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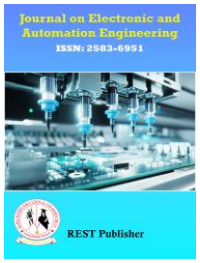

Automatic Medicine Reminder for Old Age People

[*]Thippana TejaSri, Mareppagari Chandra Sekhar, Seella Surendra, Muddulur Sravanth Kumar Raju, P. Vijaya

Annamacharya Institute of Technology and Sciences, Kadapa, Andhra Pradesh, India.

[*]Corresponding author Email: tejareddy996620@gmail.com

Abstract: *The reality is that many of us will need assistance in our later years. In some cases, people need nothing more than occasional visits from a home nurse, some light housekeeping, meals on wheels, and visitors willing to talk and notify about pills. While there is a movement to make aging at home possible for more people, it is not always an option. Dementia and other illnesses can require around the clock medical care and monitoring, things often more easily given in a professional facility than at home. On the other end, increasing number of smart systems opens area where medical treatment can be utilized to completely new level. In this paper we show a working solution how a smart home can be utilized to help people with medication related remainders. Proposed flow starts when a new medication prescription is taken from the doctor. eHealth system generates QR code which is then delivered as part of prescription, holding set of information, such as medications treatment, duration, next visit and similar. This set of information is used by the expert system which handles all the notifications generated by prescription. In used system, three types of notifications are used, smart phone notifications, home voice and video notifications.*

Keywords: *DSRTC, ARDUINO MEGA, LEDs, IR Sensors*

1. INTRODUCTION

Our intelligent medication reminder system is intended to assist elderly individuals in taking care of themselves by ensuring they take their prescriptions on time and in the appropriate quantity. It has been noted that people generally disregard their health and prioritize other activities over taking their medications. They also neglect to take their prescriptions on time because of this. Numerous health maintenance organizations, medical professionals, and researchers have come to the conclusion that using patient reminders more frequently can greatly improve the management of chronic illnesses and the availability of medical services to those who require them. The patient medication reminder system has been adopted by a number of organizations in the healthcare industry, and it is presently being used in a number of western hospitals to determine whether the approach is beneficial. It is widely acknowledged that patients who take over-the-counter (OTC) drugs should take their prescriptions in the specified amount and at the appropriate times. However, a lot of patients-especially elderly patients-do not take their medications as prescribed. They either take too many medications in the hopes of healing more quickly, or they take too few because they are afraid the doctor has prescribed more than they need. While the latter postpones the patient's treatment and, in the case of women, permits the sickness to worsen, necessitating additional care, the former has numerous catastrophic health effects.

Additionally, some patients are so busy with their daily routines that they simply forget to take their medications; this is especially true for elderly patients who must take multiple medications at different times throughout the day; setting alarm clocks is a tedious task that patients are too lazy to repeatedly set; when asked what time they must take their medications, many patients forget to answer the correct times or even remember if they have taken the medication during the day.

The elderly are particularly affected by this issue due to their deteriorating memory, and in extreme situations, they forget that they have already taken their prescription and take it twice or three times in the same period of time. This may not be harmful for milder medications, but for some strong and concentrated medications, it can have additional negative effects on the body. This is precisely where our medication reminder system can help, collects prescription information from the user, including the length of the prescription, the names of the medications, the times they are to be taken, and the dosage of each medication. Once all of this information has been submitted, our system will send a physical reminder and a mobile notice to the user at the designated time to remind them which medication they need to take. Patients are able to Don't take medications outside of our app. They will be informed when the medication's expiration time has passed, and they are only required to take their prescriptions during that window of time. When properly implemented, this will significantly reduce medication overdoses caused by forgetfulness and remind patients to take their medications.

2. LITERATURE SURVEY

The increasing aging population is a well-known trend globally. With the advent of modern healthcare, people are living longer lives, but this has also led to an increase in age-related conditions, including cognitive decline, chronic diseases, and polypharmacy (the simultaneous use of multiple medications). Given that this demographic shift is expected to continue, there is growing interest in technologies that can help elderly individuals maintain independence while ensuring their health and safety.

