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Raspberry Pi medication leftovers with an automated voice alert system

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Abstract:

Medication errors can be very harmful; avoid using this Automated Medication Reminder can assist in avoiding these potentially fatal mistakes. Users can first input reminders using this feature. The system accepts different reminders with the date, time, and dosage by means of a keyboard. Afterwards, it serves as a reminder for patients to take their medications as prescribed. The Raspberry Pi is used by the system to store the time and date stamps of users' medications. Users have the opportunity to enter the dosage for every reminder. When the timer goes out, the system analyses the information and speaks the text. At fed time intervals, the medicine reminder is now spoken by the system. Patients can now benefit from a fully computerized prescription notification device. Here, a Raspberry Pi 4 model B single board system is employed, with a database created for the pill dosage along with the time and date of the reminder and the LCD will display the pre-defined drug names.

Keywords: Medication Remainder with LCD, Raspberry pi, APR33A3 Voice Module, PCFA57 I2C Module, Health monitoring.

1.Introduction:

Even though we love our patients and the elderly so much, we are unable to always watch over them in this hectic and competitive society. We are creating this project with the use of current technological breakthroughs to create a user-friendly system and save time. The pre-recorded message will be played over the speaker. Most patients generally forget to take their prescribed medications at the appointed times; they remember to take the pills, but they forget which medication to take when. This is a serious issue, and it is challenging for physicians to constantly watch over their patients. Additionally, engaging a nurse particularly for a single patient usually not an easy or readily available option in hospitals. We have developed this initiative, which can remind the patient to take their medicines on schedule, in order to prevent these issues. The main target demographic for this campaign is older people and patients. The auto voice alert system and Raspberry Pi medicine reminder offer a flexible and easily obtainable way to keep track of prescription scheduling.

This system makes use of voice recognition software and the Raspberry Pi's GPIO pins and processing capabilities to make sure that medication is taken on time. The Raspberry Pi sounds an audio alert at predetermined intervals to remind users to take their medication. By reducing the possibility of missing doses, this automated procedure encourages drug adherence and eventually improves general health outcomes. For those handling complicated medication schedules, the Raspberry Pi medicine reminder provides a dependable and effective solution with its adjustable features and easy-to-use UI.

2.Objective:

The aim of a Raspberry Pi-powered medicine reminder featuring an automated voice alarm system is to offer a dependable and easy-to-use solution for people who require help in monitoring their prescription consumption. This system attempts to provide a user-friendly and adaptable method of reminding users to take their medication on time by utilizing the voice recognition and synthesis capabilities of a low-cost, credit card-sized computer called the Raspberry Pi. Typically, the system would have speakers for audio warnings and a Raspberry Pi board connected to a display screen for the user interface. Through the interface, users can enter their medication schedules, including the drug name, dosage, and frequency of administration. After that, the system would keep track of this data and send out reminders when needed. Typically, the system would have speakers for audio warnings and a Raspberry Pi board connected to a display screen for the user interface. Through the interface, users can enter their medication schedules, including the drug name, dosage, and frequency of administration. After that, the system would keep track of this data and send out reminders when needed. For people who might have trouble reading small writing on a screen or who have visual impairments, the auto audio alert tool improves accessibility. The device will automatically sound a voice alert, announcing the name and dosage of the drug, when it is time to take it. This audio cue ensures proper and timely medication consumption by acting as a reminder for the user to take their medication.

The system may also have features like adherence tracking and drug tracking. Users have the option to record when they take their medication, giving carers or healthcare practitioners important information to track adherence trends and take appropriate action. The ultimate goal is to develop a simple, practical solution that enables people to autonomously control their drug schedule, improving their overall health and quality of life in the process.

