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Design and Development of an IoT & Raspberry Pi Based Smart Mirror

Sweety Pradhan[1], Arun Agarwal[1,*], Kabita Agarwal[2], Gourav Misra[3]

[1]Department of ECE, Institute of Technical Education & Research (ITER), Siksha 'O' Anusandhan Deemed to be University, Khandagiri Square, Bhubaneswar-751030, Odisha, India
[2]Department of Instrumentation and Electronics Engineering, College of Engineering & Technology (CET), Ghatikia, Kalinga Nagar, Bhubaneswar-751003, Odisha, India
[3]School of Electronic Engineering, Dublin City University, Glasnevin, Dublin 9, Ireland
*Corresponding author: arunagrawal@soa.ac.in

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Abstract There is never an end to the devices that can be made smarter and smarter with the help of the adequate technology. There are a lot of smart display devices but mirrors provide an interactive environment while displaying these information's. This paper presents the design and the development of a Smart mirror using raspberry pi with some additional features which provides face recognition for security and smart unlocking process. The contents are displayed on an LED monitor who is enclosed in a wooden frame and covered with a sheet of reflective one way mirror. The mirror provides basic detail like time, news details, weather of a city and display current message. All the computing is done with the help of a raspberry pi.

Keywords: *IoT technology, smart mirrors, raspberry pi, LED monitor*

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1. Introduction

1.1. Motivation

- The motivation we got to do this research is due to technology advancement which helps to upgrade human living standard and also save their time as it helps to do multitask.
- The smart mirror concept came from movies like 'The Mass' and many other movies which shows effective and life changing gadgets. As many people want their home to be smart home which shows the interest of human towards technology to ease their lifestyle?
- Smart home is known by many but smart mirror is basically a new concept, especially in India as many of us are not aware of this.
- The smart mirror can provide the enough information either in the morning or at the end of the day, according to which you can plan your next day work.
- We can use this device not only in our home but also in schools and colleges to display the notice by which we can save a lot of paper and also can save the tree by this concept and makes our environment more beautiful.

1.2. Purpose

- The Smart Mirror is a System that combines this task in an effective and enjoyable way to save the time of the users.
- The main purpose of this research was to design and prototype a device that acted as a smart mirror which displays user's image and providing customizable information on the display.
- It can display time, date, weather and we can also open apps like Google, Face book and many more of our choice which many people prefer while bathing or doing other work in front of mirror.
- It can be used for both commercial purpose as well as home environment.
- As we know that most of the people have mirror at their home but if normal mirror is converted into smart mirror then it can be used for multipurpose uses.
- Today every people want to save their time which mirror can help them to do so.
- We can use this kind of mirror in colleges also to display notice which will also reduce the use of paper which is good for environment.

1.3. Scope

- Smart Mirrors are the interactive devices through which we can watch or read news while preparing in the morning.
- We can access our smart phones via the Bluetooth features.
- Smart Mirror are space-saving devices as they can be used both as to and mirror in one time.

- Now days we can direct to all the apps via this smart mirror.
- We can control our household appliances like switch on/off light and fans through the voice commands.
- Mostly we are using the mirror in colleges also for various functions like finger print sensor or barcode scanner are integrated for registrations etc.

1.4. Applicability

- Like the other ordinary boards, Smart Mirrors are applicable everywhere such as shops, automatic retail machines, road signs, elevators, telephone booths, railway stations , streets, metro, subway, trains, hotels ,banks ,theatres , airports, arenas, conventional halls, exhibition centers and many more.
- Smart Mirrors are for both indoor and outdoor purposes.

2. Literature Survey

Literature Survey is nothing but gathering data and information. This data should analyze with respect to our ideas because we have to approach better way, before the starting we have to document, manuals, videos which are related to our ideas. This is because of the fact that the effective time management is an essential factor in increasing production of day to day life. Technology is incorporated in many devices and the integration of this technology into people's daily lives has made that time management possible. The use of different product such as tablet, pc and smart phone are very much product to the people. There for technology should mold to our schedule.

Michael Teeuw was the first to build a smart mirror and to use a raspberry pi for this purpose smart mirror 1st blog was posted back in 2014, as it is a very new product to the world so it gained a lot of attention. This mirror is building on the pi 2 and use monitor ass the display. It display date, time, weather from the different modules linked in the original website.

In the year 2016 Ryan Nolan gather much interest and developed a smart mirror much similar to the one developed by Michael. He adds a new feature to this device which was first of its kind. It mostly serve as the entertainment system which the user can use the touch control to run various program or to control the music.

Hannah Mattel Sated Made home mirror here the mirror used a smart phone as the display screen. As it was android tablet so the android features were used to display time, weather, date, remainder. This software made the use age of android widgets which can be modified easily as it is an open source. Smart mirror are a kind of home mirror which are easier to build than the other mirror as it require just two main component like any android phone or a tablet and a mirror but this is too lacked in any kind of intelligence or interaction.

