Smart Mirror: A time-saving and Affordable Assistant

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***Abstract*— with technological advancements, almost all things are becoming a better version of their past. With the advancement in IoT, IoT-based devices have made life much easier for everyone. In the smart mirror, raspberry pi 3b is used as the main circuit along with a display, and a dark acrylic sheet is applied to it to give it a touch of reflection of the mirror. Multiple peripherals like camera, mike, speakers, etc. are added. The ability of this mirror to provide live data to the user in front of it which gives audio output and takes input by providing a custom profile to each user just by authenticating them through their face which saves a lot of user time, also the user can ask mirror to play music or show any live data through the internet.**

Index Terms—Internet of Things, IoT, Smart mirrors

INTRODUCTION

There is a step increase in demand for IoT-based smart home devices. With the advancement in many different sectors of life, people are now wanting to have a more advanced version of everyday things like a watch, Heart rate counter, locks, etc. This technology makes life easier and simple also the ability to use Wi-Fi through which the user can do much of the automation of the house lead to more demand for advanced devices. One such device is the smart mirror. It's a mirror but with a touch of smartness. It has a reflective surface with makes it looks like a mirror but behind it, there's a machine working and proving information and feedback to the user. The ability of the mirror to interact with its user and provide them custom tailored data daily which saves precious time for the user makes it a smart mirror by helping them solve everyday problems in a more efficient way

Advancements in smart devices make them more economical and compact for the everyday user. More and more people are making use of smart devices. When running around the clock on a busy schedule simple news watching would cost a lot of time loss for that person. The problem can be solved by using of smart mirror. Having a widget that shows all the news necessary for that person while getting freshened up in the morning would make it a time-saving gadget for that person. There can be multiple widgets like weather, songs, news, articles, daily slogans, daily task chart,

etc. Having all these things in front of the eye without unlocking your device in the morning would be beneficial in both ways i.e. healthy and time-saving. The user just needs to touch for interacting with the mirror. The device is better when installed as a display item in the respective space for its user.

LITERATURE REVIEW

In this paper, nine papers on smart mirror applications were reviewed and the outcome of each paper is given below

In [1], the authors have used a raspberry pi3b which allows them to use the mirror to its fullest for their project. Using a two-way voice assistant like Alexa by Amazon has allowed making the mirror to be very advance. The user doesn't need to even touch the mirror to interact. Simple voice commands would allow you to go through all the services the mirror has to give to its user which includes asking for the weather, daily news, stocks, music, maps, etc. Even a conversation can be carried out with a smart assistant while looking and getting ready in front of the mirror.

In [2], the authors have used raspberry as the main controller along with peripherals and a slave controller. Here the smart mirror has security fractures which drastically increases the security, unlike other mirrors. The mode of authentication is through facial, voice, and biometrics. The mirror by default acts as a simple mirror but once authenticated the mirror opens up all the services it has to offer to its user. By using cloud-based firebase cloud. It can get connected to multiple sensors around the house. Hence it can alert the users if gets irregular patterns of temperature and humidity around the user. By using a music module it can play music too. Having gesture control the user does not need to control the music by touch every time. It can have a Chabot [google assistant/WhatsApp Chabot] that can communicate with the user and by giving it pre-defined chat commands the user using their mobile can command the mirror to provide the service. Here the mirror is connected through Bluetooth to sensors around the house and the music system. It can also provide daily news, time, etc; it is available by default in the general smart mirror. The gesture control can be used by the user for better navigation with no touch.

In [3], the authors used raspberry pi as their main controller. They have provided a screen customization option to the user where the user can select the widget they want and even the theme of that widget. Using PI-Cam and IDS, the mirror can send an alert to the user if there is any bulgier in the home. The pi cam monitors continuously and sends a picture along with a timestamp to the user on their mobile. YOLO along with open-cv is used to provide a mirror with the ability to detect an object. The usage of YOLO is proven to result in more precise output for object detection. The main purpose of the author here is to make a smart mirror along with the ability to be an undercover surveillance camera.

In [4], the authors have provided an emotion monitoring system that consists mainly of Chabot, face recognition, speech recognition, and posture recognition. It is done to understand the user's emotions. The addition of voice recognition has greatly increased the quality outcome to determine the emotion. Voice recognition is based on a machine learning process using the RAVDEES dataset while facial recognition is based on Kaggle's FER 2013 dataset and the Chabot is based on google speech API. Hence the final output is a smart mirror that can understand the user's mood precisely compared to simple facial recognition and helps in daily life with accurate tailored output.

