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Advanced Open Source Raspberry-Pi Powered Digital Photo Frame using IOT

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ABSTRACT: As smartphones evolving day by day, Images have become so important in our lives, and more and more are taken every day. Due to our busy schedule, we can't able to see all the photos often. If it's in our smartphone, when we find some time, we can see them but as years passed, we have pile of pictures and all of them hardly we remember. More photo frames in the home/office leads to difficulty of maintenance and prone to damage. Hence, we came up with a solution called Advanced open-source digital frame. Digital picture frames are really nice because they let you enjoy your photos without having to print them out. Plus, adding and removing digital files is a lot easier than opening a traditional frame and swapping the picture inside when you want to display a new photo. Even so, it's still a bit of overhead to remove your SD card, USB stick, or other storage from a digital picture frame, plug it into your computer, and copy new pictures onto it. An easier option is a digital picture frame that gets its pictures over Wi-Fi, for example from a cloud service. We are going to add motion sensor and light ambient sensor for effective control of display.

KEYWORDS: IOT, Digital Photo Frame, Raspberry pi, Cloud services, Opensource

I. INTRODUCTION

Everyone wants to live comfortably in this world. In today's situation people require connectivity and easy access to information. Every individual wants to keep informed about global events through the internet or television. The internet of things (IOT) is a concept which refers to the internet connecting computed devices embedded with ordinary things that enables the transfer of data. The continuous growth of the internet of things expands its applications like transforming a house into a smart house and developing it into smart cities. A smart home or smart city is the one that connected to internet and enables the communication of smart gadgets. Our way of living has change to the point where the basic objective is to increase our time According to the International Telecommunication Union (2013), the concept Internet of Things (IOT) is defined as a global structure for society that enables Internet service to connect to physical matter based on information and communication technologies available. IOT came into existence with a broad perspective and it quite brings a huge implication of technology in society. Along with the developing technology, several information can be found easily and the Magic Mirror, Smart Home has been widespread increasingly. The magic Mirror system which is implemented based on the concept of Internet of Things (IOT) specifically to allow people to manage and control home appliances through voice commands. Magic mirrors are developed when a conventional mirror is transformed into an interactive information display item with unique interaction capabilities. Because we use mirrors on a daily basis, they are a perfect example of a natural interface.

II. LITERATURE SURVEY

Michael Teeuw [1] was the first person to set up a smart mirror and introductory to use a raspberry pi for this function. It was just an information panel which didn't have the ability to contact with the mirror. A module-based interface was made and on displayed climate, news, time or daily comic strips.

In 2003 Phillip discover the Mirror TV that was developed using the same principles of smart mirrors. Their product was a normal TV that was put behind a two-way mirror so that the TV would appear as a mirror when turned on and as TV when turned on. They had an option to have the mirror would be larger than the TV. A usage part presented by Phillips was to have the kids watch cartoons while brushing their teeth at the same time.

Biljana Cvetkoska, Ninoslav Marina, Dijana Capeska Bogatinoska, “Smart Mirror E health Authority – Posture Analyse”[3], Presented as, Many different kinds of smart assistants and technologies, such as virtual assistants, smart phones, and wearables, existed today with the goal of coordinating and optimizing people's daily activities all over the world. The primary target of smart assistants is on basic human needs, such as browsing, scheduling, navigating, and other comparable tasks. However, few intelligent assistants are concerned with human health in general

To improve learning, smart mirrors can be used to expose different academic information. By exposure the data on the mirror, it will make it simple for users to access the information. This product is connected to the administrator device; it can create and change the data. Approval will correspond to various time slots [4]. Hannah Mittelstaedt [5] made a home mirror. It was posted on the reddit website. Home Mirror is a kind of smart mirror that is simple to set up than other mirrors as it need just two main elements, any android mobile phone or a tablet and a mirror.

III. PROPOSED METHODOLOGY AND DISCUSSION

ARCHITECTURAL DESIGN:

The proposed system is a magic mirror using raspberry pi which provides both mirror and computer aided information services to its users. Main goal is to implement the home automation. Microcontroller cards which are present in raspberry pi, are connected to the internet and take information from the internet can show this information on the places located on the mirror. For making this personal assistant a Google account is required. Using the Google Assistant, the Google function and Google skills using skill kit will be created. Magic mirror provides the features using third party APIs.

