

Smart Medicine Box

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Abstract - In our families, many of our older relatives have diseases they all need to take multiple medicines a day with different timings and check their multiple health parameters multiple times in one month. They also missed medications during their multiple visits, and they all need to go to the hospital every time for a basic health checkup. And I see this problem, and if I look into it, I will discover that it is not limited to my situation it is present everywhere. This inspires us to begin work on the development of a smart medicine box. In this device, we will set reminders for medicines with the help of an Android application and IoT for those who forget to take medicine. Also, the device is used to check basic health parameters like pulse rate, blood pressure, the ECG of the body, and many other parameters that require checking multiple times.

Key Words: health Checkup, Medicine Reminders, Android application, IoT, Pulse Rate, Blood Pressure, ECG

1. INTRODUCTION

The Smart Medicine Box Project represents a ground breaking advancement in the field of healthcare technology, aimed at revolutionizing medication management and monitoring. This innovative system combines a smart medicine box with an Android application to provide users with a comprehensive solution for setting medication reminders and monitoring vital signs such as blood pressure, pulse rate, and ECG (electrocardiogram).

The primary objective of the Smart Medicine Box Project is to address the challenges faced by individuals in adhering to their medication schedules and maintaining their overall health. With the increasing complexity of medication regimens and the rise in chronic conditions, it has become crucial to develop solutions that can simplify the process of medication management.

The Android application integrated with the Smart Medicine Box acts as a centralized control hub, allowing users to effortlessly set reminders for their medication intake. This ensures that doses are taken at the prescribed times, reducing the risk of missed or incorrect doses. The application also offers a user-friendly interface, enabling individuals to view their medication schedules, track adherence, and receive notifications for refills or prescription renewals.

Furthermore, the Smart Medicine Box goes beyond conventional pill organizers by incorporating advanced health monitoring capabilities. The box is equipped with sensors to measure blood pressure, pulse rate, and even conduct ECG tests. These features empower users to monitor their vital signs in the comfort of their own homes, eliminating the need for frequent hospital visits. The collected data is seamlessly transmitted to the Android application, which generates comprehensive reports and provides insights into the user's health trends over time.

The integration of medication reminders and vital sign monitoring within a single system offers numerous benefits for both patients and healthcare providers. Patients gain better control over their medication adherence and health monitoring, leading to improved treatment outcomes and a higher quality of life. Healthcare providers can access real-time data, enabling them to make more informed decisions during patient consultations and remotely monitor the progress of their patients.

2. METHODOLOGY

We have tried to build a prototype model of a smart medicine box in which we set reminders for medicines multiple times and monitor different health parameters like pulse rate, blood pressure, and ECG. Basically, the project is divided into two parts: the first part is which we set reminders for medicines multiple times and monitor different health parameters like pulse rate, blood pressure, and ECG. Basically, the project is divided into two parts: the first part is hardware, which includes sensors and controllers with rechargeable batteries as power supplies, and the second part is software, which is an Android application that helps set reminders for medicines and monitor sensor data.

In hardware using the NodeMcu ESP8266, we connect with the Blynk IoT Cloud, and using the Blynk Android Application, users can set timers in the inputs for the NodeMcu digital pins for different timings of medicines that are present in different containers. Also, the MAX30100 sensor connects with the NodeMcu ESP8266, which helps monitor pulse rate and blood pressure, which are monitored on the Blynk app. Also, the AD3282 sensor connects with the NodeMcu ESP8266, which is used to make an ECG graph of the user's heart, which is monitored on the Blynk app.

For software programming for the NodeMcu ESP8266 Development Kit Board, we used the Arduino IDE platform. For the working of the overall circuit, it required a 5V supply. For this supply, we use rechargeable batteries.

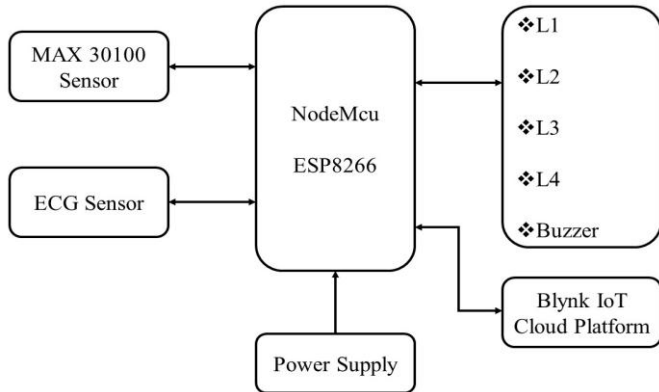


Fig -1 : Block Diagram

When we switch on the power supply, the NodeMcu ESP8266 module connects with the Blynk IoT Cloud Platform. Using this Blynk cloud and Android mobile application, the user can set reminders for medicines for different timings for different containers, and when medicine time comes, LEDs L1–L4 and Buzzer give alerts of which LED is present in the container on hardware. And when the user puts their finger on the MAX30100 sensor LED, it shows the results of pulse rate and oxygen level on the Blynk cloud gauge. Also, when the user connects ECG electrodes to the body, the ECG graph shows on the Blynk cloud chart.

