

Raspberry Based Medical Aid With Dispenser System Using IOT

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Abstract—In India, the number of deaths due to lack of medical facilities and proper access to healthcare is on the rise in India. Also, unavailability of doctors in tourist places is a hindrance to the tourism in our country. Only 27% of the total healthcare in India is accessible by the rural masses which occupies 75% of the total population. A lot of minor medical conditions like common cold, fever, acidity, vomiting (especially in hilly areas) are left unaddressed due to the lack of medicines especially at night. If though we need to check some of medical parameters like weight, blood pressure, body temperature, pulse rate we need to go quite long to the hospital, which is quite difficult in rural areas. This is where our product, comes to the rescue. Proposed system is aimed at providing immediate medical and pharmaceutical remote aid automatically via IOT. This product would definitely affect the people living in villages and remote regions who usually travel about 100km and spend around 70% - 80% of their income in travel for medical and healthcare facilities. We aim at creating an Automated Medical Aid by incorporating various sensors that can measure vital parameters of our body like blood pressure, weight, temperature, pulse rate etc. These parameters data would be analyzed with our data model and we would provide suggestion according. If needed the medicines are dispensed by the machine. The machine can also be used to Dispense First-Aid Kits, Napkins and certain scheduled drugs for emergency situation. Though there are various medicine vending machines around the world, proposed system would be a stand-alone device that provides remote medical assistance and dispense medicines at the same time.

Keywords—healthcare, blood pressure Dispense First-Aid Kits, Napkins.

I. INTRODUCTION

In India, the number of deaths due to lack of medical facilities and proper access to healthcare is on the rise in India. Also, unavailability of doctors in tourist places is a hindrance to the tourism in our country. Only 27% of the total healthcare in India is accessible by the rural masses which occupies 75% of the total population. A lot of minor medical conditions like common cold, fever, acidity, vomiting (especially in hilly areas) are left unaddressed due to the lack of medicines especially at night. If though we need to check some of medical parameters like weight, blood pressure, body temperature, pulse rate we need to go quite long to the hospital, which is quite difficult in rural areas. Non-availability of diagnostic tools and increasing reluctance of qualified and experienced healthcare professionals to practice in rural, under-equipped and financially less lucrative rural areas are becoming big challenges. Rural medical practitioners are highly sought after by residents of rural areas as they are more financially affordable and geographically accessible than practitioners working in the formal public health care sector and they usually travel about 100km and spend around 70% - 80% of their income in travel for medical and healthcare facilities.

The health care in India would come like hospitals, clinic, mobile unit. The hospitals are also being highly available 24/7 only in urban areas than in rural area. And very few clinics opened in night time which is an ban for the people need of medical solution at that point of time. This is where our product, comes to the rescue. We aimed to provide immediate medical solution and pharmaceutical Aid automatically via UI and IOT.

We used a Wi-Fi wireless protocol for our device's networking stack, since it has the benefits of having a high bandwidth and transmission rate and being highly cost-effective. This product would definitely affect the people living in villages and remote regions who usually travel about 100km and spend around 70% - 80% of their income in travel for medical and healthcare facilities. In rural healthcare environment the machine will overcome the need for on-site pharmacist and doctor. Initially, only generic drugs will be available in the machines. Officials said that patient data captured and registered electronically will also generate valuable epidemiological data.

The state health department has 8,764 sub-centers, 1,157 primary health center (PHC) and 334 community health centers (CHC). More than 600 PHCs are functioning without doctors

and about 24 CHCs do not have a single doctor. We aim at creating an Automated Medical Aid by incorporating various sensors that can measure vital parameters of our body like blood pressure, weight, temperature, pulse rate. These parameters data would be analyzed with our data model and we would provide suggestion according. If needed the medicines are dispensed by the machine. The machine can also be used to Dispense Mini First-Aid Kits, Napkins and certain scheduled drugs for emergency situation. We can also could be placed in public places like parks, schools, office etc. Also, in public transports like bus, train etc.

II. LITERATURE SURVEY

The term “health information technology” (health IT) is a broad category of solutions that includes technologies to store, share, and analyze health information. Telemedicine technology is a subset of health IT that refers specifically to remote clinical services. They say that necessity is the mother of invention, that’s why it makes a lot of sense that modern telemedicine, began in the early 1960’s when NASA first put men in space. The wellbeing of the astronauts was measured with technology onboard the spacecraft and inside the space suits. The results were transmitted to monitoring physicians using satellite technology. Eventually, NASA turned their attention earthward and started a project to deliver healthcare to the Papago Indian Reservation in Arizona. A van with a variety of medical instruments was sent to the isolated population. Two paramedics used the equipment, including an x-ray machine and electrocardiograph, and transmitted the results to specialist via microwave transmission.

