

IoT Based Automation and Blockchain for Medical Drug Storage and Smart Drug Store

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ABSTRACT

The increase in the work stress and decrease in the time for oneself has led to the rise in the dependency on the medicines and drugs. The drugs and medicines are the key sources for saving the human life when the patient is in the danger. In order to maintain regular and quality supply of the drugs and medicines has to monitor on the regular basis. There are numerous medicines and drugs brought in the store but usually drugs and medicines are stolen to satisfy one's greed, get expired or placed at unknown locations in the store. So to prevent such situation and saving the life of the patient Drug and Medicine Monitoring Model can be used. The model uses the RFID and IoT technology in order to monitor the drugs and medicines in the store. In medical and drug using systems which are increasing work stress and decreasing the time for oneself that has risen in dependency. The danger situation drugs and medicine is the main source for saving human life when the people are in danger. A daily regular basis to maintain a quality supply of the drug and medicine has been monitored. While traveling and transportation time is numerous medicines and drugs brought from the store but usually it is stolen to one's greed and the medicines and drugs or placed at unknown locations. To prevent and save a patent life and monitoring model can be used to check the medicine and drug. In our model RFID tag and IoT technology can be used to monitor medicine and drug storage with the help of hospitals and how having a knowledge of the system and chemist of the medical and drugs available, the medicines and drugs quality of location and their safety.

Keywords: Automation in drug storage, Block chain technology, IOT technology, Medical drug data storage.

1 Introduction

Medical Drug Storage method is an IOT based automation system which is used as a solution for Medical drug storage and smart drug store. It is used to maintain drug data in Hospitals and Drug stores and personal stocks using RFID and IoT. Various types of sensors are used to maintain good medical data analysis and to prevent any malicious activities. In order to protect the data, a professional security type is used and called as Blockchain. The energy and health is the highest priority of our human life if it is affected by any diseases; the medicines and drugs can act as the rescuer for human life. In other situations a government drug store is provided with the medicines and drugs by the company. We didn't know where the medicines and drugs were stored in that situation. Medicine and drugs are stolen and we didn't know the expiry date. There is know proper management to maintain the drug and medicine. The people do not have a better knowledge of the medicine and drugs where they kept and date of expiry and quality of medicine and drug. Many expensive medicines and drugs are sold without the help of chemists and doctors in order to gain monetary funds to avoid the situation where a monitoring model is used. The presence of counterfeit medicines within the health-care industry is evident, with one in 10 medical products in developing countries being substandard or falsified (do not meet the standards of safety, efficacy, and quality). Falsified medicines can contain incorrect ingredients and doses



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or show no presence of the active ingredient. This means that there are millions of patients unaware that they are taking medicines that fail to work as prescribed. Not only do they fail to treat individuals, but some counterfeits can cause serious illness or even death. The University of Edinburgh estimates that 72,000 to 169,000 children may be dying each year from pneumonia due to substandard and falsified antibiotics.

2 Materials and Methods

2.1 Methods

IoT- NodeMCU 12e X Arduino Uno, Results of an experimental and comparative survey 2018- A counterfeit of drug and medicine sales are not only the biggest problem in a country, but also a danger to mankind. Finding substandard drugs is not an easy task. Some of them are completely counterproductive. Frequent use of counterfeit drugs can lead to problems starting with delayed treatment and ending with problems up to the most dangerous side effects. Most consumers do not have the equipment to test counterfeit drugs in there are some ways to identify counterfeit drugs and avoid them [1]. Survey of drug storage practice in hospitals and patent medicine stores in Nsukka, Nigeria 2017- The numbers of illegal and unauthorized outlets operated by charlatans, that market drugs in Nigeria, are too many compared to pharmacies and hospitals. The trend is that a great number of drug users depends on these drug sellers for the procurement of their drugs. Whether drug users and sellers/dispensers are knowledgeable in the issues of drug storage. The research methodology adopted was the use of questionnaires, which were distributed to 50 homes, 8 hospitals and 42 patent medicine stores in most parts of Nsukka. The information contained therein were designed in order to assess the drug storage habits of the respondents, their knowledge of storage specifications on labels, the suitability of their shop premises for the stocking and sales of drugs and whether they have some basic drug storage facilities[2]. The Contribution of transport (road) in health care delivery A Case study of mankranso district hospital in the AHAF0 ANO south district of ASHANTI 2020- The study has looked at the impact of transportation on health care delivery. The affected parties (the patient and the health workers) have been discussed. Based on the findings of the study the following conclusions are reached. Transport to and from the facility is very high, as physical location of health facilities does not meet household needs, meaning distance as a major obstacle to the rural population. A higher percentage of the rural poor needs to travel for hours to the next health facility. Most of the households find it harder to travel to get to healthcare and other services because of few health facilities, poor roads and high transport cost. Even where motorable roads exist, transport services are unreliable and infrequent; where available, such

