International Journal of Pure and Applied Mathematics
Volume 118 No. 22 2018, 451-455
ISSN: 1314-3395 (on-line version)
url: http://acadpubl.eu/hub
Special Issue

ijpam.eu

# IMPLEMENTATION OF MAGIC MIRROR USING RASPBERRY PI 3

[1]Suryansh Chandel, [2]Ashay Mandwarya, [3]S.Ushasukhanya
[1,2,3]Department of Computer Science and Engineering
SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India
[1]suryansh.chandel004@gmail.com, [2]ashaymurceilago@gmail.com,
[3]ushasukhanya.s@ktr.srmuniv.ac.in

**Abstract:** This paper describes the designing and implementation of an voice controlled wall mirror, called "Magic Mirror". It is a device that can function both as a mirror and an interactive display displaying multimedia content such as time, date, weather and news simultaneously. The user can interact with it using voice commands. The Magic Mirror consists of various functionalities like real time data and information updates, voice commands, face detection/recognition using LCD monitor, microphone and webcam. The user can interact with magic mirror using voice commands.

**Keywords:** Magic Mirror, Raspberry pi 3, Rasbian, face detection, Internet of Things;

## 1. Introduction

Day after day we are moving towards a more automated and interconnected world because of various wirelessly connected embedded devices. These are responsible for changing and improving the standards and quality of living. Many devices are being developed which use concepts of multimedia communication, artificial intelligence, internet of things (IoT) to revolutionizing the way we perform our various day to day tasks in our home, offices or even industries. Most of us use mirrors every day to look at ourselves; we psychologically interact with the mirror every day to check how we look and how our attire is while getting ready for our work or colleges. So, The idea of having an interactive mirror that can respond to your commands can excite anyone. Magic Mirror aims at augmenting the basic reflective mirror with embedded intelligence to combine daily routine tasks like reading newspaper, getting stock updates, weather updates etc. and providing all that data to the user while he/she gets ready. The Magic mirror will help in automating our work and development of smart houses. This paper provides a detailed idea of theory of design and practical implementation of Magic Mirror.

## 2. Theory

The innovation and research work in the field of Artificial intelligence, Machine learning, Internet of things has brought a massive change in the technology we use and paved the way for Smart environment. Kevin Ashton published an article in the RFID Journal in 2009[1] in which he talked about the capabilities of things that a computer can perform if it knew everything there was to know about things by the means of gathering data and track everything. They would be able to reduce loss, waste and cost. We would be able to get updates about machines know when they needed replacing or repairing. There is need to empower the computer by automating them to see them in their full glory This is exactly what has happened after the development in field of IoT. Also, An efficient, convenient and secure home automation environment [2] can be achieved using collective application of AI and IoT. Artificial intelligence has already received attention for assisted living purposes [3]. Apart from this entertainment, automated home environment, official space and home learning [5] are also affected due to advancement in AI and IoT. Various companies are now launching products aimed at automating the day to day activities we do in our home, offices or industries. Nest Labs launched learning thermostat [6] in 2010 which used to detect smoke and carbon monoxide detector and later was redesigned to sense an control temperature in the house. Magic Mirror also provides solution to our daily routine of getting ready. It uses the concept of Internet of things to embed various chores like reading newspaper, getting stock updates, traffic updates etc. on a display that will also work as a normal reflective mirror simultaneously.

## 3. Proposed System And Components

### *A. System Overview*

Proposed system and block diagram for magic mirror are shown in figure 1. The aim of designing this model is to create an interactive interface which can be

conveniently used in home environment as well as commercial space. Various services like weather, calendar, traffic, news stock updates etc. can be accessed and controlled using voice commands. The Raspberry Pi 3 is connected to a Monitor via HDMI cable and a webcam is attached using a universal serial bus. Raspberry Pi is powered up using a 5V/2A DC supply.

We plan to deliver a working model of Magic mirror by using raspberry pi 3 for smart homes of future
as well as commercial uses. The device will look like a normal reflective mirror but would have a monitor attached on one side. A special two way mirror is used for this purpose as it can act as normal reflective mirror when the monitor is off and can also display various data as soon as the monitor is turned on. This will thus serve both the purposes.

