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A Review on “Smart Mirror”

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ABSTRACT:The use of smart technology, such as smart homes and smart communities, has become more widespread in recent years. With the smart mirror, a traditional mirror is transformed into a smart one. Smart mirrors can be used to improve convenience, safety, and luxury in human life, and this paper explores how they can do so. With today's hectic schedules, people rarely have the time to read the newspaper and keep up-to-date on current events. In addition to providing individuals with the latest news and information, a smart mirror also helps them save time. The proposed systems are designed using hardware components such as Raspberry Pi, camera, and microphone, along with Python programming. The intelligent mirror can identify its user through face recognition technology. By incorporating smart technology into traditional mirrors, we can create a more efficient and streamlined way of living.

KEYWORDS:Raspberry Pi, Smart Mirror, Face Recognition, Camera.

I. INTRODUCTION

In most households, mirrors serve as a common tool for checking our appearances. However, The popularity of smart mirrors has grown due to the integration of technology into mirrors. Smart mirrors combine the functionality of a mirror with interactive elements like multimedia and news feeds to provide a user-friendly solution. A reflective surface conceals the date, time, and weather information that a range of responses and data can be shown on, as they are specifically created for this purpose. Different computer languages and implementation techniques can be used to create smart mirrors of all types, sizes, and that can be utilized in different fields such as academic, general, and medical.

Smart mirrors have undergone advancements in recent years from being a simple interface for providing general information to becoming more interactive. One of the ways this has been achieved is through the use of sensors embedded within the smart mirror, which has a user presence prediction feature. Overall, smart mirrors represent an intelligent and innovative approach to enhancing our daily lives.

II. LITERATURE SURVEY

Biljana Cvetkoska, Ninoslav Marina, DijanaCapeskaBogatinoska, and ZhankoMitreski (2017) developed a methodology for detecting health problems using a smart mirror. In their model, they have incorporated attributes like



facial recognition authentication, identification of incorrect posture, guiding towards the correct posture, and offering recommendations for preventative healthcare. The algorithm is created to examine alterations in body and posture with an emphasis on the upper body, for the purpose of identifying health concerns over time. The proposed algorithm was evaluated by the authors, who discovered that it got better with each new analysis of an individual. In order to gather more information on health markers like heart rate, blood pressure, and stress levels during physical exercise, the authors intend to integrate communication with wearable devices in the future. [1]

Sun Yong, GengLiqing, and Dan Ke (2018) built a Smart Mirror that uses the principle of one-way perspective. The mirror's main chip is a Raspberry Pi, and it operates on the Linux operating system. The mirror is equipped with intelligent voice control, enabling users to control functions such as music playback and broadcasting through voice commands. The mirror's brightness can be controlled through a mobile phone application. Components of the Smart Mirror include a controller, display module, wireless transceiver module, clock module, Bluetooth module, speech synthesis module, and auxiliary function module. The STM32F030C8T6 microcontroller serves as the core control chip. Other capabilities of the system include the ability to remotely control the switch status, room lighting brightness, and voice playback in addition to face recognition, speech recognition, and voice playback. [2]

Ayushman Johri, Raghav Narain Wahi, Sana Jafri, and Dr. Dhiraj Pandey (2018) presented a smart mirror gadget that has SOS calling and messaging capabilities, touch-free interaction with essential information displays displayed as widgets on the screen. The system's interactive features make it easier to retrieve fundamental information and increase utility by utilizing innovative technology. Components like an LED monitor, microphone, speaker, GSM module, ultrasonic proximity sensor, HDMI cable, and a reflective sheet are interfaced with the system, which is constructed using Raspberry Pi and Arduino Uno platforms. In contrast to other smart mirror-based products currently available, this model provides a cost-effective emergency triggering technology that is appropriate for consumers with varying economic backgrounds. As users incorporate smart technology into their lives, the device provides necessary features required in their daily routines. [3]

Mayur Wani et al. (2019) developed a smart mirror with internet of things technology that allows for multitasking functions on a single screen. The system shows the weather, date, day, time, recent news, email, and a Google search engine in addition to user profile management with face recognition. The mirror features a camera that uses two algorithms, hard cascade and convolution neural network, to recognize the user's profile and allow access to the smart mirror.[4]

JayashriKawale et al. (2019) made a smart mirror system with a raspberry pi as its main processor. The mirror functions in two different ways: online and solo, and identifies users through face or speech recognition. In online mode, the system displays relevant information such as weather, temperature, humidity, date, time, hot news, appointments, agendas, and assignments. The system uses a camera for face recognition and a microphone for voice recognition using Google Speech APIs.[5]

