Design and Implementation of Smart Mirror for Health Monitoring

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ABSTRACT
Current generation devices are loaded with intelligent features. Intelligence is embedded in them to act wisely in the environment provided. Mirrors are basically used at home for grooming and getting ready for the day. The same mirror can act intelligently to provide security and monitoring in deployed environments. A smart mirror is a system that not only works like a regular mirror, but also provides security against intrusion into your home. The Raspberry Pi[22] module takes over full control of the smart mirror. This smart mirror is implemented with peripherals such as an LCD screen, a microphone, a speaker, a bi-directional acrylic sheet covering the LCD screen, and powered by a Raspberry Pi. Smart mirror features are city weather, latest news, date and time. People today are strongly attracted to smart devices. The invention of smart technology and smart devices is growing in popularity, especially among young people around the world. The ability of smart mirrors to view valuable insights and data without unlocking the smartphone has attracted a lot of attention from different regions of the world. It is a device that is applied and used in various fields such as clothing stores, barber shops, beauty salons, shopping malls, hospitals, and even in cars, in addition to home use. Growing demand for smart mirrors from various sectors is creating more opportunities and greater scope for the smart mirror industry.

Keywords
Smart Mirror, acrylic, invention, automobile, commercial, module.

1. INTRODUCTION
The paragraph describes a modern digital mirror that showcases a variety of information, including the current time, weather updates, scheduled appointments, and news headlines. This smart mirror, which is based on the Raspberry Pi module, offers personalized widgets based on individual preferences and collects real-time data for display. It is a two-way mirror with an electronic display behind the glass that provides hands-free access to relevant information, making it an ideal product for multitasking Individuals who want to stay connected on the go.This intelligent mirror system integrates various concepts and methods from existing systems and adopts a service-oriented architecture for the development and deployment of different services. It uses web services communication mechanisms for mirror interfaces and message feeds, making it a reliable and easy-to-use interactive system for home use. Despite the many advantages of the smart mirror, such as its convenience and accessibility, it does not support gesture control.

2. LITERATURE REVIEW
This article presents the development of a smart mirror using a Raspberry Pi as the host controller for Internet of Things (IoT) applications. The Raspberry Pi system is connected to a network via Wi-Fi and receives weather forecast information from the API network interface. This information, along with other details such as the time and date, is displayed on the screen using an information plasma display [4]. Users can interact with the mirror by askingit about the weather, news, and time, and it can automatically acquire and transmit the corresponding information from the network. The designed smart mirror is small in size, easy to operate, and has a low cost, making it a promising option for various applications. However, one drawback is that it does not support gesture control, which could make the mirror more interactive.

2.1 Interactive Mirror
On June 7, 2021, Vaibhav Khanna, Vash Vardhan, Dhruv Nair, and Preeti Pannu proposed an interactive mirror with appropriate built-in intelligence to provide city weather, latest news and headline updates, local time It provided advanced features such as corresponding local time. position. Smart mirrors can help develop smart homes with built-in artificial intelligence and find applications in the industry. Artificial ambient intelligence (AmI) is the technology used in the proposed smart mirror with 80% accuracy. [1]

2.2 Intelligent Mirror
Chidambaram Sethkarasi et al. (2016) used facial recognition technology to identify users, emotion recognition, progress plots of measured health parameters, size identification, clothing identification, appropriate color clothing suggestions, critical We created an intelligent mirror that provides services such as event reminders. Their paper does not address any of those themes, but attempts to unify the ideas under the smart mirror concept. [2]

2.3 Smart Mirror System
M.M. Yusuri has developed a smart mirror system that allows other users to access information and control the lights in their home. Track relevant information such as date and time, weather, alerts, traffic conditions, maps, and more. This system uses Sonus technology as the medium for interaction between humans and systems. Therefore, the user must verbally give instructions to the system and get the system's response. Sonus is a speech- to-text library that allows you to quickly and easily add her VUI (Voice User Interface) to any hardware or software

project. With this smart mirror system, users can conveniently manage their daily activities and solve many problems of managing homework because the system was not partially implemented. [3]

3. PROPOSED SYSTEM

The smart mirror is designed with a two-way mirror and an electronic display behind it, which can show various widgets, such as weather updates, time, date, news, and even songs. It is a useful product for busy individuals who want to stay informed while multitasking on the go. The project's objective is to provide people with quality time in front of the mirror by displaying relevant information.

