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RESEARCH ARTICLE

SMART MIRROR THROUGH FACIAL RECOGNITION WITH REAL-TIME, DATE AND TIME, WEATHER FORECAST

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ABSTRACT

Objective: Nowadays, people are busy with their work from the start of the day throughout. Every day when people return from work, especially who are doing their work on the computer for the whole day: they just get tired of operating the devices like computers or mobile phones. So, all they need is their stuff or information at a glance. While people are getting ready, or when people are there in the bathroom or near the sink, they cannot use their mobile phones. As people use a mirror while they are getting ready, but what if this mirror gives them every possible information they want. So, we are building up a "Smart Mirror" which gives daily weather updates, news, schedules, alarms, reminders and many more features. So, while a person is getting ready, at the same time, he/she can get all the required information and it will be helpful to the people who often forget the schedules and things. Also, near the sink, in the washroom/bathroom if there is a mirror like this, a person may not require to take their phones there. Using this mirror, one can get updates as well as live video streaming, education videos, multimedia activities can also be made available.

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INTRODUCTION

Smart mirrors are becoming increasingly popular due to their innovative features in future generation and potential to revolutionize the way we interact with human life and technology in our daily lives. Some of the importance of smart mirrors include: Convenience: Smart mirrors offer a convenient way to stay connected and informed while getting ready in the morning. They can display information like weather updates, traffic reports, news headlines, and calendar reminders, all while you are brushing your teeth or doing your hair. Facial Recognition: Smart mirrors can be customized to display personalized information through Facial Recognition and say our name with integration of given input with speaker, such as that can display real time, date, weather, News, daily and in future develop smart mirror software that can display, fitness tracking data, Gmail Notifications. This can help you stay motivated and on track with your goals. Security: Through Facial Recognition it can display personalized information while interacting with mirror. for this we need security for our data and it cannot be misused. Currently, significant research works have been conducted in the domain of developing an interactive smart mirror for personal use. Rabben et al. (1) developed a smart mirror-based solution allowing pupils to wash their hands without the assistance of teachers or adults. This technique was created for the students in kindergartens and schools who require the assistance of a teacher to wash their hands in order to keep them hygienic. Besides, by presenting the basic information of the users, Akshaya et al. (2) have developed a two-button supported smart mirror, one for the website and another for the map.

The key feature of this research is to access the smart mirror from several areas with an assistance of a user-friendly interface. He failed to develop weather update, social media notifications etc., Purohit et al. (3) used facial recognition to construct a virtual assistance-based smart mirror solution for home automation. This suggested device may be utilized as a regular mirror as well as a smart mirror to obtain the user's daily information. However, in other work, D'souza et al. (4) have built a smart mirror that allows users to manage their home appliances using speech recognition approach. This application is primarily designed to reduce users' energy use while also displaying some essential functions such as time, traffic, Google Calendar, weather, cryptocurrency, and so on. In another recent work, Halaby et al. (5) presented a smart medical mirror that would display the user's vital signals such as SPO2, heart rate, BMI, and body temperature. Surprisingly, the proposed system is time-consuming, it takes more than 5 s for initializing, measuring and displaying the result. However, for those who are having difficulty getting medical check-ups due to laziness or busyness, this method may be able to aid them in obtaining their basic vital signs, which can help them spot deadly illnesses and medical problems at an early stage. Similarly, Nadaf et al. (6) and Njaka et al. (7) also developed a smart mirror for ensuring home security along with some basic features. A biometric authentication-based user recognition model has developed by the authors (7, 8) to ensure sufficient security in accessing the smart mirror. To detect an intruder through a smart mirror in a room, Jin et al. (8) have proposed an alarm-based interactive application. This article focuses on storing images of users in a dataset and the designed

system sends notifications to the authenticated user when the model does not identify someone. The authors employed the concept of the user’s face and outbound movement detection recognize the face and identify the mood in the system. Our proposed magic mirror software developed a Facial Recognition with Real-Date and Time, Weather Forecast. In this paper, we develop the design and implementation of an IoT based smart mirror with the support of personalized information recommendation and face recognition approach is proposed. Following Table 1 highlights the available features for both categories of users (general and authenticated). This research has focused on the design and development of an interactive smart mirror; the development of a voice-controlled input; and to ensure the accurate detection of user’s faces to access the features. The objective of a smart mirror is to provide users with a personalized and interactive experience that combines the functionality of a traditional mirror with advanced technology. Smart mirrors typically have built-in displays that can show information such as the time, weather, news, and social media feeds, as well as offer voice or gesture control for hands-free operation. They can also be integrated with other smart devices in the home, such as smart speakers or lighting systems, to create a seamless connected home experience. Overall, the goal of a smart mirror is to provide users with a more convenient, efficient, and enjoyable way to start their day and stay connected with the world around them (9). The proposed work is successfully designed, implemented and tested. our smart mirror is the futuristic smart mirror provide natural interaction between home service and users. that can display through facial recognition, real time, Date, weather update and News.