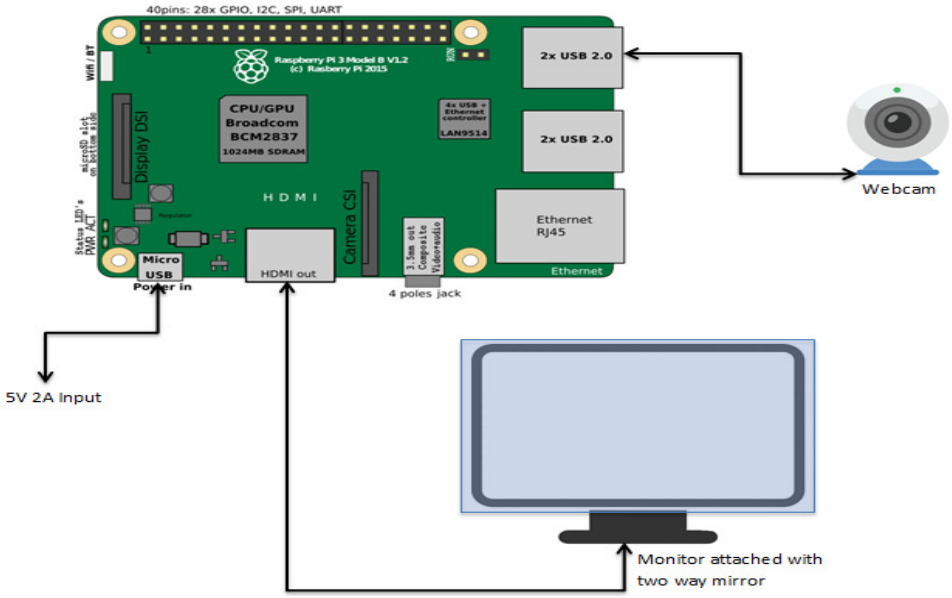


**Fig 1 Block Diagram**

### *B. Raspberry Pi 3*

Raspberry Pi 3 acts as the main control center for this proposed model. The Raspberry Pi is equipped with a micro SD card which can be loaded with operating systems like Raspbian or Windows 10 IoT core. After the OS is running the Magic Mirror code will can be implemented on it to run the application. The Monitor will be getting input from RPi using HDMI cable and voice commands can be given to RPi using a microphone.

### *C. Dual Purpose Display*

For the purpose of dual functionality, we are using a two way mirror for the display. It will be attached on top of the monitor using a wooden frame to hold the whole system together. The two way mirror can act as normal reflective mirror when the monitor is switched off and the data can be simultaneously displayed while the monitor is switched on.

## 4. Functionality

Figure 2 provides an ER Diagram for the proposed magic mirror. Proposed model can perform various functions described as follows:
i) Work as a normal reflective mirror so that the user can use it as a regular mirror.
ii) A two way mirror which can function both as reflective and see through mirror is attached to a LED monitor. This provides two major functionalities ie. Mimicking a normal mirror as well as working as a display for real time data updates.
iii) Personalized data and information services:
Anyone using this mirror will be able to get real time updates of traffic, stocks, news and headlines, date, time, weather updates as well as other reports of our particular interests.
iv) Voice Commands:
User will be able to give voice commands to the mirror using a microphone connected to the Raspberry pi 3.

The Magic mirror will display data in accordance to the user commands.

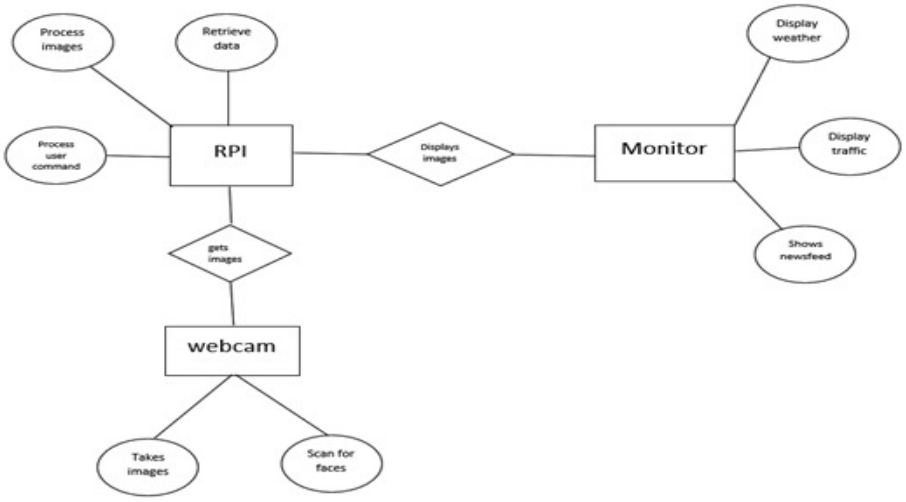


**Fig 2 ER Diagram**

The webcam is attached to the Raspberry pi using the universal serial bus to detect user's face using OpenCV. This will help in setting up the personalized profiles for different users and managing them afterwards. Figure 3 given below shows the basic user interface of the magic mirror that will be used by the end user. The user interface will be show the data on the mirror and the empty space in between will accommodate the reflection of the user.


