

# IoT Enabled Assisting Device for Seizures Monitoring

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**Abstract:** The wellbeing and health area is basic to human culture and all things considered ought to be one of the first to get the advantages of up and coming innovations like IoT. A portion of the Internet of Medical Things (IoMT) is associated with IoT systems to screen the everyday exercises of the patients. As of late there has been an endeavor to plan new therapeutic gadgets which screen the meds and help matured individuals for a superior helped living. In this paper, one such endeavor is made to plan a multipurpose compact smart gadget named MEDIBOX which enables the patients to take their drugs at the correct time. This container is a capable framework which keeps up the parameters like temperature and mugginess in a controlled range suggested by the medication producer and in this manner keeps up the intensity of the meds regardless of whether the patient is voyaging. Identified with this, we have built up a Host Management System (HMS) which is fit for cloud-based establishment and checking that stores and controls the MEDIBOX usefulness and patient's body parameters for further examination and future alteration in structure perspective

**Keywords:** Internet of medical things; compliance; assisting device; cloud storage.

## 1. Introduction

IoMT is a collection of medical devices connected to healthcare IT systems for different applications. In the fast-paced world, even ordinary persons need support with their daily activities. One such important activity is to help them to take their medications on a daily basis without missing any dose. IoT is making solid advances in the restorative business with the presentation of significant sensors and gadgets. IoMT is a gathering of medicinal gadgets associated with human services IT frameworks for various applications. The development of IoMT has especially affected social insurance for the matured and debilitated individuals, however not simply restricted to them. In the quick paced world, even conventional people need support with their day by day exercises. One such critical movement is to assist them with taking their prescriptions every day without missing any portion.

The intricacy and cost related with progressively expand frameworks prompted the improvement of another convenient gadget in this paper named as "MEDIBOX" – a savvy drug administering gadget. It is intended to help the older individuals who regularly neglect to take their drugs or take the wrong pills

or measurements. It likewise causes individuals who used to travel much of the time and should take ordinary prescription. Consequently, we proposed a multi-reason, versatile IoT-empowered MEDIBOX which is utilized deliberately to address those relevant issues. There are numerous purposes behind not entirely following the routine i.e., carelessness, intricacy, absence of appropriate mindfulness about the meds, an absence of contribution from family and companions, etc. Numerous individuals can't recall whether they took as much time as necessary, particularly the individuals who take different medications. The individuals who defer their measurement timings risk an overdose while sedating at the following planned time. Under and over-dose of drug, the nonattendance of prescription organization and observing instruments can prompt numerous complexities in wellbeing. Despite the fact that mistakes can happen in any phases of prescription procedure, it regularly occurs amid the organization arrange. MEDIBOX is intended to alarm the patient at the correct occasions alongside the correct dose in remedy.

Alongside reminding a patient about medicine it ought to be guaranteed that drugs are devoured without corrupting their intensity. Capacity is an imperative part of the all-out medication control framework, so in the plan of MEDIBOX a proper situation is made to keep up the medication adequacy. The historical backdrop of drugs an individual devoured is essential, so the utilization subtleties are transferred to the cloud for further therapeutic reference. MEDIBOX is likewise fit enough to alarm its client about their next meeting with the specialist. Ambient Assisted Living (AAL) envelops specialized frameworks to help older people in their day by day exercises to permit an autonomous and safe way of life as far as might be feasible. The paper is sorted out as pursues. Area II presents a few firmly pertinent research ventures. Area III shows the review of the proposed plan. Area IV presents the MEDIBOX working system which incorporates constant information age and incitation steps and cloud based investigation for IoMT prerequisites. Segment V delineates the outcomes and examination and in Section VI, it discloses how it advantages to matured individuals in helped living. At long last, applicable end and future works are given in Section VII.

## 2. Related work

*Medication Adherence: Measures in Daily Practice.* Medication adherence is a crucial issue that needs to be monitored and assessed continuously. Thereafter, improvements can be made once deviations are detected. In the past, a wide number of review studies that addressed the medication adherence problem have been created. However, most reviews studied the medication adherence from a clinical point of view along with interventions [1], [2].

