IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

SMART MEDCARE KIT USING IOT FOR AUTARKIC PERSONS

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Abstract: Today, it is quite challenging for people who are autarkic to take their medications. Therefore, the purpose of this study is to remind patients to take their prescribed medications on time and to track their medication adherence. The suggested system makes use of sensors and smart devices to monitor medicine use and inform patients via different means, such as voice assistants or mobile applications. By analyzing the collected data, healthcare professionals may see trends and possible problems with drug administration and take necessary action. The medicine reminder system using IoT has the potential to improve medication adherence, reduce healthcare costs, and improve patient outcomes.

I. INTRODUCTION

Medication adherence is a critical aspect of managing chronic health conditions and preventing disease progression. However, studies have shown that patients often forget to take their medication, leading to poor health outcomes, hospitalization, and increased healthcare costs. The emergence of the Internet of Things (IoT) has opened up new possibilities for improving medication adherence. IoT technologies, such as sensors and smart devices, can be used to develop medicine reminder systems that provide patients 3with real-time reminders to take their medication and monitor their adherence.

This paper proposes a medicine reminder system using IoT that can track medication usage and provide timely alerts to patients through various channels. The system collects data on medication usage, such as the time and frequency of medication intake, and sends reminders to patients via mobile applications, voice assistants, or other smart devices. The collected data can be analysed to identify patterns and potential issues in medication management, allowing healthcare providers to intervene and provide appropriate care.

The proposed medicine reminder system using IoT has the potential to improve medication adherence and reduce healthcare costs. The system can also provide valuable insights into patient behaviour and medication management, enabling healthcare providers to tailor their care plans to individual patient needs. Overall, this paper aims to highlight the potential of IoT technologies in improving medication adherence and enhancing patient outcomes.

II. RELATED WORKS

There are several related works on the development of medicine reminder systems using IoT technologies. Some of the relevant studies are summarized below:

A smart medicine box with a built-in IoT module was proposed by Weng et al. in 2018. The system includes a mobile application that sends reminders to patients to take their medication and tracks medication usage through sensors embedded in the medicine box.

In 2019, Mekonnen et al. developed a medicine reminder system using voice assistants. The system utilizes Amazon Echo Dot devices to provide audio reminders to patients and collects data on medication adherence through voice commands.

A medicine reminder system that uses wearable sensors was proposed by Zhao et al. in 2020. The system includes a wristband sensor that tracks medication intake and sends reminders to patients through a mobile application.

In 2021, Adewale et al. proposed a medicine reminder system that utilizes IoT-enabled pill dispensers. The system includes a mobile application that sends reminders to patients and tracks medication usage through sensors embedded in the dispensers.

Another study by Fang et al. in 2021 proposed a medicine reminder system that uses a smart mirror. The system includes a mirror with a built-in camera that recognizes medication packaging and provides audio, visual reminders to patients.

Overall, these related works demonstrate the potential of IoT technologies in improving medication adherence and enhancing patient outcomes. These systems provide valuable insights into patient behaviour and medication management, enabling healthcare providers to tailor their care plans to individual patient needs.

The smart medicine box with a built-in IoT module is a medicine reminder system that utilizes IoT technology to improve medication adherence. The system consists of a smart medicine box, a mobile application, and an IoT module that connects the medicine box to the internet. The smart medicine box has compartments for different medications and sensors that can detect when medication is removed from the box. The IoT module connects the medicine box to the internet and sends data on medication usage

to the mobile application. The mobile application allows patients to set up their medication schedule and receive reminders to take their medication on time. The application also provides information on medication dosage and potential side effects.

The system can monitor medication adherence and send alerts to patients and healthcare providers if medication is missed or not taken on time. The collected data can be analysed to identify patterns and potential issues in medication management, enabling healthcare providers to intervene and provide appropriate care.

