Smart Mirror: An Implementation of Voice Assistant Mirror Using Raspberry Pi

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Abstract— Automatic Foldable Smart Mirror is based on IoT (InternetofThings). Itisamultipurposemirrorthat canbeused as a simple mirror and a technologically enhanced mirror where end-user can interact with the mirror to see his/her social notifications, daily tasks, weather updates, daily news, reminders, voiceassistantandmobilenotifications.

SmartMirrorisbasedon Raspberry-Pi, anditisconnectedtothenetwo rkthroughWi-Fi.It uses Raspberry-Pi as the mainboard, Arduino to operate stepper/servo motor to move the mirror, Touch Screen LED for user interaction, Two-way mirror, or acrylic mirror sheet to hide the back-end from the user. It supports modules written in any programming language. These enhancements mitigate the hardware and software limitations with the utilization of Python asthemainprogramminglanguage.Inthispaper,wedescribethe design and execution of the Mirror. We additionally discuss the potential uses regarding the Mirror. It is very cost-efficient and reliable to outcome compared to this self-solution.(Abstract)

Keywords-Smart Mirror, RaspberryPi, Touch screen LED and AI)

I. INTRODUCTION

Smart Mirror is an IoT based project, and it is more efficient and intelligent. It is very useful for our daily life, and it makes our life easy. Nowadays people and the technology are more advanced and modern, so the people want everythinginhand,so weareintroducingthenextgeneration technology which is easy for our life and efficient even we areintheworkingstate.Thistechnologyeasilyaccessibleby touchpanelandvoicecommandandcompletelyabletowork on voice even you are so busy and don›t want to move your hand. It will be an automatic foldable sliding mirror with some exciting features, and the features will be disclosed ahead. Basically, it will be like a table or trolley, which can be turned into a table and smart mirror. Since it has multiple uses, itcan beusedinwashrooms,livingrooms, anddiningroomsaswell, but we chose to make a multipurpose type of thing that can be carried all over the house easily.

A smart mirror is a mirror that has capabilities to work as a smart cell phone; it can do some same things which oursmartphonecando.Ourbasicneedtointroducethissmart mirroristhatapersonwhohas notmuchtimetodooddjobs, he just says this mirror, and the mirror shows his important notificationanddailytask, whichcanhelphimtoworkeasily. It's basically a less time-consuming device. A common need for building a smart mirror. is a pane of two-way glass a touch LCD, a wooden frame which holds the glass or an LCD, a raspberry PI 3.0 with built-in Wi-Fior

Bluetooth adopter which helps to connect one network to another, on the other hand, the scripting languages are used in this smart mirror which is Python, Node.js is, JavaScript to provide the software features and drive the display. The operating system which is used to operate this device is Raspbian and magic mirror.

The actual purpose of this smart device is to provide a comfortable service that the users feel free to any type of Inconvenience. This device is information-oriented nature due to its feature, like notification activities multimedia and other news feed, among others. This device also allows the users to set their activities according to his need and demands manually. Such as the users set their remainders notification app and so own. Therefore, this device provides several functionalities.

- This device act as a real-time mirror interface that secures the personal user info toothers.
- It will also provide customizationservices.
- Itwillallowtheusertocreatetheirownprofileforbetter managementtheretheusersallowtostorehis/herdataon the cloudserver.
- This device provides the users with all type of updates which the user will set manually. This picture shows the real-time simple of thisdevice.
- The displays of this device basic on the information date and time, and weather likeactivates.
- It helps to integrate the social media network, which is connected to our phone and computers, which makes our daily life more effective andeasier.
- This smart mirror has an ability that we can be controlled this by the remote controller or the mobile-friendly app, says Sadeta KULOVIC[15]

II. OBJECTIVE

The smart mirror is an IoT based project in which end-user can save their time by using the Smart Mirror in their daily routine. The Smart Mirror will help them with the specific task mention below:

