ACQUISITION OF QR CODE BASED MEDICAL PRESCRIPTION AND OUTSOURCING STRTEGIES OF MEDICINES USING PIC MICROCONTROLLER 18F4520 IN PHARMA SUPPLY CHAIN

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Abstract— In the pharmaceutical supply chain, all players have to ensure the highest level of service while containing costs, because of the ethical issues concerning drugs. The outsourcing of logistics should be recognized as a competitive lever, especially in this complex and highly regulated medical industry. The major problems in medicine industries are medicines getting expired after its expiration date, huge possibility of prescription errors and dispensing errors which eventually leads to loss of human lives. Although rates of dispensing errors are generally low, further improvements in pharmacy distribution systems are still important because pharmacies dispense such high volumes of medications that even a low error rate can translate into a large number of errors. From the perspective of pharmacy organization and quality assurance, pharmacists should intensify their checking of prescriptions, in order to reduce prescription errors, and should implement strategies to communicate adequately with patients, in order to prevent administration errors. In order to overcome these issues, the QR based prescription is implemented along with automatic database management system which identifies the location of the medicine and also its expiration status. The Expired medicine can be identified here and proper medicine can be delivered to the people without making them to wait for a long time which would also prevent the usage of same prescription which proper doctor consultation.

Keywords- pharmacy, expiration date, dispensing errors

I. INTRODUCTION

The distribution of medicines to the patients is still very outdated .Patients wait for a long time to get medicines even in emergency situations. A dispensing error is a discrepancy between a prescription and the medicine that the pharmacy delivers to the patient or distributes to the ward on the basis of this prescription, including the dispensing of a medicine with inferior pharmaceutical or informational quality**.**

Categories of dispensing errors could be identified as follows:

i. Dispensing medicine for the wrong patient (or for the wrong ward)
ii. Dispensing the wrong medicine
iii. Dispensing the wrong drug strength
iv. Dispensing at the wrong time
v. Dispensing the wrong quantity
vi. Dispensing the wrong dosage form
vii. Dispensing an expired or almost expired medicine
viii. Omission (i.e. failure to dispense)
ix. Dispensing a medicine of inferior quality (pharmaceutical companies)
x. Dispensing an incorrectly compounded medicine (compounding in pharmacy)
xi. Dispensing with the wrong information on the label
xii. Incorrect patient name
xiii. Incorrect drug name

xiv. Incorrect drug strength
xv. Incorrect instruction (including incorrect dosage)
xvi. Incorrect drug quantity
xvii. Incorrect dosage form
xviii. Incorrect expiry date
xix. Omission of additional warning(s)
xx. Incorrect patient details(for door delivery)
xxi. Other labeling errors
xxii. Dispensing with the wrong verbal information to the patient or representative

These errors occur due to inefficient distribution system .there is no assurance that the unexpired medicines are delivered to the patients. On the other hand in India the same prescriptions are being used many times by the patients without proper consultation with the doctors. Our aim is to overcome all these difficulties.

II. EXISTING SYSTEM

In the existing system, the patients reach the pharmacy with the hardcopy of prescription provided by the doctors. The pharmacist would study the prescription form. Reach out for the medicines one by one, Checks the expiration date manually and sometimes might replace with the unexpired medicine if the medicines expiration date is near or is already expired. Then billing is done which may or may not be computerized. Manual updating of stocks are further done. In this practice, the patients have to wait for a long time to get their medicines even in emergency situations. Database management is manual or partially digitized and is difficult to maintain. Patients don't have proper knowledge about their medicines' expiry date.