Aging Population and the Need for Supportive Technologies The rapid aging of populations, particularly in developed countries, has been well-documented. According to the United Nations (2019), the number of people aged 60 or older is expected to reach 2.1 billion by 2050. As individuals age, the incidence of chronic diseases such as diabetes, hypertension, and dementia increases. According to a study by Prince et al. (2015), over 46 million people worldwide live with dementia, a number that is expected to double by 2030. The increase in age-related diseases has led to a significant demand for systems that support medication management and caregiving. Medication Non-Adherence in the Elderly One of the most significant issues among elderly patients is medication non-adherence. According to a study by Ho et al. (2009), medication non-adherence contributes to a substantial number of hospital admissions, and patients aged 65 and older are at a particularly high risk of poor medication adherence. This issue is exacerbated by cognitive impairment, poor health literacy, and difficulty with managing multiple medications. The adoption of digital tools to support medication adherence has gained traction. For instance, a study by Clyne et al. (2014) found that digital pill dispensers with reminders improve adherence in elderly populations. These devices can store and release medications at the prescribed times, ensuring proper dosages are taken.

Technologies to Support Elderly People Numerous studies have shown the effectiveness of assistive technologies in helping elderly individuals maintain their independence. Smart homes, wearable health monitors, and mobile applications have been designed to assist with various aspects of daily life. A systematic review by Barbosa et al. (2017) indicated that digital solutions, including medication management apps and reminders, could reduce the burden on caregivers and improve the quality of life for elderly patients. The combination of digital pill dispensers with mobile applications for caregivers represents a promising approach to improving health outcomes. For example, research by Zhaoyang et al. (2019) demonstrated that mobile apps integrated with smart pill dispensers enabled real-time tracking of medication adherence and alerted caregivers to missed doses or shortages.

3. EXISTING SYSTEM

After studying all the existing popular applications based on Android mobiles, some major findings noticed which reduce their popularity.

A. Findings in existing systems:

1. Users must manually enter the name of the tablet or capsule every time; it cannot be added automatically.
2. Users must manually enter the quantity or dose of the tablet or capsule every time; it cannot be added automatically.
3. Users must manually enter the reminder about the times of dosage, such as twice or three times per day.
4. Users must manually select the duration of the reminder.

5. They are not facilitating anything regarding the original prescription, according to studies and analyses of all the aforementioned popular Android mobile applications.

B. Everything must be done by hand; we require an app that can automate processes and reduce a lot of manual labors.

The current systems have several significant shortcomings, which include the following:

1.The inability to set reminders automatically.
2. The need for manual labor to set the reminders, which takes a lot of time.
3. The inability to store the original prescription.
4. The potential for the existing systems to malfunction as a result of the manual labor required.