*Medication adherence: A practical measurement selection guide using case studies.* [3] Has reported some commercially available technology-based solutions. In addition, they provided a brief discussion of some clinical studies that involved electronic medication monitoring. It also discussed the challenges associated with medication monitoring technologies from data analytics, reliability, and scalability sides. It is obvious that these survey studies are limited in providing a detailed discussion of the technical sides of the different technology-based sensing or monitoring approaches for medication adherence.

Medication adherence monitoring using modern technology Although we previously covered some recent applications for medication adherence monitoring [4] that relies on modalities such as sensor networks and proximity sensing, there is still a lack of comprehensive state-of-the-art survey studies concerning the recent medication adherence monitoring approaches. The main objective of this paper is to explore this topic further by extending the discussion on the monitoring systems, expanding the list of surveyed papers, taking account of other medication monitoring systems such as ingestible biosensors, and discussing the trade-offs of each technology in multiple dimensions. To our knowledge, this is the first review that addresses medication adherence monitoring approaches using a variety of emerging technologies. It is the first that looks at the medication adherence monitoring approaches from a technical point of view with the aim of promoting the future systems such that they help in filling the gaps that existed in the current ones.

### A. Proposed system

IoT is making solid advances in the therapeutic business with the presentation of pertinent sensors and gadgets. IoMT is an accumulation of therapeutic gadgets associated with human services IT frameworks for various applications. The development of IoMT has especially affected medicinal services for the matured and incapacitated individuals, however not simply restricted to them. In the quick paced world, even standard people need support with their day by day exercises. One such imperative movement is to assist them with taking their prescriptions once a day without missing any portion.

The accessible gadgets for prescription adherence have a few downsides and are confined to fundamental usefulness like filling just a solitary need of an update framework. The multifaceted nature and cost related with progressively expand

frameworks prompted the improvement of another versatile gadget in this paper named as "MEDIBOX" – a clever prescription apportioning gadget. It is intended to help the older individuals who regularly neglect to take their meds or take the wrong pills or measurements. It likewise causes individuals who used to travel as often as possible and should take normal drug. Thus, we proposed a multi-reason, compact IoT-empowered MEDIBOX which is utilized intentionally to address those relevant issues. Just around 50 per cent of patients cling to their drug routine all around ok to get the full advantages of their remedies. There are numerous explanations behind not entirely following the routine i.e., absent mindedness, intricacy, absence of appropriate mindfulness about the prescriptions, an absence of contribution from family and companions, etc. Numerous individuals can't recollect whether they took as much time as necessary, particularly the individuals who take different medications.



Fig. 1. Wearable seizures monitor

The individuals who defer their dose timings risk an overdose while curing at the following planned time. Under and overdose of drug, the nonappearance of prescription organization and checking instruments can prompt numerous complexities in wellbeing. In spite of the fact that blunders can happen in any phases of medicine process, it frequently occurs amid the organization arrange. MED BOX is intended to caution the patient at the correct occasions alongside the correct measurement in remedy. Alongside reminding a patient about medicine it ought to be guaranteed that drugs are expended without corrupting their power. Capacity is an imperative part of the absolute medication control framework, so in the plan of MED BOX a fitting domain is made to keep up the medication adequacy. The historical backdrop of prescriptions an individual expended is imperative, so the utilization subtleties are transferred to the cloud for further therapeutic reference.

MED BOX is likewise sufficiently skilled to alarm its client about their next meeting with the specialist. Ambient Assisted Living (AAL) includes specialized frameworks to help old people in their day by day exercises to permit a free and safe way of life as far as might be feasible. MED BOX is centred on helping the older and patients in sticking to the prescriptions normally no matter what, along these lines helping them to maintain a strategic distance from any future challenges. The subtleties of the expended medications with explicit time interim are saved money on a safe cloud that can be utilized for further examination. Consequently in this paper, we have planned a human services framework that, using Io T-empowered sensors and applicable equipment, helps people in

taking as much time as necessary staying away from future results

*ESP8266*: Node MCU has a firmware that keeps running on ESP8266 Wi-Fi SoC and incorporates equipment dependent on ESP-12 module. The advancement board coordinates GPIO, PWM, I2C, 1-Wire and ADC all in a similar board. Node MCU is favoured as the controller here because of progressively number of sequential correspondence pins, smaller size inbuilt Wi-Fi and minimal effort. A few modules in the hardware need a 3.3V and others 5V supply.

