

# IoT based Smart Mirror Using OpenCV with Voice Assistant

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**Abstract**—Internet of Things (IoT) lets gadgets connect together in diverse as well as vital places in real time. There are plenty of innovations ranging from keyboard cellphones to smart phones, smart watches, etc. Since the inception of IoT, IoT is a worldwide network of infrastructure where the gadgets or devices or “things” that are connected via the Internet have a self-aligning and self-acclimating ability. A very Simple day to day tool like a mirror can be turned into a smart IoT device with various integrations with an IoT infrastructure. In our proposed Smart mirror, it would be able to show various types of information such as weather forecast, time, date, news, etc. automatically with the help of a voice assistant tool or an API and it will be able to identify the user currently operating the smart-mirror with the help of Face recognition-based authentication system based on OpenCV. We will also create APIs for other purposes such as managing the user data and their preferences. All the programs and Interfaces will run on a Raspberry Pi system.

**Keywords**— Internet of Things, IoT, Smart mirror, API, Smart home, Raspberry Pi, Two-way mirror.

## I. INTRODUCTION

In past years, technology has taken over our lives and transformed our everyday routines. It has a significant impact on our life. In this machine-run world, humans are going out of their way for figuring out more and more advanced, smarter, efficient and most useful products and things as technology advances. Many smart IoT devices, such as watches, smart TVs, and phones, are now available.

Internet of Things (IoT) as defined by the International Telecommunication Union (2013) is a global infrastructure that allows Internet services to link to physical devices using accessible information and communication technology.

IoT is also viewed in a larger context, yet it still has a significant technological impact on society [1].

With the rapid advancement of technology, diverse information is very easily accessible, and the notion of Smart digital Mirrors with various functionalities has emerged. The use of smart home technology is becoming more common. Smart Mirror setups, which have their roots in the Internet of Things (IoT), was created with the goal of allowing users to get important information quickly just and also to monitor and control household appliances using voice recognition.

In this scenario, most people's main issue has been recognised as controlling household appliances. There are simply too many things to perform at once, and people reach a point where they are unable to juggle such difficult tasks. For example, if a checklist consisting of chores to be done in a home is written on paper and then misplaced, the paper is

lost. Another example is when people are so preoccupied with managing their daily tasks that they forget to do trivial- yet-critical things like switching off the lights in a space which in turn will lead to wastage of energy. Hence the idea of having a smart mirror like device that is always available in a household can be very helpful.

The smart mirror is an interactive 2-way mirror which includes a display behind a regular mirror that can reflect real-time objects while also showing information. It can display any type of information based on the user's preferences. As a result, when the user wishes to check the weather, they can do it while brushing their teeth or getting ready. This saves a lot of time and is a very important item in our everyday lives, especially in this period. In this current pandemic, the user can also examine live Covid-19 updates about safety measures, current world affairs like Ukraine war, etc. just from a mirror. The user can also view the current holidays and their duration.

## II. RELATED WORK

There have been a few instances of similar investigations done in this region of IoT appliances. A smart home appliance like a smart mirror and others with cutting edge technologies like AI and big data technologies have come to use.

Yamini Patil, et al. presented a review on how a smart mirror would function, a higher level overview of a smart mirror [2].

A.S.A. Mohamed, et al. provided a more AI based solution to the smart mirror appliances. A unique feature of this solution is that on the basis of the sentiment of user it will display a screen according to it using face recognition [3].

Dabiah A. Alboaneen, et al. wrote a literature review on various applications of the already existing smart mirror solutions [4].

Dragos Mocri, et al. have provided a comprehensive review on the IoT based smart home solutions. This review consists of all the information on how the architecture, connectivity and software of an IoT based smart home appliance should function together [5].

## III. PROPOSED SYSTEM

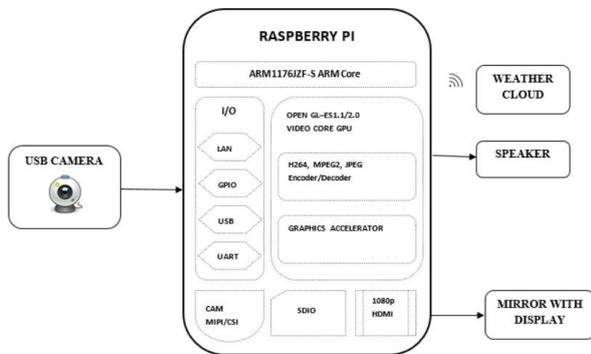
Four goals guide the development of the proposed system:

- Create a Raspberry PI Smart Mirror prototype.

