors can be made to behave like a smart mirror to provide security and vigilance in deployed environment. The system is designed using Raspberry Pi, camera, touchscreen and microphone as hardware and python for programming. The device operates in 3 modes, voice touch and mobile commands. Yolo technique with open CV for object detection is used for detection for intrusion of Human. When the intrusion is confirmed, the user of the smart mirror will be sent an alert Email along with the image of an intruder. The mirror consists of maximum possible features. The system can be used as security and vigilance system. In future artificial intelligence can be added and can be extended to control home appliances and lightning.

[4] The author proposed a model which includes application such as weather, Twitter, news, to-do list, calendar and music. The application is run from a central computer which features a multicore CPU, solid-state memory, and wireless connectivity. The applications are integrated with the use of the Leap Motion controller. The controller allows for touch free control of smart mirror by use of finger swipes, taps and circles. There is also the option to use voice control to play music, post a tweet or add a table to the to-do-list. The hardware components include the central PC components, webcam, MCU, sensors and speakers, the Leap Motion controller. The software control was composed of the software code organization and UI handling and the GUI design.

[5] The author speaks about the busy working schedule of people. This busy routine reduces ample amount of time spent on changing appearances in front of the mirror. The smart mirror is built to save time and also enabling people to update with the current news. The device is constructed using a Raspberry Pi 3-B and Arduino Uno processor, GSM module, an ultrasonic sensor to detect a person in front of a mirror and turn on the LED. The device was able to provide an interactive experience to the user by displaying information on the mirror, thus conserving time. The product is not restricted to the hospitality industry. The inclusion of touch display can help enhance user interaction.

[6] The author proposes a smart mirror which can be constructed using a raspberry pi to enhance it with security and intelligence. The aim is to develop a cost effective mirror which can display various kinds of information like weather, time, location, current events and news. The technology used is AI, voice recognition and Alexa voice service. The system was equipped with a strong authentication framework to ensure end to end security as it cannot be ignored in the modern world. With an added camera the user would be able to access all the features of a smart mirror without compromising on security.

[7] The author proposes a smart mirror which satisfies consumer needs towards intelligent life. The smart mirror is designed to solve the problem of information integration and communication. This device is developed using a Raspberry pi, a unidirectional mirror and other hardware devices. Face recognition and speech interaction are the technology used in this mirror. The device proposed in this paper provides a central platform solution for the smart home in terms of development and application. In the future, exploration of speed of speech signal processing and the accuracy of face recognition can be studied.

[8] Sarin proposed a model called maleficent mirror based on the Raspberry Pi 3 that is equipped with high technology and innovative applications. The main goal is to create a product that meets the needs of a person when preparing and receiving information such as news, time, weather. The mirror comes with ALEXA application which is a Voice service that is able to answer all user questions, which communicates between the user and the mirror itself. VNC viewer has been used where the VNC server captures desktop computers in real time and sends them to VNC viewer for display. By this facility, user's can control the desktop remotely by using various electronic devices.

[9] The author has made mirror which not only displays the weather report and time but also added web application. The application has features like digital magazine and map of the college which helps people inside the campus to know about the certification courses, and detail about the placements. The map is implemented by Google API. The author has made it

easy for the viewers to have a glance of activities upcoming in the college where the data about the activities are stored in database which can only be accessed by an admin. In future touch screen facilities can be implemented.

[10] The author deals on the purpose of implementation of smart mirror as a part of home automation which in turn optimizes the time of people as they start their day. The deviceis constructed by a reflective glass, LCD monitor, a Raspberry Pi 3, a camera, and a platform IoT oriented cloud computing, where the information is obtained by web services. In addition, the author has used photo which is accessed by facial recognition and user information to predict the news. The main concern is on news recommendation algorithm using predictive model. The input of the algorithm is constructed from the number of categories interacted by the user with the voice commands. In order to improve user experience, voice command recognition functionality is implemented.

[11] The author proposed a concept of smart home- based Internet of Things using smart mirror. The systems allow users to access information and also control lights in the house. Relevant information like time and data, weather forecast, traffic and map locations can be traced, where the system applies Sonus technology as a medium of interaction between people and the system. The methodology used by the author is the evolutionary prototyping which gathers all requirements and designs the system in a quick method. This methodology helps in better planning and management which re-examines each activity according to the system.

[12] The author proposed a Smart health Mirror model which consists of a smart mirror that work on its own algorithm and behaves as smart assistant. This model consists of face recognition authentication, posture problem detection, and proper posture guidance, followed with suggestions for preventive healthcare. The algorithm used is smart because it keeps track of the health progress and constantly updates the health advice. The body postures are controlled by Posture Analyze Algorithm by creating a web application. In future, data can be obtained by communication with a wearable device which predicts health rate, blood pressure and physical activity stress levels.

