



iDoctor Medical System

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Abstract: In today's world where technology has progressed with the lightening speed there is a need to create an electronic health platform, delivering 360-degree health services and products. In this paper, we present the idea to provide a health service, which is just a click away of a button. It includes description about measurement of various vital parameters, preparation of digital reports, sending reports to the doctor via e-mail or SMS, providing remedies as suggested by doctors, taking an appointment with doctor if needed and generating a doctor visit prep sheet. In this jet age, these services are specially designed for convenience and safety and all of this can be done by you at your home all by yourself.

Keywords: MEDiSN, ADC, WAMP

I. INTRODUCTION

Healthcare is a multimillion-dollar industry and a vital service within society. Easily accessible medical services and early treatment are the need of the hour. Advancement in the technology in the recent years has been marked tremendous. Devices became smaller, faster, portable and more powerful. Broadband networks have reached out and connected most major cities providing an effective base to launch communication-based services that were not feasible before.

Already available technological solutions are limited to a particular extent in helping the patients. Though technology like MEDiSN, a wireless sensor network [4] can tolerate high degrees of human mobility, it was designed to measure the vital signs of ambulatory patients only. Another solution includes flexible and powerful patient surveillance through wearable devices [9]. But the major challenges were to provide 24-hour services to the patients and unwillingness of customers to share their private information.

This paper proposes a system, which is designed with information technology, collaborated with medical services. This system provides medical assistance to the patients through the website, ensures medical service when patient requires. It provides an electronic platform for the patient-doctor communication. With the progress of computers and networking at present, this system establishes a base for an electronic health service to the people at their doorstep [5]. Doctors would prescribe medicines or remedies to the patient without even visiting the patient's house. In an age where work is the top most priority, this system would help in looking after the health of an individual and taking care of his well-being.

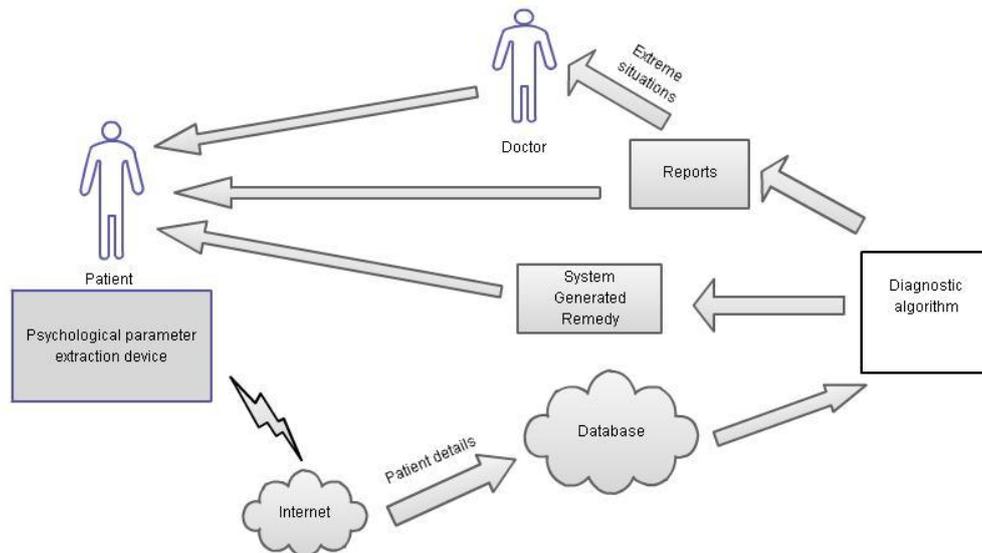


Fig. 1: Workflow

II. MEDICAL SUPPORTING SYSTEM

The objective is to design a complete medical supporting system, which intends to cover the following aspects:

- Registration of patient with his complete medical history.
- Registration of doctor with his details.

- Website services for general remedial suggestions, digital communication with doctors and accessing information about available doctors in the vicinity.
- Doctor visit prep sheet with current readings.