Mr. P. Mathivanan et al. (2019) presented a smart mirror for home automation that allows the user to monitor and control home appliances and the security system. The mirror is activated through face recognition and a biometric fingerprint, and users can interact with it via physical touch or voice command using Google Assistant on their smartphone. The system stores real-time database information on Firebase cloud and sends alert messages to authorized users. Additionally, the mirror provides a high-tech security system and fire alert system.[6]

Siddharth Anil Desai et al. (2021) designed a Smart Mirror that utilizes Raspberry Pi as the primary processing unit. Utilizing NodeJS, HTML, CSS, and Python, the mirror's software was deployed on the Raspbian OS that is based on Linux. Among its intelligent capabilities, the mirror offers face recognition that can identify multiple faces and serves to verify users and safeguard sensitive information. Using the JavaScript tool Node.js, the architecture of the proposed



system was developed, with the design being carried out through the use of HTML and CSS. The Face Recognition functionality of the Smart Mirror was implemented using Python, while a JavaScript wrapper was utilized to seamlessly integrate it with MagicMirror. Additionally, the Smart Mirror is equipped with a facial scanning feature that can detect the user's emotions. In the paper, a new model is introduced that incorporates personalized elements for daily use, along with a range of fundamental widgets and distinctive features such as Spotify, Google Events, Calendar, and Google Fit, all aimed at tailoring the user's experience. Moreover, the model includes regional Time & Date and universal greetings to further enhance user personalization.[7]

Jun-Ren Ding, Chien-Lin Huang, Jin-Kun Lin, Jar-Ferr Yang¹ and Chung-Hsien Wu (2007) created a Magic Mirror with capabilities like speech synthesis and recognition, 3D graphic creation, Internet access, and multimedia services. For audio and spoken interaction, the hardware system consists of two powerful speakers and a microphone. In order to apply the Snow White story and develop a smart home, the project combines image/speech processing technologies, Internet data, and reflective glass properties. Software and hardware devices have been integrated to create the system, which is a digital lifestyle application. On existing devices or personal PCs, this solution is simple to set up. With the use of LCD devices, the Magic Mirror offers a compelling mix of multimedia, interactivity, and HMI features, all at an affordable price point, making it an attractive option for consumers. [8]

Raju Nadaf and Vasudha Bonal (2019) proposed The hardware components of the system include a Raspberry Pi, a camera, a touch screen compatible with Raspberry Pi, and a microphone, while the programming is done using Python. Voice, touch, and mobile input are the three available modes for the system. It can be used to monitor residences for intrusions as a security system. By utilizing the Yolo technique, a Machine Learning concept, and OpenCV, object detection can be performed efficiently as this technique examines the image just once, resulting in a faster processing speed compared to other image processing techniques. The Raspberry Pi is given the video's frames as input so it can make a determination. Using Python programming and the Yolo method, objects are found. When an intrusion is confirmed, an alert email containing the intruder's photo and other information is sent to the administrator and stored in the storage device. When the administrator is in front of the mirror, they can utilize voice and touch screen commands, whereas if the administrator is not in front of the mirror, mobile-based controls can be employed. The proposed model aims to provide security using household devices. [9]

Athira S and colleagues (2016) presented a novel design of a smart mirror that can display notifications and interact with users. The smart mirror was designed for personal use and incorporated features such as user detection display mode and voice-controlled automation system using speech recognition. A pyroelectric infrared sensor was used to detect human presence and enable features such as weather, time, reminders, social media notifications, and news headlines in order to be seen on the mirror. The recommended system offered additional flexibility and comfortability, and also integrated the concept and methodologies from existing smart mirror systems. The smart mirror system also incorporated home automation and shelf security using speech recognition. [10]

Maria Seraphina Astriani, Andreas Kurniawan, and Nunung Nurul Qomariyah (2021) proposed a system that enables users to easily keep an eye on their body temperature and heart rate using a smart mirror. The system also has a monitoring capability for identifying COVID-19 symptoms, and it has the ability to, if necessary, send notifications to the user's smartphone. In order to bring this solution to life, the system necessitates several key components, including a board (like Raspberry Pi), sensors for data collection, internet connectivity, and a monitor to showcase the collected data. For simpler tracking of health data, the gathered data is saved on internet servers and is accessible via a smart mirror or smartphone. The heart rate sensor (3554) and temperature sensor (DS1820) are used to collect data, which can be analyzed to detect early symptoms of COVID-19. An alert will be presented on the smart mirror or smartphone to remind the user to take the appropriate actions if COVID-19 is suspected to be present. [11]

