

Unified System for Patient Medical History

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ABSTRACT

Today in a majority of commercial/industrial sectors, the issue of data security and data volume is quite a concern. It can be said that the key to majority of these concerns could be digitization of data and complete reduction of hardcopies.

The simple idea is to create a unified system for all users where in the patient's entire medical history would be stored. The system can be linked with Aadhar number/fingerprint identification to make it more secure and user specific. This will result in reduction of paper usage for medical records too. The portal will have two fronts, one for the user where his entire medical history would be stored and the other would be for the doctors wherein, they could feed the patient medical report directly onto the system.

Keywords

Medical History, database, patient

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Introduction

It may happen that a patient is not satisfied with the doctor's treatment, he goes to another doctor for treatment. The switching of doctor results in carrying tons of documents to the new doctor and filling out lengthy medical history forms (an important yet time consuming task).

Despite the many technological advances in health care over the past few decades, the typical patient record of today is remarkably similar to the patient record of 50 years ago. This failure of patient records to evolve is now creating additional stress and burden due to information needs of practitioners and patients.[1]

Virtually every person in our country who has received health care have multiple patient records, one for each health care provider they have visited. For a long time, the patient record has been on paper, which was the primary way for recording patient's information. Yet recently there's a trend toward automation of components of patient Records or certain patient care functions but not completely.[2] So, the next question would be, could this paperwork be eliminated/reduced?

A patient record is the accumulation of information about a single patient. This information is generated by health care professionals that are doctors and physicians in an organization as a direct result of interaction with a patient or with individuals who have personal knowledge of the patient (or with both). Traditionally, patient records have been on paper and have been used manually by both patients and doctors. Patient history record improvisation could make major contributions in improving the health care system of this nation. [3]

- First, automated patient records can improve health care delivery by providing medical history of a patient with better data access, faster data retrieval and higher quality data.
- Second, automated patient records can enhance outcomes by improving the treatment of a particular patient.

- Third, automated patient records can increase hospital's efficiency by cutting the costs and improving staff productivity if the paperwork is less.

- The step which can be taken toward patient record improvement is a close examination of the people who make use of the patient record, the technologies available to create and maintain it.



Figure 1. Unified System for Patient Medical History

Need For The Project

From the doctor's point of view, it is difficult to go through the details of the entire medical history before treating the patient. Often lack of medical history results in serious blunders and mishaps. One may never know but even the slightest of medically relevant information could be the cause of a miracle.

Mostly, every person in our country who has received health treatment may have multiple patient records, one for each doctor or physician they have visited. Earlier, the patient record has been on paper, which was the only way for recording patient's information. Recently, there's a trend towards automation of components of patient records functions but not completely.

Some conditions of the society and today's problems due to which this whole unified system should be implemented are: The current demands for unified patient information throughout the health care sector will not decrease, rather they will eventually increase. Technologies essential for unified electronic based patient's history records at a single

portal are becoming more powerful, efficient and less expensive. Nowadays, patients and doctors are becoming bound to the use of computers in almost all aspects of their everyday life. In this age of mobile population, people want all their activities to be managed on their phones and PCs. Therefore, demands ease in transferability or portability of stored medical history of the patient.

USPMH system, as defined, could positively affect the quality of patient health care in following ways:

- This system offers a means of improving both the quality of treatment and access to patient health care data.
- Allow providers to integrate information about patients over time or with more advanced system real time data recorded can stored simultaneously.
- Makes medical knowledge and history of patient more accessible for physicians or doctors when needed.
- Provides decision support to physicians/doctors and doctors can suggest the good treatment for the problem.

Components Used

Raspberry pi 3, b+

The Raspberry Pi is a series of several small single board computers. The Raspberry Pi has passed several versions of the hardware that features variations in memory capacity, peripheral device support and also includes some features such as System On Chip(SOC), ARM compatible CPU and an on chip GPU.