1) Notifications
2) Dailynews

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3) Weatherreports

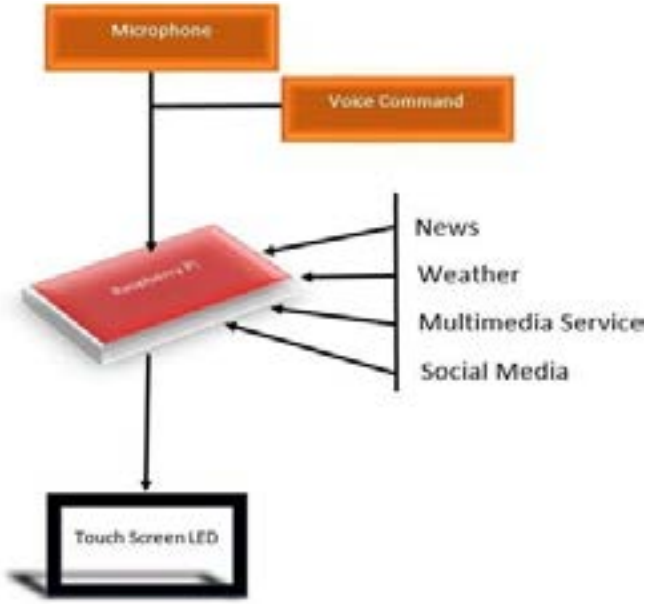

Figure 1: Flow chart of smart mirror

4) Less timeconsuming
5) User-friendly

III. LITERATUREREVIEW

The time management now a day is effective due to technical multitasking because business was becoming enhance, and the academic world would agree and allow this every second change, which is held time by time and day by day as we know very well about these smart devices became more advance and formulated. Basically, these devices inspired by science fiction movies like iron man, black panther, Lucy, ant-man series, etc.

According to Ceccaroni L, As an ordinary item at home mirrorsarenotonlyservedasareflectivesurfacebutalsoas interactive display as a part of a smart home environment, a smart mirror is commonly used for displaying multimedia data it will help us to relate to social media too [1]. Themain taskofthissmartmirroristhatpeoplecanaccessinformation effortlesslywhiledoingdailyactivitiessuchasbrushingteeth and washing hands insidewashrooms.

The working on the mirror is firstly introduced by Philips Researchincorporatedin2004asamagicalsmartmirrorthese days. The concept of this smart mirror is for health care, intelligent bathroom oretc.

The first mirror also has the concept of a healthier lifestyle and stays cool behavior's in the simulated magical mirror, says del Valle[5]. This mirror introduced for monitoring, emotion recognition, facial expressions, healthcare and etc. Some Common Mistakes.

However, Hossain says, to give a customized administration, a smart mirror needs to identify the user who is standing in frontofitandwilldisplayhis/herschedule,appointmentsand things to do list [3]. Han Krishman says facial recognition will not be used in this smart mirror because it may not be suitable for a smart mirror installed in washrooms due to securityreasons [2].Interactivewaystocommunicatewiththis smart mirror include touch, voice, and physical widgets, Fujinami [4]. Each method is unique in itself and off course having some strengths and weaknesses. For example, the voice command may not work properly in a noisy environment or publicspaces.However,usingtouchscreeninsidewashroom with wet/dirty hand could lead tofailure.

According to Gomez Carmona, comparing with other frameworks, a smart mirror is made to be straightforward, lighter in weight, and adjustable. It doesn›t require a big and complex computing system and can keep running on RaspberryPi.Theuserofthissmartmirrorcanusetwoways to interact with this mirror. First, the user can utilize a touchscreen. Secondly, the user can also use their cellphones to access the web interface to configure the availableplugins. [16]

IV. METHODOLOGY

Smartphones and tablets are popular nowadays, but the only thinglackingwhileusing a mobilephoneisourtime.Thehuge experimental analysis has been done to build a device which can perform all the smartphone task like watching the news, messages, reminder, social media updates and voiceassistant and that experiment is known as a smartmirror.

The Smart mirror consists of 3 main components

1) Hardware
2) Voice control
3) Mirror.

The initial two parts are important for the mirror to work practically.ThethirdoneisjustforgivingtheSmartmirrora mirrorlooks.

