A Smart Mirror System Using Raspberry Pi and Iot Platform

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Abstract

On comparing with various other research papers on smart mirror systems, it was inherent to implement advanced functionalities and were developed for specific functions such as monitoring a baby, theft detection, face recognition or implementation of smart mirror as a personal assistant. While some did have the basic functionalities like displaying time, weather, news, calendar; they didn't have some of the advanced but fundamental features to be able to call the mirror "smart" such as connecting with an android device to display notifications or a smart voice assistant integration. Some systems [1] mention a smart assistant however there is no presence of an actual assistant such as google assistant or Alexa. The smart mirror demonstrated here implements all the basic functionalities such as displaying time, live weather updates, calendar, latest news and some advanced functionalities such as displaying phone notifications, voice assistant integration and motion sensor activated on/off. On top of this, the mirror also provides a framework for adding additional features such as strava integration, reddit integration, google calendars, gmail, display what music you're currently listening to, Displays current stock prices of companies, etc. The possibilities for expansion are endless using the framework provided here.

1. INTRODUCTION

In todays world, all basic devices such as refrigerators, watches, TVs and even light bulbs are getting smart. A smart mirror fits right into this smart home ecosystem. A smart mirror is a good DIY project. It is cheap to build, versatile and definitely has a place in every samrt household.

The smart mirror to be implemented here will work on the concept of internet of things (IoT).According to zdnet, Internet of Things (IoT), collectively includes billions of physical devices connected to each other via the internet and collect and share data with each other. Since computer chips can be super-cheap and the wide availability of wireless networks, one can turn anything from something as small as a pill to something as big as an aeroplane, into a part of the IoT. [2]

The smart mirror to be implemented here will host a load of features such as time, date, temperature, show news headlines, calendar, a smart voice assistant and notifications from phone using Pushbullet. This smart system will be a versatile device having endless capabilities for expansion. More functionalities such as a video player. Chromecast support, reddit feed, etc. can be added seamlessly. Since the heart of the system will a raspberry pi, this mirror is basically a full-fledged linux computer with Raspbian OS.

Raspberrypi.org describes Raspberry P as a small computer, almost the size of a credit card that can be connected to a computer monitor or TV and uses a standard USB keyboard and mouse. It has the ability to interact with the outside world, and has been used in a wide array of digital maker projects.[3]

2. REVIEW OF LITERATURE

2.1. "IoT based Smart Mirror using Raspberry Pi"

Authors: Lakshmi N M, Chandana M S, Ishwarya P, Nagarur Meena.[4]

Their proposed system provides information like time, date, accurate temperature andhumidity, and latest news and the main additional feature of this proposed system is thief detection. It also proposes plans of designing the smart mirror that receives online news and displays it using IOT.

Figure 1: [5]Raspberry Pi 4 Model B from the side, by Michael Henzler, 3 July 2019, **https://**en.wikipedia.org/wiki/Raspberry_Pi#/media/ File:Raspberry_Pi_4_Model_B_-_Side.jpg, CC BY-SA 4.0

2.2. "Smart Mirror Using Raspberry PI"

Authors: Prof. P Y Kumbhar, Allauddin Mulla, Prasad Kanagi, and Ritesh Shah. [6]

Their proposed system will show Time and Date, Weather conditions, status, News and Indian Upcoming Holydays. Their proposed system has basic features and will be used to display information to the users.

2.3. "Raspbian Magic Mirror-A Smart Mirror to Monitor Children by Using Raspberry Pi Technology"

Authors: R.M.B.N. Siripala, M. Nirosha, P.A.D.A. Jayaweera, N.D.A.S. Dananjaya, Ms. S.G.S. Fernando. [7]

In this paper, the system proposed for smart mirror is used to display date, time, weather and

News and the main feature of the system proposed is to help parents to monitor their kids and also to help them keep a track of their work or daily chores. The system connects with various applications and communicates through smart phone notifications.

2.4. "Design and Implementation of smart mirror as a personal assistant using Raspberry pi"

Authors: Divyashree K J, Dr. P.A. Vijaya, Nitin Awasthi [8]

In this paper, the proposed system will be acting as a Personal Digital Assistant providing day-today schedule and appointments pulling the information from the users google account. It will help the user in efficient and proper time management of the user using a interactive smart mirror.

2.5. "Smart mirror integrated with smart assistant"

Authors: Prof. Sheetal Patil, Prathamesh S. More, Pratik P. Nashine, Ritali P. Rajput, Vitika Diwakar [9]

In this paper, the proposed system will incorporate a virtual assistant that will act as an interface between user and a mirror. Basic details including temperature, news feed, time etc. are displayed in this paper.

2.6. "A Comparative Study and New Model for Smart Mirror" [6]

Authors: D.K. Mittal, V. Verma, R. Rastogi

In this paper, they have analyzed various previously implemented smart mirror projects. The various technologies and functionalities implemented by these projects have been compared and analyzed for their different approach towards developing smart mirror systems. A general methodology which is followed for developing smart mirror systems if given. They have proposed a design of a futuristic smart mirror which could be a great device for ambient home services and also it is mentioned how the proposed system can be extended for other frameworks.

