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The Smart Mirror of Tomorrow: An IoT Solution for Home Information and Connectivity

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ABSTRACT

The paper describes the design, construction and working of the smart mirror. Smart Mirror is one of the applications of Raspberry Pi. A computer screen embedded in mirror looks very futuristic. The Raspberry Pi stays at back scenes and controls the data displayed on mirror. While looking at mirror you can look at various notifications from social sites as well news, weather forecast and more things. Such mirrors can be programmed to work as AI and control home appliances by voice input or touch screen. The Raspberry Pi is connected to monitor via HDMI as well as it also has inbuilt Wi-Fi and Bluetooth interfaces so we can just swipe music and videos to mirror. It is also used for theft detection and for security surveillance in home environment it provides assistance for home automation using IoT

KEYWORDS: Home Automation, Artificial Intelligence, Raspberry Pi.

1. INTRODUCTION

The world around is constantly changing. Smart mirrors have the additional capability of displaying different things rather than a normal mirror. Everything is becoming smart day by day. This Fast Way of Life Requires. The Developments of Home Automation Projects. Whether it is through the television or internet, people need to be informed and in touch with the current affairs happening around the world [5]. This Paper Presents the Implementation of a Smart Mirror Using Raspberry Pi. It is a wall mounted mirror which displays relevant items to the user such as weather, time, date, temperature, humidity and news and other fields of interest [4]. The Many Benefits of Using a Smart Mirror It Make Life Easier as Need to Look at Phones Every Time We Need to Check Time, Weather Is Also reduced. Smart home is a connected home that connects all type of digital devices to communicate each other through the internet [11]. The mirror automatically detects the presence of humans. The Smart Mirror Help in Developed Smart House with Embedded Artificial Intelligence Finding Application in Industries. Another option is that it can be voice controlled or touch screen for playing YouTube, Facebook etc.

The Interactive Mirror Is Develop the Mirror with Proper Embedded Intelligence for Offering Feature Such as Weather of City, Latest Updates of News and Headlines and Local Time Corresponding to Location. The Raspberry Pi (RPI) will be used as an embedded device to capture video from a camera hidden behind the mirror. When it comes to our home, security is crucial issue to the general public. For enhancing the security of home this framework is used by owner of the house. Here home automation and home security systems are the main aspect incorporated in this project. The currently built prototype of the system sends alerts to the owner over message using the Internet if any sort of human movement is sensed near the mirror [6]. The design of the smart mirror is broken down into subsystems that represent important components of the project. A block diagram is needed to represent each subsystem. each subsystem specification is needed to draw this block diagram.
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2. RELATED WORKS

In2003Phillip sun veiled their Mirror TV that was built using the same principles that of smart mirrors. Their product was a normal TV that was put behind a two-way mirror so that the TV would appear as a mirror when turned on and as TV when turned on. They also had an option to have the mirror be larger than the TV.

A usage example presented by Phillips was to have the children watch cartoons while brushing their teeth at the same time. Later in 2005 Phillips announced their research project My Heart that built upon the idea of an informative mirror. While their original Mirror TV was simply a TV that also functioned as a mirror, the My Heart project would integrate a display to showcase various medical statistics. However, this project required nobody electronics to collect and analyze the data. The mirror itself simply served as an informative display. James Law Cyber tecture developed a commercially sold smart mirror in 2011. This mirror is more in line with the smart mirror we've come to know today.The product consists of a 32"LCD-display covered by a 37" two-way mirror. The display can show weather forecasts, stream internet, TV, the current time and various widgets. The smart mirror has numerous input methods such as remote controller, smartphone app and onscreen virtual keyboard. Paper by Franco Chiarugietal (2013) discusses the motivation and rationale behind the project. Their idea was to extract quantitative features official expressions related to stress, anxiety and fatigue and use those