V. SYSTEM PLANNING ANDREQUIREMENTS

A. Non-FunctionalRequirements

These requirements depended on the quality attribute or any software system as we, in the simple word it defines all types of features which is existing internally in it. These attributes described a set of inputs and outputs operation which are held on the overall software system. This nonfunctional requirement shows and demonstrate how it calculates the data, manipulate it, process it, and others.

Specific functions that are doinginit. Performance Requirements

Table 1 Test Procedure

Test	Procedure	Expected Outcome
Boot-up time	The smart mirror is Boot- up by plugging in the power cable in the socket.	The Smart Mirror takes 10 seconds to boot up and providing power to other components of the smart mirror
Shutdown time	The smart mirror properly Shut down by initiating the companion app which is defined in the window of a smart mirror	The Smart Mirror should take 20 to 40 seconds to shut down completely It depends on the processes which are running on that time or any query or command which makes the issue in the down shutting process
Speaker Volume Level	The level of the speaker is Initiate by music playback, and a speech recognition command is allowed to increase and decrease the volume level.	All group members should agree that the volume level is appropriate and audible for the mirror
Display Brightness	We place the smart mirror in a bright side of the room and power it up, so the completer and proper look is defined.	The front end of the smart mirror is visible, and despite the user, it still unfavorable lighting conditions due to tint mirror foil. The rest of the smart mirror screen is the real estate that should retain its shows a mirror-like finish, which defines it as a real mirror.
Speech Recognition Consistency	All group members check and perform the multiple time›s speech recognition prompts and the features and attributes of each point, which are defined in this prompt and observe the nature of the smart mirror›s response.	The smart mirror should become active all the time with its user front end prompts; the elements of the interface are visible within 3 seconds with all the front-end features which define into its start-up.

This part of this document describes the performance requirements of the smart mirror. Basically, smart mirror performance depends on the speed which is connected with the internet or the applications which are synchronized with the phone and displays each item on the screen. Using WIFItechnology,oranysortofconnectivitystaff.Thespeed oftheinternetconnectioniseffected theperformanceoflive information, which are streams on the front end of the smart mirror.

Availability Requirements

Now a day the technology became more and more moderate due to which the availability requirements are must for everything the requirements which we are defining for this project is very simple or easy to use, this project is basically the home base project which allows the user to use it anywhere, where the user wants to be.

This project is designed for makes or life easier because, in this fast and non-stopped working era, there is no much time to do odds jobs, so the performance and the users› requirements are matched with this project.

Capacity Requirements

The next generation smart mirrors are fitted in the growing technologies. Ithelpsintomanythingswhichhavebeenourlife easy like system monitoring, personal information, social activates,Evisionplatforms,healthgrowinggoals, andithas many more options or enhancement which are grown day by day. These smart devices can do multi-tasking, managed multiple sensing cameras, motion and surveillance detector, speakers› lasers beams, microphones, as well as new generation software, which are based on artificial intelligence (AI). This smart mirror is designed and includes the capacity to image sensing and communicate with multiple sources of data,linkingthemtothebroaderecosystemofsmartproducts and thecloud.

B. FunctionalRequirements

1) Critical:
- Must show basic information on thescreen.
- It can be controlled via anything without userinput.

2) Recommended:
- Automatic timer to go on sleep mode to save power.
- I am integrating web UI to control over the internet.
- RSS Feed editing to users can add their own newssources.
- More than one inputmethod.

3) Suggested:
- Users and developers can build their own modules with the help ofthe framework.

Error Data Handling

Every project makes perfection, and perfection comes with mistakes, so in order to perfect the Smart Mirror, we will be testing the Smart Mirror extensively in order to catch any error, which is making the end-user experience not so good. The errors will be noted down to and will be gone through the best solutions, and then the solutions will be applied, andthenagain, SmartMirrorwillbegonethroughthe testing again to make sure that no other errorsexist.