3. Existing System:

In medical diseases to be adequately managed, adherence to prescribed medication regimes is essential. Medication reminders with display elements are only one of the many tools and techniques that can make it easier to remember to take your meds on time. drug schedule adherence is made easier with the use of drug remaining systems that have display capabilities. Typically, these systems consist of a gadget that has a digital display on it to remind users when to take their medications. They can be standalone gadgets or connected to other gear, such as smartwatches or smartphones. Users can get short and clear reminders about when to take their meds thanks to the display feature. Even more details like the name of the medication being taken or dosage guidelines may be provided by certain

systems. Those who suffer from memory problems or visual impairments may find this visual reminder especially beneficial. Additionally, a few medication reminder gadgets that have a display feature have adjustable settings. Users can set up customised medicine schedules according to their prescriptions, making sure that the reminders meet their own requirements. Furthermore, in order to accommodate complicated medication schedules, these devices could provide choices for setting several alarms throughout the day. Additionally, certain drug reminder devices that have display functions come with connectivity features. They could be linked to internet portals or smartphone apps, enabling users to monitor their prescription compliance over time. For those with long-term medical issues, this connectivity can be helpful in tracking their drug use and exchanging information with medical professionals.
To sum up, medication reminder systems that have display elements are essential for encouraging people to follow their healthcare provider's prescriptions. These devices provide users with the ability to properly manage their meds and take charge of their health through programmable settings, clear visual reminders, and connectivity possibilities.

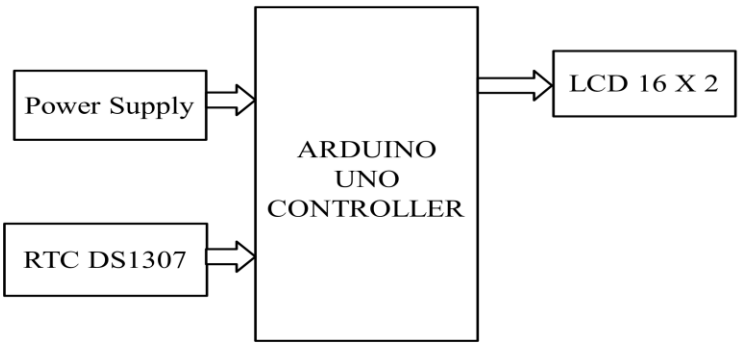

Fig: 3 Existing System

4. Proposed System:

Medication adherence might be considerably aided by a Raspberry Pi-based automated voice alert system for medication reminders. By using this approach, users can programme the Raspberry Pi to receive their prescription schedule, and the Pi will then speak notifications at certain intervals. Large passageways like hallways or common rooms can be organised using this technique without the need for subheadings. The reminder system's central processing unit is the Raspberry Pi. It activates the voice alerts and controls the medication schedule through a programme that it executes. Through an intuitive interface, which can include a touchscreen display linked to the Raspberry Pi, users can enter the specifics of their medications.

After the establishment of the medicine schedule, the Raspberry Pi keeps an ongoing eye on the system time. The voice alert system is triggered by the Raspberry Pi when it is time to take a dose of medication. The alarms can be heard from anywhere in the area by connecting this system to speakers positioned at key points along the lengthy corridor. You can personalise the voice warning to include pertinent details like the medication's name, dose guidelines, and any additional notes. This guarantees that consumers receive reminders that are precise, succinct, and suited to their particular prescription schedule.

In addition, the Raspberry Pi can have communication features like Bluetooth or Wi-Fi installed. This makes it possible for carers or healthcare professionals to remotely monitor and manage the system, allowing them to supervise medication adherence and make necessary adjustments. Overall, without the need for complex subheadings or signs, a Raspberry Pi-based medication reminder system with an auto voice alert feature offers a practical and affordable way to encourage medication adherence in wide passageways.

- The proposed system is an Raspberry Pi medicine reminder with auto voice alerts.
- It utilizes a Raspberry Pi as the central controller, integrated with IoT connectivity for remote monitoring.
- Users interact through a user-friendly interface to input medication schedules. Voice alerts are triggered based on schedules, aiding medication adherence.
- Security measures ensure data integrity, while remote monitoring allows users to adjust settings. Overall, the system offers a comprehensive solution for medication reminders, leveraging IoT and voice alerts to enhance adherence.