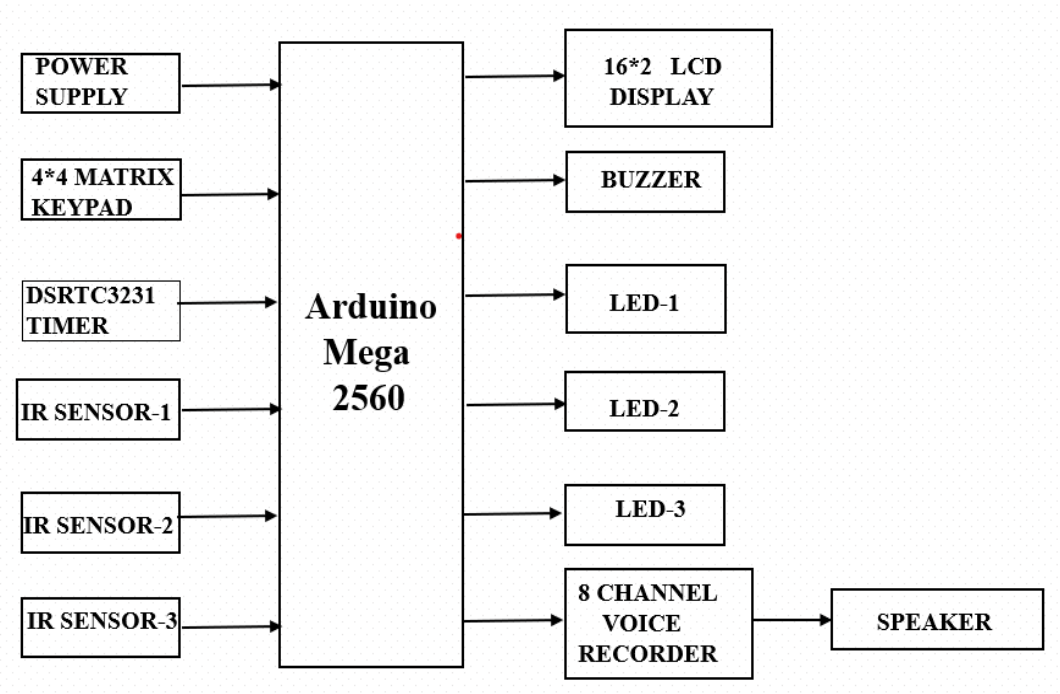

FIGURE 3.1. Block diagram of existing system

The block diagram represents a system designed using an Arduino Mega microcontroller. It integrates multiple input and output components to perform specific tasks. Below is a description of the key components and their functions:

Input Components:

1. **Power Supply:** Provides the necessary voltage and current to power the entire system.
2. **4×4 Matrix Keypad:** Used for user input, likely for entering commands or numerical data.
3. **DS3231 RTC Module (Real-Time Clock):** Provides accurate time and date information
4. **IR Sensors (IR Sensor-1, IR Sensor-2, IR Sensor-3):** Detect obstacles, motion, or other infrared signals to trigger system responses.

Processing Unit:

Arduino Mega: The central microcontroller that processes input data and controls the output components.

Output Components:

1. LCD Display (16×2): Displays relevant information such as time, status updates, or sensor readings.
2. Buzzer: Generates an alert sound in response to specific events or triggers.
3. LEDs (LED-1, LED-2, LED-3): Indicate various statuses or warnings.
4. 8-Channel Voice Recorder: Stores and plays back voice recordings.
5. Speaker: Outputs recorded voice messages from the 8-channel voice recorder.

This system appears to be designed for security, automation, or user-interactive applications, where IR sensors detect activity, user input is processed via the keypad, and alerts are given through the buzzer, LEDs, and speaker.

4. PROPOSED SYSTEM

The only purpose of the medication reminder system is to remind the user when it is time to take his medication. To ensure that the user never forgets, we have three different ways to remind him to take his medication: first, we have a visual indicator, which is a light; second, we added a buzzer, which will provide an auditory reminder that the medication is due; and third, if the patient is outside, we have a mobile reminder app that will remind him via mobile notifications at that time. The mobile application may be loaded in the android smartphones. It will add recurring events to the mobile's calendar and will remind the user when he has to take the medicine with the list of medicines and its prescribed dosage.

A camera-enabled automatic medicine reminder for elderly individuals can enhance their medication adherence and overall health monitoring. Here's how camera access can be utilized in such a system:

1. Facial Recognition for Authentication

- The system can use facial recognition to identify the user before dispensing medication.
- This ensures that the right person is taking the prescribed medicine, preventing mix-ups.

2. Medication Intake Verification:

- The camera can capture images or video to confirm that the user has taken the medicine.
- AI can analyse gestures, such as picking up pills or drinking water, to verify compliance.