In the year 2018, Mr. Abhiskeh Pathak, Mr. Amit Kumar Mishra, Mr. Rohit Sarate, Mr. Swapnil Bhausar, Mr. Nirav Patel had purpose "smart mirror using raspberry pi". In this paper he design smart mirror using with feature like weather forecast, news and by the permission of the person it will show the days plan of that person.

3. Design Scheme

3.1. System Design

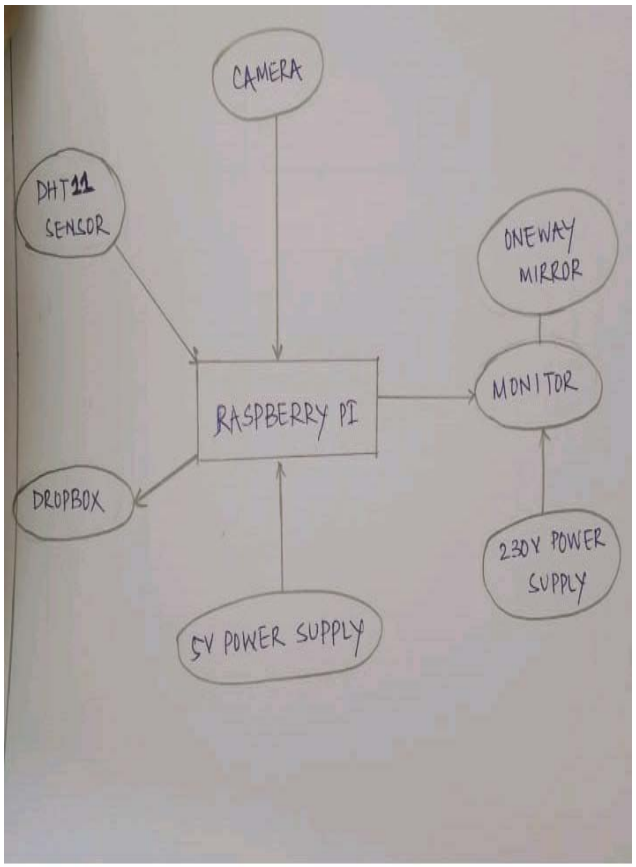

Figure 1. System Design scheme

3.2. Architecture

In fabricating the mirror, we buy a computer monitor and remove the plastic bezel. Instead of that we use duct tape to tighten the electronic components. By using the laser cutter the acrylic is cut into two same sizes of mirror. Then we started our work on the frame which has custom dimensions. It is the most time taking part of the research. We cut four pieces of 1*3 sizes with 45degree meter cut to join those to create the front face of the mirror. To put the miters together, we us dowels and wood glue with no use of nails.

After the bare frame is completed, we use handheld router for making the edges exciting. After sometime the frame is properly fitted, it looks like one piece of wood. The next step is to put dark stain and a protective polyurethane coat in a humid atmosphere. The mirror is dried and it is finally fitted.

In the final stage the monitor and all the electrical components are integrated. We see that every point is secured. When the monitor is functional, we load Michmich's magic mirror to our raspberry pi.

3.3. Implementation

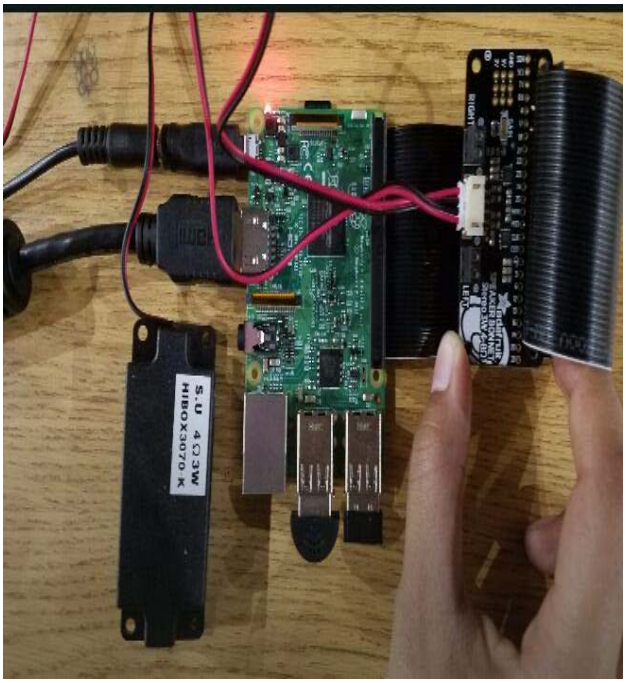

Figure 2. Hardware Implementation

3.4. Installation of Operating System Raspberry pi

After that we execute the following command on our raspberry pi to install Magic Mirror.

Step 1:- Download the required software and files.

Step 2:-Get the SD card and the card reader.

Step 3:- Check the Drive in which SD card is Mounted.