Existing System Study

During a study of existing studies of Smart Mirror, we got to know that existing Smart Mirror lacks user privacy, and anyone can access it. We are building a Smart Mirror, which also focuses on Security to provide an experience whereusers can feel safe with their Smart Mirror device. Nowadays, IoT devices are getting a lot of heat from the Security Experts about how IoT lacks general security and risking the user›s data, which will fall in the wrong hand. Our Smart Mirror will include multiple security measures to protect user›s data from getting into the wrong hands. During our study, we did not find any existing Smart Mirror or related project, which is

created until now to providesecurity.

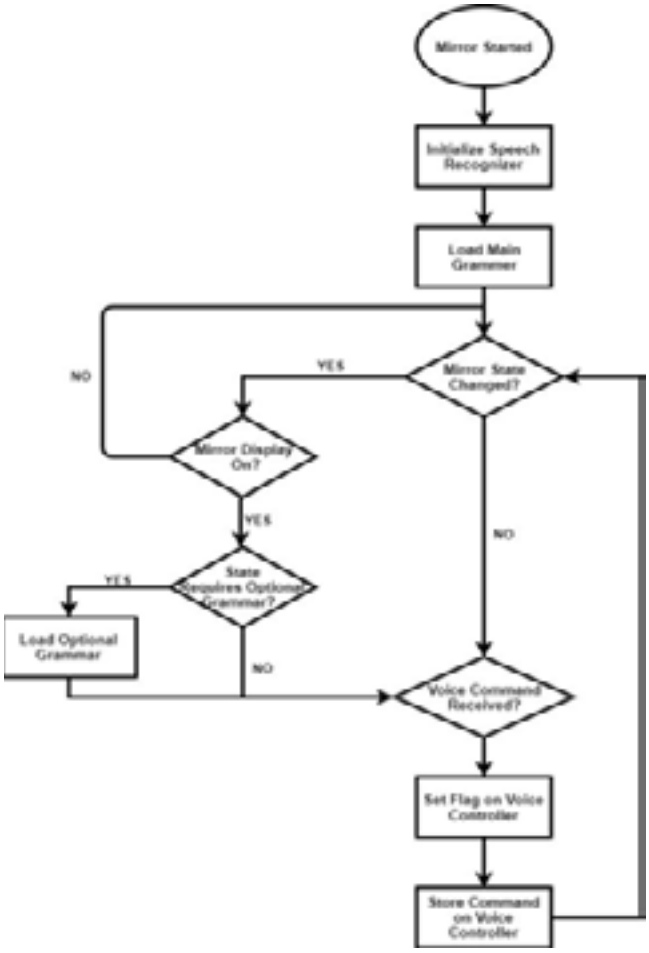

Figure 2: Model of voice recognition

Voice Recognition:
According to Patel, Voice recognition is a process of changing speech into digital data by translating an acoustic signal in a bunch of words; the main purpose of voice recognition is to recognize the person speaking.[17]

However, Syntony says, Voice recognition works upon certain algorithms with the help of acoustic and language model. The acoustic model shows the connection between linguisticunitsofspeechandaudiosignalshowevertheother model works on matching sounds with word chain to differentiate between words and same sound[18]

Testing Phase
In order to ensure the experience of end-user, we have to test the functionality of every module of Smart Mirror to make sure that nothing is causing any kind of delays. Testing will be required again and again to make sure that all errors and bugs are no more exists. The testing phase is important for any project before going into the production phase.

Pre-Development Testing

Before going into all the development of the project, we must test all the required pieces of equipment and software. Nowadays, everything is vulnerable, and to tackle this kind of incident, we must choose those hardware and software which are gettingroutineupdatesfromthevendorstomakethesecurity of the products. When products are secure, and all things are good to go, we can start developing ourproject.

Pre-Deployment Testing
After the development of the project, we will be testing the Smart Mirror extensively in order to catch any error, which is making the end-user experience not so good. The errors will be noted down to and will be gone through the best solutions, and then the solutions will be applied.

On-site Testing
Nothing in this world is 100% bug-free and to tackle this problem we will be making a 24/7 Support Panel to receive end-users problems and when user submit their problem a tea mofprofessionalswillbegoingtotheusertodosomeon-site testing and check if the error really exist and if possible solve it on theirown.

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