

# Wireless Communication: Medicine Vending Using IoT Unique Product Key

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**Abstract-** Vending machine is an automated machine that provides items such as snacks and cool drinks to consumers after money, a credit card or specially designed card is inserted. This concept can be implemented for medicine supply in hospitals. In existing system people have to wait in long queues to get prescribed medicines. Even after reaching the spot the process takes additional time for packing and billing. Another disadvantage of the current system in India is that it requires hard cash. We hereby present a solution where the payment part is bypassed to the online sources. Here we are solving the problem with a simple algorithm providing an interface to the user, after payment a product key is generated which is entered in the vending machine to dispense the medicine.

**Keywords-** Internet of Things, Vending machine, Razor pay, Arduino.

## I. INTRODUCTION

Mobile phones have become an integral part of our lives. They are not only used for communication via short messaging services, calls, emails, and internet but advanced applications such as remote health monitoring systems and security systems have been integrated with mobile phones. The recent years have seen rapid advancements in the value addition applications in mobile phones such as high definition cameras and high speed internet connectivity. The country has also experienced developments in the infrastructures to support the rising need of faster internet connectivity. Despite the advantages enjoyed by these advancements in mobile technology, there has been limited effort to implement this into the field of medicine. We all know that in present scenario with the rapid outburst of various pathogens in the country, we witness an unprecedented demand for health care. The country's pharmaceutical industry is expected to expand at a CAGR (Compound Annual Growth Rate) of 22.4 percent over 2015-2020 to reach US 55 billion[1]. Long queues to purchase medicines in hospital and the delay associated with it has been a great threat to the lives of patients. With rapid development of semiconductors allowing electronic components to be miniaturized encompassing a large no. of transistors in a given space, developments in recent

networking technology architectures the development of light weight based server applications has led us to come up with a solution that is both facile and elegant. The model enables consumer to purchase the medicines prescribed by the doctor through the hospital website and can obtain the medicine from a vending machine that will identify the user and the medicine he has paid. This will bypass the human intervention and delay related to the purchase of medicine. It will also increase the quality of service provided to the patients.

### A. Main objective

The main objective of this project is to build a medicine vending machine with online payment facilities. The patient has to perform online payment of the prescribed medicine. Once the payment is completed patient can receive the corresponding medicine from the vending machine after entering the payment key.

## II. DESIGN

### A. User

Users or patients need to log-in or register via the web application. The users are provided with a product key which contains information about the medicine which he/she has purchased. The user is provided with these provisions:

- Change medicine count to suit his purchase.
- Hospital map for finding nearest vending machine.
- Make payment through any service providers.
- Know the count of medicine available in a particular vending machine.

### B. Data Flow and Processing

User first consults doctor who enters the medicine prescription, user through his account can view the medicine prescribed along with the amount that has to be paid in total. User has the provision to change the count of medicines to suit his wallet and can make payment accordingly, after payment the user is provided with a unique key which the user provides as an input to the vending machine. This key is processed by an arduino, the entered key is sent as a query to server to know

its authenticity, if the key matches at the database a flag value and medicine coordinates is returned to the arduino board via nodemcu which connect arduino board to server, if the flag value is true the corresponding code is divided with a series of prime numbers to find which medicine is to be dispatched.

### III. DATA FLOWDIAGRAMS

#### A. User

User DFD (Data Flow Diagram) specifies how user interacts with the system. The Figure 1 shows the user data flow diagram.



Fig1.: User DFD

for alternate formatting if the content is accessed on a mobile device.

The payment is performed using Razorpay payment gateway. This gateway provides an excellent test mode facility, powerful mobile SDKs are provided for both Android and iOS. Razorpay is a payments company that provides payment solutions to online merchants in India. Razorpay is head quartered in Bangalore, India. Razorpay allows online businesses to accept, process and disburse digital payments through several payment modes like debit cards, credit cards, net banking, UPI and prepaid digital wallets. Razorpay payment solutions can be integrated by both web and mobile applications.[5].

The Figure 2 shows the doctor DFD which specifies the interface of doctor who can update and edit medicine details in patient page.

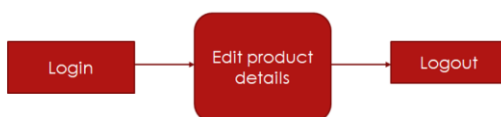


Fig2.:Doctor DFD

### IV. IMPLEMENTATION

#### A. WEBINTERFACE

User Sign Up/Log In and in his account prescription by the doctor will be available. The patient can select the medicines and its count, payment is performed using razorpay gateway. After performing the payment a product key is generated with respect to the user, medicine and its count. At a time four different medicines can be purchased.