2.7. "Design and Development of Smart Mirror using raspberry pi"

Authors: Vaibhav Khanna, Yash Vardhan, Dhruv Nair, PreetiPannu [10]

Here, the concept of Ambient Artificial Intelligence (AAI) is mentioned for its impact on the industries involved in smart environment development. They have indicated the utility of smart mirror in environments such as home and
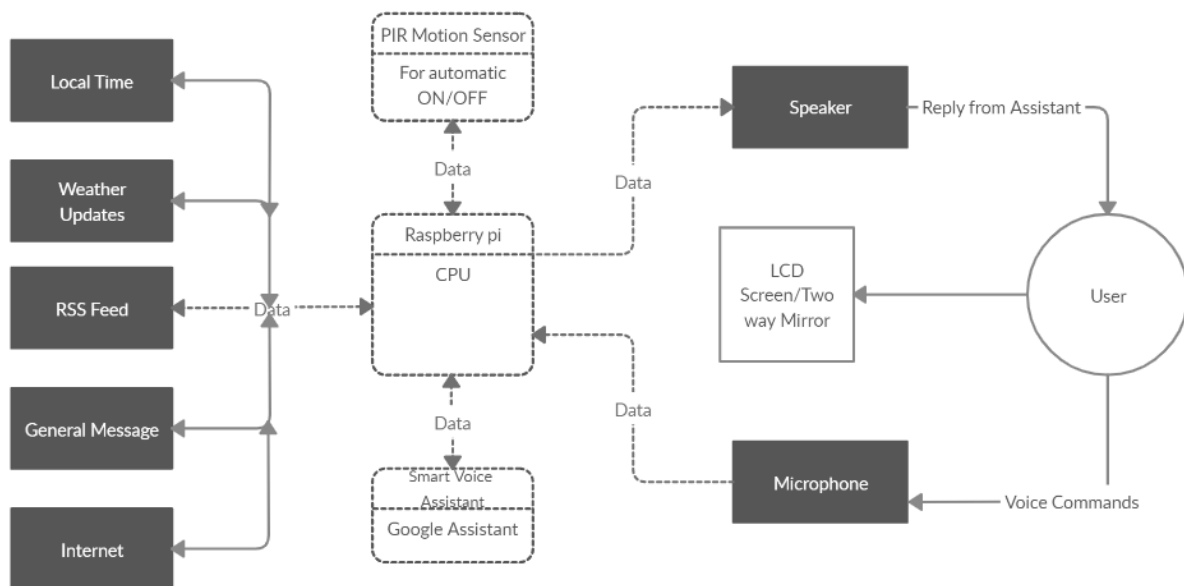

Figure 2: Context level Diagram for the system, by Mihir Kadam, 2020

industries. For the development of smart mirror, raspberry pi is used. Aim of this proposed system is to provide an interface for accessing various services such as weather, time and date, Youtube, maps etc.

2.8. "Smart Mirror"

Authors: Khurd Aishwarya, Shweta S. Kakade, Prof.R. M. Dalvi [12]

In this research paper, various components which are needed to build a smart mirror have been mentioned such as microphone, speaker, LCD screen, webcam etc. Two important examples of algorithm needed for face recogition and speech to text conversion are given. For face recognition, 'Eigenfaces', 'LBPH(Local Binary Pattern Histogram)','Fisherfaces' and 'OpenFace' are mentioned and for speech to text, Sonus technology is used. Sonus and cloud recognition services are used in conjunction where Sonus listens for the hotword and the cloud recognition service fetches the results. For future work on this project, functionalities such as iris detection and thumb impression can be used for added security for accessing mails and personal data.

3. PROPOSED METHOD

This smart mirror will be implemented by gathering all the necessary requirements; Raspberry pi 3b+, monitor, two-way mirror, and a PIR sensor for smart switching ON/ OFF of the screen. We aim to implement various modules to display the necessities such as time, date, Temperature, weather forecast, News headlines from a given source and notifications from connected phones using PushBullet.[13]

The context level diagram shows how the internal working of the proposed system. The user stares in the the screen/the two-way mirror and will get presented with relavent information. The user will also be able to interact with the mirror using voice assistant. A smart voice assistant will be implemented for this interaction. [14].

The system will also house a PIR sensor to switch the screen on/off for saving energy. The screen/mirror surface will only turn on when a is presence is detected. The rest of the time, the system acts as a normal mirror.

Upon successful implementation, the final system will have the following functionalities-
• Capability of showing temperature and weather updates
• Displaying notifications and Time
• Integrated voice assistant
• Voice Control
• Smart ON/OFF

4. RESULT AND ANALYSIS

The final system will be housed in compact box with an open front side. This box will be handmade from wood

and will house the speakers, mirophone, Raspberry pi and the Monitor. The front side will be covered by two-way mirror. Due to this configuration, the system will be able to reflect light from outside as well as show the contents of the monitor screen behind the two way mirror.

Upon start up, the Raspberry pi will be configured to directly boot into the mirror interface instead of the raspbian OS homepage. Once turned on, there will be no need to turn off since the PIR sensor will take care of that. Upon booting, the interface will connect to the internet to fetch latest temprature, weather, news and time related information and display it on the screen, or for the observer, on the mirror surface. It will also show any new notifications present on the connected phone.

This will be a very versatile system and given the expansion opportunities, it is more of a computer than a smart mirror. The user market for this kind of system is vast. It will benefit people who have every single minute of their day scheduled. They can glance through the basic information on the mirror and read messages while brushing their teeth or doing make up. This will save the time they would usually take to go through their phones. The system can also be used for security in a smart hoame system by system a notification to the owners phone every time any movement is detected. By addition of a camera, a photo or even a video can be sent.

Due to a wide range of applications, smart mirror systems like this will definitely have a place in every modern household in the future.

5. CONCLUSION

Hence upon successful implementation, we will have on our hands a smart system will loads of smart functionalities added to a basic mirror. This will cut down the time taken for browsing our phones. The latest news module will provide headlines, temperature and weather will be visible. PushBullet app will allow to display phone notifications on the mirror itself and smart voice assistant will provide means to interact with them. This will completely eliminate the need for a smart phone during the morning routine and will save lots of time. The framework of the system is such that it will provide endless expansion capabilities. Therefore, the system can be tailored according to specific needs. Hence, a smart mirror system implemented here will be beneficial for every single person.

6. REFERENCES

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