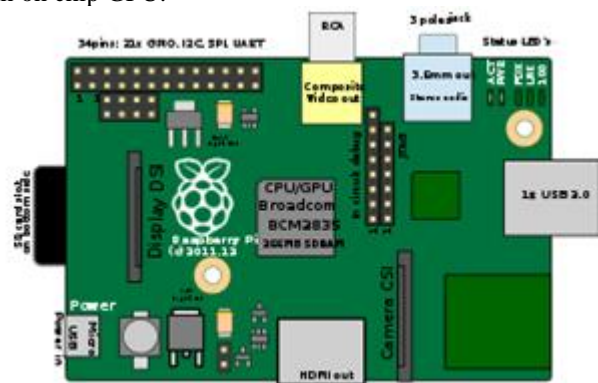


Figure 2. Schematic of Raspberry Pi 3

Fingerprint sensor, r307

R307 Fingerprint Module comprises of optical fingerprint sensor, high speed DSP processor, high performance fingerprint alignment algorithm, image processing, algorithm for fingerprint matching and search and template storage and other functions.

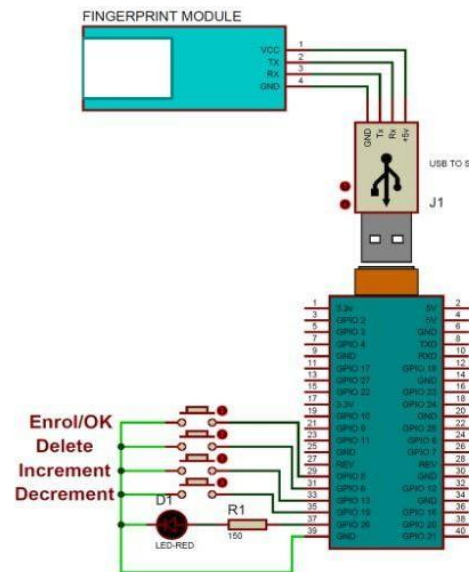


Figure 3. Schematic of Fingerprint sensor with Raspberry Pi

Human body temperature sensor, ds18b20

The DS18B20 Human Body Temperature Sensor provides configurable 9, 10, 11 and 12-bit of temperature readings with increment of 0.5°C, 0.25°C, 0.125°C, and 0.0625°C, respectively. The DS18B20 communicates over a 1-Wire bus that means it only requires only one data line and ground for communication with a central processor(Here in this case Raspberry Pi). It can derive power directly from the data line and eliminates the use for an external power supply. This sensor has been included in many applications such as Thermostatic Controls, Industrial Systems, Medical Systems and etc.

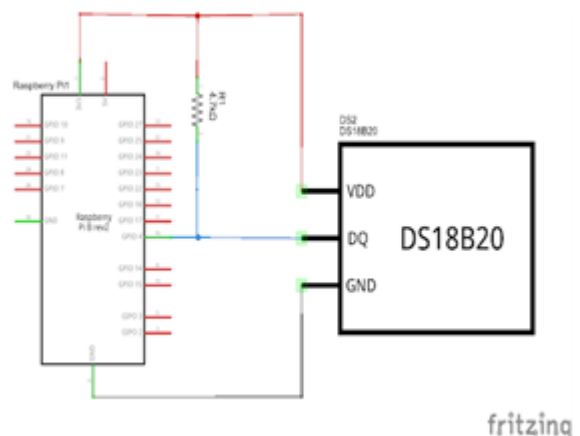


Figure 4. Schematic of DS18B20 with Raspberry Pi

Pulse rate sensor

The sensor has two sides, on one side the LED is placed along with an ambient light sensor and on the other side circuitry. This circuitry is responsible for the amplification and noise cancellation work. The LED on the front side of the sensor is placed over a vein in our human body. This can either be your Finger tip. It should be placed directly on top of a vein. If the flow of blood is detected then the light sensor will pick up more light as they will be reflected by

the blood, this minor change in received light is analyzed over time to determine our heart beats.