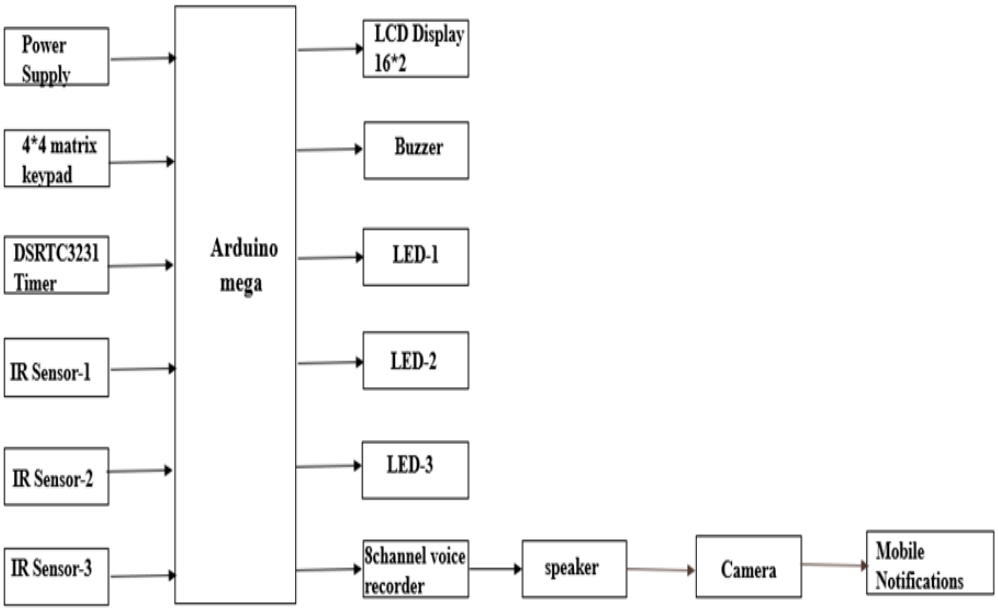

FIGURE 4.1. Block diagram of proposed system

5. SYSTEM OVERVIEW

It is possible to categorize the system into two groups: software and hardware. The software component will handle the task's reminder function, which involves reminding patients to take their medications and the recommended dosage of spoons or tablets. There are two ways to set the reminder: either the mobile app or the web application. Users must log in to both apps in order for their calendar and prescriptions to sync. Since it has been demonstrated that visual cues, like colours, are easier to recall than names, we will further improve this process by giving each medication a colour. When the reminder time.

When the magic mirror is turned on, the layout that appears on it is created using JavaScript and XML. It displays the user's daily schedule, weather, calendar, and new headlines. It has the MMM-voice assistant API, which allows it to react to voice instructions from users