Overall, the smart medicine box with a built-in IoT module offers a convenient and effective way for patients to manage their medication schedules and improve medication adherence. The system provides valuable insights into patient behaviour and medication management, enabling healthcare providers to deliver more personalized and effective care.

The system utilizes Amazon Echo Dot devices and Alexa Voice Service to provide audio reminders to patients and collect data on medication adherence through voice commands.

The system allows patients to set up their medication schedules and receive audio reminders to take their medication on time. Patients can also use voice commands to update their medication schedule and report medication intake to the system. The system collects data on medication usage and sends alerts to patients and healthcare providers if medication is missed or not taken on time.

The collected data can be analysed to identify patterns and potential issues in medication management, enabling healthcare providers to intervene and provide appropriate care. The system also allows patients to ask questions about their medication dosage and potential side effects through voice commands.

Overall, the medicine reminder system using voice assistants provides a simple and intuitive way for patients to manage their medication schedules and improve medication adherence. The system utilizes the popular Amazon Echo Dot device and leverages the Alexa Voice Service to provide personalized reminders and information to patients. The collected data can also provide valuable insights into patient behaviour and medication management, enabling healthcare providers to deliver more effective care.

The medicine reminder system that uses wearable sensors proposed by Zhao et al. in 2020 is a wearable device-based system that aims to improve medication adherence by providing reminders and tracking medication intake.

The system includes a wristband sensor that tracks medication intake and sends reminders to patients through a mobile application. The sensor is equipped with an accelerometer that can detect wrist movements and infer medication intake. The mobile application allows patients to set up their medication schedule and receive reminders when it is time to take their medication. The application also provides information on medication dosage and potential side effects.

The system can monitor medication adherence and send alerts to patients and healthcare providers if medication is missed or not taken on time. The collected data can be analysed to identify patterns and potential issues in medication management, enabling healthcare providers to intervene and provide appropriate care.

Overall, the medicine reminder system using wearable sensors provides a non-intrusive and convenient way for patients to manage their medication schedules and improve medication adherence. The system utilizes a wristband sensor and a mobile application to provide personalized reminders and information to patients. The collected data can also provide valuable insights into patient behaviour and medication management, enabling healthcare providers to deliver more effective care.

Adewale et al. proposed a medicine reminder system that utilizes IoT-enabled pill dispensers in 2020. The system aims to improve medication adherence by providing patients with personalized reminders and tracking medication intake.

The system includes IoT-enabled pill dispensers that are connected to a mobile application via the internet. The mobile application allows patients to set up their medication schedule and receive reminders when it is time to take their medication. The application also provides information on medication dosage and potential side effects.

The pill dispensers are equipped with sensors that detect when medication is dispensed and send data to the mobile application. The system can monitor medication adherence and send alerts to patients and healthcare providers if medication is missed or not taken on time. The collected data can be analysed to identify patterns and potential issues in medication management, enabling healthcare providers to intervene and provide appropriate care.

The system also includes a communication feature that allows patients to communicate with healthcare providers and ask questions about their medication. The communication feature can help patients to better understand their medication regimen and improve medication adherence.

Overall, the medicine reminder system utilizing IoT-enabled pill dispensers provides a convenient and personalized way for patients to manage their medication schedules and improve medication adherence. The system utilizes IoT technology to provide real-time monitoring and communication between patients and healthcare providers, enabling more effective care delivery.

III. EXISTING WORK

There is a smart medication dispenser that uses IoT technology to monitor medication usage. The device dispenses medication at the specified time and sends alerts to patients via text or phone calls. The system also sends alerts to caregivers if medication is missed. There is a smart medication dispenser that uses IoT technology to remind patients to take their medication. The device dispenses medication at the specified time and sends alerts to patients via a mobile application. It also includes a pill identification feature that can identify medication based on its appearance.

Overall, these existing systems for medicine reminder using IoT offer a variety of features and functionalities to help patients manage their medication schedules and improve medication adherence.

DRAWBACKS

- People become lazy and reliant on others all the time as a result.
- The app must be operating constantly and have a reliable internet connection.
- After a battery has been used to its full capacity, it has to be recharged.