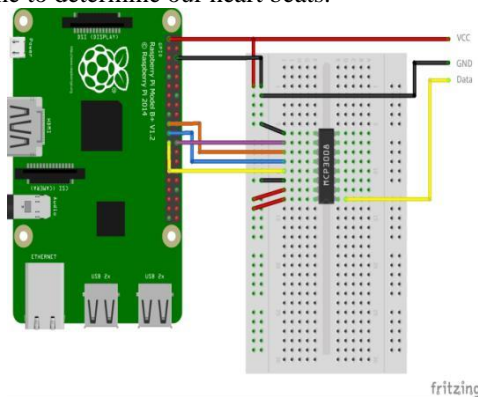


Figure 5. Schematic of Pulse Rate Sensor with Raspberry Pi using MCP3008 ADC

Other components

- Breadboard
- MCP3008 ADC used for interfacing the pulse sensor
- USB cable and Connecting wires(Male-Male, Female -Male)



Figure 6. MCP3008 ADC

Software Used

Python language

Python is one of the most well-known and easy programming languages. It is very well known for its ease of understanding and widespread community. Python is so designed that it is very similar to the English language and is influenced by mathematics. Python works on multiple platforms and is based on an interpreter system. i.e. Python is an interpreting language and not a compiling language.



Figure 6. Python Logo

Visual code studio

Visual Code Studio is an application/source-code editor developed by Microsoft used to code, debug and run modern cloud applications.



Xampp software

XAMPP is a software used to locally host websites. It has a variety of servers such as apache and Maria DB Database. It was created by Apache Friends.



Figure 8. XAMPP Software Logo

WordPress

WordPress helps you easily develop front end for website without having to go through the tedious process of writing full-fledged HTML and CSS codes. It has an easy to understand drag and drop kind of interface. Technologies Used

HTML and CSS (Front End)

It is a standard language that stands for „Hypertext Markup Language“ and is used to make web pages. It is assisted by technologies such as Cascading Style Sheets (CSS) and Java Script. It creates the structure and layout of a web document with the use of tags and various attributes.

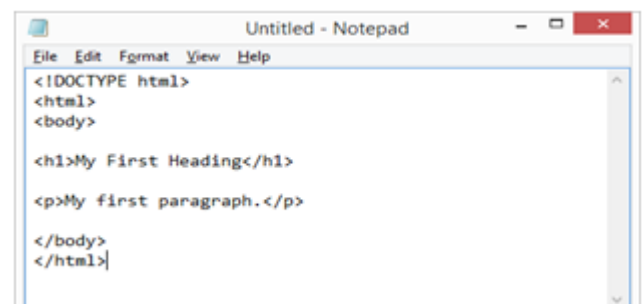


Figure 9. Sample HTML Code

Flask (back end)

Flask is a micro web application framework. That means it is basically a set of tools and libraries that make it easier to build web applications in Python. Flask does however include a web server that can be used for testing and development.

Block Diagram

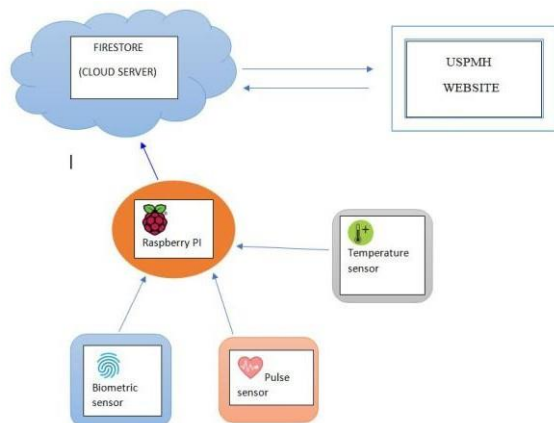


Figure 10. Block Diagram

Working Of Uspmh System

The doctor will have the entire set up for USPMH. The website will have a login page would have a two-step verification (password and then fingerprint). The home page would contain details of the patient, past medical records and current medications.