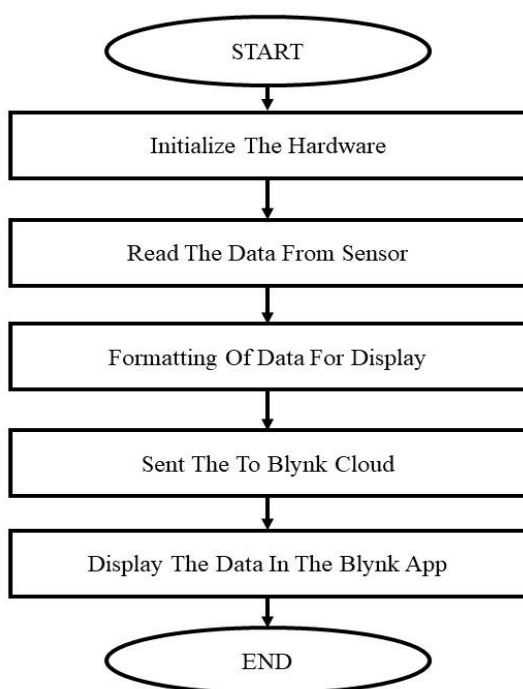


Fig -2 : Flow Chart

2.1 Components Used In Our Project:

1. NodeMcu ESP8266: The NodeMCU ESP8266 CP2102 is a popular and versatile development board used in the field of the Internet of Things (IoT). It is based on the ESP8266 Wi-Fi module and features an integrated USB-to-serial converter chip called CP2102. This combination makes it an ideal choice for IoT projects, enabling wireless connectivity and easy programming.

The ESP8266 module on the NodeMCU board is a low-cost, low-power, and highly integrated Wi-Fi chip. It provides Wi-Fi connectivity to microcontrollers and other devices, allowing them to connect to the internet and communicate with other devices or servers. With its built-in Wi-Fi capabilities, the NodeMCU ESP8266 CP2102 eliminates the need for additional Wi-Fi modules, reducing the cost and complexity of IoT projects.

The CP2102 chip on the NodeMCU board is responsible for converting the USB interface to a serial interface, enabling communication between the board and a computer. This allows developers to programme the NodeMCU using popular programming languages such as Lua or the Arduino IDE. The CP2102 also provides a convenient and straightforward method for uploading code and debugging the board.

One of the key advantages of the NodeMCU ESP8266 CP2102 is its extensive community support and availability of libraries and resources. Numerous online forums, tutorials, and documentation are available, making it easier for developers to get started and troubleshoot any issues they encounter. The NodeMCU board has gained popularity due to its user-friendly development environment and a vibrant community that actively contributes to its growth.

2. MAX30100: The MAX30100 sensor is a highly versatile and widely used integrated sensor module designed for heart rate and pulse oximetry monitoring applications. It combines two key functionalities into a single compact package, making it ideal for wearable health devices and medical equipment. The photoplethysmography (PPG) technique uses the sensor to measure blood volume changes in the microvascular bed of tissue. It emits both infrared and red light through an LED and detects the reflected light using a photodetector. By analyzing the light absorption patterns, the sensor can accurately calculate heart rate and blood oxygen saturation levels.

The MAX30100 offers high precision, low power consumption, and excellent noise performance. It features a 16-bit ADC for precise measurements and includes built-in filters and algorithms for reliable data processing. With its small form factor and easy integration capabilities, the MAX30100 sensor has become a popular choice for various healthcare and fitness applications, enabling non-invasive monitoring of vital signs in real-time.

3. **AD3282 ECG Sensor:** The AD3282 ECG sensor is an advanced electronic device designed to accurately measure and monitor electrocardiogram (ECG) signals. It is equipped with state-of-the-art technology and features that make it an essential tool in the field of cardiology and healthcare. The sensor utilises high-resolution analogue-to-digital converters to capture ECG waveforms with exceptional precision and fidelity.

With its compact and lightweight design, the AD3282 ECG sensor offers convenience and portability, making it suitable for use in various clinical settings, ambulatory monitoring, and even personal health monitoring applications. Its user-friendly interface allows for easy operation and integration into existing medical systems.

One of the key strengths of the AD3282 ECG sensor is its ability to provide real-time data analysis and interpretation. It employs advanced signal processing algorithms to identify and analyse various cardiac parameters, such as heart rate, QRS complex duration, and ST segment deviations. This enables healthcare professionals to make accurate diagnoses and monitor patients' cardiac health effectively.

4. **LED:** LED stands for light-emitting diode, a semiconductor device that emits light when an electric current passes through it. LEDs have gained widespread popularity due to their energy efficiency, durability, and versatility. They are extensively used in various applications, including lighting, electronic displays, indicators, and backlighting. LED technology has revolutionized the lighting industry by offering long-lasting and environmentally friendly alternatives to traditional incandescent and fluorescent lights. LEDs consume significantly less energy, have a longer lifespan, and produce less heat, making them an ideal choice for both residential and commercial lighting solutions. Moreover, LEDs come in a wide range of colours and can be easily dimmed or controlled, allowing for creative and dynamic lighting designs.