5.Block Diagram:

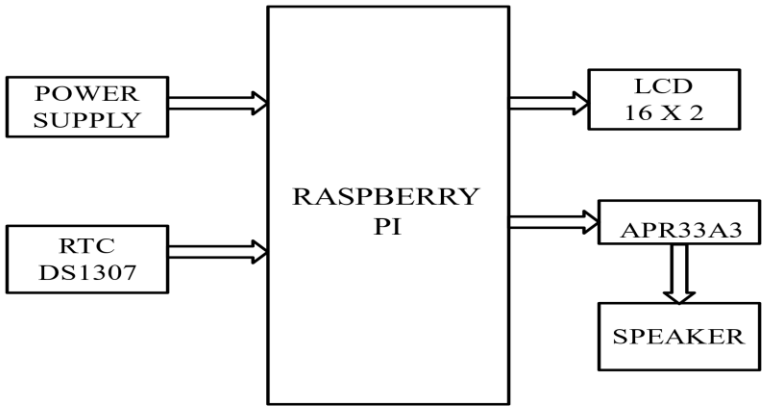

Fig:5 Block diagram of Raspberry Pi Medicine Remainder With Auto Voice Alert System

5.1 Schematic Diagram:

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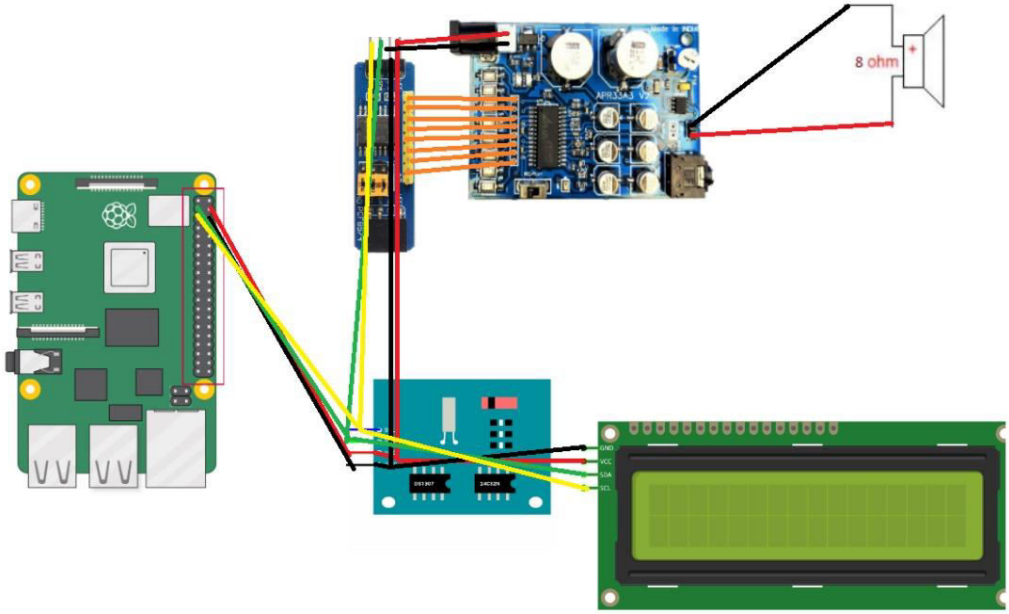

Fig:5.1 Schematic Diagram

5.2 Hardware components:

5.2.1 Raspberry pi:

The Raspberry Pi 4 Model B is the fourth-generation single-board computer (SBC) developed by the Raspberry Pi Foundation. Released in June 2019, it brought significant improvements in performance, connectivity, and versatility compared to its predecessors.
Here are some key features of the Raspberry Pi 4 Model B:
Processor: The Raspberry Pi 4 is powered by a quad-core ARM Cortex-A72 processor running at up to 1.5 GHz, providing a considerable performance boost over previous models.
RAM: It is available with varying RAM options, including 2GB, 4GB, and 8GB LPDDR4 RAM, allowing users to choose the configuration that best suits their needs.
Connectivity: The Raspberry Pi 4 offers enhanced connectivity options, including:

- Gigabit Ethernet
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0
- Two USB 3.0 ports
- Two USB 2.0 ports
- HDMI video output (supporting resolutions up to 4K)

GPIO Pins: Like previous models, the Raspberry Pi 4 features a 40-pin GPIO (General Purpose Input/Output) header, which allows users to interface with external components and sensors for various projects.
MicroSD Card Slot: It uses a microSD card for storage, allowing users to install and run operating systems and store data.