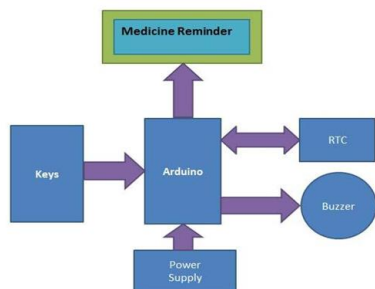


Fig. 2. Medibox overview

As Node MCU fuses both 3.3V and 5V stick there was no requirement for outside managing hardware for these modules. We have utilized Node MCU V1.0 which is an ESP8266 breakout board.

- Prescription Storage*: High temperature and relative moistness (RH) are the most essential factors that lead to medicate debasement. Every restorative item should be put away as per the producer's headings. Meds, particularly immunizations which are touchy organic materials are vulnerable to warm, light and so on. They will lose their power with time however this turns out to be increasingly quick on the off chance that they are not consistently put away at the suitable temperature. MEDIBOX configuration utilizes an ecological sensor BME280 for constantly monitoring the temperature and moistness which are considered as the key parameters of prescription corruption. The temperature and mugginess are kept up utilizing a cooling framework comprising of a warmth sink and a fumes fan.
- DS1307*: The DS1307 sequential on going clock (RTC) is a low power, full paired coded decimal (BCD) clock/logbook also 56 bytes of NV SRAM. Address and information are exchanged sequentially through an I2 C, bidirectional transport. The clock/schedule gives seconds, minutes, hours, day, date, month, and year data. The finish of the month date is consequently balanced for a considerable length of time with less than 31 days, including adjustments for jump year. The check works in either the 24-hour or 12- hour group with AM/PM marker. The DS1307 has a worked in power-sense circuit that

recognizes control disappointments what's more, naturally changes to the reinforcement supply. Timekeeping task proceeds while the part works from the reinforcement supply.

- Prescription Reminders*: We utilized the MUL to define a rating framework for following the recurrence of drug reactions for every member. A rating of 1 was given if the member recognized a medicine update. The most extreme conceivable day by day rating for the member is then equivalent to the times each day that a drug is expected to be taken. We determined the week after week rating as the total of the member's every day evaluations for seven days isolated by the total of the member's most extreme conceivable day by day rating for seven days (along these lines considering the variety in the quantity of day by day updates among the members). We found the middle value of the week after week rating to acquire the normal week after week rating (AWR). To recognize comparative use designs among members, we performed k-medoids clustering<sup>34</sup> on the members' week after week appraisals, utilizing the proportion of outline width<sup>35</sup> to assess the quantity of groups. In view of the most extreme normal outline width,



Fig. 3. Buzzer and LCD with Arduino

### 3. Assisting device framework and working methodology.

In the existing system, Pettier based medicine cooling system is implemented. It consumes more power for operating and the battery weight is increase and there is no compact size. It's not easy to carry the med box system. In the proposed system, IoT and wireless sensor network based seizures monitoring system is implemented for baby. If the baby is infected by any virus fever or fever seizures may occur due to heavy temperature, so it'll create big problem to the baby health. In our system continuously monitoring the temperature, if it's suddenly changed and send the command to the med box and the med box analysis' the details and book the appointment from the child doctor.