5. **Buzzer:** A DC buzzer is a small electronic device commonly used in various applications to generate audible alerts or warning signals. It operates on a direct current (DC) power supply and is designed to produce a distinct buzzing sound. The DC buzzer typically consists of an electromagnetic coil and a diaphragm that vibrates when current passes through the coil. This vibration creates sound waves, resulting in the characteristic buzzing sound. DC buzzers are widely utilized in alarm systems, electronic appliances, automobiles, and industrial equipment where auditory notifications are crucial. They provide a cost-effective and efficient solution for signaling and alerting purposes, ensuring important messages reach users effectively. With their compact size and easy integration into circuitry, DC buzzers have become a popular choice across various industries.

6. **3000mah lithium-cell:** The 3000 mAh lithium cell is a type of rechargeable battery widely used in various portable electronic devices. With a capacity of 3000 milliampere-hours (mAh), it offers a decent amount of power to keep devices running for extended periods. The lithium-ion technology used in these cells provides high energy density, making them lightweight and compact.

This type of lithium cell is commonly found in smartphones, tablets, portable gaming devices, and other consumer electronics. Its moderate capacity strikes a balance between power and size, allowing for efficient use in compact devices without compromising performance. The 3000 mAh lithium cell offers a reliable power source for everyday use, providing users with extended battery life and minimizing the need for frequent recharging.

7. **Power Bank Module:** A power bank module is a portable device that stores electrical energy and provides it to other electronic devices such as smartphones, tablets, or laptops when their batteries run low. It typically consists of a rechargeable battery, a circuit board, and various input and output ports. Power bank modules come in different capacities, ranging from a few thousand milliampere-hours (mAh) to tens of thousands, allowing users to charge their devices multiple times before needing to recharge the power bank itself. They often feature LED indicators to show the remaining battery capacity and may include additional features like fast charging or multiple USB ports to charge multiple devices simultaneously. Power bank modules have become increasingly popular due to their convenience and ability to keep devices powered on the go, making them a valuable accessory for modern technology users.

2.2 Project Module:



Fig -3 : Project Module

3. RESULTS

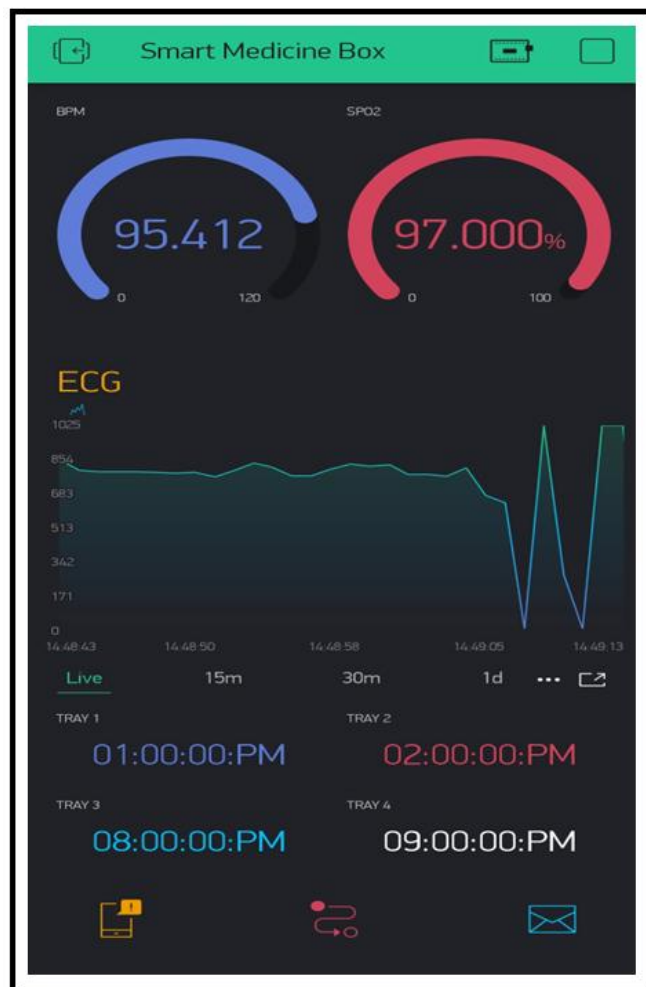


Fig -4 : Results On Blynk App

4. CONCLUSIONS

In conclusion, the Smart Medicine Box project is a revolutionary product that offers an innovative solution for medication management and health monitoring. With the help of a mobile application, users can easily set reminders for taking their medication and receive alerts on the hardware device itself. Additionally, the device can monitor crucial health parameters such as blood pressure, oxygen levels, and ECG readings, which can be accessed from anywhere in the world.

The inclusion of a rechargeable battery ensures that the device can be used on the go without the need for a constant power source. Overall, the Portable Smart Medicine Box project has the potential to greatly improve the lives of those who require regular medication and health monitoring, providing a simple and effective solution to an important problem.

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