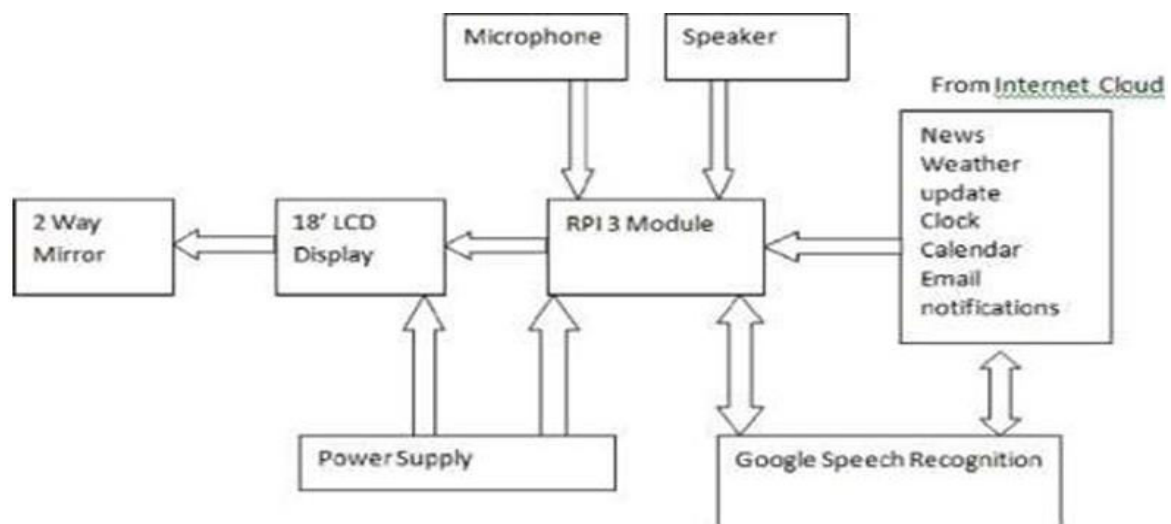


Fig: Architectural design of proposed system

METHODOLOGY:

We plan to develop and design the smart mirror which provides a new experience to the user while using the mirror. Our proposed magic mirror consists of a high-quality one-way mirror, lcd monitor, raspberry pi, sensors, raspberry pi modules, cables and connectors. A wooden frame is used to cover the hardware attached to the mirror. we attach monitor and raspberry pi, microphone, speaker and sensor behind the mirror. the power supply is attached to the raspberry pi which is used to power the monitor and sensors

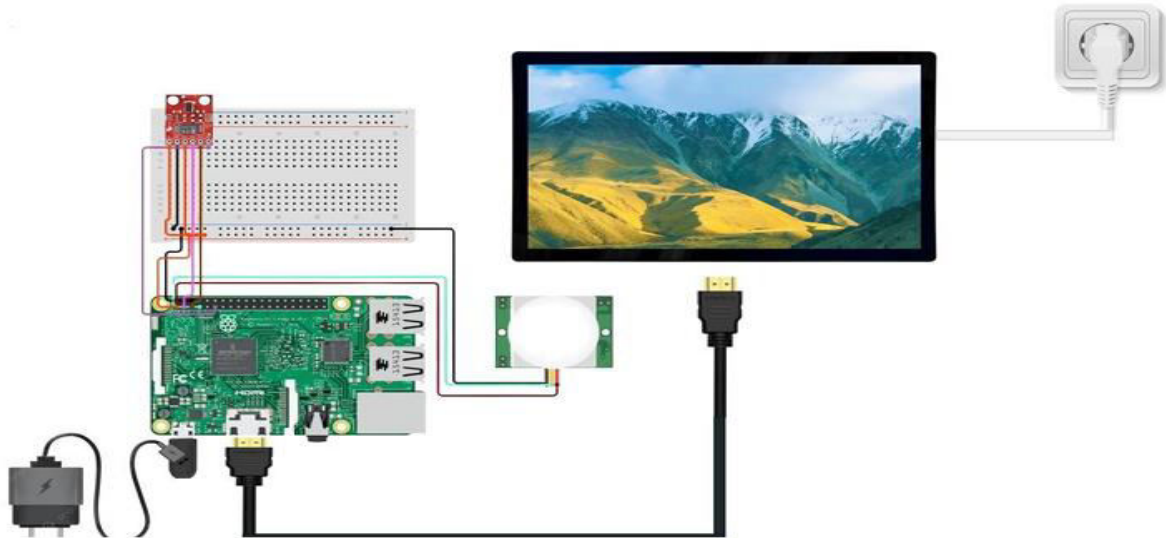


Fig: Connection diagram of proposed system

This magic mirror implements home automation which means it controls all the smart devices present in home through voice commands. In this magic mirror we use the software called node.js to develop the application along with use of languages like python and JavaScript as server-side languages. The proposed magic mirror performs these activities:

1. A high quality screen displays the user real time image connected to google account photos platform along with user interface to perform activities.
2. Real time with calendar date is shown in one part of the screen.
3. Customized regional calendar is getting showcased under the real-time widget.
4. Location based weather information which is fetched from open weather map API.
5. Forecasted weather information up to 5 days will be shown as well.
6. We can see the latest news fetched from international wide news coverage open-source News API platform; we can scan the news article through QR code for quick access of news articles.
7. Through gesture sensor, we can give various inputs to display for multiple customized actions and we can see the moon phase in real time.
8. Sending a personal message from mobile to display can be performed after connecting to smartphone.
9. Entire widgets can be turned on or off through smartphone.
10. Display brightness, turning off display for certain period of time, shutting down the system and even rebooting the entire system can also be possible with smartphone.

IMPLEMENTATION:

In this photo frame we use various modules from python for development of application. JavaScript is the primary language in which all the software is built up on. JavaScript is used for creation, linking and accessing all the modules that are used in the magic mirror.

1. Connect the hardware components as per the circuit diagram.
2. Download the Raspberry Pi, Raspberry Pi imager software from official websites.
3. Using the Raspberry Pi imager, install the OS in the SD card.
4. Mount SD card into Raspberry pi, connect to display, provide power supply.
5. On successful boot we can able to access the Raspberry Pi OS GUI.
6. Clone and install the magic Mirror code into local system
<https://github.com/MagicMirrorOrg/MagicMirror.git>
7. Using this link install the magic Mirror and make the magic Mirror running
<https://github.com/MagicMirrorOrg/MagicMirror.git>
8. Create or use Google account and add photos in Photos platform.

9. Clone & install the MMM-Google Photos module into the magic Mirror module by following this link. Make sure use setup the Google photos API for this project <https://github.com/hermanho/MMM-GooglePhotos/blob/master/INSTALL.md>

10. Create a new project in <https://console.firebase.google.com> and get linked to your project.

11. Download the Regional calendar (Telugu).ics file from <https://www.drikpanchang.com/telugu/panchanga/telugu-month-panchanga.html> and upload into the Fire.

12. Configure your magic Mirror with other modules like Complements,

Date Time and PIR (<https://github.com/bugsounet/MMM-Pir>),

Gesture(<https://github.com/MMRIZE/MMM-GroveGestures>)

Smartphone Control (<https://github.com/Jopyth/MMM-Remote-Control>)

13. Once configuration is done, run the magic Mirror and we can see the required widgets.

IV. HARDWARE REQUIRED

RASPBERRY PI 4B:

Raspberry Pi is the name of a series of single-board computers made by the Raspberry Pi Foundation, a UK charity that aims to educate people in computing and create easier access to computing education.