In [5], the authors have focused on a posture-analyzing model where the mirror required users to match their position along with marked points on the screen. Here, first, the profile of a new user is created and their posture is analyzed and a report is made. Through facial recognition, the user's profile is activated. A new user is asked general questions based on their age, lifestyle, chronic pain history, etc. This helps in creating a more accurate report of that respective user. To allow the user to correct themselves in front of the mirror by aligning themselves along with the mirror is done through the PAA model. It's the backbone of this architecture, also the camera can analyze the skin condition of the user using Hue filters to determine predefined skin colors. eg: red color on the skin means infectious zone on the user. All this information is updated on daily basis depending on the user's usage on daily basis. This mirror helps to keep the user's posture in proper condition which would help in eliminating chronic pain in the back and also detect any visible skin infection is exposed rather than being under clothes.

In [6], the authors have used a raspberry pi as their main controller along with Arduino UNO as their secondary controller. The main circuit is connected to different peripherals like a camera, mike, speakers, and other sensors. The Arduino Uno is connected to GSM and an Ultrasonic sensor proximity sensor. The user is given an option for emergency calling in case of an unfortunate incident. To conserve the power, the mirror is switched off/sleep mode until its proximity sensor does not sense anything in front of the assistant included in this mirror can have a voice conversation with the user while providing all the necessary information on the screen.

In [7], the authors have used raspberry pi as the MCU along with a central pc. The components of the audio, video and motion detector are under the central pc while the humidity and temperature sensors are under the MCU. The mirror continuously monitors its environment through the sensors and if any usual reading is found it may turn it off to protect the components from getting damaged due to external stimuli. The mirror is also made to work efficiently when switched on and on not receiving any command from the user it stays on for 2 mins after which it goes to sleep mode. This greatly reduces the energy usage of the display. The mirror has a reference image in which a person is detected as an object. The camera, while the display is off, takes a pic every 30 seconds and compares it with the reference image. If the user is found the display is turned on or else it continues to monitor silently.

In [8], the author has used raspberry pi along with stm32 as the secondary controller. Different modules are used for different purposes like SYN6288 for speech synthesis, an HC-05 port for Bluetooth connectivity to wireless sensors, an X202-232 API for wireless TX/RX, and clock module PCF 8565 is used. The mirror has smoke, and carbon monoxide and it also has a pyroelectric sensor to monitor its environment. Here the user is not only able to interact with the mirror but also see the room's reading. In case of any irregularities occurring in the readings, the mirror shall alert

the user. It can be used as a fire/smoke alarm as well or gas leak alarm.

In [9], the author has created a mirror with the sole purpose of health and well-being. The mirror is made to aid the user in exercising daily and properly. The machine here is fed a video of a person doing exercise which acts as a base video. The machine learning model learns to trace the joints of the body with every movement. The user can select to exercise out of many pre-installed videos in the mirror's system. The mirror first calculates the distance from the user to itself and tries to align the user's joints with the videos. If a user is standing improperly way the mirror shall ask the user to properly align with the humanoid body as seen in the mirror. When the function starts, it continuously monitors the movements and compares the accuracy for perfect body movement of the user along with the video person. This way the user can exercise properly without the need to have to step outside for gym or yoga class. As the algorithm continuously detects and helps the user to be in proper posture and alignment with the joints of humanoid the body, the chances of doing exercise in the wrong way have vanished. Thus, saving time and energy.

CONCLUSION

With an increase in technology, devices are becoming smarter day by day which is increasing the productivity of humans in one way or another. Here, the smart mirror can do multiple tasks successfully to help its user in the day-to-day task. It also acts as a burglar alarm system or smoke/gas/fire detector. It can also be used for health monitoring or exercise guidance. The use of smart mirrors increases every day with advancements in the technology of AI, ML, and sensors, which aids this device in working effectively. is the future, we may use Augmented Reality too where the user can stand in front of the mirror to try on clothes without the need to change them actually which would make it just a more time-saving device. Also, the upcoming mirror using raspberry pi as the main controller is cost-effective for the user side too. Hence it is easy to acquire the mirror for making life easier and more futuristic.

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