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DEVELOPMENT OF IoT BASED MEDICINE DISPERSING SYSTEM FOR ELDERLY PEOPLE

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Abstract: Elderly people find it hard to do things on their own and on time. It is often an issue to take care of their health, taking medicines on time, look after their surroundings etc. This project aims on resolving this issue by using a Home Assistance System for Elderly Population. A home assistance system with integrated sensor and miniature antenna technology connected with IoT provides the elderly people with a more comfortable and independent lifestyle. It assists the elderly people in taking medicines on time at regular intervals, monitoring their activities to detect any abnormality in health using physiological sensors, alerts the caretaker/guardian in dangerous situations by performing fall detection, smoke detection, intrusion detection, etc. The main part of this project aims at developing a Medicine Dispersing System and Health Monitoring System which plays a vital role in taking care of elderly population. It sends alerts at a specified time for the elderly to consume their medicines. It also has a sensor that measures the SPO2 level in their blood, their heart rate and body temperature. The entire system will be designed to operate on ESP32 board, ensuring efficiency and flexibility. In case of abnormalities in any of these parameters, the guardian will be notified about this using SMS/ e-mail/App.

Index Terms **-** IoT, elderly population, Health monitoring, Medicine dispensing system, ESP32 board, Remote monitoring

I. INTRODUCTION

The need for assistive technology, which enables senior citizens to preserve their independence and improve their quality of life, is rising due to the aging population. A more pleasant and independent living for senior citizens can be achieved with home assistance systems that integrate sensor and tiny antenna technologies linked to the Internet of Things (IoT). These systems also offer reasonably priced care and support. Accurately and regularly administering their drug regimens is one of the main problems that older people have. By creating an all-inclusive medication dispensing system that automatically delivers the right drug at the appointed time, this project seeks to overcome this difficulty and ensure timely medication adherence.

The system also sends reminders to the elderly person and their caregiver when a dose is missed, promoting compliance and reducing the risk of adverse effects from missed or incorrect medication use.

This study focuses on complete health monitoring in addition to medication management. Physiological sensors in the system measure the elderly person's heart rate, temperature of the body, and blood oxygen saturation (SPO2) on a continual basis. The system alerts the carer in the event that any of these parameters deviate from standard operating norms, allowing for early action and medical assistance.

In this paper, we outline the design, implementation, and evaluation of key components within our IoT-based medicine dispersing system. We describe the functionalities and capabilities of each subsystem, including a medicine dispersing system, health monitoring system all while highlighting their contributions to enhancing the comfort of elderly individuals who are living independently. The integration of these subsystems into a cohesive framework, enabling seamless communication and coordination to provides support for elderly residents.