Step 4:-Format the SD card.

Step 5:-Write the OS on the SD card.

Step 6:-Eject the SD card.

bash -c "$(curl -sL https://raw.githubusercontent.com/MichMich/MagicMirror/master/installers/raspberry.sh)".

3.5. Manual Installation

1. We download and install the latest Node.js version

- curl -sL https://deb.nodesource.com/setup_10.x | sudo -E bash -
- sudo apt install -y nodejs

2. Then we clone the repository and check the master branch by:-

get clone https://github.com/MichMich/MagicMirror

1. Enter the repository: cd MagicMirror/

2. Then we install and run the app with:- npm install & npm start

After that the following apps are installed by default:-

- Date
- Time
- Day
- Calendar
- Current Weather
- News Feeds

4. Testing, Analysis and Evaluation

4.1. Relevance

In today's society information is available to us at a glance through our phone, laptop, desktop and many more. But an extra level of interaction is necessary to access the information and the smart mirror. Smart mirror is a product of new technology. The smart mirror acts as a personal assistant and as an enquiry centre and it provides customized information to the user across the globe.

The magic mirror facilitates basic daily information starting from small issues to large issue. It can answer questions, display time tables, show directions, weather report and it is also useful for various industries like automotive, retail, residential, healthcare etc. In residential sector the mirror recognize people, talks to them, learn their habits. In automotive sector it is used for side view and rear view safety purpose. In the age of fashion and design it gives the most trusted results. This technology saves the valuable time of the users and reduces physical, mental burden of the masses. That is why smart mirror has an increasing demand worldwide. This technology has become popular and universal.

4.2. Effectiveness

Smart Mirror is devices that help you check daily updates easily. It helps you to do multitasking as well like you can catch up latest news while brushing your teeth. You can also watch your favorite shows while getting ready for work. It can help you save time. In future smart mirrors can also be used as side view and rear view mirror for enhanced safety purpose. We don't have to check our mobiles all the time we can also fit motion sensors in Smart Mirror to make it more efficient. In future even our home appliances can be controlled with the help of Smart Mirror. It is like the next generation gadget which can make everything look more futuristic and systematic.

4.3. Efficiency

We have design a product which cost is much less than the product which are available in the market. We have tried to reduce its costs by using the second hand things which has same efficiency of doing work. We have also tried to reduce its price by using less material as possible. It is an efficient product as it will reduce the use of paper which is used in schools and colleges in daily basis for displaying notice of different kind. In our research we are able to display things like day, date ,time ,weather etc. which is quite enough for a normal person .We are happy that we have build a research at low cost compare to the market price.

5. Engineering Tools and Standards Used in the Research

5.1. Monitor

The monitor is directly connected to the Raspberry pi. It has both display and voice output. IR frames are used to provide touch ability to the monitor.

Figure 3. Monitor

5.2. Raspberry pi

Figure 4. Raspberry pi

It is the most vital part of the mirror and it is the processing unit. It is like a motherboard and a great CPU. Its size is like a credit card but it works fully fledged computer. Python language is used for raspberry pi programming. The raspberry pi has its own inbuilt capacity to program C++, Python, C, Java etc.

5.3. HDMI Cable

Figure 5. A HDMI Cable

It is a component with audio video interface. It transmits uncompressed video data and digital audio from a HDMI device. The device may be display controller. The data is transmitted to a computer monitor, video researcher, digital television etc.

5.4. Acrylic Sheet

Acrylic is a plastic material and it is also known as plastic glass. It has a variety of purpose and benefits found in different colors and sizes. Today it is use as sheets of various thicknesses. Acrylic can be found in different styles like frosted, mirrored etc. Many times an acrylic is best suitable to our needs and applications.

6. Challenges

The magical mirror is a product of information to the user across the globe. It also facilitated the basic daily information of the globe. It save the valuable time of the user and reduces the burden of the people. These mirrors are majorly used in various industries like automotive, retail, residential, healthcare etc. that is why it has an increasing demand in worldwide. For example: - in residential sector, the mirror recognize people, talk to them, learn their habit etc. In automotive sector smart mirror are used for side view, rear view, for safety purpose. In the age of fashion a design, smart mirror gives the trusted result that why this technology has become popular and universal today.

7. Conclusion

The main goal of the research was to reduce the time needed in a users daily routine and reduce the use of paper in schools and colleges and create a technology that create an enhancement not a new burden. At minimum the research set out to have a mirror that could display a dynamic date, time, weather and can display a notice of any kind and cancan also be able to display many apps like Google, Face book, Instagram etc. and we are happy with the display that results. Originally we wanted to add some more things like camera and sensor but due to the cost and time problems we were not able to add these things knowing what we know now we would to be excited to attempt this in the future. Our only regret in this area is met the research is very heavy and bulky. Future Version would need to work on reducing weight and summing down the product. Overall the research met most of its goals and we are happy with its success.

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