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IOT-Based Medicine Reminder and Monitoring System for Safe Health

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Abstract - *Despite the slower rate of IoT (Internet of Things) adoption in the healthcare sector compared to other industries, IoT in the area of medicine is destined to keep people safe and healthy with the main objective of lowering healthcare costs in the next years. Here, a smart healthcare system built on the Internet of Things is made available, complete with a smart medication box. Connected sensors and servers allow for continuous health monitoring. Patients may get consistent medical treatment and patient without actually meeting in person because to this internet-connected smart medicine box link. The suggested medicine box helps the patient take the right dosage at the right time and includes instructions that will help the sufferer. In today's world, people often miss important daily details due to their hectic schedules. Dementia, which causes forgetfulness in daily activities, affects the elderly and those with chronic illnesses who must take their medications on time without skipping any. Taking into account the circumstance research that was conducted in this By reminding patients to take their medications on time, monitoring patients remotely, and updating their patient records with new medication information, which may be done by a prescriber online, home health care technologies are now being utilized to improve this issue.*

Key Words: Healthcare, Medicine Box, Internet of Things, Remote Monitoring.

1. INTRODUCTION

The degree to which a patient appropriately complies with medical guidance is known as medication adherence. Medication non adherence is defined as carelessness and delays in taking your medications, failing to follow your prescriptions, or even skipping doses due to cultural and racial influences. In addition, un-prescribed polypharmacy, prescription alterations, and taking many drugs are all examples of medical non-adherence. According to studies, medical adherence is just approximately 50% in wealthy nations. The situation is significantly worse in developing nations. Farmers traditionally find it difficult to choose which crop is most suited and financially advantageous to their soil, their circumstances, and their location because of the variability in soil types across the country, and as a result they frequently suffer losses. Because of 1) Forgetfulness in the case of elderly patients, 2) Inability to read and understand the prescription and the names on the medicines, and 3) Lack of resources and knowledge to use the various mobile-based medication reminder applications, the problem of medication non-adherence is critical in our country, particularly in the rural areas. Non-adherence to medication regimens can have a serious detrimental impact on the patient. It might result in negative consequences like health issues or even longer treatment times and greater costs.

You may categories the solutions into hardware- and software-based approaches. The bulk of software-based solutions consist of several medication-reminder apps for various mobile platforms, which are inaccessible to elderly and illiterate rural Indians. The system that is suggested in this study is hardware-based. The pharmaceutical tablets and their schedule must be input into it by the doctor, the doctor's assistant, or another literate family member (hence referred to as the "caretaker"). The patient is then informed by the gadget at the appropriate moment.

1.1 Proposed Solution

As a device-based answer to the aforementioned issue encountered by rural Indians, this project is put forth. Your medications are stored, along with a reminder of when to take them. The issue of memory loss and forgetfulness in the elderly is addressed, and attempts have been made to make this gadget useable for those with disabilities. The patient is not assumed to have any medical literacy or understanding when designing this project. It presupposes the presence of a Caretaker who could configure the gadget using the patient's basic interface. The parts that follow provide further information on how this Project operates.

2. LITERATURE SURVEY

Iranpak et al [1] this study makes use of IoT device datasets that are connected to patients via wrist sensors. On an hourly basis, data from IoT devices is provided. As a result, 10,000 data points are received every hour and each sample is larger than 1 terabyte. A prioritizing approach is used in this study to priorities sensitive data in the Internet of Things, and LSTM deep neural networks are implemented in cloud computing to relegate and monitor patients'

conditions remotely, which may be regarded as the paper's most original component. The 5th-generation Internet is used to send sensor data from the IoT platform to the cloud. The LSTM (long short-term recall) deep neural network method is at the heart of cloud computing.

Archip et al [2] the procedures taken to develop and construct a low-cost modular monitoring system prototype are described in the current work. This device, which was created utilizing low-power, specially designed sensor arrays for EKG, SpO2, temperature, and movement, intends to provide mobile assistance for quicker and better medical actions in emergency situations. These sensors' interfaces have been created using the IoT concept, where a central control unit exposes a RESTful-based Web interface that assures platform independence and offers a flexible means of adding additional parts.