[13] The author proposes the design and development of a smart artifact called "Interactive Mirror". The device identifies the user using facial recognition and is able to recognize emotions, height identification, identify garments, suggest garments will suitable color, and can remind important events. The device incorporates image processing and RFID technologies. There are two modes of operation, normal mode which acts like a traditional mirror, interactive mode which acts as an intelligent device that recognizes information and provides personalized services. The features can be enhanced according to the environment in which it is used. However, security and privacy need to be addressed.

[14] The author offers three main benefits. First, it is modular and extensible. Developers can add plugins to customize their smart mirror applications. Second, it utilizes a server design that allows one to sidestep a sandbox created by a web browser, by enabling users to interact with a smart mirror through an external hardware interface. Third, it allows for plugins to be created in all programming languages hence allowing a growth in smart mirror application development. New plugins can be added using motion detectors, temperature and light sensors, gesture recognition, voice commands and some form of proximity detection such as detecting the closest phone in range.

[15] The author proposed a mirror which eventually is a technology augmented interaction device, allowing facial based authentication. It provides a natural interface in the ambient home environment for accessing various information services such as news feed, multimedia and so on and also controls household smart applications when required. One of the core values of the system is to provide customized services based on user credentials. The system provides access to the live feeds from the home security camera installed in strategic functions, which reduces the work of the user while doing another activity at the same time. The mirror user interface is the application that runs on the mirror node where the user is in direct contact.

TABLE 1: LITERATURE SURVEY

AUTHORS	YEAR	TECHNIQUE	ADVANTAGES
Ramya M, Ramya R, Sandhiya A, Prof Karthick Raghunath	Jan 2019	Individual collaborator are used to simplify the work load	Refreshes client's logbook plan and daily agendas
Amit Dhavale, Saurabh Chavan, Mayuresh Supe	April 2019	RFID reader provides recognition of users	Mathematical computations can be done
Raju Nadaf, Vasudha Bonal	2019	YOLO a machine learning concept is adopted	Mobile based controls can be used
Varsha Singh, Devi Singh	Feb 2019	Use of Leap Motion controller	Touch free control of smart mirror
Ayushman Johri, Sana Jafri, Raghav Narain Wahi	2018	GSM module is connected	Provides interactive emergency triggering technology
Adokiye Charles Njaka, Na Li, Lin Li	2018	Google's "Speech-to- text",Google's "Custom search engine"	Enables multifactor biometric authentication
Kun Jin, Xibo Deng, Zhi Huang, Shaochang Chen	2018	API of Baidu Speech recognition	Solves smart home communication and information integration of the family
R Akshaya, N.Niroshma Raj, S.Gowri	2018	Map is implemented using Google API	The map can show Satellite view and Ariel viewtoo
Ivette Cristina Araujo Gracia, Eduardo Rodr barrientos	2017	IoT oriented cloud computing is used	Face recognition and voice commands are helpful
Muhammad Mu'izzudeen Yursi, Shahreen Kasim, Rohayanti Hassan	2017	Evolutionary Prototyping method and Sonus is adopted	Information like traffic and warning can be traced
Biljana Cvetkoska, Ninoslav Marina, Zhanko Mitreski	July 2017	Use of Posture Analyze Algorithm for accurate positions	Image processing offered accurate detectionof healthissues
Chidambarm Sethukkarasi Karuppiah PalAmutha Raja Pitchiah	2016	Incorporates intelligence into a normal mirror by embedding image processing and RFID technologies	Recognizes the user using face recognition and offers personalized services
Derrick Gold, David Sollinger, Indratmo	2016	Face recognition, tag based identification , biometric data	The system is light weight, modular and extensible
M. Anwar Hossain, Pradeep K. Atrey, Abdulmotale b Ei Saddik	2007	Web services, X10 device drivers, Flash based widgets, face authenticationmechanism framework	Provides access to personalized information services

III. CONCLUSION AND FUTURE WORK

This smart mirror provides natural interactions between user and the ambient house. By viewing the mirror it displays all the contextual data that can be used by the user in a conventional way. Mirror is also equipped with "ALEXA" to enhance the user experience. It also provides two-way communication between the user and the mirror. It is also used to control electrical appliances home automation. After going through all the papers, there are several methods to implement a SMART MIRROR, but the best and latest possible way of obtaining is proposed in this paper.

In future works, we can take feedback of the home environment through sensors and optimize the home environment according to user requirements. Mirror can also be built with face recognition and speech processing.