EHR Integration

Most medical practices already ELECTRONIC HEALTH RECORDS (EHR) or patient management technology. Healthcare Providers believes that it is important that telemedicine technology integrate seamlessly with these core solutions. Providers are able to schedule a “Telemedicine” appointment using their normal scheduling system. We with many of the most popular solutions.

Tablets Vending machine in INDIA

For the first time, a state-of-the-art mini vending machine was set up at an Mohalla clinic in Todapur, Delhi, yesterday. The mini-medicine shop has the capacity to dispense up to 50 different types of prescribed medicines, including tablets and bottles.

The automatic vending machine uses sensor technology to dispense medicines based on doctor's prescription. They also aim to setup similar machines in nine other Mohalla Clinics across the state. Earlier, the medicines were being distributed by the helper, directly under the supervision of the doctor. With the installation of the machine, the patients would be able to collect their medicines directly.

This new mechanism saves the need for a full-time pharmacist and helps doctors keep a tab on the medicines that are being distributed off the counter.

First Aid Vending Machine in INDIA

The first-aid vending machines that Lalbagh, Bangalore. The authorities are mulling on installing more. Currently one machine is available near Glass House and 35 other first-aid

boxes have been fixed on cement poles at various other locations. At the moment, it is stocked with six water bottles, 12 pain sprays, 12 sanitary napkins, 12 mini-first aid boxes and 12 maxi-first aid boxes. While the water bottle costs 10, spray costs 50, napkin costs 10, mini first aid costs 100 and maxi first aid costs 150 (it has gloves and ointment with it).

M-Health

M-Health (also written as m-health) is an abbreviation for mobile health, a term used for the practice of medicine and public health supported by mobile devices. The term is most commonly used in reference to using mobile communication devices, such as mobile phones, tablet computers and PDAs, and wearable devices such as smart watches, for health services, information, and data collection. The mHealth field has emerged as a sub-segment of eHealth, the use of information and communication technology (ICT), such as computers, mobile phones, communications satellite, patient monitors, etc., for health services and information. mHealth applications include the use of mobile devices in collecting community and clinical health data, delivery of healthcare information to practitioners, researchers, and patients, real-time monitoring of patient vital signs, and direct provision of care (via mobile telemedicine).

III. PROPOSED SYSTEM

Raspberry pi 3

The Raspberry Pi 3 is the third generation Raspberry Pi. One of the most popular microcontroller platforms of all times is Arduino. It doesn't run an operating system; just a boot loader and firmware. Its upsides are real-time signals processing, analog value measurements etc. It replaced the Raspberry Pi 2 Model B in February 2016.

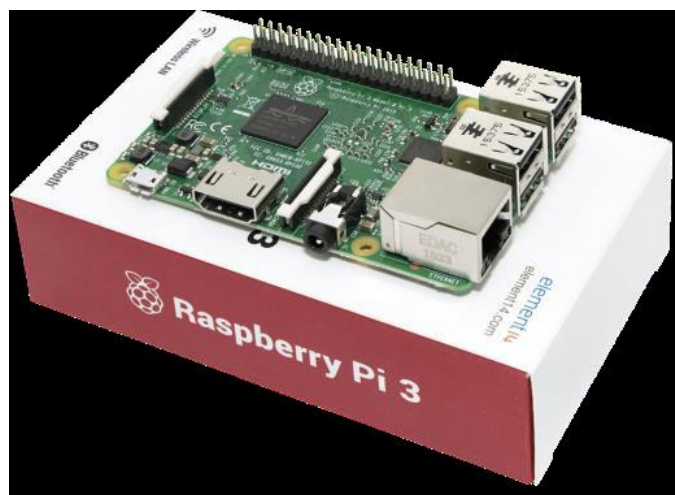


Figure 1: RASPBERRY PI 3

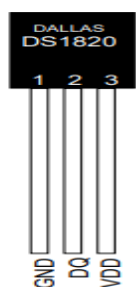
Microcontroller can be said as a simple computer that is application specific, which means one program can be run at a time. Whereas Raspberry Pi is a mini-computer or a mini-CPU, which works with Linux operating system and can handle multiple programs running simultaneously. Pi is capable of doing multiple tasks at a time like a computer.