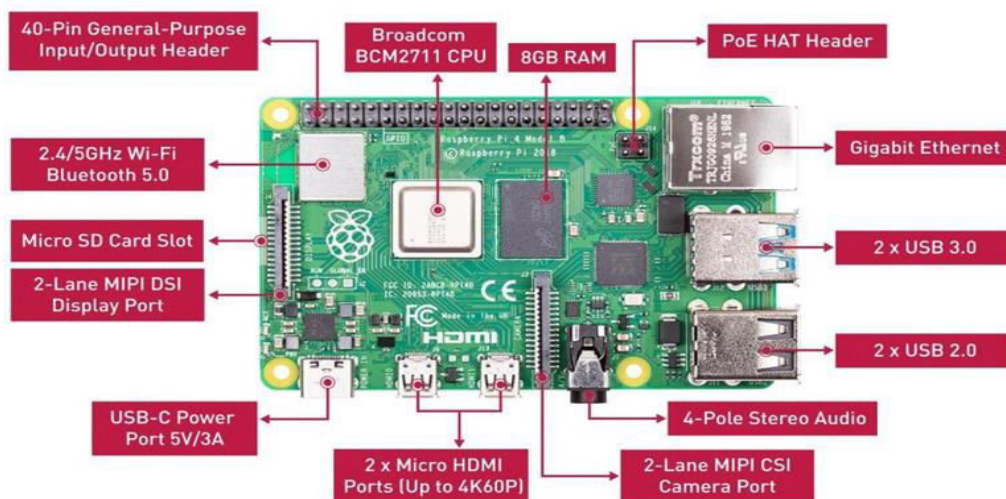


Fig: Raspberry Pi 4B board

The Raspberry Pi launched in 2012, and there have been several iterations and variations released since then. The original Pi had a single-core 700MHz CPU and just 256MB RAM, and the latest model has a quad-core CPU clocking in at over 1.5GHz, and 4GB RAM. The price point for Raspberry Pi has always been under \$100 (usually around \$35 USD), most notably the Pi Zero, which costs just \$5.

All over the world, people use the Raspberry Pi to learn programming skills, build hardware projects, do home automation, implement Kubernetes clusters and Edge computing, and even use them in industrial applications. 12 The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins, allowing you to control electronic components for physical computing and explore the Internet of Things (IoT).

The Raspberry Pi operates in the open-source ecosystem: it runs Linux (a variety of distributions), and its main supported operating system, Pi OS, is open source and runs a suite of open-source software.

SPECIFICATIONS:

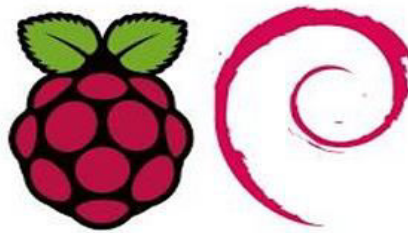
- SoC Broadcom BCM2711, quad-core Cortex-A72 (ARM v8) 64-bit at 1.5GHz
- SDRAM 4 GB LPDDR4-2400

- Wireless LAN 2.4 GHz and 5.0 GHz IEEE 802.11b/g/n/ac, Bluetooth 5.0, BLE
- True Gigabit Ethernet
- USB 3.0 ports, 2 USB 2.0 ports
- Fully backward compatible 40-pin GPIO connector
- HDMI micro ports supporting video resolution up to 4K 60Hz
- 2-way MIPI DSI DSI/CSI ports for camera and display
- Stereo audio output and composite video port, 4-pole
- Slot for Micro SD card, for operating system and data storage
- Requires 5.1V, 3A power supply via USB-C or GPIO
- PoE (Power over Ethernet) enabled (requires PoE HAT)

V. SOFTWARE REQUIRED

RASPBERRY PI OS:

The technical definition is an operating system is an interface between the hardware of a machine and the user who is using it, but what does this really mean? It means it is basically the medium using which we communicate with our computer machine. so we need some medium that works as an intermediate between us and the computer, i.e., when we press ctrl on our keyboard, it should instruct the computer what to react based on that; when we want to open some application, it should provide us a way to do so, by listing all the available applications on the system. if we want to install some program on our computer, we would be needing an OS; if we want to create a file, we need an OS; we want to delete a file, we would again be needing an OS, i.e., without an operating system we cannot use the computer hardware, we would be needing some underlying software, i.e., some operating system, using which we would do so.