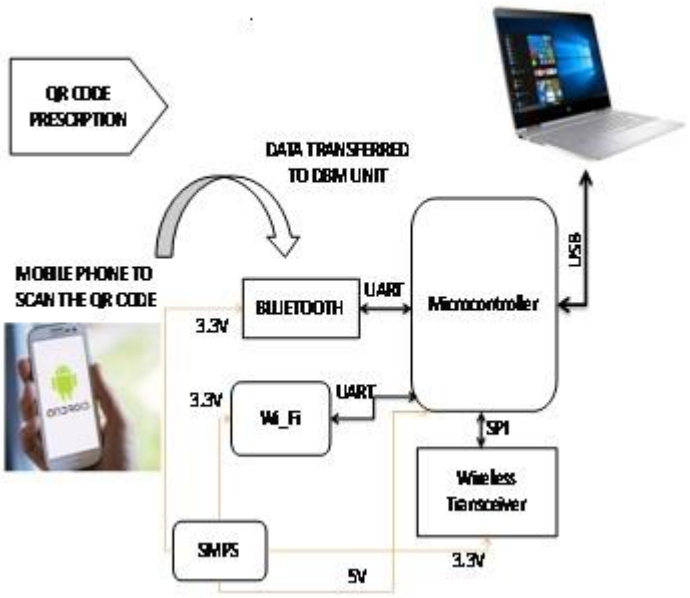
III. PROPOSED SYSTEM

The advanced QR based prescription system is implemented. The doctor will generate the prescription QR code and it will be taken to the pharmacy by the users. At the QR code based prescription is scanned using a mobile application which contains the details of medicines and the patient. The details would be transmitted to the Data Base Management Unit (DBMU) via mobile Bluetooth. The medicines would be analyzed and the location of appropriate medicines will be indicated. The Bluetooth in the DBMU will receive the information. This will be done with the help of transceiver unit.USB is interfaced with DBMU unit which will send the data to the PC server. The process PC server will give the instruction to DBMU about the particular medicine location and it will process. The processed data is send to Med Rack Unit wirelessly via wireless transceiver. The Med Rack unit will open the door of the medicine and also expired medicines are indicated using indication lights further the details of entire medicines along with expiration dates will be sent as an SMS to the patients. The prescription can be used only once for the benefit of the patients. But it could be used again to buy only the medicines which were not bought earlier. Here we generated a billing application for pharmacy in order to bill a medicine according to the expiry data i.e., to select the medicine form database that which are going to expire soon.

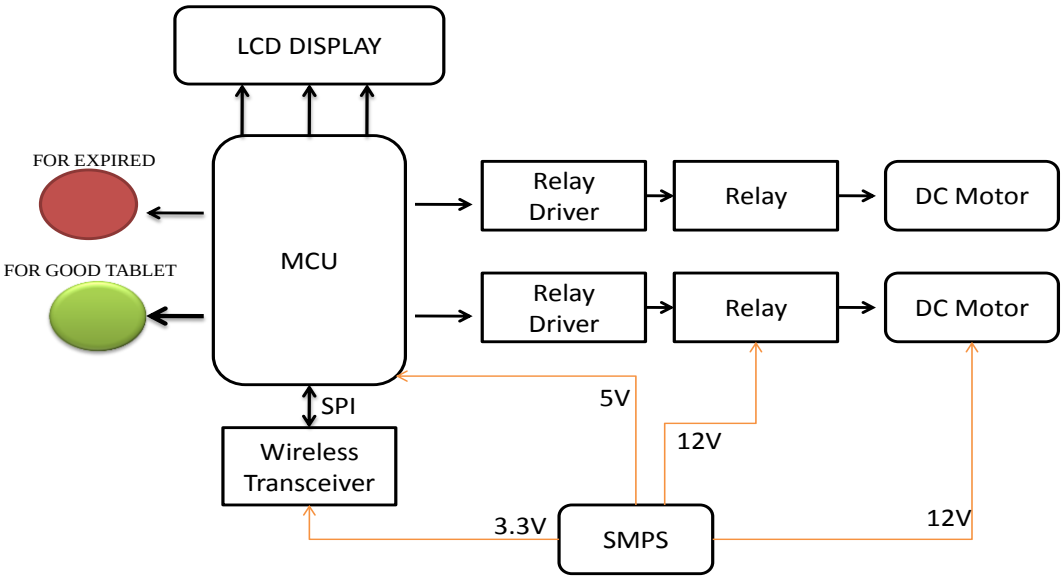
IV. FEATURES

- QR based medical prescription.
- Indication of medicine's location.
- Differentiating expired and unexpired medicines.
- Intimation to patients, if expired medicine is delivered.
- One time usage of prescription.
- Re-usage of prescription only for buying medicines not bought earlier.

BLOCK DIAGRAM



MED RACK UNIT



V.HARDWARE COMPONENTS

5.1 MICROCONTROLLER

The microcontroller is the heart of the power saving unit, which get the data from sensor and driver the control circuit. It is an integrated chip that is often part of an embedded system. The microcontroller includes a CPU RAM, ROM, I/O ports and timers like a standard computer but they are designed to execute only a single specific task to control a single system they are much smaller and simplified so that they can include all the functions required on a single chip. Other than the normal Microcontrollers PIC Family supports more features.