features to quantify an individual's well-being. The features would be extracted from data collected from multisensory devices. The data would be collected in the form of videos, images, 3D face scans and breath samples. The project is first and foremost a research project to digitalize semeiotics - the physical signs produced by diseases - from facial images. At the 2014 International Consumer Electronics Show (CES) Toshiba showcased their smart mirror concept. It utilized gesture control as an input method. Toshiba showcased their smart mirror in different home environments. Their idea was that the smart mirror would be customized for the purpose it would serve in each room. The bathroom smart mirror would show information such as weather forecast and a personal fitness monitor.In 2016 Microsoft released detail on the smart mirror they have been working on. Their intention does not seem to be to create a commercial smart mirror to sell to consumers, but rather they unveiled all the details on how to build one and made all the code publicly available at a github repository. Rather than selling a finished product consumers have the option to assemble their own mirror as a do-it-yourself project.Daniel Bessereretal (2016) created a smart mirror for adding interactive fitness exercises to a person's morning routine. Their project utilizes the Microsoft Kinectv2 for tracking gestures and a Wii Balance Board for presence detection.Chidambaram Sethukkarasi et al. (2016) created an intelligent mirror that identifies users based on facial recognition, recognizes emotions, records health parameters and gives clothing advise. Their paper does not go in-depth on any of its subjects, but rather try to unite the ideas under the concept of an intelligent mirror.In 2017 a company called New Kinpo Group launched their take on the smart mirror called Hi-Mirror.This smart mirror has a camera to specifically monitor your skin health. The mirror will scan your skin and give you metric to tell you what to improve. The mirror uses facial recognition to log a user's skin firmness, texture, clarity, brightness and health on a day to day basis.GriffinTechnologies unveiled their take at the smart mirror at the 2017 CES convention. They call their product the Connected Mirror and it will serve as the smart home hub for several smart home appliances made by Griffin Technologies. The mirror can display local time and weather, notifications from your phone and statuses from other Griffin smart home tech connected to the mirror. The mirror does not employ any user recognition, but the interface can be customized through a smart phone app that is also used to control any other Griffin smart home devices.

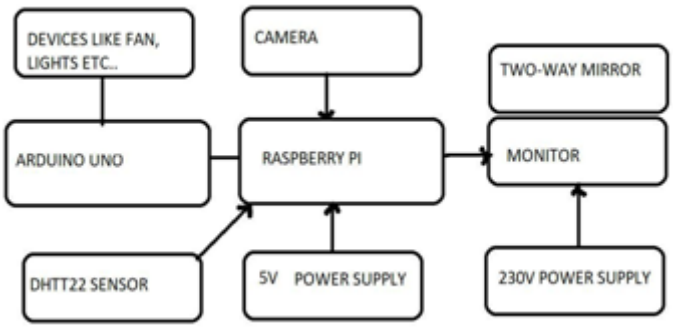
3. METHODOLOGY

The primary hardware component for our system proposed system is the Raspberry Pi. In particular, we use the Raspberry Pi 3 b+ as it maintains the same price point but offers additional processing power, more RAM, and offers onboard Bluetooth and WIFI for connectivity. The Raspberry Pi is capable of running several flavors of Linux, all of which should be capable of running our software platform. NodeJS is chosen for implementation of voice commands. The server has extensions to interact with the Raspberry Pi's hardware GPIO so future users may add additional IoT connectivity.

4. FUNCTIONALITY

Basic functions of the Proposed model are described as follows:

- Work as a normal reflective mirror that can be used as a regular mirror. .
- 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.
- Voice Commands: User will be able to give voice commands to the mirror using a microphone connected to the Raspberry pi 3.



Our project phases are defined broadly in three categories, according to the scope of work involved in each: Design, Microcontroller Programming and Display Programming.

Design

The most important thing in doing our project was determining the dimension of the mirror. Since we ended up using a LG 23" monitor, we needed a mirror of a size such that both the display elements and your reflection would not be competing for space. Next, it became necessary to design a frame to contain both the mirror and the electronic devices should perfectly fit. Mainly a wooden frame is used. It is screwed together and fit it in like a box shape. Next step is to find the mirror material so that we searched in department shops but the mirror was opaque and shine light through. So that we bought a two-way mirror to avoid reflection. This design needs a lot of flexibility so the microcontroller should be chosen carefully. We chose a Raspberry Pi 3b+ for its popularity, its functionality, and it support Wi-Fi and many more new applications are incorporated and the wealth of tutorials and instructions that exist online for it. And we are displaying weather, date, time and social media sites as well and our camera is acting as a surveillance camera.