Whenever the patient visits a doctor, he will only have to log in onto the website using his Aadhar Number and unique pin. The portal will have the entire medical history of the particular patient. The doctor can fill up a general medication form and update the details in the portal accordingly.

Through this project we wish to slowly start eradicating the problems related with patient medical history, be it usage of paper or the tediousness of filling out forms again and again. Our system will provide an ease of work for doctors and a relief for patients throughout the community. If this project could be implemented on a larger scale, it would turn out to be secure and efficient way to deal with patient medical history.[4]

Flow Chart

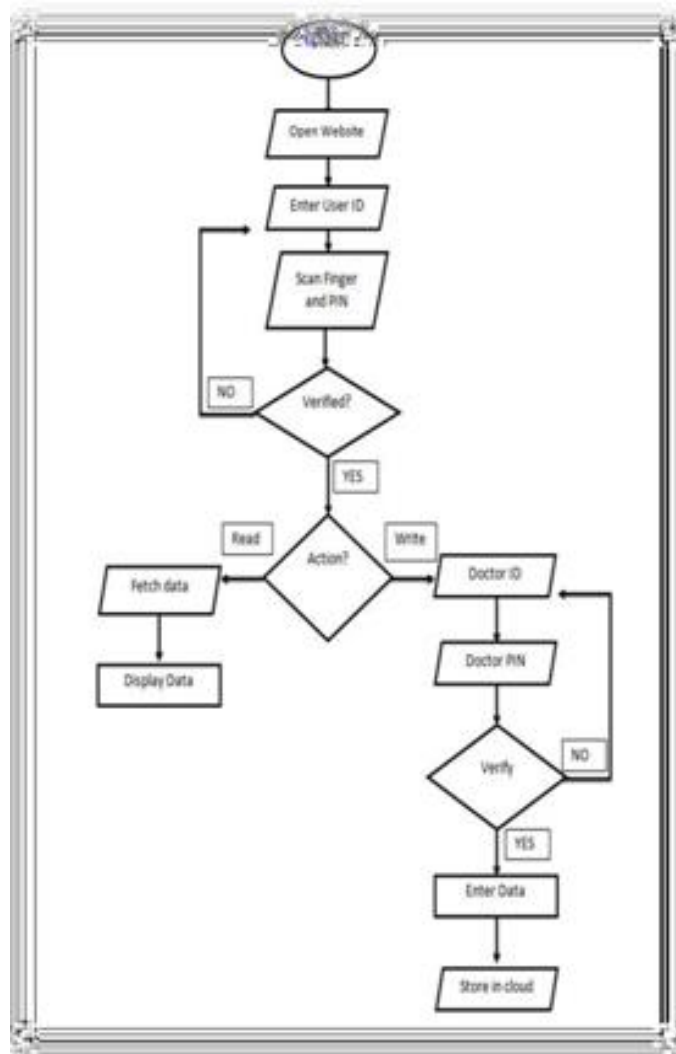


Figure 11. Flow Chart

Website At A Glance

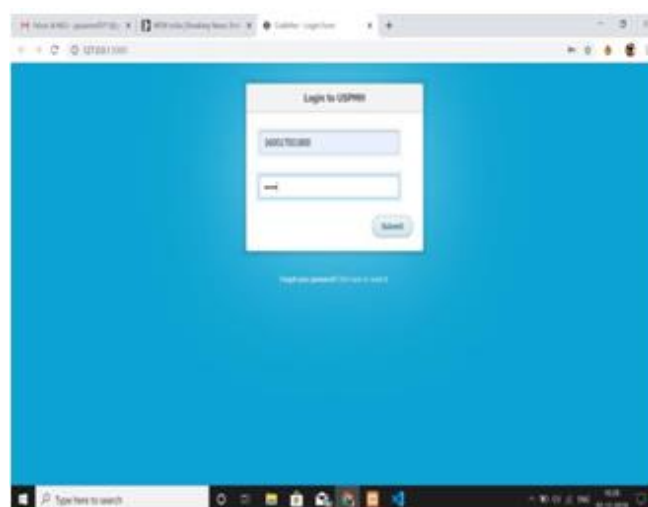


Figure 12. Login Page

The very first page is the login page, with the aadhar number as the ID and a specific pin for each user as password, one can login into the system.

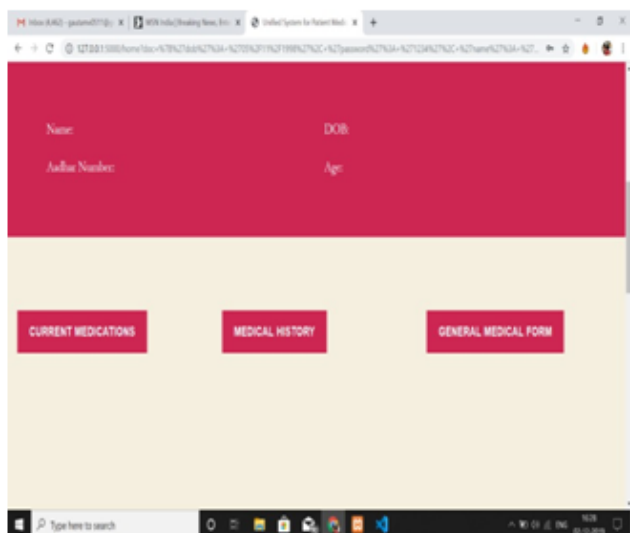


Figure 13. Home Page

The Home page also contains three buttons to access the following

1. Current Medications
2. Medical History
3. Fill General Medical Form



Figure 14. General Medical Form

The General Medical form is a very basic medical form consisting of fields such as height, weight, temperature, pulse rate, blood pressure and previously known allergies.

Hardware Setup



Figure 15. Raspberry Pi setup with all the sensors on VNC Viewer

All the short wire connections are made using either Male to Male or Male to Female wires.

The MCP3008 and the temperature sensor are placed on the breadboard for convenience where as the fingerprint sensor module and the pulse sensor can be placed a small distance apart.

The USB to TTL converter is used to connect the Fingerprint sensor module with Raspberry Pi and the ADC is used along with the pulse sensor.

Scope And Applications