P. S. Akram et al [3] IOT is essential for data collection, monitoring, data analysis, recording, storage, and presentation. In this research, we examine variables such GPS, body temperature, blood pressure, and pulse sensor, to monitor the patient's present location. The data is transferred to an Arduino Board, which serves as a CPU, where it is further processed. We transfer data over the internet for analysis using the WIFI module. This data has been evaluated and is kept for future use. When a serious situation is found, the results are instantly communicated to the doctor.

Lakmini P. Malasinghe et al [4] this paper offers a summary of current developments in both contact-based and contactless remote monitoring and healthcare. The writers talk about a few difficulties that are present in most systems along with the review. The report also offers several suggestions for further study. With the least amount of user disturbance, these programmes enable activities including sitting, standing, using the restroom, watching television, reading, and sleeping. Even if there are wearable sensors, their impact on the activities is minimal. One such instance is sensor-based smart watches.

Tanmay Patil et al [5] the project's goal was to develop a Remote Health Monitoring System that could be created using readily accessible local sensors in order to keep costs low if it were to be mass produced. There have been attempts to use the new technology in numerous sectors to enhance the quality of human existence as a result of technological advancement and sensor shrinking. The healthcare industry is one significant field of research where the technology has been adopted. Healthcare services are exceedingly expensive for the people who require them, and this is especially true in developing nations.

Yedukondalu Udara et al [6] a low-cost, accessible health monitoring device for those living in distant areas without access to specialized medical care. This device is transportable. Low cost and simple to use even for those with little experience. In order to transfer the data to a distant server where doctors may view it, this concept was also created utilising IoT.

3. PROBLEM STATEMENT

The majority of medical mistakes often involve medication errors and unfavorable drug responses. These unfavorable pharmacological side effects have an adverse influence on patient fatalities, medical costs, and harm to healthcare professionals' reputations. These are typical reasons of these errors:

1. The patient takes medications irregularly as a result of their hectic lifestyle.

2. Complex scheduling for admission.

3. Lack of understanding about how to utilize medications properly.

4. A lack of doctor consultation.

5. A lack of procedures to monitor the state of the patient's intake.

The doctor must also keep track of the patient's heart rate, blood pressure, and body temperature in an emergency. In cases of crises, the patient might not have the time because this requires time. Therefore, it is necessary to be aware of these aspects in advance.

4. PROPOSED WORK

In this Projects only one specific drug will be kept in each of the box's numerous tiny compartments, which are all present. The device contains an LCD, a keypad for user interaction, and buzzers, vibrators, and LEDs for notification purposes. Each medication's regimen for the patient must be programmed by the keeper into the Box. It follows. The patient is informed about the timetable and just needs to take the medication that is in the box that has a vibrating or light indicator. In addition to the medication's expiration date, it keeps details such how many tablets must be taken, how long the medication must be taken, and must be done. The schedule of each medicine for the patient needs to be programmed into the Box by the caretaker. It tracks the schedule, notifies the patient, and all the patient has to do is take the medicine kept in the box indicated by a light/vibrator. Apart from time of the medicine, it stores information like number of pills to be taken and for how many days the medicine is to be taken.

Parts of the Working are as follows:

Step 1: After receiving the medication prescriptions, the caregiver arranges the medications into compartments (one kind in each) and establishes the medication regimens using the device's LCD and Keypad.

Step 2: After Step 1, the gadget has all the necessary information. A real-time clock is used to maintain track. The device alerts the user when it's time to take a medication.

Step 3: Using an internal buzzer, the gadget alerts the user by creating a loud noise. Both the associated vibrator (for the blind) and the indication light adjacent to the compartment holding the medication that has to be taken will turn on. As long as the compartment lid is closed, the light and vibrator won't activate (the gadget will presume that the user opened the container to take the medicine).

Because it presupposes no prior information on the side of the patient, this approach is ideal for rural India. All that is needed is for the patient to take the medication when instructed to do so and the matching indicator (light or vibrator) is on.