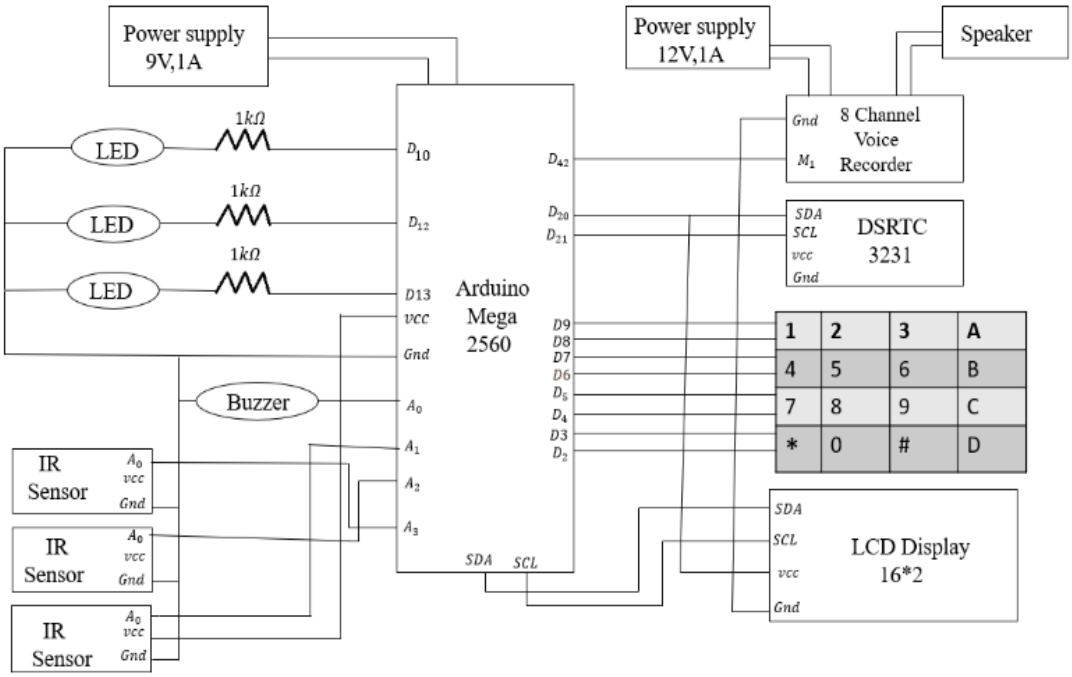

FIGURE 5.1. Connection diagram of proposed system

By using home automation, this magic mirror uses voice commands to operate every smart gadget in the house. Python and JavaScript are used as server-side languages in this magic mirror, and the application is developed using the Node.js framework. By utilizing various sensors and cutting-edge hardware, the suggested magic mirror accomplishes more sophisticated functions than current systems. The following tasks are carried out by the suggested magic mirror:

1. The high-quality screen shows the user's current image linked to the Google Account Photos platform, coupled with the user interface for carrying out tasks.
2. A portion of the screen displays the current time together with the date.
3. The real-time widget displays the customized regular calendar.
4. For bigger high-resolution panels, motion sensors allow us to turn off the display, saving a significant amount of electricity. To make it more instructive, we can also see the display turn off the timer.
5. Weather data based on location that is obtained from the Open Weather Map API.
6. The weather forecast for the next five days will also be displayed.
7. The most recent news is retrieved from an open-source news API platform with worldwide news coverage; we may quickly access news articles by scanning their QR codes.
8. We can provide different inputs to display for many customizable actions using gesture sensors.
9. The moon phase is visible in real time.
10. After connecting to a smartphone, you can send a private message from your phone to the screen.

6. ANALYSIS

After researching and evaluating all of the aforementioned well-known Android mobile applications, several significant conclusions were drawn that lessen their appeal.

A. Results in current systems:

1. The user must manually enter the tablet or capsule name each time. It can't be inserted automatically.
2. The user must manually enter the tablet or capsule's dosage each time. It can't be inserted automatically.
3. The user must manually enter the dose reminder, which should be entered twice or three times each day.
4. The user must manually choose how long the reminder will last. Nothing pertaining to the original prescription is being facilitated by them.

Everything must be completed by hand. We require a program that can automate tasks and cut down on a lot of hum an labour. Additionally, there are several significant problems with the current systems.

B. Drawbacks of existing systems:

1. It is not possible to schedule reminders automatically. To set the reminder, manual labour is required.
2. Setting the reminders by hand takes a lot of time.
3. The original prescription is not made easier to store by them.
4. Because of the physical labour required, there is a chance that the current systems will malfunction.

7. SYSTEM REVIEW

It is possible to categorize the system into two groups: software and hardware. The software component will handle the task's reminder function, which involves reminding patients to take their medications and the recommended dosage of spoons or tablets. There are two ways to set the reminder: either the mobile app or the web application. Users must log in to both apps in order for their calendar and prescriptions to sync. Since it has been demonstrated that visual cues, like colours, are easier to recall than names, we will further improve this process by giving each medication a color. When the reminder time comes, an LED of that color will turn on to indicate that it is time to take that medication. Additionally, there are two ways to use the medication reminder system: either a mobile application or a web site.