In 2018, R Akshaya, N.Niroshma Raj, and S.Gowri proposed a Smart Mirror project that acts as a digital magazine for



a university campus. The system is built using Raspberry Pi and showcases a variety of useful information, including weather reports, time, college maps, and a digital magazine. The primary objective of this project is to provide students with up-to-date information about certification courses and placement opportunities. It also makes it easier for visitors to find their way around the campus. The map's implementation makes use of the Google API, and latitude and longitude points are used to get the position. The campus architecture may be viewed on the map from both a satellite and an aerial perspective. The Smart Mirror facilitates easy communication between users and administrators, and the required data is shown on a flat LED display monitor. The proposed system can be useful for both students and visitors to the campus. [12]

Kun Jin, XiboDeng, Zhi Huang, Shaochang Chen (2018) proposed a smart mirror that is suitable for many kinds of occasions, has the common smart home function and increases the safety factor through the face recognition technology. It adopts Raspberry Pie as the control processing center to meet the multi-purpose realization and signal processing. The smart mirror owns so many modules, which includes Raspberry Pi external imaging control, wake-up touch, voice conversion, image capture module and built-in portraits recognition processing, voice recognition and other interactive programs, in order to realize the function of information display, voice interaction, human perception, intelligent security and entertainment. The imaging control system mainly relies on display technology to present the information and control unit we urge to get on the home op mirror. In order to solve the most basic touch interaction problem, this solution adopts the way of adding infrared frames. As a result, the development and implementation of the smart mirror discussed in this paper offers a centralized platform for smart homes.[13]

Eriko Iwabuchi, Maki Nakagawa, and ItiroSito (2009) proposed a unique Smart Mirror for makeup application. The system utilizes a high-resolution camera for providing practical makeup application. The image processing is carried out using OpenCV, while FlyCapture is used for controlling the high-resolution camera. The proposed system helps individuals in applying makeup efficiently, and with a high degree of accuracy. [14]

	Authors	Parameters									
		Technology	Language	Voice Command	Gestur e	Postur e	Reminde r	Human Emotion Detectio n	Googl e API	Face Recognitio n	Calendar
[1]	Biljana Cvetkoska, NinoslavMarina, et al.	Raspberry pi 3	Python	Yes	Yes	Yes	No	No	No	Yes	No
[2]	Sun Yong, GengLiqin g, et al.	Raspberry pi, STM32F030C8 T6	Python	Yes	No	No	No	No	No	Yes	No
[3]	Ayushman Johri, Raghav NarainWahi, et al.	Raspberry pi, Arduino Uno	Python	Yes	No	No	Yes	No	Yes	No	No
[4]	Mayur Wani et al.	Raspberry pi 3	Python	No	No	No	Yes	No	No	Yes	No



[5]	JayashriKawale et al.	Raspberry pi	Python	Yes	No	No	Yes	No	No	Yes	No
[6]	Mr. P. Mathivanan et al.	Raspberry pi	Python	Yes	Yes	No	No	Yes	Yes	Yes	No
[7]	Siddharth Anil Desai et al.	Raspberry pi	Python	No	No	No	No	Yes	Yes	Yes	Yes
[8]	Jun-Ren Ding, Chien-Lin Huang, et al.	Raspberry pi	Python	Yes	No	No	No	No	No	Yes	No
[9]	Raju Nadaf, VasudhaBonal et al.	Raspberry pi	Python,ML	Yes	No	No	No	No	No	No	No
[10]	Athira S et al.	Raspberry pi	Python	Yes	Yes	No	No	No	Yes	Yes	Yes
[11]	Maria Seraphina Astriani, et al.	Raspberry pi	Python,ML	Yes	No	No	No	No	No	No	No
[12]	R Akshaya, N.NiroshmaRaj, et al.	Raspberry pi	Python	No	No	No	No	No	No	No	Yes

III. CONCLUSION

A review on smart mirror systems available in the literature is done and provided in this report. The implementations, capabilities, and uses of smart mirrors in many industries were the main focus. A gap analysis was performed based on different parameters such as technology, on programming language, voice commands, gesture, posture analysis, reminder, human emotion detection, face recognition and calendar.

The Smart Mirror has a wide range of applications and is not just used in the hospitality sector; it also has uses in home automation, healthcare, and security. The device's voice assistant enables users to complete tasks like web searches without the use of a touch screen.

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