WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Smart Mirror: A Modern-Day Mirror

Prof.Nandini N[1], A Anagha Bhat[2], Eshwari S Gowda[3], Sangeetha N S[4], Vaishnavi S[5]

[1] Asst.Professor, Electrical & Electronics Engineering, Rajrajeswari College of Engineering

[2,3,4,5] UG Students, Electrical & Electronics Engineering, Rajrajeswari College of Engineering

ABSTRACT—

The Smart Mirror is an innovative interactive system designed to integrate everyday personal grooming with real-time digital information. This project utilizes a two-way mirror combined with a display panel and a microcontroller/mini-computer to present essential data such as time, date, weather updates, calendar events, and news feeds. The system incorporates sensors and voice-control capabilities to enable hands-free operation and improve user convenience. By combining hardware and software elements—including a reflective display, IoT connectivity, and a customizable user interface—the Smart Mirror enhances daily routines while demonstrating practical applications of embedded systems and smart home technology.

Index Terms—Internet of Things, IoT, Smart mirrors

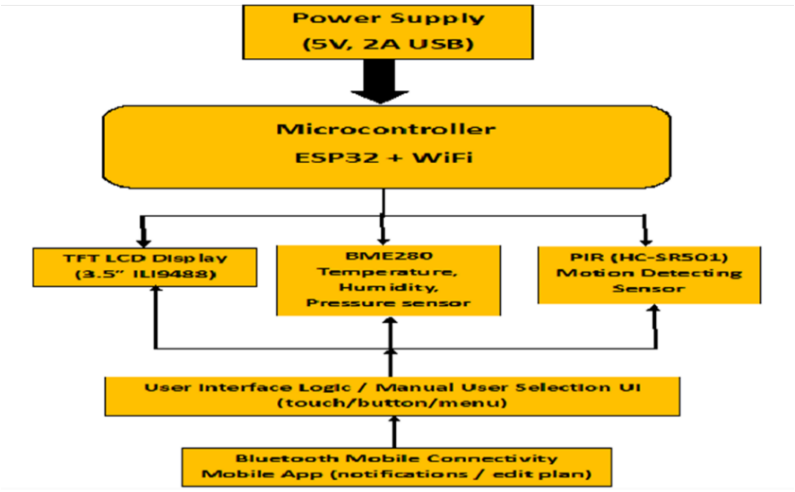
INTRODUCTION

The Smart Mirror is an intelligent system that combines a regular mirror with digital display technology to deliver real-time information to the user. By placing a screen behind a two-way mirror and integrating it with microcontrollers, sensors, and internet-based services, the Smart Mirror provides useful content such as date, time, weather updates, reminders, notifications, and personalized data. This project aims to demonstrate how everyday household items can be enhanced using IoT and embedded systems to create a more convenient, interactive, and efficient user experience. The Smart Mirror serves as a practical example of how modern technologies can improve daily routines and bring smart home concepts into reality..

The primary goal of this project is to explore how embedded systems, IoT components, and user-centered software design can be combined to develop a functional Smart Mirror prototype. By integrating modules such as microcontrollers, a two-way mirror, a display panel, and internet-enabled services, the Smart Mirror is capable of showing real-time weather data, date and time, reminders, calendar events, news updates, and other personalized content. This hands-free interaction makes the device both practical and efficient, particularly in environments like bedrooms, bathrooms, and dressing areas.

BLOCK DIAGRAM

The main circuit used in the project is raspberry pi 3b+ along with other peripherals that include Raspberry Cam, USB mic, Display, and Speaker.



ESP32 Devi kit

ESP32 Devi kit is the brain of a "Magic Mirror" - that displays information such as news, weather, and calendar events. The ESP32 Devi kit can handle running the necessary software to display this information and drive the display. It is powered by a 64-bit quad-core ARM Cortex-A53 CPU clocked at 1.4 GHz. This processor is much faster than its predecessor, making it more capable of handling demanding tasks.

TFT LCD Display

A TFT LCD display in a smart mirror works by being placed directly behind a two-way mirror, where the mirror reflects most light like a normal mirror, but still allows enough light to pass through from the TFT screen so that information such as time, weather, or notifications becomes visible when the display is on, and remains hidden when it's off; the TFT panel provides bright, high-contrast output that can shine through the semi-transparent mirror layer while being controlled by a microcontroller or mini-PC to show dynamic content.

Ultrasonic sensor

Ultrasonic sensors work by sending out sound waves at frequencies higher than humans can hear (typically 40 kHz) and then measuring the time it takes for the waves to bounce back after hitting an object.

BME280 sensor

A BME280 sensor can be used in a smart mirror to continuously monitor indoor environmental conditions—temperature, humidity, and air pressure and display them in real time on the mirror's interface; the sensor connects to the smart mirror's microcontroller

Two-Way Mirror

For the screen to work like a mirror. A dark Acrylic sheet is used which when put on the screen shows the reflection of the user while also showing the GUI of the screen behind the sheet. It is not costly and the maintenance of this sheet is very low. An extra clear sheet of dark acrylic is used here to give HD vision experience to users of the GUI.