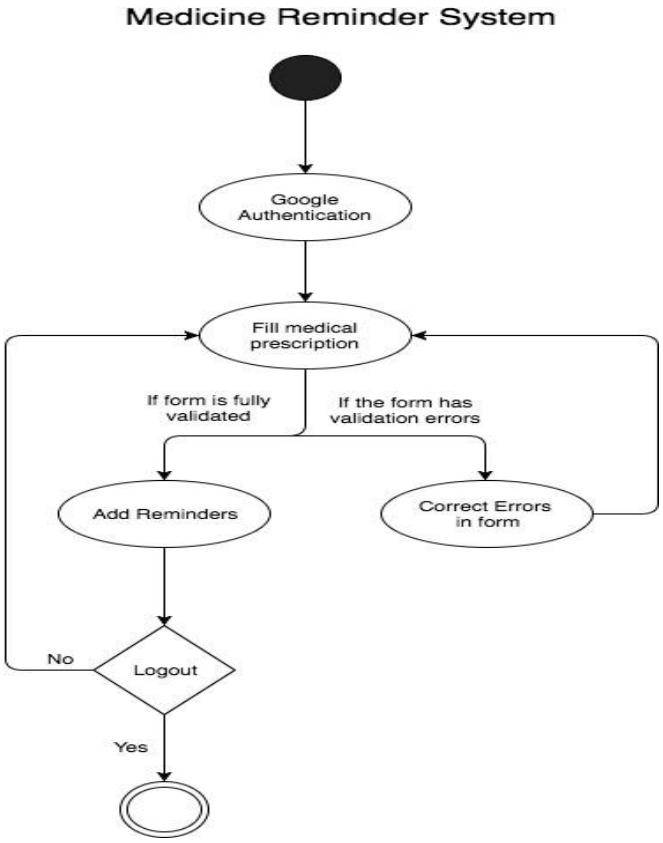

FIGURE 7.1. Activity Diagram of the Medicine Reminder System

Following Google authentication via OAuth2, the web application will accept prescription medication as input and use this information to add the event to the user's Google calendar. Additionally, MongoDB stores the data, which Arduino uses to turn on the appropriate LEDs at a specific moment in accordance with the doctor's order.

8. IMPLEMENTATION OF PROPOSED SYSTEM

Among our system's primary characteristics are:
1. Storing the doctor's prescription: The user must fill out the form with the doctor's prescription details, and MongoDB will store the information.
2. Including Medication Reminders Before the user fills out the form, which is used to add reminders to their calendar based on the time slot and recurrence indicated in the form, they are first confirmed using Google login.
3. Displaying the list of medications and their dosage at the designated time: When the user takes a medication, a notice appears on his device with the list of medications and their corresponding dosage.
4. Using LEDs to show which medication has to be taken at the moment.

For the mobile app:

FIGURE 8.1. Smart Camera

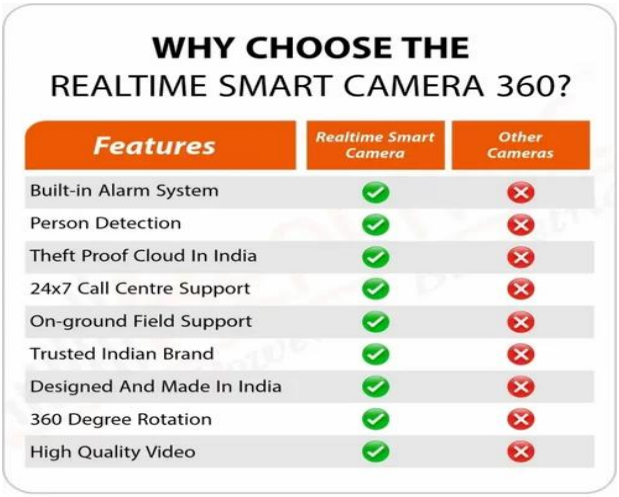

FIGURE 8.2. Features of Smart Camera

9. RESULT

Automatic Medicine Reminder For Old Age People

One excellent method to make sure senior citizens take their meds on time is to use a webcam to create an automatic medication reminder system. Making ensuring senior citizens remember to take their prescriptions on time is the major objective. You can keep an eye on the activities associated with taking medication by using a camera.