Operating System: The Raspberry Pi 4 is compatible with various operating systems, including Raspberry Pi OS (formerly Raspbian), Ubuntu, and others. Raspberry Pi OS is the official operating system optimized for Raspberry Pi.
Form Factor: The Raspberry Pi 4 maintains the same form factor as the Raspberry Pi 3 Model B+, making it compatible with existing accessories and cases.

Cooling: Due to the increased performance of the Raspberry Pi 4, heat dissipation became more critical. The board features improved thermal management compared to previous models**.**

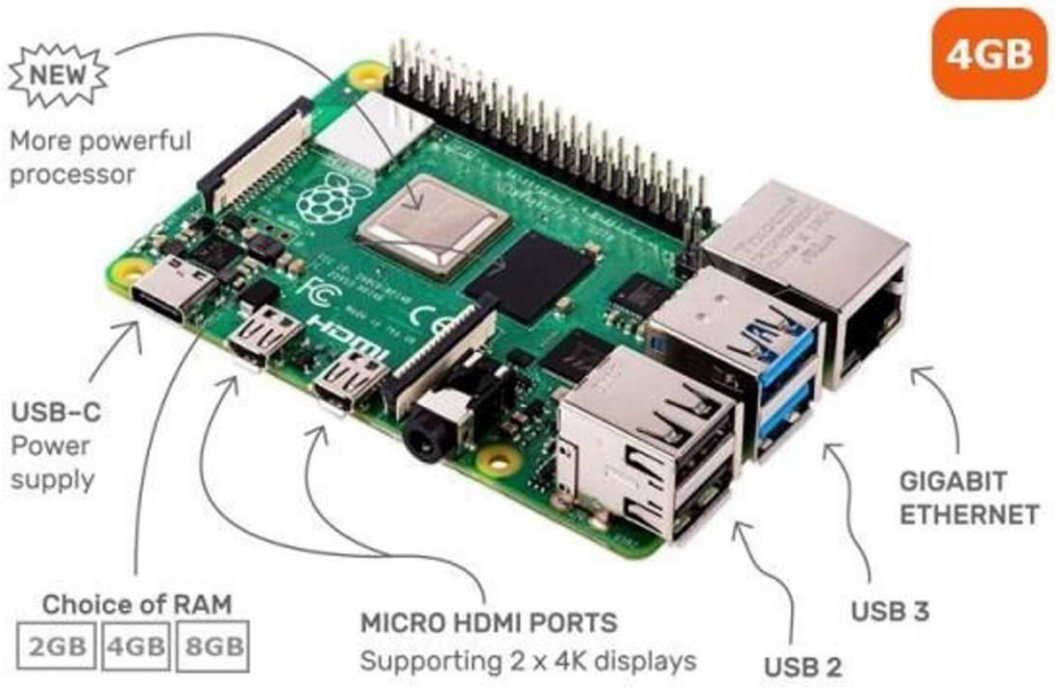

Fig:5.2.1 Raspberry pi

5.2.2 APR33A3 Voice module:

The APR33A3 is a voice module designed to provide audio playback functionality in various electronic applications.
It offers a convenient solution for integrating voice prompts, messages, or sound effects into products such as toys, appliances, industrial equipment, and interactive displays.
The module typically consists of an integrated circuit (IC) with built-in memory storage for audio files, along with control interfaces for easy integration into electronic systems.
One of the key features of the APR33A3 is its simplicity of use. Developers can easily upload audio files onto the module's memory using a computer and a simple programming interface.
This allows for flexibility in customizing the audio content to suit specific application requirements. Additionally, the module typically supports multiple playback modes, enabling developers to trigger audio playback in response to various events or user inputs.
Another important aspect of the APR33A3 is its compact size and low power consumption, making it suitable for use in battery-powered devices or space-constrained applications.

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Despite its small footprint, the module often offers high-quality audio output, thanks to built-in digital-to-analog conversion and audio amplification circuitry.

