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Smart Mirror using Raspberry Pi

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Abstract: ***This project has been developed within the context of a time where every day we see more and more connected devices. The Internet transformed our lives by connecting us more easily to information and other people in the virtual world. Mobile phones then became smartphones and since then this concept has erupted and morphed into the Internet of Things, things that connect us to everyday objects. There is no end to objects that could be made "smarter", some being more suited to this than others. Mirrors, for example, provide a large surface ideal for displaying information and interacting with it. Most people have mirrors at home so the concept of a smart mirror that you can interact with is attractive and has been fantasized about in many futuristic movies. Smart mirrors, such as Magic Mirror and Home Mirror, have been only developed by people in the Maker community, with varying degrees of interactivity. However, so far, the features of these mirrors have been limited. This final year project describes how a smart mirror was built from scratch using a Raspberry Pi for the hardware and custom software built on top of Raspbian, a Linux distribution. The goal of the project was to create a Smart Mirror device that people could interact with but also to further develop the technology so that it would let you install and develop your own applications for it. Overall, results were good because a higher level of interactivity has been achieved by being able to use voice commands, gestures, and smartphones. A few problems arose in the construction and software side of the project, such as the glass not being reflective enough and the gesture recognition being unreliable, but these drawbacks can be addressed by doing more tests and trials to further develop the Smart Mirror.***

Keywords: Smart Mirror, Raspberry Pi, Home Automation, Artificial Intelligence, Internet of Things 1.

I. INTRODUCTION

Everyone knows what a mirror is. It is an object found in most people's homes. In mirrors, we see our reflections. But what happens when you combine the idea of a mirror with technology? What possibilities are there and how smart could a mirror be? These are some of the questions that inspired my choice of final year project, a project which aimed to develop a smart mirror and a small operating system to power it. The device was to go beyond an ordinary mirror, to have a screen inside that you would be able to interact with by using voice commands, hand gestures, and smartphones or other devices. Multimedia is a very broad area and I like every aspect of it, so it was difficult to choose a specific area and I had many ideas. However, I finally decided to build a smart mirror because it is a great combination of many of the things we have studied: web technologies, Electronics, UI design, etc. The smart mirror is a popular project among DIY enthusiasts, and it usually consists of a one-way mirror with a screen attached to it that displays a static web page. However, what I wanted to achieve was something you could interact with. My goal was to learn how a Raspberry Pi worked and to understand how to combine the software and the hardware components to create a multimedia project. I started by obtaining a Raspberry Pi and creating the software. At the same time, I began documenting everything and I also searched for a suitable one-way mirror and a computer screen, as well as some sensors to physically interact with the device. I then spent a long time calibrating the 2 sensors to work with the software. Once the software was almost finished, I started designing the frame, and finally, I built the smart mirror and attached all the components. 6 Developing this project has been a great experience. I have learned a diverse range of skills in different fields, such as DIY, Linux, electronics, and web development. To obtain the result I've had to work with many different technologies. I used Photoshop and Illustrator for the UI designs, web development tools for the software, and electronics for the hardware. Not sticking to just one field has made this project a fun one and I would recommend it to anyone who is passionate about creating things.

II. OBJECTIVE

The objective of this project is to make the mirror do smart things like play music, show the news,date,daily routine which saves time. We built these smart features by using the raspberry pi. This device is to effective time management technology in multitasking and provides necessary capabilities onto visually appealing mirror.