services are for-hire and the majority of rural inhabitants cannot afford them[3]. Research on HTML5 in Web Development 2016- At many platform web resource that is widely and steadily used. Some developers can develop their technologies proprietary that can provide more than the web standards functionality it is ability to build an internet application. For example: apple's, adobe systems flash, microsoft silverlight, quick time, google gears, oracle java FX etc. For running a web application it provides priority formats. The latest research on HTML by W3C is to create a standard that handles all the jobs that the proprietary technologies are performing currently. W3C to increase web openness and platform independence is developing HTML5 with cooperation of Web Hypertext Application Technology Working Group (WHATWG) as a standard that facilitates the users and developers with intensified functionality without much using the additional plug-ins[4]. Barcode Recognition System 2018- The interface between message and barcode is called coding. Symbolic specification includes the encoding of single digits/character of the message, including the beginning and end marks within bars and spaces, the size of the quiet zone required before and after the barcode and the use of barcodes for the

presentation of business information based on the use of bar codes, depending on the extension of business. This allows decisions to be made quickly and confidently. The information can be transmitted through communication system such as the Electrical Data Interface (EDI). So the retailer can know the information about the item before the item arrives[5].

2.2 Materials

Node MCU ESP8266 - It is developed by the ESP8266 Opensource community. The node MCU is called by the single board microcontroller and its memory is 128k bytes. The MCU contains 12 pins.

Proximity sensor - Without any physical touch A proximity sensor is able to detect the near objects. The sensor is also used to monitor machine vibration. A proximity sensor adjusted a very short range of use as a touch switch.

Temperature sensor - The sensor is an electronic device that can measure the environmental temperature and convert the input data into electronic data to record and monitor a signal temperature change. The temperature sensor can require straight contact with the physical object that can be monitored.

RFID Reader - The RFID reader is the brain of this system . The reader interrogator, a device which is used to communicate the radio waves of the transmitter and receiver use RFID tag. The frequency Range is 902-928 MHZ us, 865-868 MHZ EU, WI-FI, LAN, SERIAL, USB, is a connectivity option. The RFID reader is the most costliest component in a system . Ultrasonic sensor, An RFID system a radio receiver and transmitter consists of a tiny radio transponder.

3 Theory and Calculation

This system mainly consists of an RFID reader and a tag. The complete setup of an IoT based automated medicine dispenser is as shown in the block diagram. To use this system firstly the users can register for obtaining the RFID card. The communication comes when the user swipes the RFID tag to the RFID reader. The RFID reader reads the details of the user when an RFID card is swiped and displays the read data. To avoid card misuses the system asks for the PIN. After user identification is done by the LCD displays the list and quality of the medicines in the system which is divided into two types i.e., in an ordinary type which contains BP and Diabetic medicines and the other one is General Type which contains a First Aid Box, are present in the system. The particularized medicine's expiry dates will be checked by the system. If the medicines are expired then displays the system an alert message on the LCD and also sends the message alert to the pharmacist to remove the medicines, and the transaction ends without dispensing the medicines. Depending on the medicine selected and their quantity amount and quality of medicine will be calculated and the respective amount will be deducted from the card. Then the system delivers the selected medicines through a servo motor. Further, with the help of the GSM module, the generated e-bill will be sent as an SMS to the user's registered mobile number. After dispensing the medicine, the remaining medicine count in the system is updated to the cloud (ThingSpeak) through the WiFi module and this medicine data is represented in a graphical forming system. Later when the medicine count in the storage reaches the minimum level immediately an message alert will be sent to the near pharmacist suggesting the refilling of the medicine via GSM modules.

3.1 Working

As per the (*Fig. 3.1.*) Power supply of 12V which is converted to 5VDC supply using bridge rectifiers and to reduce fluctuations filter capacitors are used in circuit. Current sensor has been used to find the overcurrent

that occurs in the setup connected to Arduino. Voltage regulator is implemented to produce desired duty of voltage as 5V which is integrated in circuit converter. To trigger Nodemcu 8266 switches 12v input voltage is converted to 5V DC. but microcontroller is unable to fulfil the needs, in this case a driver circuit is added to boost voltage to 5v. With the help of driver circuit switches in the converter is activated by respective duty ratio. Further processes occur in the converter the dc voltage is reduced and desired output voltage is obtained. There will be some noise and harmonics in output voltage so a filter circuit is designed and integrated. After noises are eliminated output is given to the respective sensors for an alternating source finally it will be connected to the grid. To track the the temperature a temperature sensor is used to sense the temperature and make cooling methods for the medicines. To track the position of the drug container a GPS positioning system is used.