We can get internet connectivity in microcontroller. It's doable but not that easy. Whereas it is fairly easy to connect your raspberry pi to internet. We can work with many different programming languages on such as C, C++, Java, Python, Perl etc. Whereas mostly C is used for many microcontrollers. Operating system can be easily switched on the single Raspberry Pi board. Pi uses SD card as flash memory to install the OS, just by swapping the memory card you can switch the operating system easily. Raspberry Pi provides us to work on GUI mode very easily as it has HDMI port. Recent release of Pi is compatible to work on WINDOWS 10. Not completely windows 10 mode but it can be used for various IOT based projects. For server-based application Raspberry Pi is best suited. It can be connected via SSH and files can be transfer over FTP. Raspberry Pi has hardware support for SPI and I2C, to enable interfacing with various other devices. The list goes on. The cost of Raspberry Pi is pretty comparable with microcontrollers when you are offered number of things which aren't present in microcontrollers.

DS18B20(Temperature sensor):

The DS18B20 Digital Thermometer provides 9 to 12-bit (configurable) temperature readings which indicate the temperature of the device. The DS18B20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor. In addition, the DS18B20 can derive power directly from the data line ("parasite power"), eliminating the need for an external power supply. This sensor has been included in many applications such as Thermostatic Controls, Industrial Systems, Consumer Products, Thermometers, Thermally Sensitive Systems.

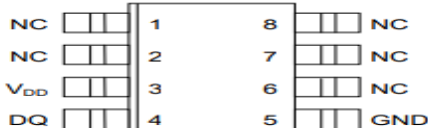
PIN ASSIGNMENT



BOTTOM VIEW



DS18B20 To-92 Package



DS18B20Z 8-Pin SOIC (150 mil)

PIN DESCRIPTION

GND - Ground
DQ - Data In/Out
VDD - Power Supply Voltage
NC - No Connect

Figure 2: DS18BS0 PIN Description



Figure 3: DS18B20 Temperature sensor

Load Cell

Load cells are used to measure weight. They are an integral part of our daily life. "In your car or at the cheese counter in the supermarket – we encounter load cells everywhere," says HBM Product Manager Stefan Schmidt. Of course, they are usually not immediately recognizable, because they are hidden in the inner workings of instruments.

HX711(Load cell amplifier)

HX711 is a precision 24-bit analog to-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor. The input multiplexer selects either Channel A or B differential input to the low-noise programmable gain amplifier (PGA). Channel A can be programmed with a gain of 128 or 64, corresponding to a full-scale differential input voltage of $\pm 20\text{mV}$ or $\pm 40\text{mV}$ respectively, when a 5V supply is connected to AVDD analog power supply pin. Channel B has a fixed gain of 32.

On chip power supply regulator eliminates the need for an external supply regulator to provide analog power for the ADC and the sensor. Clock input is flexible. It can be from an external clock source, a crystal, or the on-chip oscillator that does not require any external component. On-chip power on-reset circuitry simplifies digital interface initialization. There is no programming needed for the internal registers. All controls to the HX711 are through the pins.

The clock generator has built-in calibration and self-test circuits. Quadrature clock phases and phase noise are optimized on-chip with patented calibration algorithms to ensure the best performance of the receiver and transmitter.

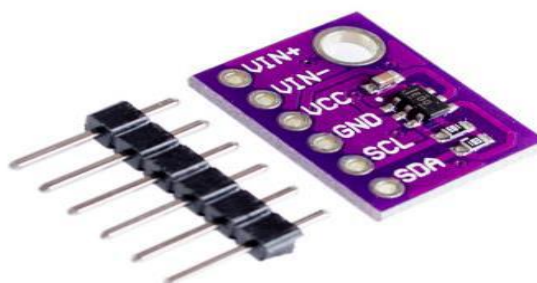


Figure 4: HX711 Load Cell Amplifier

Pulse Sensor

We do to measure the heart rate is, first we will detect the heart beat/pulse and count the pulses for one minute to get the beats per minute. So, in order to detect the pulse, we will pass light (using an LED) from one side of the finger and measure

the intensity of light received on the other side (using an LDR). Whenever the heart pumps blood lighter is absorbed by increased blood cells and we will observe a decrease in the intensity of light received on the LDR. As a result, the resistance value of the LDR increases. This variation in resistance is converted into voltage variation using a signal conditioning circuit usually an OP-AMP. The signal is amplified enough to be detectable by the microcontroller inputs. The signal given to the microcontroller input will look somewhat like shown in the image above in a oscilloscope. The microcontroller can be programmed to receive an interrupt for every pulse detected and count the number of interrupts or pulses in a minute. The count value of pulses per minute will give you the Heart rate in bpm (Beats Per Minute).