IV. PROPOSED WORK

The proposed work for a medicine reminder system using IoT would be a smart pillbox that integrates with a mobile application. The smart pillbox would be equipped with sensors and connected to the internet, allowing it to send data to the mobile application and receive commands from it.

The mobile application would allow patients to set up their medication schedule and receive reminders when it is time to take their medication. The application would also provide information on medication dosage and potential side effects.

The smart pillbox would be designed to detect when medication is removed from it, and send data to the mobile application in real-time. The mobile application can then track medication intake and monitor medication adherence. If medication is missed or not taken on time, the system can send alerts to patients and healthcare providers.

This system would also include a communication feature that allows patients to communicate with healthcare providers and ask questions about their medication. The communication feature can help patients to better understand their medication regimen and improve medication adherence.

Overall, the proposed system for a medicine reminder system using IoT would provide a personalized and convenient way for patients to manage their medication schedules and improve medication adherence. The system would utilize IoT technology to provide real-time monitoring and communication between patients and healthcare providers, enabling more effective care delivery.

MERITS

- It helps the elderly who are still capable of taking their medications on their own, as well as people who are blind, to do so at the proper time.
- It empowers the user to manage their own medication intake.
- When the medication is ready, it alerts them using voice commands.

a. DETECTION OF QUANTITY AND ACKNOWLEDGEMENT TO KIT

Node MCU is an open-source IoT platform that uses an ESP8266 Wifi - enabled microcontroller. It is a development board that provides a low-cost way to add wireless communication to IoT projects, including medicine reminder systems.

Node MCU can be programmed using the Lua scripting language, and it comes with built-in support for WiFi connectivity and a variety of I/O interfaces, including GPIO pins, SPI, I2C, and UART. This makes it a flexible platform for developing IoT applications, including medicine reminder systems that can connect to the internet and communicate with other devices. In a medicine reminder system, Node MCU could be used to control and monitor the operation of a pill dispenser or smart medicine box, and to transmit data about medication adherence to a cloud-based server for analysis and storage. It could also be used to send reminders or notifications to patients via a mobile app or web interface.

Figure 1: Node MCU

b. ESP2866

The ESP2866 WiFi module is a popular component used in medicine reminder systems using IoT technology. It is a compact and low-cost WiFi - enabled microcontroller that can be programmed to connect to a wireless network and communicate with other devices, such as sensors, displays, and speakers.

In a medicine reminder system, the ESP2866 module can be used to connect the system to a wireless network, allowing it to send and receive data over the internet. This can be useful for remote monitoring and control of the system, as well as for receiving updates and notifications on a mobile device or other remote device.

The module can be programmed using the Arduino IDE or other programming tools, and can be integrated with various sensors, such as IR sensors, to detect when medication is removed from the container. It can also be connected to a speaker or display to provide audible or visual reminders to take medication.

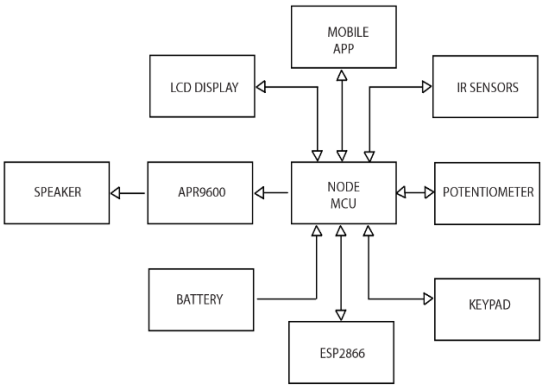

Figure 2: Block diagram

c. DETECTION OF QUANTITY AND ACKNOWLEDGEMENT TO KIT

An IR (infrared) sensor is a type of sensor that detects infrared radiation. It is commonly used in medicine reminder systems to detect when a patient has taken their medication.