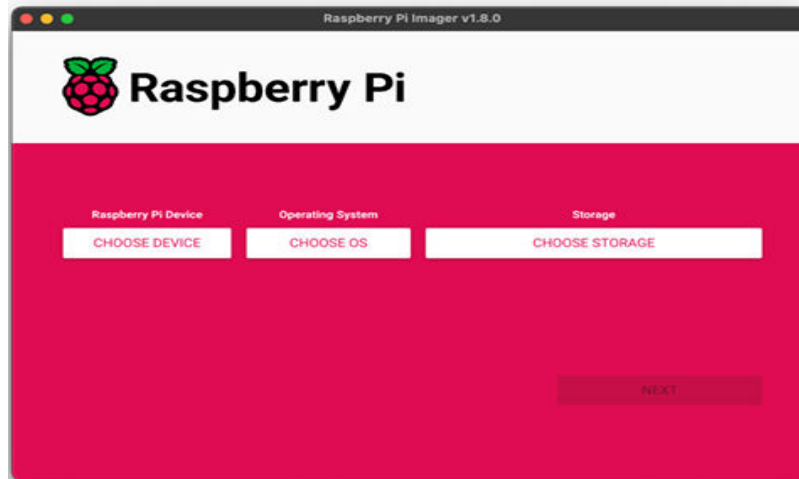
Raspberry Pi OS

RASPBERRY Pi OS

Logo Raspberry Pi OS (formerly Raspbian) is a Unix-like operating system based on the Debian GNU/Linux distribution for the Raspberry Pi family of compact single-board computers. First developed independently in 2012, it has been produced as the primary operating system for these boards since 2013, distributed by the Raspberry Pi Foundation. Raspberry Pi OS is highly optimized for the Raspberry Pi with ARM CPUs.

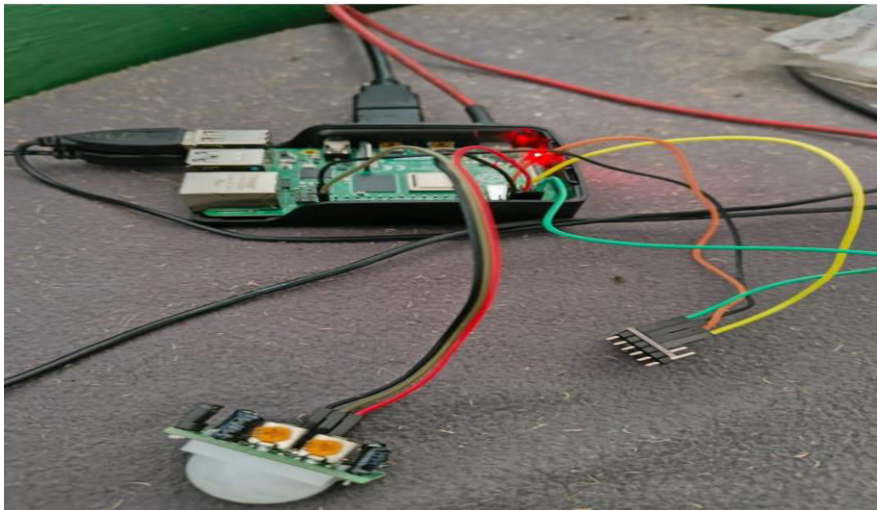
RASPBERRY PI IMAGER

One of the most important aspects of the Raspberry Pi experience is trying to make it as easy as possible to get started. Since launching the first Raspberry Pi, they added a GUI to operating system, a wizard to help you set up your Raspberry Pi the first time you boot it, and lots of books and magazines to get people up and running. Despite all these moves towards more simplicity, when it comes to microSD cards, programming them with your favourite Raspberry Pi operating system has always been a little bit tricky.



The main problem comes from the differences between the operating systems that people's main computers are likely to use: Windows, macOS, and Linux all use different methods of accessing the SD card, which doesn't help matters. And, for some new Raspberry Pi users, understanding where to find the latest up-to-date image and how to get it onto the microSD card can be a bit confusing, unless you've had prior experience with image-flashing tools such as Etcher. Raspberry Pi Imager is the quick and easy way to install Raspberry Pi OS and other operating systems to a microSD card, ready to use with your Raspberry Pi. Download and install Raspberry Pi Imager to a computer with an SD card reader. Put the SD card you'll use with your Raspberry Pi into the reader and run Raspberry Pi Imager.

VI. RESULTS AND DISCUSSION



VII. CONCLUSION

The digital photo frame designed in this project provides a new experience to society. We can see all the necessary, important information along with our photo memories. This application is an advanced technology to provide smart life to everyone. Though it has advantages it still has a room for improvement to the development of new features. This application is an advanced technology to provide smart life to everyone. It has lot of features that we can use this as a personal assistant as well, though it has advantages, it still has a room for improvement to the development of new features.

FUTURE SCOPE

This proposed system can be easily extended for frameworks such making phone calls and add face recognition to activate user information but this system is a enhancement for other existing systems. We can add voice/video calling, person- based dashboard profiles, easy navigation by providing touch screens and possibilities is limitless.

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