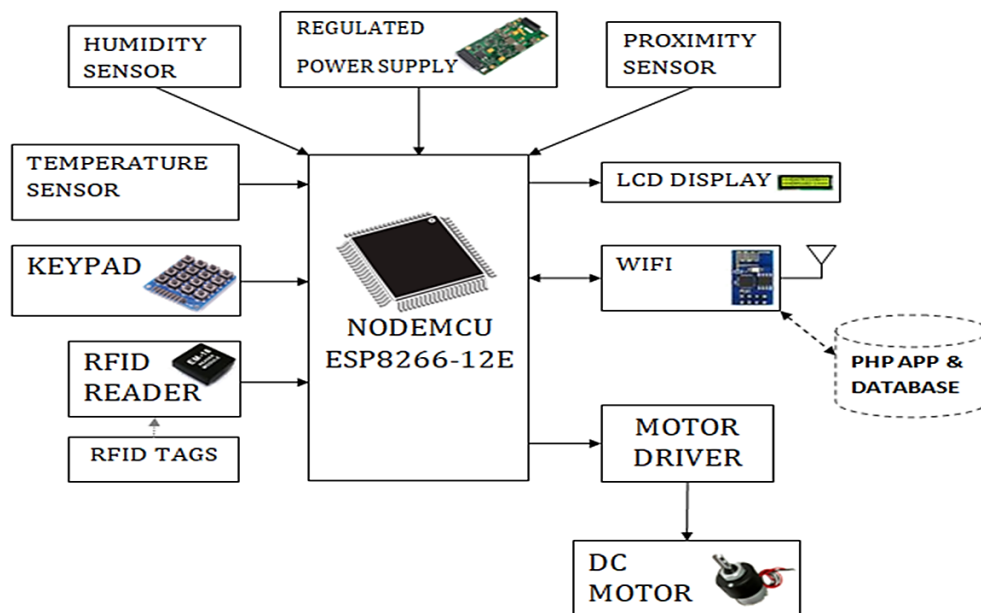


fig 3.1 block diagram

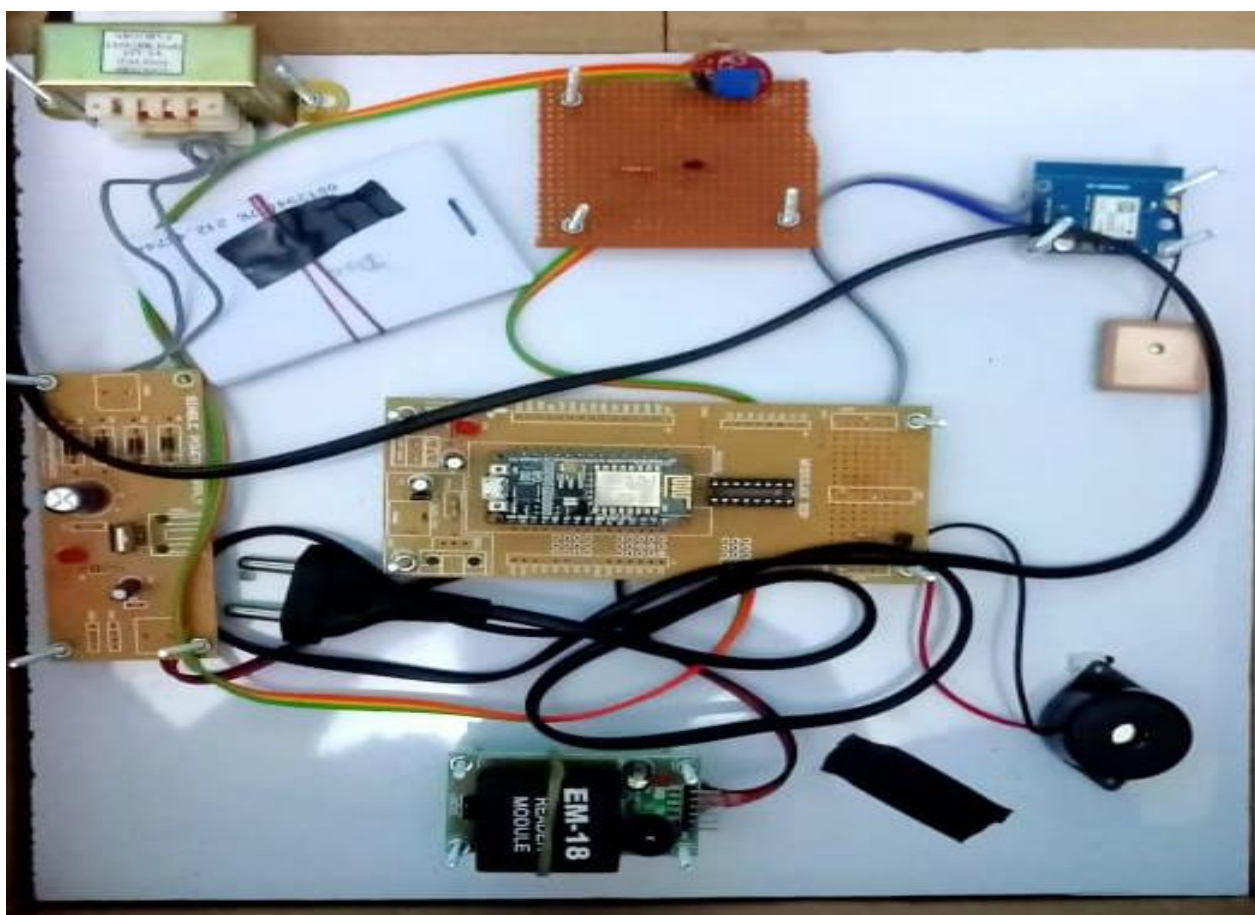


fig 3.2 Hardware setup

4 Results and Discussion

As this project is done by hardwares but the output is developed by software methods. The Results are shown in the web page which was developed by our team and its databases are protected by Blockchain technology. From the ideology inferred during the analysis, the hardware setup is configured based upon the concept to bring out the maximum securities to prevent illegal activities in the medicine container. As the hardware setup which is located inside the drug containers performs its activities and tracks