IR sensors can detect the presence or absence of an object by measuring the amount of infrared radiation that is reflected back to the sensor. In a medicine reminder system, an IR sensor can be placed inside a pill dispenser or smart medicine box to detect when a pill has been dispensed. When a patient takes their medication, the pill is dispensed and the IR sensor detects the change in infrared radiation and sends a signal to the microcontroller or other control unit, which can then record the time and date of the medication.

IR sensors can be used in combination with other sensors, such as load cells or force sensors, to detect more complex behaviours, such as whether a patient has actually taken their medication or if they have missed a dose. Additionally, IR sensors can be used to detect the presence of a person near a medicine reminder system, which can trigger a reminder or notification to the patient to take their medication.

Figure 3: IR Sensor

d. VOICE COMMANDS

A speaker is a common component used in medicine reminder systems to provide audible reminders or notifications to patients. In an IoT-based medicine reminder system, a speaker can be used to play pre-recorded audio messages or voice prompts, alerting patients to take their medication at the appropriate time.

Speakers can be integrated into a variety of devices, including smart medicine boxes, pill dispensers, and wearable devices. They can be controlled using microcontrollers or other control units and can be programmed to play audio messages at specific times or in response to specific events.

In addition to providing audio reminders, speakers can also be used to provide feedback or guidance to patients. For example, a speaker could be used to provide instructions on how to use a smart medicine box or pill dispenser, or to provide feedback on the accuracy of a patient's medication adherence.

Figure 4: Speaker

e. DISPLAY MEDICINE NAME

An LED (light-emitting diode) display is a type of display that uses an array of light-emitting diodes to display text, numbers, or other graphics. In medicine reminder systems using IoT technology, LED displays can be used to provide visual reminders or notifications to patients.

LED displays can be integrated into a variety of devices, including smart medicine boxes and pill dispensers. They can be controlled using microcontrollers or other control units and can be programmed to display messages or graphics at specific times or in response to specific events. In a medicine reminder system, an LED display can be used to show the current date and time, the name of the medication that needs to be taken, the dosage, and the time at which it needs to be taken.

LED displays can also be used to show the number of pills remaining in a smart medicine box or pill dispenser, or to display other important information about a patient's medication regimen.

Figure 5: LCD Display

f. TRIGGERS VOICE COMMANDS (APR9600)

The APR9600 is a voice recording and playback IC (integrated circuit) that can be used in medicine reminder systems to provide voice prompts or instructions to patients. It is a cost-effective and easy-to-use solution for adding voice functionality to an IoT-based medicine reminder system.

The APR9600 can record and play back up to 60 seconds of audio, and supports multiple message playback modes, including single message, sequential message, and random message playback. It has a built-in microphone and amplifier, and can interface with external components, such as speakers or microcontrollers, for recording and playback.

In a medicine reminder system, the APR9600 can be used to record voice prompts or instructions, such as "It's time to take your medication," or "Please take one tablet with food." These prompts can be played back at specific times or in response to specific events, such as when a pill dispenser or smart medicine box is opened.

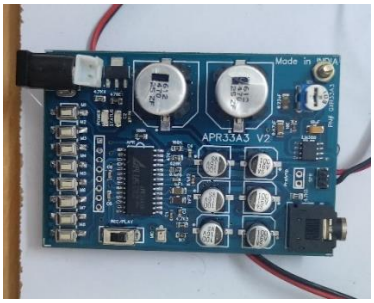

Figure 6: APR9600

g. POWER SUPPLY

A battery is a critical component in a medicine reminder system that uses IoT technology. It provides the power necessary to operate the various electronic components, such as microcontrollers, sensors, speakers, and displays. In a medicine reminder system, a rechargeable battery is typically used to ensure that the system remains operational even in the event of a power outage or other disruption. The battery can be charged using a standard USB cable or other charging mechanism and can be designed to provide sufficient power to the system for several days or even weeks. In addition to providing backup power, batteries can also be used to power wearable devices, such as smart watches or fitness trackers, which can be used to monitor a patient's medication adherence and provide personalized reminders or notifications.