Fig 3 Magic Mirror UI

## 5. Related Work

The proposed Magic Mirror represents a natural interface that provides a platform to access information and data services in a more personalized manner. This project is aimed at contributing to the design and implementation of a Magic Mirror-like interface as well as the automated home environment where user can interact with the mirror interface, we briefly comment on some related work and research in similar direction. SmartReflect[7] is a similar work carried out by the students of MacEwan University. It basically aimed at providing a platform that can facilitate the development of smart mirror. It acts an alternative option than the sandbox environment. It is light in functioning as compared to already present platforms. Its major advantage is its multiple language and environment support so as to ease end user efforts.

Another project named MagicMirror[10] as carried out by students of NUS, They created a magic mirror which can recommend you appropriate clothing in the morning while you get ready. The Magic mirror model will scan the user and then based on the particular occasion or event it will recommend most suitable attire and other styling options. The events can be retrieved from user's social media account or can be added to the calendar manually.

Philips HomeLab [8] acts as testing platform for interactive and automated home environment. The Philips Hue is one such example of smart lighting which can be controlled using mobile application. Another example is of an Interactive Mirror [9] which can installed in room or washroom to get personalized services depending on the end user. Children can customize it view cartoons, adults can get live news feeds and updates on weather, traffic etc.

In comparison to various works as mentioned above, The model proposed in our paper is different as our it's aim is to develop a functional prototype of a interactive and technologically enhanced platform

which can provide personalized services which can be operated and controlled using user's voice commands

## 6. Conclusion

We have designed an intelligent mirror keeping in mind the up-coming future advancement in the field of home automation environment. The prototype of the magic mirror is powered and controlled by the Raspberry Pi 3 and all the final output in form of real time data feeds are displayed on LED screen fixed with a two way mirror.

We have built a working model to demonstrate various functionalities of the mirror using voice commands. It gives a layout that can be extended in future to accommodate even more functionalities.
In our future work we will try to add advanced gesture controls, automated salutation using face recognition of the end user and also understand that how advanced artificial intelligence can be implemented to the mirror so that it can automatically take care of all the requirements of the end user.

## References

[1] K.Ashton, "That 'Internet of Things' Thing" RFID Journal, July 22, 2009. (*references*)

[2] M. S. Raisinghani, A. Benoit, J. Ding. M. Gomez, K. Gupta, V. Gusila. D. Power, and 0. Schmedding. Ambient intelligence: Changing forms of human computer interaction and their social implications. Journal of Digital Information, 5(4), 2004.

[3] F. Bomarius, M. Becker, and T. Kleinberger. Embedded intelligence for ambient-assisted living. ERCIM News, 67:19-20, 2006.

[4] P.L. Emiliani and C. Stephanidis. Universal access to ambient intelligence environments: Opportunities and challenges for people with disabilities. IBM SystemsJournal, 44(3):605-619, 2005.

[5] M. Friedewald, 0. Da Costa, Y. Punie, P. Alahuhta, andS. Heinonen. Perspectives of ambient intelligence in the home environment. Telematics and Informatics, 22(3):221-238, 2005.

[6] Nest Labs Thermostat,"Programs itself, Then pays for itself", 2010 https://nest.com/thermostats/nest-learning-thermostat/overview/

[7] Derrick Gold, David Sollinger, and Indratmo. SmartReflect: A Modular Smart Mirror Application Platform. IEEE Journal, Nov 2016.

[8] Philips Homelab. http:// www.research.philips. com/ technologies/misc/homelab/index.html

[9] Tatiana Lashina. Intelligent bathroom. In European Symposium on Ambient Intelligence (EUSAI'04), Eindhoven, Netherlands, 2004.

[10] Si Liu, Luoqi Liu, Shuicheng Yan, Department of Electrical and Computer Engineering National University of Singapore. 2013 Second IAPR Asian Conference on Pattern Recognition.

[11] S.V.Manikanthan and D.Sugandhi " Interference Alignment Techniques For Mimo Multicell Based On Relay Interference Broadcast Channel " International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume- 7 ,Issue 1 –MARCH 2014.

[12] T. Padmapriya and V. Saminadan, "Inter-cell Load Balancing technique for multi-class traffic in MIMO-LTE-A Networks", International Journal of Electrical, Electronics and Data Communication (IJEEDC), ISSN: 2320- 2084, vol.3, no.8, pp. 22-26, Aug 2015.