In terms of application, the APR33A3 finds use in a wide range of scenarios where audio feedback or prompts enhance user interaction or provide informative feedback

For example, in educational toys, the module can be used to deliver instructions or feedback to children, enhancing the learning experience. Similarly, in industrial equipment, it can provide audible alerts or status updates to operators, improving safety and efficiency.

Overall, the APR33A3 voice module offers a convenient, versatile, and cost-effective solution for integrating audio playback functionality into various electronic devices and systems, making it a popular choice among developers and designers alike.

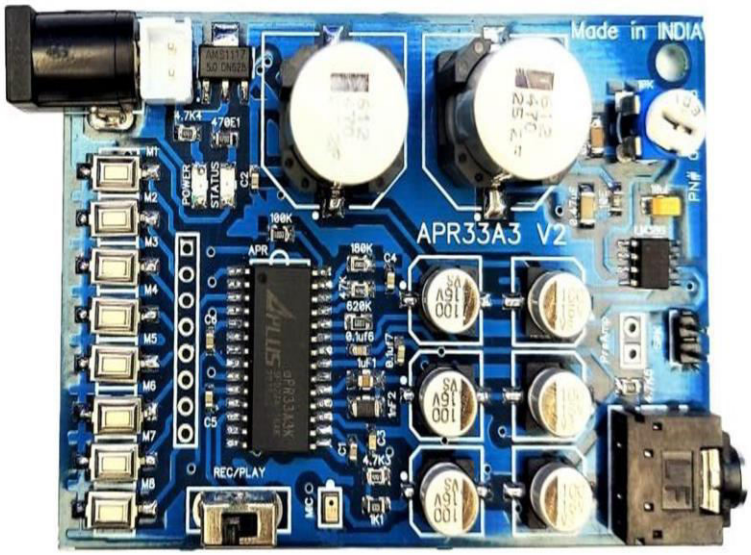

Fig:5.2.2 APR33A3 Voice Module

5.2.3 LCD:

LCD, or Liquid Crystal Display, is a flat-panel display technology widely used in electronic devices for displaying text, images, and video. It works by controlling the alignment of liquid crystal molecules through an electric current, which alters the polarization of light passing through them. This manipulation of light allows LCDs to create images on the screen. LCDs are known for their thin profile, low power consumption, and ability to produce sharp and clear images. They are commonly found in devices such as televisions, computer monitors, smartphones, and digital watches. Despite their advantages, LCDs have limitations, including limited viewing angles and the potential for image persistence. Nonetheless, LCD technology remains prevalent in modern electronics due to its versatility and widespread adoption.

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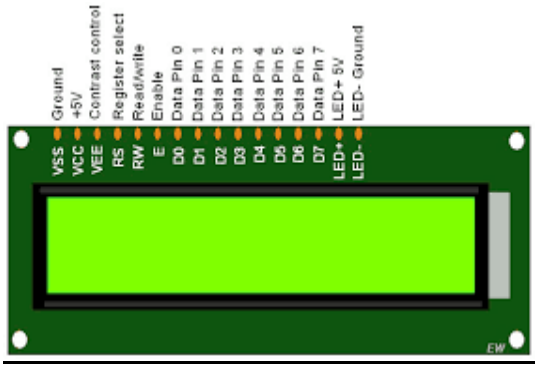

Fig:5.2.3 LCD

5.2.4 Real Time Clock DS 1307 (RTC):

RTC D31307 is a real-time clock (RTC) module commonly used in electronic devices to keep track of time even when the device is powered off. Here are some key points about RTC D31307:

1. Accuracy: It provides accurate timekeeping functionality, often with a high degree of precision.
2. Low Power Consumption: Designed to consume minimal power, making it suitable for battery-powered devices.
3. Integrated Circuit: The D31307 likely consists of an integrated circuit (IC) responsible for timekeeping functions.
4. I2C Interface: It typically communicates with the host microcontroller or system through the I2C (Inter-Integrated Circuit) serial bus interface.
5. Battery Backup: Contains a small battery or supercapacitor to maintain timekeeping functionality during power loss or when the main power source is disconnected.
6. Usage: Commonly employed in various applications such as embedded systems, IoT devices, consumer electronics, and industrial equipment where accurate timekeeping is essential.
7. Programming: May require configuration and setup through software to initialize time, set alarms, and adjust other parameters.