III. LITERATURE REVIEW

1) Dr. Malini S et al. [2022] created a futuristic smart mirror that allows customers to connect naturally with their home ambient services.
2) Mrs. Yamini Patil et al. [JUNE 2021] Proposed to solve that error by manually creating a file on boot drive of the pi. A problem with Two-way mirror was that it crashed whenever we tried to cut it, but after surfing over internet we found solution to that problem that sticking a tape before cutting it helps. The next big issue was providing a touch interface to mirror, there isn't a sign of how to give the smart mirror touch ability, we found solution to that problem after looking at IR Frames on the internet.
3) Simone Bianco et al. [OCT 2021] Proposed a smart mirror for emotion monitoring in home environment smart mirror provides the user with an interactive interface that can be used comfortably in the home environment.
4) Apurva Joshi et al. proposed IOT BASED SMART MIRROR WITH NEWS AND TEMPERATURE, [JUNE 2020] The objective of the paper is to develop smart mirror that interacts with users and provides information such as news, temperature. The smart mirror is designed using Raspberry PI, microphone, lcd display and a two-way mirror. The user interacts with the mirror through the microphone and the results would be displayed on screen. The information provided is very limited, which can be further extended, and doesn't provide user privacy.
5) Nathasia Florentina Thejo Wahyono et al. [JUNE 2020] The proposed framework permits clients to use a generally discovered family unit object as an intelligent interface for showing an assortment of data administrations and normal updates [10]. It was created with CSS, HTML, Python, and JavaScript parts, the plan and appropriation of the gadgets were redesigned to exploit each space of the mirror considering the new administrations that the Smart Mirror will show without dismissing the fundamental capacity of a typical mirror.
6) Mariya Nooreen Patel et al. the 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 [MAY 2019]. The application is the new technology for smart life. We have designed a futuristic smart mirror that provides natural interaction between users and the ambient home services. The mirror display is provided by a flat LED display monitor which displays all the necessary information which is useful for the user. The mirror also provides a picture-in-picture sub-display to facilitate the display. Overall, the prototype provides an easily extendable framework that can be utilized to provide even more functionality to the user. The system can be made much more useful to the users by adding more functionality like integrating light settings, speech processing, etc.
7) Sun Yong, et. al., they have presented the Smart Mirror as a combination of a controller [2018], a display module, a wireless transceiver module, a clock module and auxiliary function module. User 3 can interact with the speech module such as interacting with the mirror by asking the details like weather updates, news updates, time, the mirror can automatically obtain the related information through broadcast and Network.
8) N. Narshima Raj, et. al. they have bridged the Raspberry Pi to the mirror [2018] that can be accessed by the students at the university for perceiving course registration and queries are stored in the database which can be only retrieved by the admin, the controller.
9) Ayushman Johri et. al. they have coated Smart Mirror as a thin fine sheet [2018], that bridges as a pensive mirror to the user, allowing the monitor at the back to display content by the thin pensive sheet. Raspberry Pi module is connected to the monitor through an HDMI cable, and it relates to Arduino Ultrasonic sensor which supports the outputs via the monitor.

IV. METHODOLOGY

The Smart mirror is a device which displays the information required by the user as well as a conventional mirror. We have used an LED screen as an interface between the user and mirror. The monitor is connected to the Raspberry Pi-3B+, then the required information by the user is retrieved through Wi-fi access. The information which is to be displayed is pre-requisitely set by the user. The LED screen is used to display the required information for the user. In this, time and date, weather updates, calendar, reminders and news-updates are displayed in the mirror

V. IMPLEMENTATION & BLOCK DIAGRAM

We plan to design and develop a kind of futuristic smart mirror that provides a whole new experience to the user with the flavor of AMIL. Our proposed smart mirror consists of a two-way mirror, acrylic glass, monitor (LED), Raspberry Pi, Raspberry Modules, and sensors. A wooden frame will be prepared with LED attached behind the glass with all the sensors and the raspberry pi. The power supply is attached to the raspberry pi which will power the LED monitor and the sensors. Once the mirror is activated, it will connect to the docker which contains all apps and software needed to run the mirror.

This will require internet access which will be provided by the wi-fi module (LAN can be also used) on the raspberry pi. The virtual layout that will be prepared using HTML and CSS will be displayed in the mirror when it is turned on and will show the calendar, weather, and news headlines. The mirror will perform facial recognition which will be helpful for real-time image zooming in and out.

The proposed smart mirror will perform these tasks:

1) A normal two-way mirror and acrylic glass will display a real-time image.
2) After activation the mirror will display weather, time, and news.
3) The mirror can play music and videos.
4) The mirror can zoom in and out on real-time images.
5) The mirror will automatically sleep if a person disappears from the front with the help of sensors.
6) The mirror can be used to display moving images and animations in the case of the ideal situation with the help of sensors that will detect the presence and absence of any person in front of the mirror.
7) All the social networking websites or apps can be accessed with voice.
8) The mirror can be synced with other devices, which leads to home automation.
9) The mirror also supports multiple user profiles.
10) YouTube videos are also supported by the mirror.

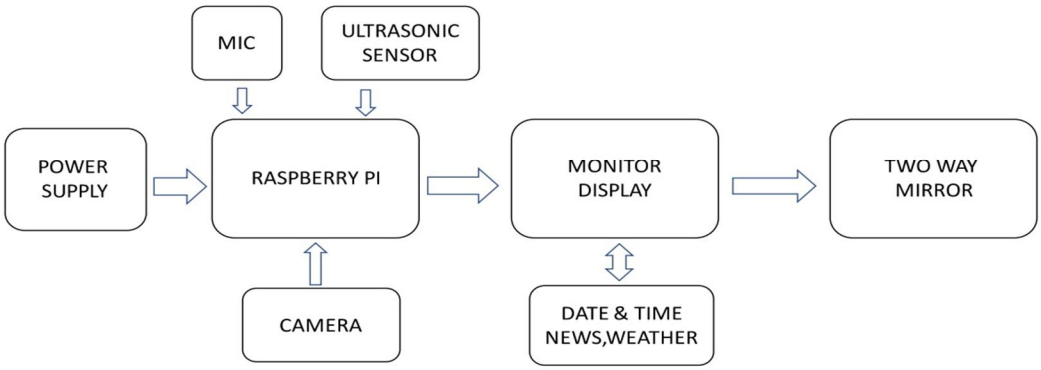

Fig 1- Block Diagram.