5.1.1 PIC MICROCONTROLLER 18F4520

- PIC microcontroller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality and ease of availability. It is ideal for machine control applications, measurement devices, and study purpose and so on.
- It is also called as "Computer on a Chip".
- PIC was developed as Peripheral controller.
- PIC Microcontrollers are designed with a separate 14 bit program memory bus to carry instructions.
- A Separate 8-bit data memory bus to carry data.
- This Design is commonly called Harvard architecture, and So PIC Microcontroller is based on Harvard architecture.
- Every instruction is coded as a single 14 bit word and fetched simultaneously with the corresponding data variable for that instruction.
- The Harvard architecture speeds up the Process by its design.
- The instruction set for the PIC Microcontroller consists of 35 instructions.
- Each occupying a single 14 bit program memory word and a two stage Pipelining.
- It consists of Flash Memory which makes the programming cost and time less.

5.2 UART

A Universal asynchronous receiver/transmitter, abbreviated UART is a piece of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with communication standards .The universal designation indicates that the data format and transmission speeds are configurable. The electric signaling levels and methods (such as differential signaling etc.) are handled by a driver circuit external to the UART.

A UART is usually an individual (or part of an) integrated circuit used for serial communications over a computer or peripheral device serial port. UARTs are now commonly included in microcontrollers. A dual UART, or DUART, combines two UARTs into a single chip. An octal UART or OCTART combines eight UARTs into one package, an example being the NXP. Many modern ICs now come with a UART that can also communicate synchronously; these devices are called USARTs (universal synchronous/asynchronous receiver/transmitter).

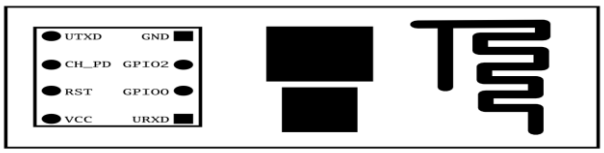
The Universal Asynchronous Receiver/Transmitter (UART) takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes. Each UART contains a shift register, which is the fundamental method of conversion

between serial and parallel forms. Serial transmission of digital information (bits) through a single wire or other medium is less costly than parallel transmission through multiple wires.
The UART usually does not directly generate or receive the external signals used between different items of equipment. Separate interface devices are used to convert the logic level signals of the UART to and from the external signaling levels. External signals may be of many different forms. Examples of standards for voltage signaling are RS-232, RS-422 andRS-485 from the EIA. Historically, current (in current loops) was used in telegraph circuits. Some signaling schemes do not use electrical wires. Examples of such are optical fiber, IrDA (infrared), and (wireless) Bluetooth in its Serial Port Profile (SPP). Some signaling schemes use modulation of a carrier signal (with or without wires). Communication may be simplex (in one direction only, with no provision for the receiving device to send information back to the transmitting device), full duplex (both devices send and receive at the same time) or half duplex (devices take turns transmitting and receiving).

5.3 ESP8266 WIFI MODULE

ESP8266 is an impressive, low cost WIFI module suitable for adding WIFI functionality to an existing microcontroller project via a UART serial connection. The module can even be reprogrammed to act as a standalone WIFI connected device–just add power! The feature list is impressive and includes: 802.11 b/g/n protocol Wi-Fi Direct (P2P), soft-AP Integrated TCP/IP protocol stack. This guide is designed to help you get started with your new WIFI module so let's start! The hardware connections required to connect to the ESP8266 module are fairly straight-forward but there are a couple of important items to note related to power: The ESP8266 requires 3.3V power–do not power it with 5 volts. The ESP8266 needs to communicate via serial at 3.3V and does not have 5V tolerant inputs. ESP8266 on-board processing and storage capabilities allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. With its high degree of on-chip integration, which includes the antenna switch balun, power management converters, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

5.3.1 PIN DIAGRAM



ESP8266 WiFi Pinout
Top View (Not to scale)

5.3.2 ESP8266 PIN DESCRIPTION

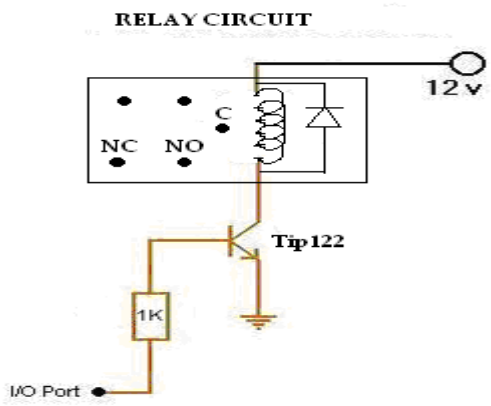
ESP8266 has 8 pins, 4 in the row of 2. The first pin on the top left is GND. The two pins right from the GND are GPIO 2 and 0. The pin on the top right side is the RX pin and the pin on the lower left is TX. These are the pins for communication. The middle pins on the bottom are CH_PD (chip power-down) and RST (reset).The main thing to remember is, that this device works with 3.3V; Even the RX and TX pins. Controller or many USB to serial converters work with 5V.