3.1 Technical Specification

3.1.1 Hardware

- Two-way mirror
- Speaker
- Mic

3.1.2 Software

- Raspberry Pi
- Mirror OS
- API Integration

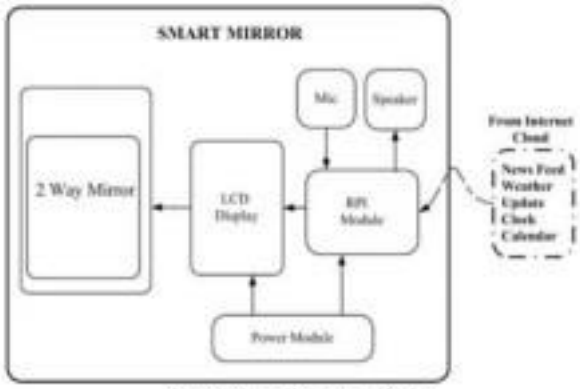


Fig.1 Block Diagram of the Proposed System

4. METHODOLOGY

This project is divided into 4 categories according to the amount of work involved: Design, microcontroller programming, display programming and manufacturing. [10]

4.1 Design

4.1.1 Dimension

During the design phase, the most crucial step was to determine the dimensions of the mirror. This was primarilydependent on the size of the monitor chosen for the display. To ensure that there was no competition for space between the display element and the reflection, we decided that a mirror large enough was necessary. After considering various options, we settled on a size of 20" x 30", which not only looks great but also works effectively.

4.1.2 Frame Construction

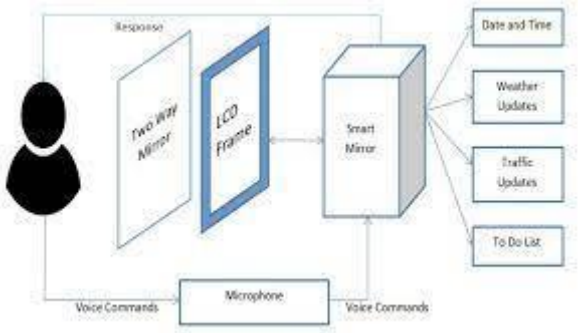
It became necessary to design a frame that included both the mirror and the electronics behind it. We chose this material as a design solution because wood frames are standard for most mirrors. After some browsing, I settled on a 2x3 construction as I realized I needed a sturdy piece of wood due to the weight and volume of the contents of the mirror. Bolting into a box shape provides strength and depth to accommodate our materials.

4.1.3 Microcontroller type (Raspberry Pi 4 Microcontroller)

The flexibility in our design allowed us to choose from various microcontrollers that met our programming requirements. After considering several options, we decided to use the Raspberry Pi 2 due to its popularity, functionality, and the availability of numerous tutorials and guides online.

4.1.4 Display elements (Date, Time, and Weather display widgets)

They consist of visual applications that you have chosen to form your ad. From the beginning of the project, I wanted to at least display the date and time. However, we thought it would be functional and visually appealing to also display the weather forecast for the day. It was a combination of these three that ultimately made our design.



4.2 Microcontroller Programming

4.2.1 MIRROR-OS setup

To achieve the minimal display of the smart mirror, the controller had to be programmed to boot the mirror OS first[24]. I decided to run the display on a standard operating system, so I needed the Raspberry Pi operating system. To actually get this to work, I had to create a file on the Pi and use a terminal program to write the appropriate code.

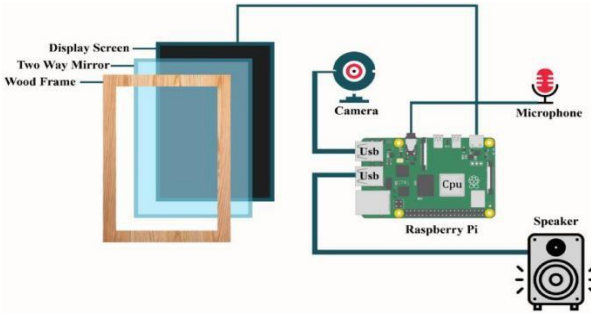
4.3 Fabrication

4.3.1 Two-way Glass

We had to install a real mirror. The aforementioned overlapping panels allowed for a hassle-free installation, with the glass carefully inserted into the frame itself, and behind themirror itself he screwedin two blocks of wood to secure it. The glass is basically sandwiched between the rear block and the front overlapping fairing.

4.3.2 Electronics

The final step in the manufacturing phase was the installation of the electronics that power the mirrors. I assembled the display monitor against the glass. Next, mount the Raspberry Pi on the glass and connect the necessary cables.



5. SYSTEM IMPLEMENTATION

Voice commands are used to start and run services. Voice-based systems are preferred over touch-based systems for two reasons. One is that it's cheap, and the other is that the user doesn't have to be near the mirror, just somewhere within audible range. [14]

5.1 Hot-word Detection

Hot words are keywords or phrases that your computer is constantly waiting to trigger other actions. Common uses for hotwords include Alexa, OK Google on some Android devices, and Hey Siri on iPhone. Hot words are used in smart mirrors, where the system listens for commands to trigger actions such as displaying the weather, updating news feeds, stocks, and more. Once the system is up, all voice commands that control actions are processed online by the Google Cloud Voice API. [17]

5.2 Speech to Text Conversion

We used the Speech Recognition API (SR) to recognize the user's voice commands and convert them into text messages. These text messages are required to call the required services. SR can be from speaker-dependent or speaker-independent systems. A speaker-dependent system is trained on a specificuser's voiceand recognizes speech based on the voice's unique characteristics. She used only one language library, Google Cloud Speech API.