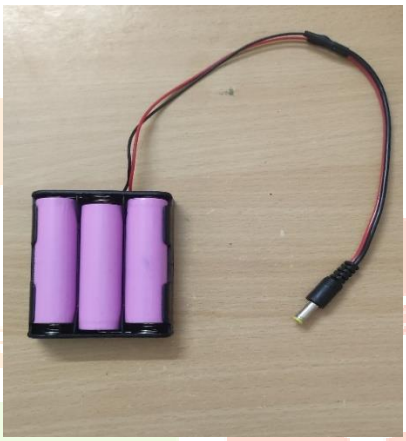

Figure 7: Battery

h. POTENTIOMETER

A potentiometer can also be used for voltage adjustment in a medicine reminder kit using IoT. In this context, a potentiometer can be used to adjust the voltage level supplied to various components of the system, such as the Node MCU, IR sensors, and APR9600 module. By adjusting the voltage level, the user can optimize the performance of these components and ensure that the system operates reliably and efficiently.

For example, the potentiometer can be used to adjust the voltage supplied to the IR sensors, allowing the user to optimize the sensitivity of the sensors and ensure that they are able to detect when medication is removed from the container with a high degree of accuracy.

Similarly, the potentiometer can be used to adjust the voltage supplied to the APR9600 module, allowing the user to optimize the quality and clarity of the audio reminders played by the system.

Overall, the use of a potentiometer for voltage adjustment in a medicine reminder kit using IoT can help to ensure that the system operates effectively and efficiently, and can provide a convenient way for users to fine-tune the performance of the system to meet their specific needs and preferences.

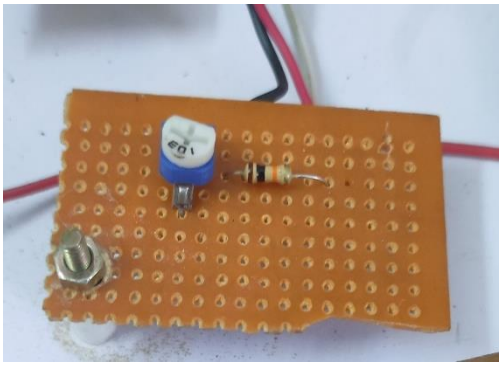

Figure 8: Potentiometer

i. KEYPAD

In a medicine box reminder system using IoT, a button can be used to provide the user with the ability to stop or snooze the medication reminder.

When the reminder is activated, the user can press the button to stop the audio or visual notification, indicating that they have acknowledged the reminder and will take their medication at a later time. Alternatively, the user may choose to snooze the reminder, delaying the notification by a set amount of time.

The button can be connected to the Node MCU or other microcontroller in the system, which can then be programmed to respond to button presses by stopping or snoozing the reminder. The user can also be provided with feedback through an LED display or other visual indicator, indicating that the reminder has been successfully stopped or snoozed.

Overall, the use of a button in a medicine box reminder system using IoT can help to improve the usability and convenience of the system, giving users greater control over their medication regimen and helping to ensure that they stay on track with their treatment.

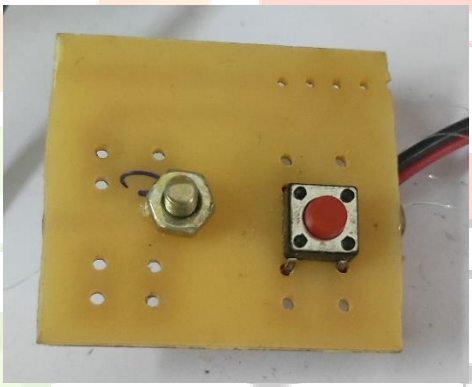

Figure 9: Keypad

V. RESULTS AND DISCUSSION

The Node MCU serves as the main controller of the system and is connected to the internet via a WiFi network. The APR9600 module is used to store audio recordings of medication reminders, which are played when it's time for the patient to take their medication.