Pressure Sensor

A pressure sensor is a device for pressure measurement of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical.

Servo Motor:

For the vending machine, we are using Servo motor for 360 rotations. We are using SG90 micro servo motor. A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used

SG90 SERVO

Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction) and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware.



Figure 5: HX711 Load Cell Amplifier

IV. SOFTWARE DESCRIPTION

Bootstrap:

Bootstrap is a free and open-source front-end web framework for faster and easier designing of websites and web applications. It is mainly known for its mobile first and responsive projects on web. It includes HTML and CSS based design templates for typography, forms, buttons, and tables and much more as well as optional JavaScript plugin. It concerns itself with front-end development only.

HTML:

Hypertext Mark-up Language (HTML) is the standard mark-up language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript, it forms a triad of cornerstone technologies for the World Wide Web. Web browser receives HTML documents from a web server or from local storage and renders them into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

CSS:

CSS stands for Cascading Style Sheets. It describes about how a file written with mark-up languages such as HTML displayed on any media such as screen, paper, etc. It saves us a lot of time and work. It can control the layout of multiple web pages all at once. External Style sheets are stored as CSS files. CSS is designed primarily to enable the separation of presentation and content, including aspects such as the layout, colours and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple HTML pages to share formatting by specifying the relevant CSS in a separate .CSS file, and reduce complexity and repetition in the structural content. CSS has a simple syntax and uses a number of English keywords to specify the names of various style properties.

JavaScript:

JavaScript is the programming language of HTML and the Web. JavaScript is a high-level, dynamic, weakly typed, object-based, multi-paradigm and interpreted client-side programming language. It is used to make web pages interactive and provide online programs, including video games. As a multi-paradigm language, JavaScript supports event-driven, functional and imperative programming styles. Used in Web pages, JavaScript is a "client-side" programming language. This means JavaScript scripts are read, interpreted and executed in the client, which is your Web browser. By comparison, "server-side" programming languages run on a remote computer, such as a server hosting a website. Nowadays, JavaScript is supported by all modern web browsers and is used on almost every site on the web for more powerful and complex

functionality. In short, JavaScript is a programming language that lets web developers design interactive sites

JQuery:

jQuery is a fast, small and feature-rich JavaScript library. Query's syntax is designed to make it easier to navigate a document, select DOM elements, create animations, handle events, and develop Ajax applications. jQuery also provides capabilities for developers to create plug-in on top of the JavaScript library. This enables developers to create abstractions for low-level interaction and animation, advanced effects and high-level, theme able widgets. The modular approach to the jQuery library allows the creation of powerful dynamic web pages and Web applications. It makes things like HTML document traversal and manipulation, event handling, animation, and Ajax much simpler with an easy-to-use API that works across a multitude of browsers.

AJAX:

AJAX, or Asynchronous JavaScript and XML, is a client-side technique for communication with a web server. The best definition for Ajax is "the method of exchanging data with a server and updating parts of a web page – without reloading the entire page. In other words, it allows you to fetch data 'in the background' without having to reload a whole page. AJAX is a technique for creating fast and dynamic web pages, AJAX allows web pages to be updated asynchronously by exchanging small amounts of data with the server behind the scenes. This means that it is possible to update parts of a web page, without reloading the whole page. It is a client-side script that communicates to and from a server/database without the need for a post back or a complete page refresh.

Node.js

Node.js is an open-source, cross – platform JavaScript run time environment for executing JavaScript Code Server-side. Historically, JavaScript was used primarily for client-side scripting, in which scripts written in JavaScript are embedded in a webpage's HTML, to be run client-side by a JavaScript engine in the user's web browser. Node.js enables JavaScript to be used for server-side scripting and runs scripts server-side to produce dynamic web page content before the page is sent to the user's web browser. Consequently, Node.js has become one of the foundational elements of the "JavaScript everywhere" paradigm, allowing web application development to unify around a single programming language, rather than rely on a different language for writing server-side scripts.