Microcontroller programming

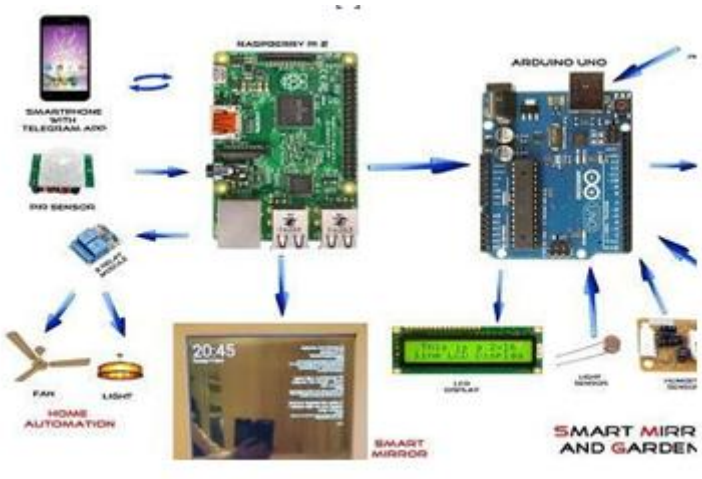
For programming we are installing a Raspbian software and in this project python and js node programming language are used because it is a voice-controlled mirror certain library need to be defined.

Display programming

An app is where the Smart Mirror's display actually exists. In this way we were able to insert applications to display the date, time, and local weather and social media sites certain speech to text libraries are used.

Fabrication

The final step of the fabrication is to install the electronics to the power supply. First, we mounted the display monitor by laying it against the glass and screwing it to hold it in place. Next, we mount the Raspberry Pi on the glass and proceeded to hook up the necessary cabling. Finally, we installed our power bar. At its heart the mirror is powered by a microcontroller, the Raspberry Pi 3b+, a platform on which to build all of our functionality.



5. IMPLEMENTATION

It consists of two main sections such as hardware implementation and software implementation .At the hardware implementation, the physical mirror body is designed with the Two-way mirror, LCD Monitor and the Raspberry Pi Circuit. Database is also implemented and integrated to our system in this phase.

Software Platforms and Languages used are:

- Application Running on Raspberry Pi: Python, JavaScript and Node JS
- Mobile Application: Android Framework using Java Language

6. CONCLUSION

The main strengths of this project are that this is a new kind of smart device that people don't see every day and it looks very spectacular. The platform has a very simple API that makes it very easy for developers to make apps. The voice recognition is very accurate thanks to Google's services. The Smartphone integration works very well and it is something that hasn't been done with smart mirrors before. Of course, there are also weaknesses: the app ecosystem is currently very small, the glass could be more reflective but it can be easily changed, the swipe gestures are sometimes unreliable and finally I would have liked to have the hardware and software more decoupled because currently the sensors and microphones are tied to the software and it can be difficult to make

the OS work with different hardware. However, this can also be solved given enough time by making the software more modular. There are many future possibilities for this project and hopefully it will be continued. For the software, it would be interesting to create an installer for it or even bundle it as a Linux distribution to be able to install it very easily on any Raspberry Pi device. It would also be good to make some changes to make it truly multiplatform. The companion app needs a new UI, maybe an app repository and also the ability to easily change settings for the mirror. A community around the OS and the hardware should be created so people can help each other build and evolve these devices and create apps for them. Once polished, the software could be made open source. Finally, for the hardware part, the glass panel could be replaced for a more reflective one and there's a new, recently released Raspberry Pi 3 that could bring improvements to the overall performance of the device. could be made open source. Finally, for the hardware part, the glass panel could be replaced for a more reflective one and there's a new, recently released Raspberry Pi 3 that could bring improvements to the overall performance of the device.

7. FUTURE SCOPE

In Our Future Work We Will Investigate How the Surrounding Context of The User and The Environment Can Be Utilized in Order to Provide Optimal Service Experiences in The Home Environment. The System Can Be Made Much More Useful to The Users by Adding More Functionality Like Integrating Light Settings, Speech Processing, Etc.

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