Power Supply

The Raspberry Pi 3B+ requires a 5V DC power supply with a minimum of 2.5A. This is because the 3B+ model consumes more power than its predecessors due to the additional processing power consumed and features. An adequate power supply is important because the Raspberry is connected to other peripherals and needs the power to do the tasks assigned

MODULES

There are many modules used in this project. Each module serves its independent aim to the user. Modules servers are an essential part of this project. An Internet connection is needed for the modules to work properly.

Clock

This module is used to display the current time to the user. It is available in both analog and digital clock formats.

Event Calendar

This module is more toward the upcoming event. Hence, it is said an Event calendar module.

News

The news modules show the headline of the news that is displayed on the news pages. The news module is actual showing headlines that can be seen by the user for a couple of seconds before it transitioned to the next headline.

Humidity

The module's aim is to show the amount of water vapor present in the air. It's usually expressed as relative humidity (RH), which tells you how much moisture the air contains compared to the maximum it can hold at that temperature.

Face Detection

The module is used to create custom profiles of multiple users and show custom module profiles made for each respective user. When the user comes in front of the camera the mirror switches from the general profile to the user's profile and shows the requested module by the user. The user can select which modules to be shown in the config file of the mirror

Weather

The weather module shows the weather along with the upcoming weather status to the user. A mini logo representing the sun, cloud, etc is used to bring more liveliness to the interface.

Greetings

The module is used to greet the user and show different positive messages to the user.

WORKING

The Smart Mirror operates by combining a two-way reflective mirror with an embedded digital display and a microcontroller or single-board computer such as a Raspberry Pi. When powered on, the display projects essential information—such as the time, date, weather updates, and notifications—through the semi-transparent mirror surface, allowing users to view both their reflection and the displayed data simultaneously. The system connects to the internet via Wi-Fi to fetch real-time information from APIs, which is then processed and presented on a custom-designed graphical interface. Additional components such as sensors can be used to detect user presence and automatically activate the display, improving energy efficiency. The Smart Mirror software continuously updates the information at set intervals, ensuring that users always receive current data without any manual interaction. Overall, the Smart Mirror functions as a seamless blend of hardware and software, providing a hands-free, visually appealing, and interactive information display integrated into an everyday object.

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. Which would make it just a more time-saving device. In addition, the days the mirror would become more advance, and useful to the industry, and individuals. Having multiple modules of software at a glance allows users to be more productive in everyday life with a little lesser effort.

REFERENCES:

[1]. S. Kothari and P. N. Simha, “REFLECTA — Artificial Intelligence Based Smart Mirror,” International Journal of Innovative Technology and Exploring Engineering (IJITEE), vol. 8, no. 6S4, 2019.

Annotation: Practical implementation of a Raspberry-Pi based smart mirror with AI features; useful for system-level comparisons and inspiration for voice/AI add-ons.

[2]. “IoT Smart Mirror” — IARJSET / IARJ (conference paper / project PDF), 2022.

Annotation: Example implementations integrating PIR, sensors, camera, and voice — useful for methodology and hardware selection rationale.

[3].Chew, G., & Stadelmann, K. (Year). Smart Mirror: Final Report. Kastner Research Group.This final report provides details on hardware selection (Raspberry Pi, monitor, two-way acrylic) and cost efficiency, which can be useful for project justification.

[4].G. Coulby et al., “Toward Low-Cost, Multimodal Environmental Monitoring,” (accepted manuscript) — review and validation of low-cost environmental sensors including the BME280. Sensors / environmental monitoring literature.

[5]. Smart Mirror E-health Assistant – Posture Analyze Algorithm by Biljana Cvetkoska, Ninoslav Marina1, Dijana Capeska Bogatinoskon IEEE EUROCON 2017, 6–8 JULY 2017, OHRID, R. MACEDONIA.

[6]. 2018 4th International Conference on Computing Communication and Automation (ICCCA) by Ayushman Johri, Sana Jafri, Raghav Narain Wahi, and Dr. Dhiraj Pandey.

[7]. 2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (Com-IT-Con), India, 14th -16th Feb 2019 by

Varsha Singh and Devi Singh.

[8]. 2020 Joint 11th International Conference on Soft Computing and Intelligent Systems and 21st International Symposium on Advance Intelligent Systems (SCIS-ISIS) by Seoungtak Kim, Dasol Seo, Ssangyong Lee, Yeonjun Kim, Hyun Wook Kang, Yong-Sik Choi, and Jin-Woo Jung.

[9]. 2020 IEEE 9th Global Conference on Consumer Electronics (GCCE) by Noriki Ikeuchi, Erika Sakai, and Hidekazu Suzuki.