Central Medical History database

Unified patient management system for hospital chains

One Nation One Portal

Government Hospitals

Can be later modified to provide payment mechanism in the same portal

Authenticate government medical scheme beneficiaries

Conclusion

Unified and computerized medical history will provide support for clinicians. While doctors or physicians will still be eventually making a final diagnosis, the USPMH system will suggest possible diagnoses for the physician to consider according to the medical history under a patient's identity along with tests and treatments based on guidelines and literature that are a click away. [5]

Also, the process of creating and using unified electronic health records is not an easy task and involves a number of barriers and difficulties that make achieving the defined goals difficult. Before creating a system like this technical and non-technical issues and errors must be identified and resolved so that no error occurs in the registration of the medical history of patient. Generally, barriers to the adoption of USPMH system can be categorized as technical, organizational, personal, financial, and legal.[6]

An USPMH system is an information system that helps to collect patient's health information from cradle to grave so that it can be registered, certified, and shared in different places by hospitals and doctors/physicians. The main idea of implementing USPMHs is improving the quality of care by reducing medical errors due to lots of paperwork, providing an effective and efficient means of communication, sharing information between doctors and patients, and collecting health information for academic and research purposes.

USPMH system helps to facilitate use of electronic health record and are the most important and effective type of health information system in terms of the availability, accessibility, and accuracy of data

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