the location of the container which can be easily accessed by the application or web server. Databases are stored in the php server and it is protected by the blockchain technology which is considered as one of the most secured method for storing a database till date. Each and every step or activity performed inside the container are stored and uploaded in the database server. This Blockchain technology prevents the illegal activities done inside the medical drug container which is to be given a quality drugs and medicines to patients to have a healthy system.

4.1 Output figures

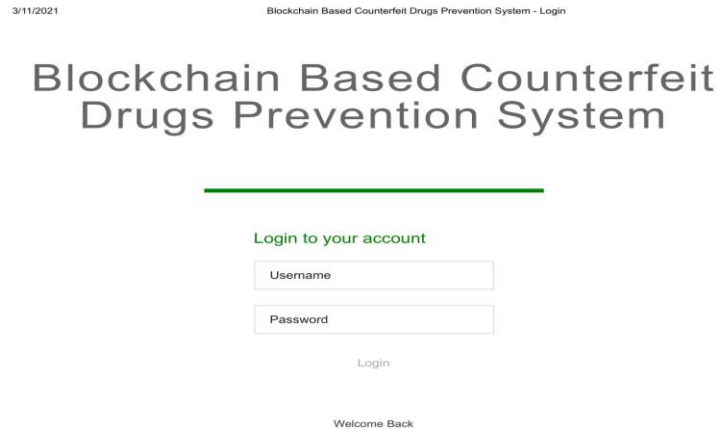
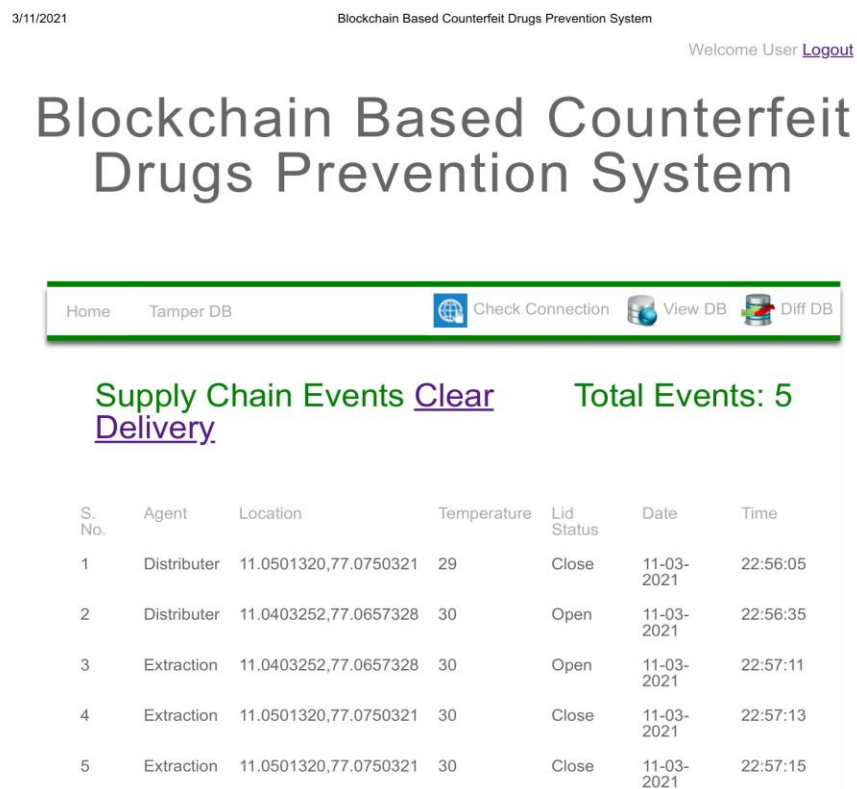