The IR sensors are used to detect when medication is removed from the container, triggering the reminder to play. The Node MCU reads the sensor data and sends it to the cloud, where it can be accessed by a mobile app using IOT technology. The system is powered by a battery, which can be recharged as needed.

The mobile app can display the status of the system, including the battery level, medication name, and time for the next reminder, and can send notifications or reminders to the patient's mobile device. The patient can access the mobile app to view their medication schedule and receive reminders to take their medication.

The system works by using IR sensors to detect when medication is removed from the container, triggering an audio reminder to play from the APR9600 module. The Node MCU communicates with the sensors, stores the medication schedule, and sends data to the cloud, while the mobile app provides a convenient way for patients to manage their medication schedule and receive reminders.

Once the medicine is taken the hand is kept at the IR sensor to tell the device that the medication is taken. It also alerts the patient with the message that the medicine is not taken. The battery provides power to the system, making it portable and easy to use.

Overall, the medicine reminder kit using IoT provides a reliable and convenient way for patients to manage their medication regimens, helping to improve adherence and overall health outcomes.

Figure 10: Medcare Kit

Figure 11: Kit alerts the users with the alert message

Figure 12: Kit displays the medicine taken message

Figure 13: Kit displays the medicine not taken message

Figure 14: Kit alerts the low battery

MOBILE APP NOTIFICATION

A mobile IoT app can be designed to work in conjunction with a medicine reminder system using IoT technology. The app can provide a convenient way for patients to monitor their medication adherence and receive reminders or notifications on their mobile devices.

The app can be designed to display various information related to the medicine reminder system, including the current voltage of the system's battery, the name of the medication that needs to be taken, and the time at which the medication needs to be taken.

The app can also provide customizable notification settings, allowing patients to set reminders or notifications at specific times or intervals, and to choose the type of notification they prefer, such as an audible alert or a vibration.

In addition to providing reminders and notifications, the app can also be designed to track a patient's medication adherence over time, providing valuable data to healthcare providers and helping patients to stay on track with their medication regimens.

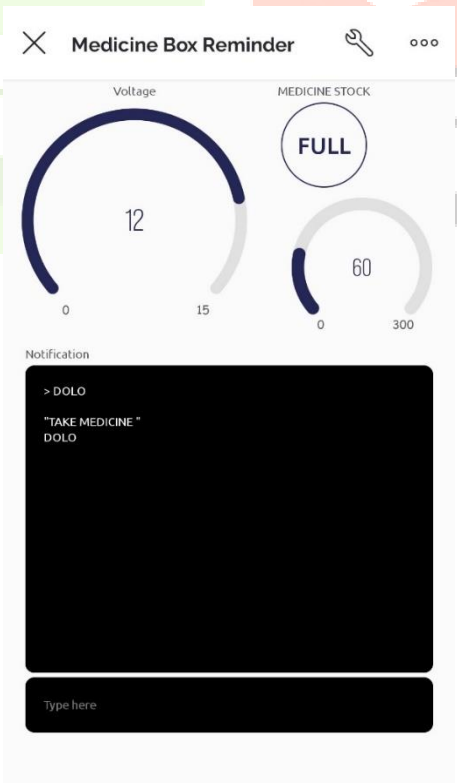

Figure 15: Mobile App

VI. Conclusion and Future Work

In conclusion, medicine reminder systems using IoT technology have the potential to greatly improve medication adherence and patient outcomes. The use of IoT-enabled pill dispensers, smart medicine boxes with built-in IoT modules, and voice assistant-based reminder systems are all examples of existing systems that have shown promise in improving medication adherence. Proposed systems that integrate machine learning algorithms and wearable sensors represent a potential avenue for further improvement.