To check if the person has taken the medication, the device can employ a camera. For instance, it can determine whether the patient takes the medication from a particular place (such as a pill container or medicine box) and drinks it. When it's time to take their medication, the system will notify them via speakers or a smartphone app. The dosage, frequency of ingestion, and regimen for various medications can all be tracked in a database. A top-notch camera, ideally with night vision if nighttime surveillance is required. An environmental speaker or a smartphone app can be used to send alerts.

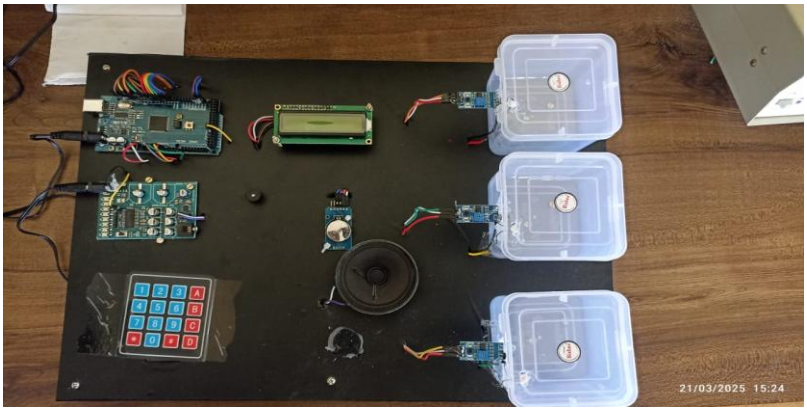

FIGURE 9.1. working Model

Whether on a device screen or a mobile app, the interface should be straightforward and easy for senior users to understand. Large text sizes and clarity are essential for notifications. For improved accessibility, you might also include spoken messaging or audio cues. It should be possible to customize alerts (e.g., Vibration, loudness control).

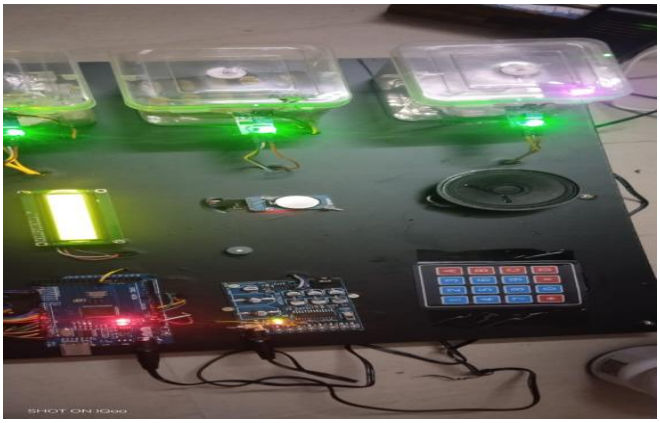

FIGURE 9.2. Morning Alert

FIGURE 9.3. Afternoon Alert

FIGURE 9.4. Night Alert

10. CONCLUSION

This paper presents a working example of how a smart home system can be part of patient medical treatment. While the described solution is based on the smart home as end point, the same solution with smart phone notifications can be used in hospitals when nurses have to monitor patients. The RES system can be extended to send notifications to nurses showing what patients should get medications, measure temperature, or similar. In the modern world, it is important to catch up with the rest of the community when every component has network connectivity. On the other hand, the growing number of smart systems opens up the area where medical treatment can be utilized to a completely new level. Since the described system is a proof-of-concept solution, no further assessment has been conducted. Promotion of this in medical circles, including academic institutions and hospitals, has not yet begin.

11. ACKNOWLEDGEMENT

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