II.METHODOLOGY

A. MEDICINE DISPERSING SYSTEM:

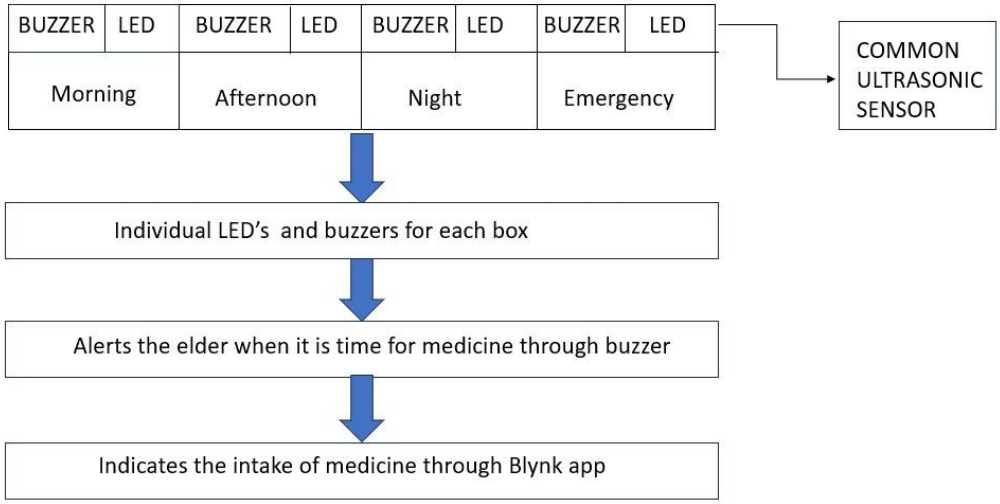

Fig.1 Block diagram of the Medicine Dispersing System

The system operates using different sensors: the IR sensor module, the Reed switch sensor and the Ultrasonic sensor. The process starts when the time is 9.00 AM, where it alerts the elder people through buzzer for the intake of morning medicine and whenever he approaches the medicine dispersing system (distance<20cm using ultrasonic sensor) then the morning medicine box will open and allow to take the medicine ,after taking a medicine from strip and placed the strip into box it ensures that medicine intake was done and also notified to the caretaker through BLYNK App. If the medicine intake was not done within 2 mins from scheduled time again the buzzer will ring and alerts the elder people. This process is common for the afternoon and night boxes .Emergency box will be opened whenever he approaches other than the morning, afternoon and night medicine boxes.

B. HEALTH MONITORING SYSTEM :

Fig.2 Block diagram of the Health Monitoring System

The system operates using two sensors: the MAX30100 Pulse Oximeter sensor and TMP102 sensor which both are integrated with 0.96 inch OLED display and BLYNK app. When the elder people place the finger on the both sensor it will detect the finger and displays the Heart rate(BPM),Oxygen saturation levels(SpO_2) on 0.96 inch OLED display and notified the health parameters through BLYNK app.

III. HARDWARE USED

i. ESP32 MICROCONTROLLER

Fig.3 esp32 microcontroller

The ESP32 is equipped with a high-performance MCU that drives its processing power and overall performance. This device seamlessly integrates Wi-Fi and Bluetooth features, allowing for wireless connectivity and communicate with a range of peripheral interfaces such as SPI, I2C, UART, and I2S, the ESP32 facilitates seamless interaction with external devices and sensors. The ESP32 comes with memory capacity, including both RAM and flash memory, to support data storage and program execution.

ii. 0.96 inch OLED display

Fig.4 oled display

The 0.96-inch 4-pin display is a compact and versatile screen suitable for various electronic projects. With its small form factor, it offers clear and crisp visuals, making it ideal for displaying essential information. Its four-pin interface simplifies connectivity, enabling easy integration into devices such as wearable gadgets, IoT devices, and embedded systems. Despite its size, this display packs impressive functionality, making it a popular choice among hobbyists and professionals alike. This is used to display the health parameters.

iii. MAX30100 PULSE OXIMETER:

Fig.5 MAX30100 PulseOximeter

The MAX30100 pulse oximeter is a highly accurate sensor commonly used for measuring blood oxygen saturation levels and heart rate. Its compact design and low power consumption make it ideal for wearable health monitoring devices. With its advanced algorithms, it provides reliable readings, ensuring precise health tracking without compromising on efficiency. This is used to measure heart rate(BPM) and SpO_2 levels in elder people.

iv. TMP102 SENSOR

Fig.6 Tmp102 sensor

The TMP102 sensor is a highly accurate temperature sensor commonly used in electronics and IoT applications. With its small size and low power consumption, it's ideal for battery-powered devices and remote sensing applications. Its digital output and I2C interface make it easy to integrate into various projects for precise temperature monitoring. This is used to measure elder people body temperature

v. ULTRASONIC SENSOR

Fig.7 Ultrasonic Sensor

The ultrasonic sensor is a non-contact device used for distance measurement and object detection in various applications. It emits high-frequency sound waves and measures the time taken for the waves to bounce back, providing accurate distance readings. Widely utilized in robotics, automotive, and industrial sectors, its versatility and precision make it a cornerstone of modern sensing technology. This plays a crucial role in measuring the distance of the elder people and involves in the control of servomotor.

vi. IR SENSOR

Fig.8 IR sensor

An infrared (IR) sensor detects infrared radiation emitted by objects. It operates by measuring the heat emitted from these objects in the form of IR radiation. Widely used in various applications such as motion detection, temperature measurement, and remote controls, IR sensors provide efficient and accurate detection capabilities. This plays a crucial role in detecting the motion in the medicine boxes.