In this project, Arduino microcontroller is used for monitoring the child health monitor system is implemented during heavy fever seizures may occur so the parent can't

continuously monitor the baby temperature, In this system continuously monitor the baby temperature if the change is occur suddenly it send the emergency message to med box and the med box analysis and send the message to android mobile, the android phone send the message to the server and booking the appointment from the nearby doctor. Arduino Uno is an open source microcontroller, and it's an 8bit microcontroller, the sensor are connected to the microcontroller for continuously monitor, temperature sensor is used to continuously monitor the baby temperature and heart rate is continuously monitor the heart rate, if the temperature and heart rate are changes it'll send the message to the server and book the appointment from the child doctor.



Fig. 4. The data flow and Working methodology

*Distributed storage:* Medical records are the records of the emergency clinic and don't have a place with the patient, clinical office or the specialist. The patient additionally has no restrictive directly all alone clinical record today. The patient just conveys with him the release outline of his clinical examination reports and for the most part radiology movies or pictures. Imperative clinical information is additionally not accessible for research and reference to helper in clinical choice help. Putting away the clinical information on a verified distributed storage makes it helpful for the future reference.

#### 4. Results and discussions

The MED BOX as clarified before comprise of a hardware with different segments. Every one of these parts are tried and checked independently. Every one of the modules is interfaced with the micro-controller utilizing I2C or SPI correspondence. Hub MCU is utilized as a controller here because of its minimization, inbuilt Wi-Fi highlight and number of sequential correspondence pins. The sequential correspondence pins are required to interface with alternate modules in the plan that utilization sequential correspondence. A considerable lot of the sheets bolster a higher number of GPIO pins than sequential correspondence pins. BME280 sensor incorporates temperature, moistness and weight in one module. So instead of utilizing diverse sensors for various parameters a solitary module helps in disentangling the plan and in the estimation of the considerable number of parameters. RTC gives exact planning and SD card lumberjack utilized in indexing all the essential information. Peltier module is an extremely minimal module for cooling system inside the crate. Temperature

esteems are communicated in Celsius and relative moistness in rate. The readings of temperature range from 280 C to 300 C and relative stickiness ranges from 72% to 55%. Introductory setup of the MEDIBOX is finished utilizing an App. The timings at which the patient ought to be reminded about his/her prescriptions are entered utilizing the App. The timings that are entered will be put away in the SD card module and will be contrasted with the RTC time with send the warnings. The capacity conditions likewise can be input utilizing the App and the cooling framework is incited in like manner. The application screen for contribute the update time and capacity conditions. Presently we will clarify our commitments in the equipment plan.

Node MCU miniaturized scale controller and different modules like, BME280, RTC, SD card lumberjack, LCD, battery, buck converter which are fastened on to a PCB. A 12V battery is utilized as a power supply what's more, is ventured down utilizing a buck converter for driving distinctive modules. The fumes fans are furnished with a voltage of 12V utilizing battery though Peltier is fuelled from the yield side of the buck converter. A prescription - for instance "Allercet" is set to time 11:52 PM. This spares the information on the SD card and patient will be reminded at time 11:52 PM. The showcase will likewise demonstrate the medication name and dose. All the medicine subtleties are then spared in the cloud for further reference.

#### 5. Conclusion and future work

In the present situation, individuals are occupied with their day by day plans and can't recall their medicine timings, which places them in a troublesome condition. In this paper, we have structured another gadget MEDIBOX which goes for helping a patient totally with a conservative and easy to understand way. It reminds the patient to devour the meds and gives a reasonable stockpiling condition to the medications. Capacity of prescriptions consumption subtleties can help the specialist for future references for example the adequacy of medications on the patient can be found through the historical backdrop of prescription admission helping him to recommend as needs be to the patient. The drug subtleties are likewise put away in a safe cloud alongside its stockpiling subtleties and wellbeing checking sensors are additionally be added to the framework. As a future enhancement to the MEDIBOX, Expectation of capacity conditions incorporated into the framework makes the container progressively shrewd and furthermore to think about the position of various compartments inside the case to fulfil the necessity of various clients in a home domain. Protection and dependability measures should likewise be taken consideration. A reasonable cooling framework with less battery rating can make the framework increasingly minimized and financially savvy.

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