CORS

Cross-Origin Resource Sharing (CORS) is a mechanism that uses additional HTTP headers to let a user agent gain permission to access selected resources from a server on a different origin (domain) than the site currently in use. A user

agent makes a cross-origin HTTP request when it requests a resource from a different domain, protocol, or port than the one from which the current document originated. CORS is a node.js package for providing a Connect/Express middleware that can be used to enable CORS with various options. We have used CORS to set Access-Control-Allow-Origin CORS header, which allow performing cross-origin HTTP request.

MySQL

MySQL is an open-source relational database management system (RDBMS). Its name is a combination of "My", the name of co-founders Michael Widenius's daughter, and "SQL", the abbreviation for Structured Query Language. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. For proprietary use, several paid editions are available, and offer additional functionality.

V. RESULTS AND DISCUSSIONS

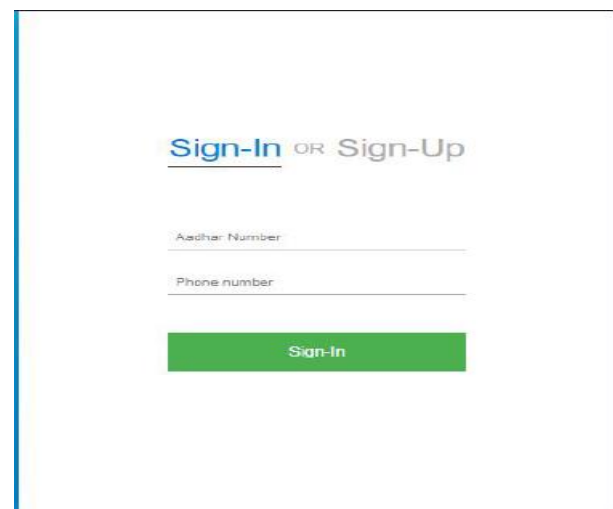


Figure 6:login and sign up page

The above figure shows the login and sign up page of software from which the user must to enter the login id as Aadhar no and password as mobile no. after entering those details, user would get an OTP msg from our server for login.

FROM WHEN YOU ARE FEELING THIS
KIND OF UNCOMFORTABLE?

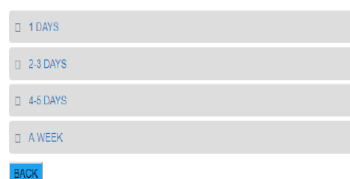


Figure 7:Users interaction screen

After few secs later, this page figure would occur, showing some questions for the user. The User should click the correct option after reading the question, as they are being asked related to that particular check-up they should click next for next question.

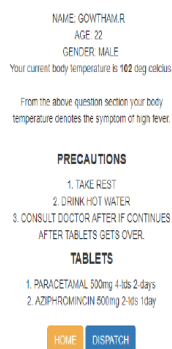


Figure 8:full report page of the user's entire body temperature.

This figure shows the full report page of the user's entire body temperature. This page shows us the reading, precautions, tablets, remedies. If the user wishes they could vend the tablets by paying through online payment or move back to home page.

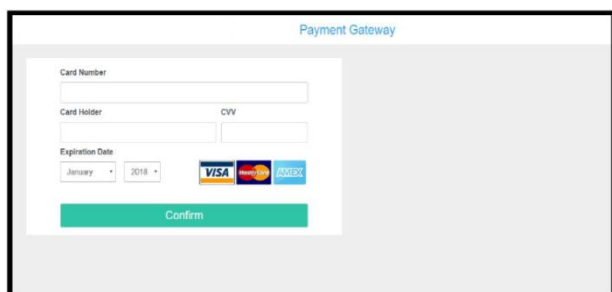


Figure 9:payment gateway page

This figure shows the payment gateway page where the users can do the payment for the vending tablets, FIRST AID

KIT, Napkins. If the payment done successfully, the vending machine vends the products.

VI. CONCLUSION

The project is planned in a practical and convenient way that it would be received as a product among the customers. It is a multipurpose machine which gives scan reports, First-Aid Kits, Napkins, Tablets facility of the medicines by the prescription. The medicine stock would be monitored regularly. The USER would be guided by simultaneous video and audio demonstration regarding its usage. The instructions would be provided in a step by step manner. This project would be a great success because of its need and features. This project is aimed at providing immediate medical and pharmaceutical Remote Assistance automatically via IOT. The future scope of our project is that we can make it this project implementing in big scale and placing this in public places like schools, intuition, malls etc.

VII. ACKNOWLEDGMENT

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