Google Cloud Speech API is a speech recognition API that allows you to apply powerful neural network models to convert speech to text. This API recognizes speech in over 90 languages and their variants to support a global user base. Transcribe user text, voice commands and controls, or audio files that you dictate into your application's microphone. [11]

5.3 Services

5.3.1 5.3.1 Auto Sleep Service

In this mode, the smart mirror works like a regular mirror. The service runs in the background, with slower performance, but can be reactivated later usingthe wake- up voice command. The auto sleep service is implemented locally to keep the device idle for a specified amount of time.

5.3.2 Weather

The weather information is displayed for a week along with metadata such as sunny, cloudy, clear sky or rainy. The weather information is obtained via the API provided by the site Forecast.io using push communication model at pre-defined intervals for up-to-date information and displayed to the user. It takes the following parameters: Geolocation Service, Refresh Interval. [20]

5.3.3 Maps

It allows users to search for any location on the map around the world. Similar to weather, we use push technology to get traffic and public transportation information from Google Maps.

5.3.4 YouTube

YouTube is a well-known website that provides users with free video sharing services. To ensure seamless video playback without frame drops, a pull communication model is used to retrieve videos. To retrieve videos from YouTube, the API must be called with specific parameters, such as the query and voice service.

5.3.5 Calendar

Calendars allow users to organize their daily activities. Calendar is designed to be transport protocol agnostic and uses Secure Socket Layer (SSL) to protect sensitive information from other users. [18]

5.3.6 Reminders

Users can set notifications and create lists of items they want. Synchronize data between user devices and the cloud. Reminder items are labeled to prevent duplication of information. The Reminders service is implementedlocally and calls the Reminders APIto sync data.

5.3.7 Greeting Messages

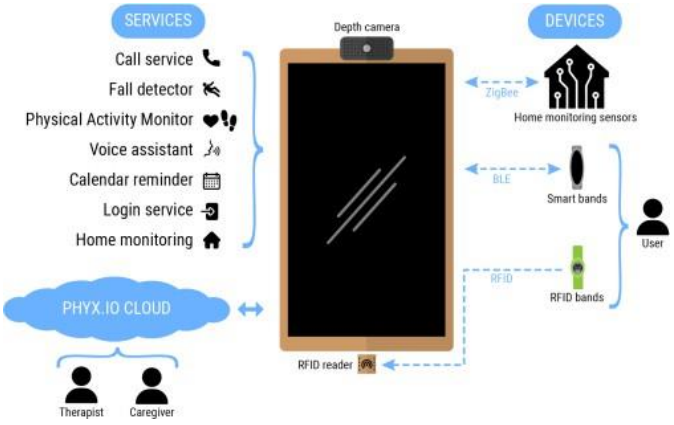
The welcome message is a message that can be personalized to the user's liking. This means that when the user turns on the mirror, a customized welcome message, which includes the user's name, will be displayed on the screen. Additionally, the message can be configured to display different welcome messages based on the time of day, such as morning, noon, and night.

5.3.8 Spotify

Spotify is an onlineplatform that providesusers with access to millions of songs, podcasts, and videos created by various artists around the world. This feature is made possible by using the Spotify Web API, which allows developers to integrate Spotify's functionality into their own applications. [16]

5.3.9 News

The Smart Mirror will have a news functionalitythat displays the latest news on the screen. This feature is enabled by utilizing the News API, which enables developers to integrate news content into their applications. [19]



6. CONCLUSIONS

Our smart mirror system integrates existing system concepts and methods to realize new applications of smart interaction technology. This reliable and easy-to- use system is designed for home use and offers many benefits. Develop and deploy a variety of services such as mirror interfaces and news feeds using a service- oriented architecture.[13] All use the web services communication mechanism. Additionally, the system includes sensors that detect the presence of people and reduce

power consumption by displaying information only when needed.

Smart mirrors have the potential to revolutionize the field of IoT[12] and home automation. In addition to serving as a standard mirror, they offer a range of additional features such as weather updates, calendars, timekeeping, and music playback, making them a desirable addition to any home. Furthermore, the mirror's functionality can be extended by connecting it to other home appliances and mobile devices. Smart mirrors serve as an excellent example of how AI can be incorporated into consumer electronics to make our lives simpler, more efficient, and enjoyable. With further AI upgrades, smart mirrors have the potential to become even smarter in the future.

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