5.4 RELAY

Relays are electromagnetic switches used as protective devices, indicating devices and as transmitting devices. Protective relay protect good component from the effects of the circuit components that have failed. Transmission relay are used in communication systems. Indicating relay may be used to identify

a component which has failed. Transmission relay may be used to identify a component which has failed.

The relay is one of the most widely used components in industrial electronic. In combination with transistors, electron tubes and other circuits elements, this electromagnetic device performs countless tasks. Relays are electro magnetically operated remote controlled switches with one or more sets of contacts. When energized, the relay operates to open or close its contacts or to open some contacts and close others. Contacts which are opened and close others. Contacts which are opened when energized are called "Normally Open" (NO) or simply open contacts. Contacts which are closed when energized are called "Normally Closed" (NC) or simply open contacts. Normally open contacts are referred to as "a" contacts. Normally closed contact are sometimes referred to as "b" contacts.



5.5 DC MOTOR

The electric motor is a device which converts electrical energy to mechanical energy. There are mainly three types of electric motor.

- DC Motor.
- Induction Motor.
- Synchronous Motor.

All of these motors work in more or less same principle. Working of electric motor mainly depends upon the interaction of magnetic field with current. Now we will discuss the basic operating principle of electric motor one by one for better understanding the subject.

5.5.1 WORKING PRINCIPLE

A motor is an electrical machine which converts electrical energy into mechanical energy. The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force".

5.6 WIRELESS TRANCEIVER

A transceiver is a device comprising both a transmitter and a receiver that are combined and share common circuitry or a single housing. When no circuitry is common between transmit and receive functions, the device is a transmitter-receiver.

RFM75 is a GFSK transceiver operating in the world wide ISM frequency band at 2400- 2483.5MHz. Burst mode transmission and up to 2Mbps air data rate make them suitable for applications requiring ultra low power consumption. The embedded packet processing engines enable their full operation with a very simple MCU as a radio system. Auto re-transmission and auto acknowledge give reliable link without any MCU interference.

5.7 BLUETOOTH MODULES

Bluetooth is a telecommunications industry specification that describes how mobile devices, computers and other devices can easily communicate with each other using a short-range wireless connection. The EGBT-04 module will work with supply voltage of 3.1VDC to 4.2VDC. When supplied with 3.3VDC, it will interface directly with the UART port of any microcontroller chip running at 3.3VDC. When used with 5V microcontrollers, The TXD output logic swing of the EGBT-04 still falls within the valid 5V TTL range, hence, can be connected directly to the UART RXD of the 5V microcontroller host. EGBT RXD and inputs, however, are not 5V tolerant, and can be damaged by 5V level logic going in.

VI.SOFTWARE PROFILE

6.1 CCS COMPILER

A compiler is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language (the target language,

often having a binary form known as object code). The most common reason for wanting to transform source code is to create an executable program.

This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high level language. The compiler includes built-in functions to access the PIC microcontroller hardware such as READ_ADC to read a value from the A/D converter. Discrete I/O is handled by describing the port characteristics in a PROGRAM. Functions such as INPUT and OUTPUT_HIGH will properly maintain the tri-state registers. Variables including structures may be directly mapped to memory such as I/O ports to best represent the hardware structure in C.

6.2 PROTEUS 7.0 SIMULATION TOOL

Proteus 7.0 is a Virtual System Modeling (VSM) that combines circuit simulation, animated components and microprocessor models to co-simulate the complete microcontroller based designs. This is the perfect tool for engineers to test their microcontroller designs before constructing a physical prototype in real time.

This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC, switches and buttons. One of the main components of Proteus 7.0 is the Circuit Simulation -- a product that uses a SPICE3f5 analogue simulator kernel combined with an event-driven digital simulator that allow users to utilize any SPICE model by any manufacturer. Proteus VSM comes with extensive debugging features, including breakpoints, single stepping and variable display for a neat design prior to hardware prototyping. In summary, Proteus 7.0 is the program to use when we want to simulate the interaction between software running on a microcontroller and any analog or digital electronic device connected to it.

VII.CONCLUSION

In summary, dispensing errors are an unfortunate part of the health care delivery system. It can only be prevented and reduced by focusing on the system as a whole, not on the individual clinician or pharmacist. Safe, organized and effective dispensing systems are therefore fundamental to ensure that drugs are properly dispensed according to the prescription order forms, and to reduce the possibility of errors which leads to loss of lives. Hence this paper provides a reliable and a comparatively affordable mechanism of delivering proper medicine along with database management while ensuring patients safety.

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