fig 4.1 Login page

fig 4.1 represents the login page of the medical drug prevention system database which was accessed only by the admins of the web browser. These web pages are developed by php server and it was protected by flat file database which is considered as one of the basic techniques in the Blockchain technology. The flat file database produces a hash value for each data created by the user or workers which was done through the RFID tags.



The lid is opened on the way, there is a great possibility that the drug is swaped for a fake one.

fig 4.2 Data of the medical drugs Transportation

As the fig 4.2 shows the each every Agent activities which is on the medical drug container. As it shows the exact location of the drug container and indicates the temperature and gives alert when it was not to set limit. It also shows the Lid status whether it is opened or closed and the exact time of the activities performed on the drug container.

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3/11/2021                                contraptions.in/projects/sr19173_iot_counterfiet_drug/viewDB.php

[indexes]
last_block_index=9
[block-0]
nonce=0
timestamp=1514745000
data=Genesis Block
previousHash=
hash=72d0da95b0f69225846372c50f2b1052205fb73e224cc524d064b82d1bb0b082
[block-1]
nonce=3448
timestamp=1615483565
data=Distributor*11.0501320,77.0750321*29*Close*11-03-2021*22:56:05
previousHash=72d0da95b0f69225846372c50f2b1052205fb73e224cc524d064b82d1bb0b082
hash=00005411c7f6364a39053e627b41a8c877cb91570ab2b69d5d32451941a74098
[block-2]
nonce=5696
timestamp=1615483595
data=Distributor*11.0403252,77.0657328*30*Open*11-03-2021*22:56:35
previousHash=00005411c7f6364a39053e627b41a8c877cb91570ab2b69d5d32451941a74098
hash=0005bba762898a13b2f015c9583a5c89f00c440b74fc8e55f47fe8a32b216700
[block-3]
nonce=354
timestamp=1615483631
data=Extraction*11.0403252,77.0657328*30*Open*11-03-2021*22:57:11
previousHash=0005bba762898a13b2f015c9583a5c89f00c440b74fc8e55f47fe8a32b216700
hash=000b3d3d2b385a632bab54a346bc228514962322c5119fbc02b59fcc35f079a8

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fig 4.3 Blockchain Database

As fig 4.3 clearly shows the blockchain database of each and every activity performed by the agent. Each activity is stored in the form of blocks and it represents in numerical order. These blocks are linked with each other and each blocks will produce a unique hash value for itself. As this blocks are interlinked when a person tries to tamper the data it changes the hash value and its linked hash value blocks. This results in corruption of data.

5 Conclusions

To maintain the quality supply of drugs and medicine due to regular basis it will be monitored. We found the expired date and quality of medicine and drug. And we can monitor the location of drug and medicine where it will be stored. And stop the theft of medical drugs. Mainly we controlled the medicine and drugs are selling in the black market. By using our monitoring model kit consumers can get premium quality of drugs and medicines. And the government can stop the drugs selling in black market. There are numerous medicines and drugs brought in the store but usually drugs and medicines are stolen to satisfy ones greed, get expired or placed at unknown locations in the store. So to prevent such situation and saving the life of the patient Drug and Medicine Monitoring Model can be used.

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7 Competing Interests

I declare that I have no significant competing financial, professional, or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

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