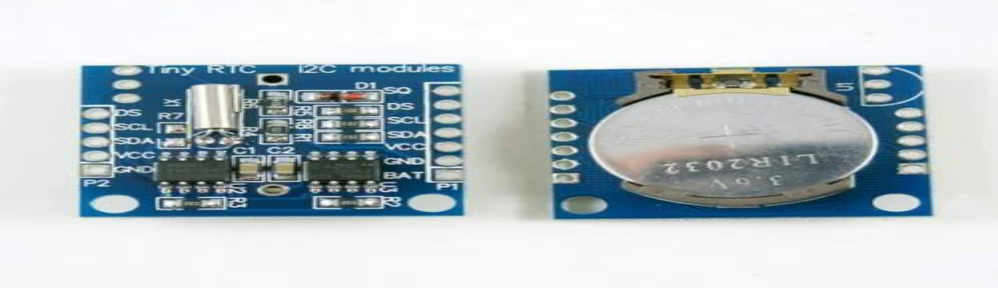

Fig: 5.2.4 Real Time Clock

5.2.5 I2C Module:

I2C, or Inter-Integrated Circuit, is a widely used serial communication protocol developed by Philips Semiconductor (now NXP Semiconductors) in the early 1980s. It's designed for communication between integrated circuits on a circuit board, enabling them to exchange data and control information. At its core, I2C utilizes a master-slave architecture, where one device (the master) initiates communication and controls the data flow, while the other devices (the slaves) respond to commands from the master. The communication in I2C is achieved through a two-wire interface, consisting of a serial data line (SDA) and a serial clock line (SCL). These lines are connected to all devices on the bus, allowing them to transmit and receive data asynchronously. One of the key features of I2C is its support for multiple devices on the same bus, each identified by a unique address. This allows for efficient communication between various components in a system, such as sensors, memory modules, and display controllers.I2C operates at different speeds, commonly ranging from 100 kHz to 400 kHz in standard mode, and up to 3.4 MHz in high-speed mode. This flexibility makes it suitable for a wide range of applications, from low-power, low-speed applications to high-speed data transfers. Despite its widespread use and versatility, I2C does have some limitations. Its relatively slow speed compared to other protocols like SPI (Serial Peripheral Interface) and UART (Universal Asynchronous Receiver-Transmitter) can be a bottleneck in high-speed applications. Additionally, the shared bus architecture can lead to issues such as bus contention, where multiple devices attempt to communicate simultaneously, causing data corruption.

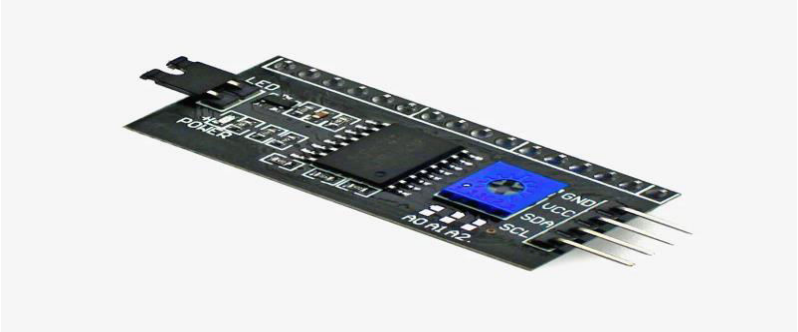

Fig: 5.2.5 I2C Module

5.3 Software tools:

1. Install RealVNC Viewer
2. IDLE (Python 3.10 64-bit)

6. Implementation:

- **Setting up the Raspberry Pi**: Start by setting up your Raspberry Pi and installing the necessary software. You'll need to connect a speaker or headphones to the Raspberry Pi for the voice alerts.
- **Medication schedule:** Create a schedule for your medication reminders. This could be done through a program or script on the Raspberry Pi. You can set specific times for each medication reminder.
- **Text-to-speech conversion:** text-to-speech (TTS) functionality to convert the remainder messages into words. There are libraries available for the raspberry pi that can handle TTS.