5. METHODOLOGY

The circuit includes a microcontroller, LCD, regulator, driver IC, RF transceiver, crystal oscillator, capacitors, and a transformer. It also includes blood pressure, heart rate, and temperature sensors. The microcontroller has 28 pins in total. The microcontroller has three inputs. They are the temperature, heart rate, and blood pressure sensors. The microprocessor PIC18F25K20 has a blood pressure sensor linked to pin 15, a heart rate sensor to pin 3, and a temperature sensor to pin 2. The LCD is attached to the microcontroller's output pins 22 through 26. The DRIVER IC is attached to pins 11, 12, and 13. MAX 232 is coupled to pins 17 and 18.

The output of the MAX232, which serves as a timer IC, is linked to the RF module. The RF module functions as a module for two-way communication. The data is delivered to the doctor's desk through the RF module. The regulator controls the voltage in the range of 0 to 5 volts.

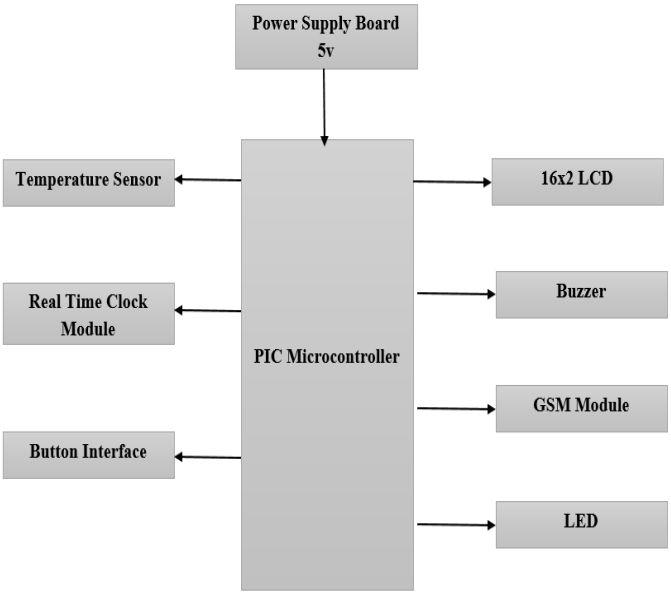

Fig-1: Block Diagram

The microcontroller has a software that uses a system-integrated buzzer to remind the patient to take the prescribed medication on time. The amount of dosages the patient must take and when they are due will be shown on the LCD attached to the microcontroller. If the patient accidentally forgets to take the recommended medication, an alert will sound. If the patient still forgets to take the medication, the patient can review all missed alarms at a later time.

The different modes are explained below:

Home: Real Time Clock (RTC) is shown on the LCD screen by default, and the microcontroller is in its Low Power Mode with interrupts enabled. When an interrupt occurs, it quits low power mode, performs the requested function, and then enters low power mode again. The alarm notification function is an internal hardware interrupt, while the other interruptions are produced by actions like pushing keys on a 4X4 Keypad or opening pill boxes.

Set an alarm: Pressing a certain key on the keypad initiates the interrupt for "Set an Alarm." The device calls the "Set Alarm" function after waking up from low power mode, runs it, and then returns to low power mode.

List Alarms: A keypad button labelled "List Alarm()" can be clicked to examine the list of alarms that have been fed into the device. Using the buttons on the Keypad, you may traverse the list of alarms that is displayed. Additionally, the user has the choice to use the Delete button to remove any specific alert.

Notification: An interrupt for notifications is started when the timing of an alarm matches the real-time clock of the MCU. Box buzzer, the LED and Vibrator of the respective compartment, as well as the main LED, switch on as soon as the Notification interrupt is triggered.