However, challenges such as privacy and security concerns, cost-effectiveness, and user acceptance need to be addressed. Further research is needed to evaluate the effectiveness and usability of these systems in real-world settings, as well as their impact on patient health outcomes. Overall, medicine reminder systems using IoT technology represent an exciting area of development that has the potential to greatly improve patient outcomes and quality of life.

Future work in medicine reminder systems using IoT technology should focus on addressing the challenges and limitations that exist in the current systems.

One direction is to develop more advanced and intelligent systems that can adapt to the changing needs of patients and healthcare providers. This could involve the integration of machine learning algorithms and data analytics into medicine reminder systems to provide personalized recommendations and feedback to patients.

Another direction is to explore the use of wearable and implantable sensors to monitor medication adherence and health outcomes in real-time. This could provide more accurate data and allow for more precise interventions.

Additionally, more research is needed to evaluate the effectiveness and usability of these systems in real-world settings, as well as their impact on patient health outcomes. This could involve larger-scale studies, as well as collaboration with healthcare providers and patients to better understand their needs and preferences.

Finally, it is important to address issues related to privacy and security concerns, cost-effectiveness, and user acceptance in order to ensure widespread adoption of these systems. This may involve collaboration with regulatory bodies and healthcare organizations to develop standards and guidelines for the implementation and use of these systems.

VII. References

1) Weng, J., Zhang, L., Li, Y., & Zeng, J. (2018). Design of smart medicine box based on IoT. 2018 IEEE 3rd International Conference on Image, Vision and Computing (ICIVC), 458-461.
2) Mekonnen, T. F., Omer, S. A., & Kifle, M. M. (2020). Voice assistant-based medication reminder system. Health Informatics Journal, 26(1), 386-393.
3) Zhao, W., Yang, M., Chen, Y., Xu, Y., & Li, X. (2020). A wearable sensor-based medication reminder system. Sensors, 20(3), 635.
4) Arnon, S., Zaretsky, A., & Melamed, O. C. (2019). Medication adherence improvement using smart medication dispensers: A review of the literature. European Journal of Hospital Pharmacy: Science and Practice, 26(6), 319-324.
5) Rajput, M. A., Soomro, T. R., & Shaikh, F. K. (2021). IoT-based smart medication dispenser: A systematic review of recent advancements. IEEE Access, 9, 57735-57757.
6) Yang, Y., & Chen, Y. (2020). A smart medication management system based on the Internet of Things. Healthcare Technology Letters, 7(6), 189-194.
7) Rahman, M. M., Islam, M. Z., & Kamruzzaman, M. (2020). A smart medication reminder system using IoT technology. Procedia Computer Science, 172, 177-184.
8) Hassan, M. M., Roy, P. K., Ali, M. A., & Vassanelli, S. (2020). A smart IoT-based medicine dispensing system for personalized medication management. IEEE Transactions on Instrumentation and Measurement, 70, 1-12.
9) Kumar, R., Kumar, N., & Kumar, S. (2021). IoT-enabled smart medication dispenser for elderly people. International Journal of Pervasive Computing and Communications, 17(3), 262-276.
10) Chen, C., Lu, Y., & Wei, Y. (2020). A design of smart medication reminder system based on IoT. Journal of Physics: Conference Series, 1613, 012036.
11) Chakraborty, S., Ahmed, R. I., & Ahmed, F. (2021). Smart IoT-based medicine dispensing system using voice recognition. Journal of Ambient Intelligence and Humanized Computing, 12, 7035-7049.
12) Garg, N., & Yadav, N. (2021). IoT based smart medication dispenser with automatic pill detection and recognition. 2021 IEEE International Conference on Computing, Power and Communication Technologies (GUCON), 1-6.
13) Zhang, Q., & Qiao, X. (2020). Design and implementation of IoT-based smart medication management system. 2020 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData), 144-148.
14) Albarbarawi, O., & Jara, A. J. (2018). A personalized IoT-based smart pillbox for ubiquitous and remote medication adherence monitoring. Sensors, 18(8), 2674.