METHODOLOGY

This section discusses the method chosen to complete this project. The author looks for various kinds of references related to smart mirrors, then filters there references that have been collected to select references that are relevant and by the purpose of this paper. The search process is carried out by searching for appropriate keywords and filtration is done by looking at the discussion topics from each reference and selecting which can be used for the process of using Smart Mirror to enhance learning. After filtration, authors start to create ideas and designs from smart mirrors that can help the learning process. Smart mirrors are created by combining ideas from the collected references and applying them according to the purpose of this paper. The approach of the methodology used in smartest mirror project is called The Evolutionary Prototyping that collects feedback from users so it can be modified easily. The viewpoint that usually concentrated on is the issue related explanation about the current circumstance, after investigating the issue. In this case, it is to enhance learning. The researcher settled on the goal to be accomplished and the huge of this task for the user. The examination was additionally directed to decide the extent of the user appropriate for the utilization of the smart mirror. Other than that, products and equipment for the smart mirror were additionally investigated in guaranteeing roughly applied in the plan and advancement.

Table 1. User wise features availability of Smart Mirror architecture

	General users	Authenticated users
Features category	Time, weather, calendar, alarm, news update, COVID-19 update,	All the available features of the general user, , YouTube, Gmail, stock market update

Hardly any examinations have been done around there. By including advances in smart mirror, various assignments can be done faster. With headways in Internet of Things and its applications, the mirror is structured to such an extent that the inhabitants can access some information while enhancing the user profile and experience Face recognition can be used to detect who is accessing it and will display the information as

requested. If the user is not listed in the machine’s database, display will not turn on. With this, it is hoped that the safety of the smart mirror will be guaranteed, because only right user will can access this machine. Besides face recognition feature, smart mirror also has voice recognition feature. Voice recognition will help user to run smart mirror and make user’s life easier. This can be happening because user can open any feature in this smart mirror only with his or her voice. After receiving the audio, smart mirror will check the database. If the command matches with the database,then smart mirror will run according to the command that requested by the user. Otherwise, it will not run untiluser use the right command (10-16).

Design And Implementation: In this section, the design and implementation approach has discussed with the architectural view of hardware and software. The hardware of the proposed framework consists of various components including two-way mirror, raspberry pi 3B+, camera, microphone, wood frame, display screen, speaker and some others.

Hardware Implementation: Implementing a hardware smart mirror requires selecting the right components and configuring them properly. Here are the components to implement a smart mirror hardware:

Raspberry pi: The Raspberry Pi Model 3 is a popular choice for many projects, including media centers, retro gaming consoles, and home automation systems. Its low cost, small size, and versatility make it an excellent choice for both hobbyists and professionals.

Two-way mirror: The one-way mirror film is commonly used for privacy purposes, especially in offices, conference rooms, and homes. It can also be used for security purposes in areas where observation is required without being noticed.

LCD Monitor: In order to present the basic information including date/time, weather update, alarm, news headlines, traffic update and so on, a display monitor is essential in this model. Therefore, in the development of the model, LG 14-inch monitor is connected to the Raspberry pi module using HDMA interfacing.

Pi camera module: The Pi Camera Module is a small camera board that can be attached to the Raspberry Pi single-board computer. It was developed by the Raspberry Pi Foundation and is designed to be an easy-to-use camera solution for various projects, including robotics, home automation, and surveillance systems.

Microphone and speaker: To utilize the features of the voice-based activity, a microphone is needed in the designed model. A single Bluetooth speaker is also attached to the system to receive feedback. However, all the output results can be received through the speaker. Software Implementation. To implement a software smart mirror, you will need to use a software platform that can display the information you want and customize the appearance of the mirror. Here are the components to implement a software smart mirror:

Raspbian Operating System: Raspbian Is the Best All-Around Operating System. Raspbian is the “official” operating system of the Raspberry Pi and because of that, it’s the one most people will want to start with. Raspbian is a version of Linux built specifically for the Raspberry Pi. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run.