User interface created by html, Java script, CSS in the front end and PHP in the back end. JavaScript often abbreviated as JS, is a high-level, interpreted programming language that conforms to the ECMAScript specification. JavaScript has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions[2].

Alongside HTML and CSS, JavaScript is one of the core technologies of the World Wide Web.JavaScript enables inter- active web pages and is an essential part of web applications. The vast majority of websites use it, and major web browsers have a dedicated JavaScript engine to execute it.

Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a markup language like HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.[3]

CSS is designed to enable the separation of presentation and content, including layout, colors, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file, and reduce complexity and repetition in the structural content[4].

Separation of formatting and content also makes it feasible to present the same markup page in different styles for different rendering methods, such as on-screen, in print, by voice, and on Braille-based tactile devices. CSS also has rules

After successful payment unique Product key is generated. This product key and the information of the medicines purchased are stored in the database and messaged to the user.

#### B. Generation of UniqueKey

The vending machine is divided into sections, each section dispatch only a single type of medicine. The sections are uniquely assigned with a non prime number as its base.

When a user purchases medicine the count of the medicine and the base number of the section is stored in a database. This data base is linked to the user details in database through patientid. The patientid and the base number are assigned into following equation to generate a unique key.

$$(a * x + b * y + c) d$$

x= patient id, y= base number, a and b= very large prime number, cand d=any random number. When patient purchases more than one product the base number is the sum of the This key is saved in database near corresponding patient. When the user enters the key into the vending machine it checks with the database to confirm the dispatch of medicines.

### C. Hardware Implementation

User enters the unique identification key into to vending machine. With the help of NodeMCU, used to connect to the target WiFi, attached to arduino mega checks the database to verify the product key. Arduino is an open-source hard- ware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control both physically and digitally.[6]

Here we used arduino MEGA 2560 which is designed for more complex projects. With 54 digital I/O pins, 16 analog inputs and a larger space for the sketch it is the recommended board for 3D printers and robotics projects. This gave project plenty of room and opportunities.[7][8]

Once the user enters the product key, the key is encrypted using AES and send to the database for verification. Once the verification successful a Boolean value, and the coordinates of medicines is returned as a JSON file[9]. If the value is true then arduino passes message to dispatch medicines.

Medicines are dispatched with the help of servo motors. Servo motors have three wires: power, ground, and signal. The power wire is typically red, and should be connected to the 5V pin on the Arduino board. The ground wire is typically black or brown and should be connected to a ground pin on the Arduino board. The signal pin is typically yellow, orange or white and should be connected to a digital pin on the Arduino board. The servos draw considerable power, and so power was provided from a separate supply (i.e. not the +5V pin on Arduino). Servos have integrated gears and a shaft that can be precisely controlled.[10]

## V. RESULT

Separate portal for doctors and patients have been created where the doctor can use the patient id and add the prescribed medicines to the patient's portal. The patient after login can view the medicines recommended by the doctor in a tabular form. Provision has been provided to the patient to reduce the count to suit his wallet and make payment accordingly using Razorpay API. After the payment a unique code was generated depending upon patient's purchases. Now patient can input the code received and the medicines are dispensed pill by pill according to the count provided by the patient.

The main problem addressed by the proposed system was the delay in purchase and dispatching of medicine. The system design is in such a way that the cost and resources required are restricted to a minimal level. This was necessary in order to cut the production cost to an extent where the product will be affordable to the hospitals.

## VI. CONCLUSION

Medicine has become a necessity, taking into consideration on how our environment evolves. There is an immediate demand in dispatching the medicines with minimum delay and high efficiency, by considering the above problem statement and justification provided. We believe that the the technologies suggested and implemented by us will set a benchmark in the medical industry thus directing the use of technology as a way to ease the lives of people. The proposed method is a more advanced technique to access the medicine at hospitals with ease, saving time and effort of patients. Introducing the concept of digitization in medical industry has created a revolution in the way people get benefits, in a more personalised and effective manner. This opens doors for other business ventures to invest in medical industry creating more job opportunities. The use of web technology for medicine prescription and payment will decrease the use of paper and hard cash tremendously. The use of IoT for medicine dispensing and network interfacing will reduce human delay incurred in dispatching medicines.

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