REFERENCES

[1] Ramya R, Ramya M, Sandhiya A, karthick raghunath,(2019) " IOT Smart Mirror With News and Temperature", ISSN No.2348-8387

[2] Amit Dhavale, Saurabh Chavan, Mayuresh Supe, Pravin Rahate (2019)," Smart Mirror using Virtual Voice Assistant", ISSN No. 2395-0056

[3] Raju Nadaf, Vasudha Bonal,(2019) "Smart Mirror using Raspberry Pi as a Security and Vigilance System", ISBN NO.978-1-5386-9439-8

[4] Varsha Singh, Devi Singh,(2019)" Smart Interactive Mirror Display" ISBN No. 978-1-7281- 0211-5

[5] Ayushman Johri, Raghav Narain Wahi, Sana Jafri, (2018) "Smart Mirror: A time-saving and Affordable Assistant", ISBN No. 978-1-5386- 6947-1

[6] Adokiye Charles Njaka, Na Li and Lin Li,(2018) "Voice Controlled Smart Mirror with Multifactor Authentication", ISBN No. 978-1- 5386-5959-5

[7] Kun Jin, Xibo Deng, Zhi Huang, Shaochang Chen,(2018) "Design of the Smart Mirror Based on Raspberry Pi", ISBN No.978-1-5386-1803-5

[8] Suzi Seroja Sarnin, Aida Akbar, Wan Norsyafizan W. Mohamad, Azlina Idris, Nani fadzlina Naim, Norsuzila Ya'acob,(2018) "Maleficent Mirror with ALEXA Voice Services as an Internet of Things Implement Using Raspberry Pi 3 Model B" ISBN No.978-1-5386-5457-6

[9] R Akshaya, N Niroshma Raj, S Gowri (2018), "Smart Mirror - Digital Magazine for University Implemented Using Raspberry Pi" ISBN No. 978- 1-5386-5743-0

[10] Ivette Cristina Araujo Garcia, Eduardo Rodrigo Linares Salmon, Rosario Villalta Riega, Alfredo Barrientos Padilla, (2017) "Implementation and Customization of a Smart Mirror through a Facial Recognition Authentication and a Personalized News Recommendation Algorithm", ISBN No.978-1-5386-4283-2

[11] Muhammad Mu'izzudeen Yusri, Shahreen Kasim, Rohayanti Hassan, Zubaile Abdullah Husni Ruslai, Kamaruzzaman Jahidin, Mohammad Syafwan Arshad(2017) "Smart Mirror for Smart Life", ISBN No.978-1-5090-6255-3

[12] Biljana Cvetkoska1, Ninoslav Marina1, Dijana Capeska Bogatinoska1, Zhanko Mitreski1(2017) "Smart Mirror E-health Assistant – Posture Analyze Algorithm" ISBN No. 978-1-5090-3843-5

[13] Chidambaram Sethukkarasi, Vijayadharan Suseela Kumari HariKrishnan, Karuppiah Pal Amutha, Raja

Pitchiah,(2016)" Interactive Mirror for Smart Home" International Journal on Advances in Intelligent Systems (vol 9 no 1 &2)

[14] Derrick Gold, David Sollinger and Indratmo,(2016) "SmartReflect: A Modular Smart Mirror Application Platform", ISBN No. 978-1-5090-0996-1

[15] M. Anwar Hossain, Pradeep K. Atrey and Abdul motaleb El Saddik,(2017) "SMART MIRROR FOR AMBIENT HOME ENVIRONMENT" Published at Multimedia Communications Research Laboratory University of Ottawa

[16] Dongwook Lee, Jieun Park, Moonheon Lee, Minsoo Hahn (2007) "Personalized Magic Mirror: Interactive Mirror Based on User Behavior", Information and Communications University (LNCS, volume 4541)

[17] https://maker.pro/raspberry-pi/tutorial/an-intro- to-raspberry-pi-and-its-fundamentals

[18] Prof.V.E.Pawar, Pooja Sisal, NeelamSatpute,(2018) "Smart Mirror Using Raspberry Pi"International Journal of Engineering and Techniques (Volume 4 Issue2)

[19] Project Proposal For Magic Mirror By ChangShuo Feng. Retrieved from ChangShuo Feng Xukai ZhongZiye ZhuHong JiDaiYanJieZhan http://www2.ensc.sfu.ca/~whitmore/courses/ensc305/projects/2016/3prop.pdf

[20] Jane Jose, Raghav Chakravarthy, Jait Jacob, Mir Masood Ali, Sonia Maria D'souza "Home Automated Smart Mirror as an Internet of Things (IoT)Implementation."

[21] Smart Mirror High Level Design. Retrieved from Teague Kohlbeck, Chris Rectenwald, and BennyRichmond,http://seniordesign.ee.nd.edu/2017/Design.%20Teams/smartmir/HighLevelDesign

[22] Review On Smart Mirror Using RaspberryPi3 Based On IOT. Retrieved from Miss.Neelam Sharma1, Miss. Rohini Awsare2, Miss.Rasika Patil3,Mr.PawanKumar4 http://ijrise.org/asset/archive/16 December12.pdf