Vnc viewer:

VNC Viewer for Raspberry Pi is a software tool that allows you to remotely connect to and control a Raspberry Pi device using VNC protocol. With VNC Viewer, you can view and control the Raspberry Pi’s desktop interface as if you were sitting in front of the device. This can be particularly useful for managing and troubleshooting headless Raspberry Pi devices, where there is no display or keyboard attached to the device.

Table 2. A comparative features analysis of designed *smart mirror* application with others research work

Article/features	Basic Information	Reminders	Social media notifications	Voice Recognition	Voice control	Face Recognition	Email notifications	Google map	Weather update
Rabben et al. (1)	✓								✓
Akshaya et al. (2)	✓							✓	
Purohit et al. (3)	✓					✓			✓
D'souza et al. (4)	✓				✓			✓	✓
Halaby et al. (5)	✓								✓
Nadaf et al. (6)	✓				✓	✓			
Our Proposed system (mirror me)	✓	✓	✓	✓	✓	✓	✓	✓	✓

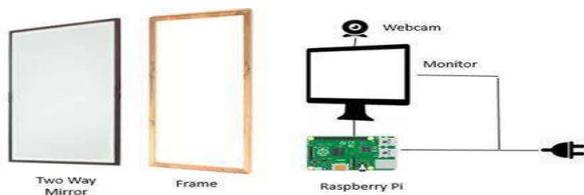


Fig. 1. IoT based hardware configuration diagram of the proposed Smart Mirror application



Fig. 2. Hardware overview of our proposed smart mirror

Magic Mirror Software: Magic Mirror² is an open-source modular smart mirror platform. With a growing list of installable modules, the Magic Mirror² allows you to convert your hallway or bathroom mirror into your personal assistant. Magic Mirror² is built by the creator of the original Magic Mirror with the incredible help of a growing community of contributor. The Magic Mirror can be installed manually or using automatic installers. At the start of 2020 the decision was made to remove the automatic installer from the Magic Mirror² core repository and move it to a community maintained separate repository.



Fig. 3. Final output of proposed Smart Mirror

Manual Installation

- Download and install the latest *Node.js* version:
- `curl -sL https://deb.nodesource.com/setup_16.x | sudo -E bash -`
- `sudo apt install -y nodejs`
-

- Clone the repository and check out the master branch: `git clone https://github.com/MichMich/MagicMirror`
- Enter the repository: `cd MagicMirror/`
- Install the application: `npm run install-mm`
- Make a copy of the config sample file: `cp config/config.js.sampleconfig/config.js`
- Start the application: `npm run start`
For Server Only use: `npm run server`.

RESULTS AND DISCUSSION

As we had seen in the comparison of research journal works on a table that every mirror is working on different technologies and platforms. These mirrors also differ in functionalities and users. We had proposed a mirror which works on common architecture and also had all the required functions for users. This exploration observes that our suggested system outperforms other recent work in the categories of general information, reminders, social media alerts, voice recognition, voice control, face recognition, email notification, google map, weather update, and YouTube, based on a comparison with other recent work. Overall, the originality of this investigation is the design and development of an interactive smart mirror capable of conducting daily tasks while providing the highest level of security in terms of face and voice recognition for end users. Based on the feature assessment matrix, we observed that our proposed system contains every feature that considered as a complete interactive smart mirror and has outperformed other work in the specific category. The research's next focus will be on the creation of a comprehensive home security gadget. The burglar may be spotted with this smart mirror, and the owner may be notified through email or text message with a real-time image of the intruder.

CONCLUSION

This paper demonstrated a smart mirror device with a user-friendly architecture with many impressive features. Following a service-oriented approach, a stable and easy-to-use architecture was also introduced in this article. However, security issues cannot be overlooked in today's world of interconnected devices. A smart mirror provides information like hot news, weather condition, appointments, agendas, assignments. It gives data by recognizing correct user by face and voice recognizing unit when it operates in Online mode. It acts as a traditional mirror & when no one is in-front of mirror it operates in standalone mode.

Feature Of Scope: Overall, the originality of this implementation is the design and development of interactive smart mirror capable of conducting daily tasks while providing the highest level of security in terms of face and voice recognition for different users. In future smart mirror is interactive and smart home gadget who adapt for home into smart home.

We can add more features to smart mirror like, fitness. Health, Home automation etc., The most notable aspect of smart mirror displays across the entire house.

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