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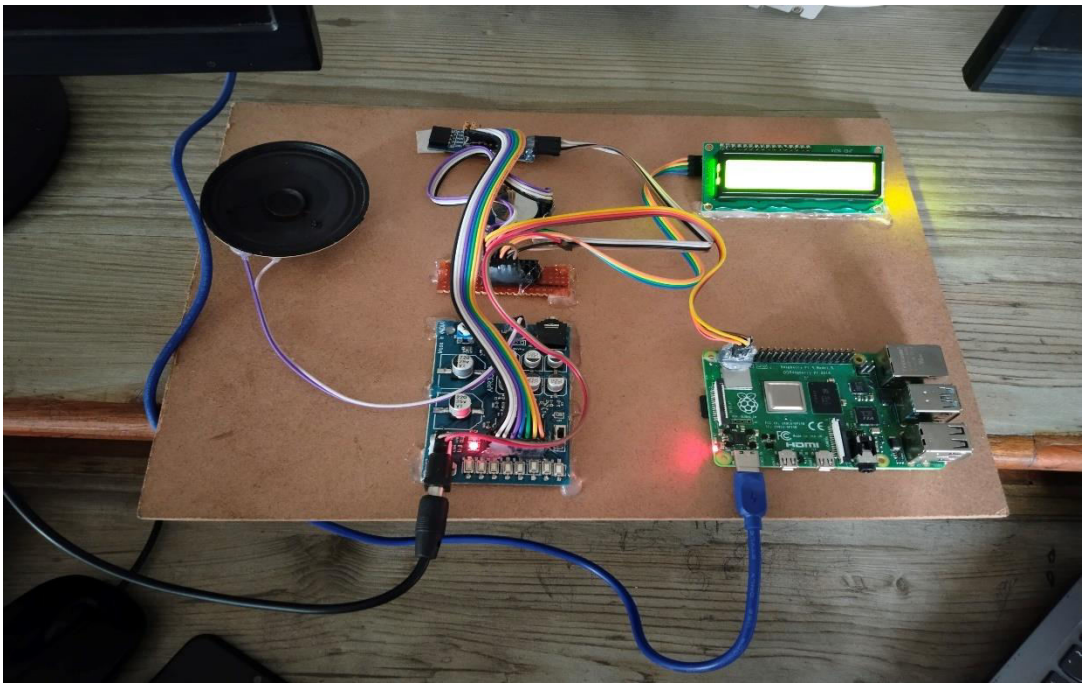
- **Voice alerts:** When it's time for a medication reminder, the Raspberry Pi will play the pre-recorded or synthesized voice message through the connected speaker or headphones. This will serve as an audible reminder for you to take your medication.
- **Repeat reminders:** You can program the Raspberry Pi to repeat the reminders at specific intervals until the medication is taken. This ensures that you don't miss any doses.

7.Result:

The Raspberry Pi medicine reminder with voice alert system is a practical and efficient solution for individuals who need to manage their medication schedules effectively. By combining the capabilities of the Raspberry Pi mini-computer with voice alert functionality, this system can provide timely reminders to take medications, helping users stay on track with their treatment plans.



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Using the Raspberry Pi's GPIO pins, the system can interface with various sensors or switches to detect when medication needs to be taken. This information can then trigger the voice alert feature, which announces the medication name, dosage, and the specific time it should be taken. Additionally, the Raspberry Pi can be programmed to log medication adherence data, allowing users to track their compliance over time. This data can be valuable for both individuals and healthcare providers in assessing the effectiveness of the treatment regimen.

8. Conclusion:

In conclusion, the Raspberry Pi-based medicine reminder with auto-voice alert system offers a comprehensive solution to the common problem of medication non-adherence. By combining the versatility of Raspberry Pi with voice recognition technology, this system provides a user-friendly interface that can be easily customized to individual needs.

Overall, this system represents a promising step towards leveraging technology to address healthcare challenges, enhancing patient autonomy, and promoting better health management practices. As technology continues to advance, further refinements and integrations could make such solutions even more effective and widespread in the future.

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