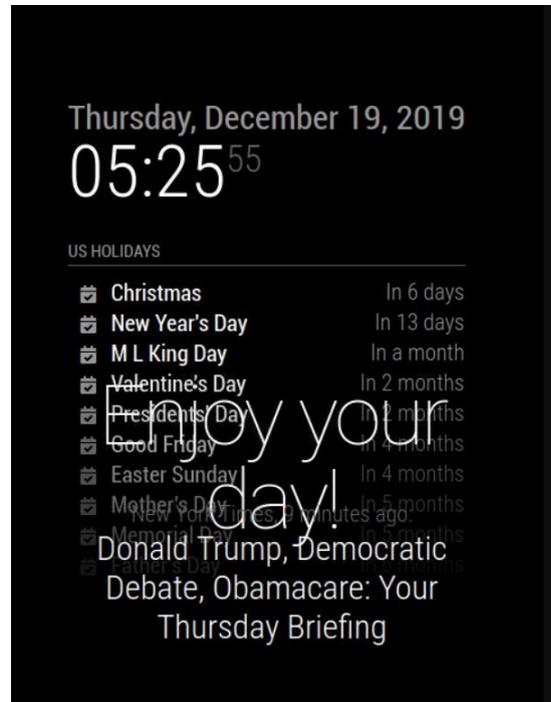
- To make it easier to implement Smart Mirror, create a voice assistant system.
- Use a Face recognition-based authentication system to identify users and show data as per their preferences.
- Make it easier for the user to control home appliances using the mirror.

A smart mirror is seen in the block diagram below. The suggested smart mirror will show the user's picture and provide configurable information. A single-sided wall mirror will be employed in the suggested design since it may show user-relevant information including current weather reports, local time and date, and recent trending headlines [6].

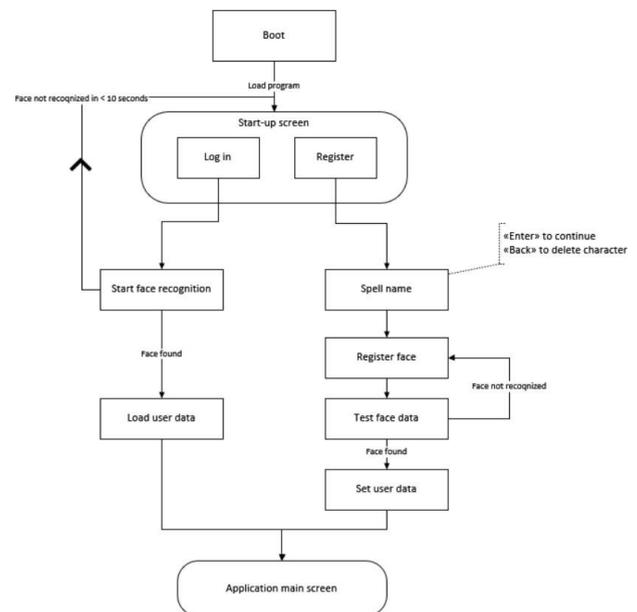
The total system contains a Raspberry Pi at its core, which can handle all instructions and has been interfaced with a camera, speaker, and display device, all of which are linked via IoT [7]. We can extract the weather report and display it in that display monitoring unit by utilising weather cloud APIs. It uses the espeak python module to show the date, time, and calendar along with speech information [8].



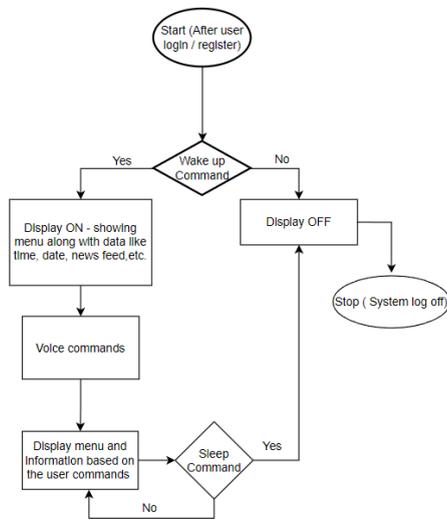
The following image demonstrates how the UI of the mirror would look like. We will be creating this with the help of already available open source libraries that are available for raspian setups.



Flowchart detailing the implementation of face recognition-based authentication for smart mirror,



Here if a user has an account then he or so would be recognized by the system and relevant user data would be shown to them and they will be redirected to application menu screen. If a user doesn't exist in the system or they would want to register then the system will setup for a new user and then show menu screen. Our menu screen will be operated using voice commands and would function as per this flowchart.



Here we can see that a user can navigate the smart mirror system using their voice and can open up different menus available to them and as shown on the screen. When the display is ON it would show time, date, news feed and other menus. Which can further be accessed using their voice commands. Then if a user wishes to log off then there is a sleep command that will disable the screen and the smart mirror would be just a normal mirror until the user turns the display ON with the wake command.

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#### CONCLUSION

We were able to implement a working implementation of the smart mirror IoT device which can accept voice commands and also do user recognition using OpenCV. We created the UI using magic mirror library and we used minor python packages for setup. We have specifically emphasized on importance of voice assistant due to its growing demand in recent times [9]. Also, we have worked towards making the application secured using recognition softwares [10].

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