vii. REED SWITCH SENSOR

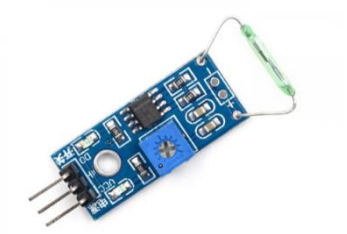

Fig.9 Reed Switch sensor

A reed switch sensor operates by using a pair of magnetizable, flexible metal reeds that are sealed in a glass tube. When a magnetic field is applied near the switch, the reeds attract each other, closing the circuit and allowing current to flow. This design provides a reliable and durable method for detecting the presence

of a magnetic field, commonly used in various applications such as proximity sensing and security systems. This plays a crucial role in identifying the opening and closing of the lid medicine boxes.

viii. SERVO MOTOR

Fig .10 Servo Motor

A servo motor is a type rotary actuator or engine capable of precisely managing its angular position, speed, and acceleration. The motor is responsible for supplying the rotational force necessary to operate the servo's output shaft and plays a crucial role in opening and closing lids of medicine boxes.

ix. BUZZER

Fig.11Buzzer

A buzzer, when electricity passes through it, creates sound. It serves as an alarm for medicine taken.

IV.RESULTS

As mentioned in the methodology section, the results are obtained.

A. MEDICINE DISPERSING SYSTEM

TEST CASE-I : Status of the All-Medicine Boxes and Health Monitoring in initial phase:

Fig.12 All boxes are closed and are at initial stage

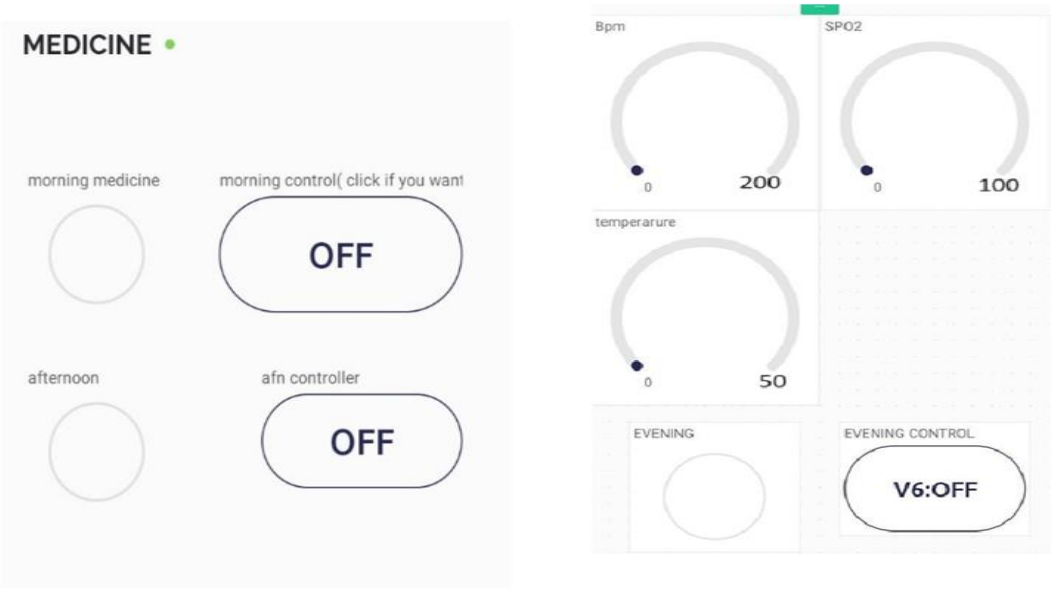

Fig.13 The Blynk interface where all the parameters are at intial stage

TEST CASE-II : Status of the boxes and Blynk interface when morning medicine is taken:

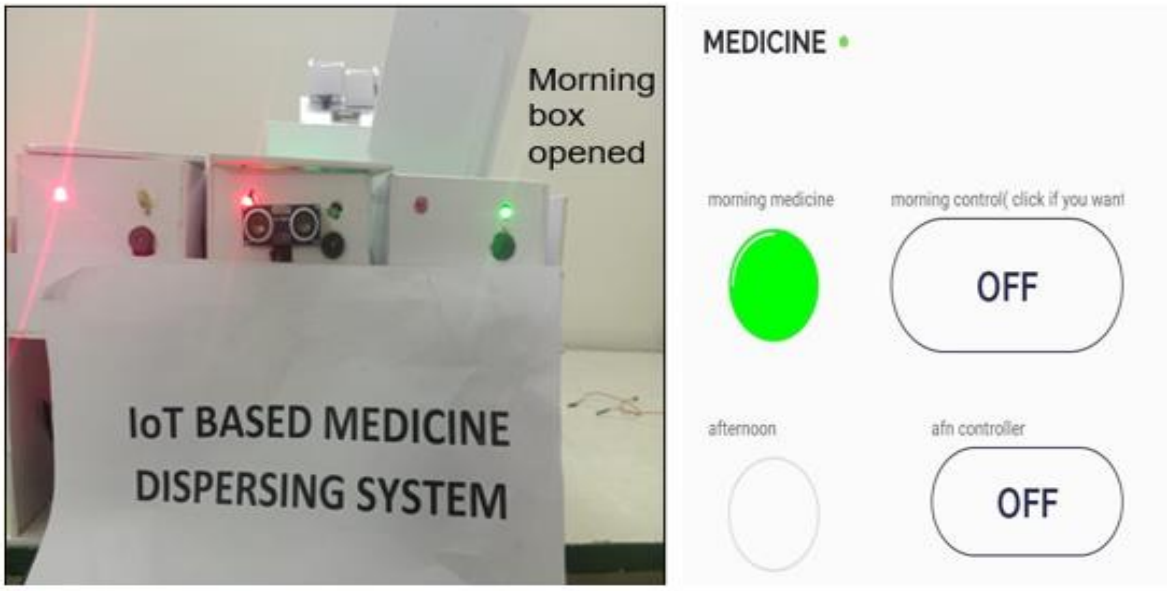

Fig. 14 The box opens in between 9.00 AM and 9.30 AM to enable user to take medicine and when medicine taken ,the status is updated in the Blynk Interface

TEST CASE-III : Status of the boxes and Blynk interface when afternoon medicine is taken:

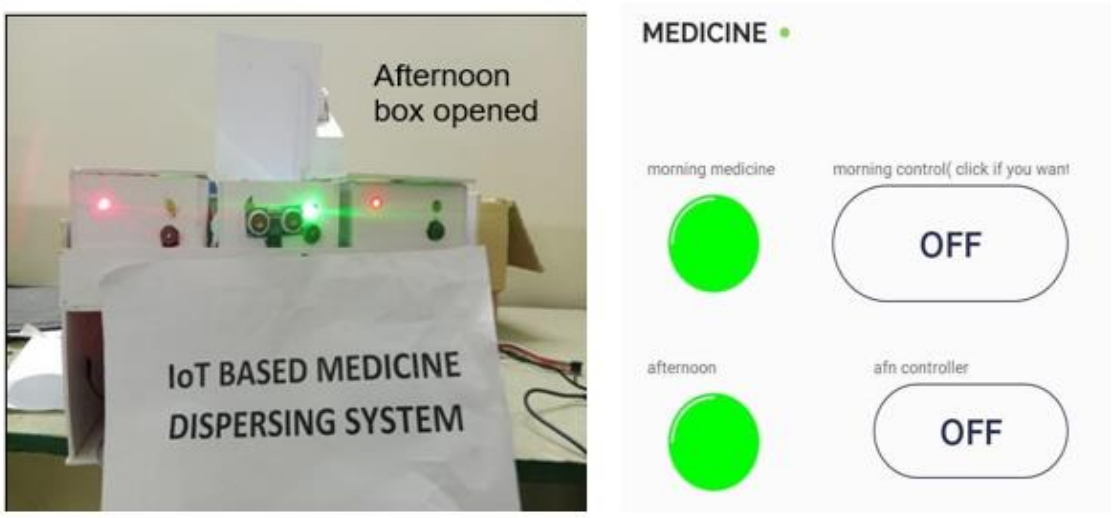

Fig. 15 The box opens in between 1.00 PM and 1.30 PM to enable user to take medicine and when medicine taken ,the status is updated in the Blynk Interface

TEST CASE-IV : Status of the boxes and Blynk interface when evening medicine is taken:

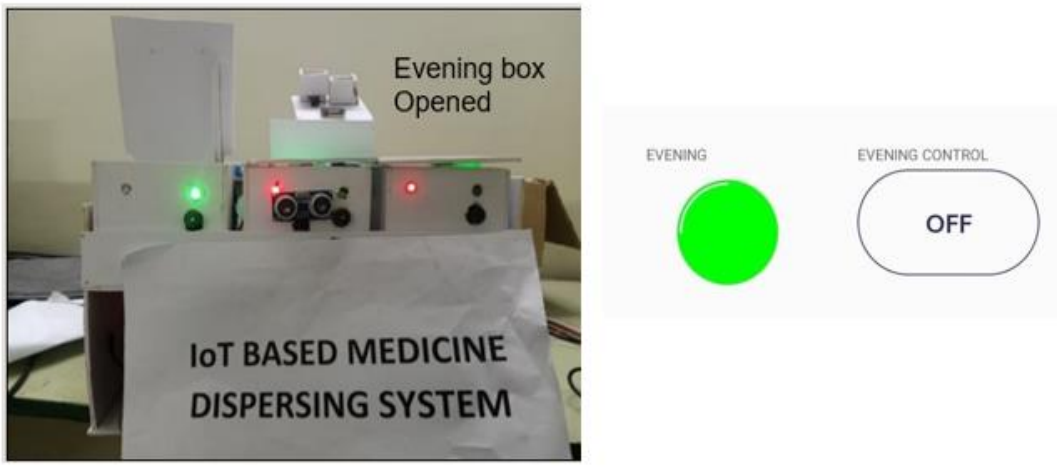

Fig. 16 The box opens in between 7.00 PM and 7.30 PM to enable user to take medicine and when medicine taken ,the status is updated in the Blynk Interface

TEST CASE-V : Status of the emergency box when Emergency medicine istaken:

Fig. 17 The box opens whenever the person nears the box

TEST CASE-VI : Status and usage of toggle switch when medicine intake was missed

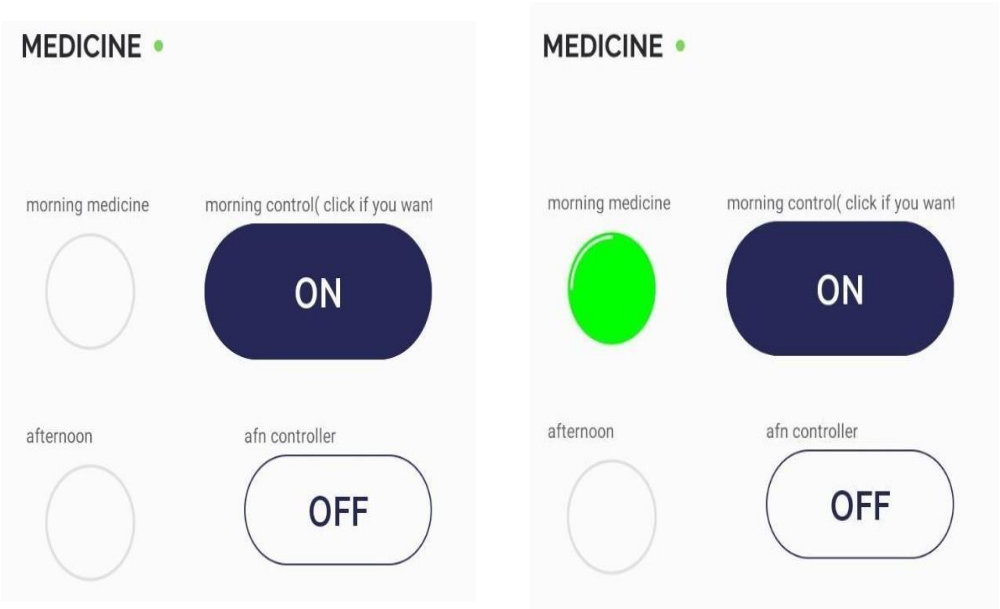

Fig. 18 When medicine is missed ,it can be abled by using toggle switch

B. HEALTH MONITORING SYSTEM

Fig.19 Health Monitoring System model

Fig.20 Health parameters displaying on OLED

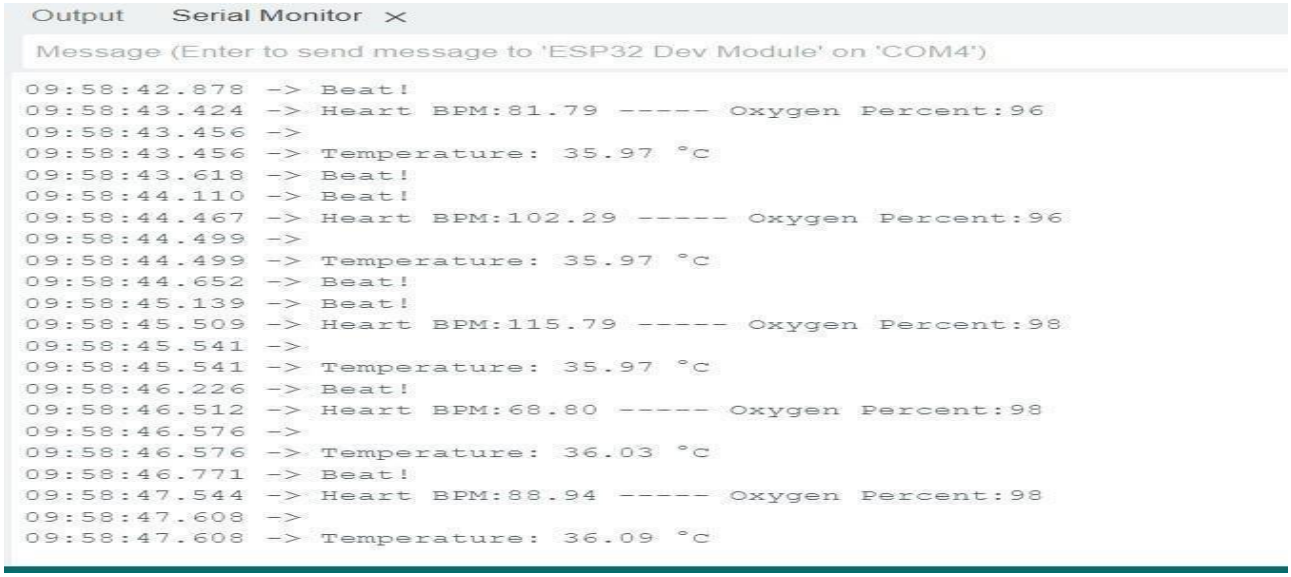

Fig.21 Health parameters like heartbeat, SPO_2 and temperature displaying on Serial monitor

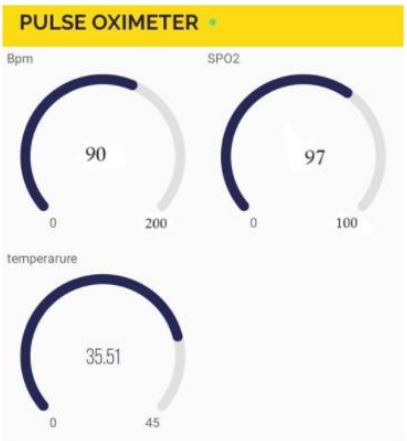

Fig.22 Health parameters like heart rate, SPO_2 and temperature on Blynk app

V.CONCLUSION

The development of a medicine dispensary system and health monitoring system for the elderly population, leveraging Internet of Things (IoT) technology and the ESP32 Dev board, represents a significant advancement in personalized healthcare and medication management. This project successfully integrates four medicine dispensary boxes designated for different times of the day, including an emergency box, all controlled by servo motors and a proximity-based opening mechanism using an ultrasonic sensor. Furthermore, the incorporation of physiological sensors to monitor vital healthparameters such as SPO_2 levels, body temperature, and heart rate enhances the system's capability to offer a comprehensive health overview. The innovative use of green and red LEDs to indicate the boxes' status, coupled with real-time updates on health and medication adherence provided through the Blynk app, ensures caretakers can efficiently monitor and support the well-being of elderly individuals. This system not only embodies the potential of IoT in revolutionizing elder care by ensuring timely medication dispensing and health monitoring but also highlights the importance of technological solutionsin fostering independent living, thereby enhancing the quality of life for the elderly population.

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