VI. RESULT

Every mirror works on different technologies and platforms. The functionalities of these mirrors also differ. So, we had proposed a mirror which works in a simple structure and has all the required functions for the user such as news, time & date, weather and many more.

VII. CONCLUSION

We had proposed the comparative study and a design of a futuristic smart mirror which could be a great device for ambient home services. Speech recognition is one of the major advantages of the mirror. Live animations will make the bathroom more fashionable. The proposed smart can be easily extended for some other frameworks like making phone calls. In future this mirror can be used to build smart home networks with devices such as lights, virtual assistant, TV, music system, refrigerators, etc. can be integrated together. This would lead to a smart home.

VIII. FUTURE SCOPE

It can be used for many purposes.

1) Security Purpose.
2) In fashion Store.
3) In Hospital.
4) For Controlling Home Appliance .

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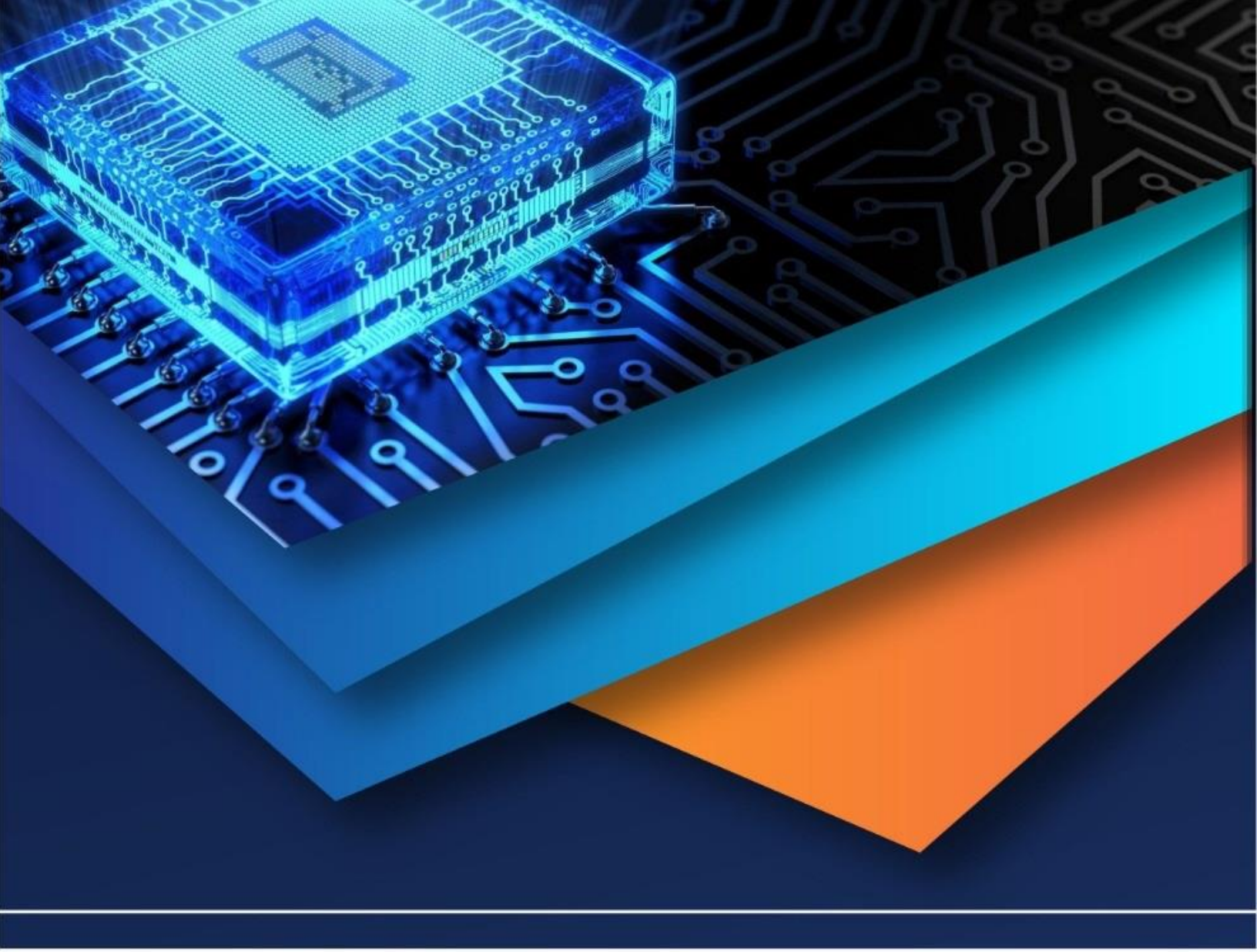

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