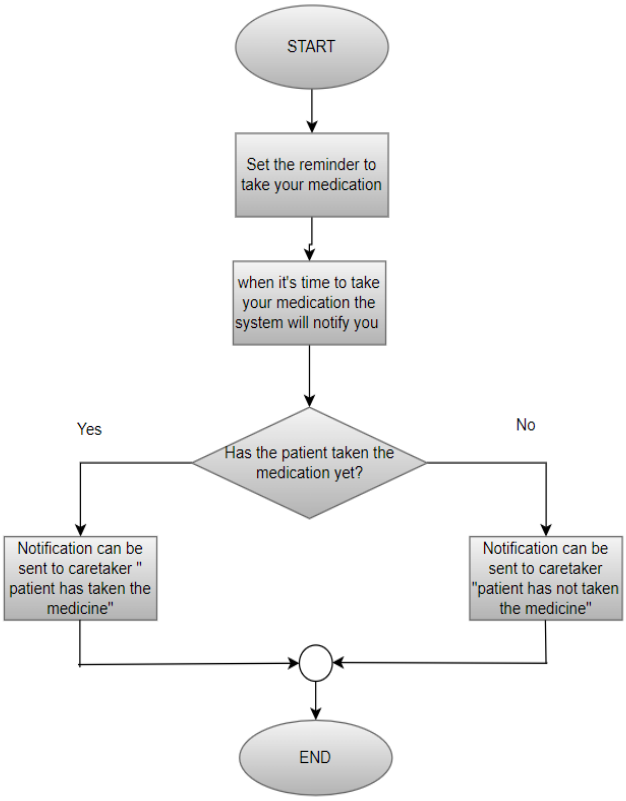

Fig-2: Flowchart of Notification

List Missed Alarms: If the user fails to take the prescribed medication within the allotted one-hour window, Medicine reminder thinks that the user is not responding and adds that alert to the "List of Missed Alarms." Trigger the interrupt corresponding to "Stack Alarm ()" to see the "List of Missed Alarms". With the help of the buttons on the keypad, you may traverse the list of missed alarms that is shown. The Patient/Caregiver can utilize this to learn about missed medicine and call their doctor for advice on how to go forward. Then, they may use the Delete option to remove that specific alert from this list.

6. REQUIREMENTS

IOT: The network of physical items, or "things," that are implanted with sensors, software, and other technologies for the purpose of communicating and exchanging data with other devices and systems through the internet is referred to as the Internet of Things (IoT). The use of IoT in the healthcare sector has made it possible for doctors to keep an eye on patients' ailments in real-time, allowing them to head off emergency scenarios like heart failure, diabetes, asthma attacks, cardiac arrest, etc.

Temperature Sensor: Accurate non-contact temperature measurement in medical applications is made possible by infrared (IR) temperature sensors. The most typical uses for this kind of temperature sensor are for monitoring skin, forehead, or ear temperatures.

PIC Micro-controller: The purpose of PIC microcontrollers in embedded system design is to provide easy programming and interfacing. Although Microchip did release several 16-bit and 32-bit PIC microcontrollers, the majority of PIC microcontrollers that are available are 8-bit microcontrollers. The smallest microcontrollers available are PIC devices, which may be programmed to do a wide variety of activities. Numerous electronic products, including phones, embedded systems, computer control systems, alarm systems, etc., contain these microcontrollers.

GSM Module: For wireless radiation monitoring through Short Messaging Service, a customized Global System for Mobile Communication (GSM) module is created (SMS). This module can provide text messages as serial data to host servers from radiation monitoring devices like survey meters and area monitors.

LCD Display: Liquid crystal display is referred to as LCD. It is a particular type of electronic display module used in a wide array of circuits and devices, including mobile phones, calculators, computers, TVs, and other electronics. These displays are mostly favored for seven segments and multi-segment light-emitting diodes. The primary advantages of adopting this module are its low cost, ease of programming, animations, and ability to show bespoke characters, unique animations, etc.

7. CONCLUSION

The pill box would be trustworthy, of great quality, and appropriate for cases and elderly people as a result. The system would work and be high caliber. In light of the other items included in the request, the price would be reasonable. The number of dosage to take each time is up to the patient. The alarm will go off when it needs to. The programming language being utilized is easy to learn and flexible.

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