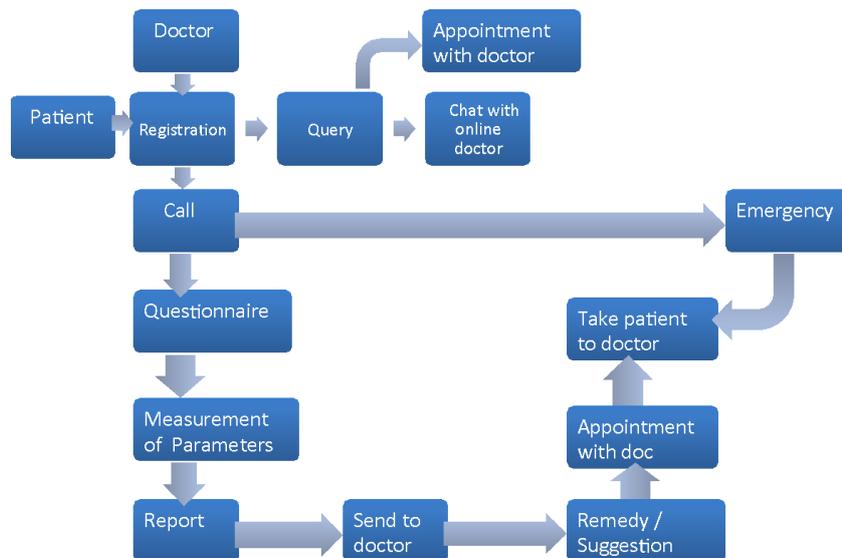


Fig. 2: Complete Block Diagram

For availing the medical services the patient should register with the system through the website. It registers patients' complete information, which includes the basic information of the patient such as name, address, mobile number etc., demographic information, medical history, also any major or minor illness, allergies, operative history if any etc. When needed, patient can visit the website using his email and password to measure his or her vitals like Temperature and blood pressure. The details like patient's login information and measured vital parameters will be stored on a web based cloud storages so that they can be accessed through a web browser [1,2].

The digital report showing patients' current condition is generated and is send to the doctor for diagnosis. If asked by the doctor, medical history will be provided. Depending on the doctors' diagnosis and advice, remedies are suggested. The patients can also avail the facility of asking the queries to the doctors on the website. This system will be a boon for the people living alone or with old age or in case of emergency.

III. MEASUREMENT OF ESSENTIAL PARAMETER

The parameters to be measured which include body temperature; the output of the sensor goes through amplifier and filter circuit and after signal conditioning it's given for digitization and the value is then directly interfaced on the web page via USB connector. Other parameter is blood pressure the output from the digital blood pressure is fed into the laptop via USB, similarly the oximeter. Output from the probe is connected to the USB connector and is fed into the computer /laptop. After all the essential parameters are measured a report of the patient is generated.

1. Temperature

The digital temperature sensor, DS18B20 [3,8] provides calibrated digital temperature readings directly and precisely without complicated calculation in code. It measures temperatures from -55°C to $+125^{\circ}\text{C}$ (-67°F to $+257^{\circ}\text{F}$) with $\pm 0.5^{\circ}\text{C}$ accuracy from -10°C to $+85^{\circ}\text{C}$. The tip of the sensor is placed in the patient's armpit for a minute. Using the Arduino IDE, the program code is uploaded on the Arduino board. The temperature is converted into a digital value using the code uploaded and fed into the PC using the USB cable. The temperature can then be read on the computer monitor.

2. Oximeter

The pulse oximeter sensors used are the DS100 series sensors. The red and infrared signal then passes through the filtering and amplification block. Now the signal is digitalized by ADC and is then fed to computer/laptop via USB connector.

3. Blood Pressure

This monitoring system is a Pulse Transit Time method to measure blood pressure. A pressure cuff and pump, along with the transducer, are used to measure blood pressure and heart rate in 3 phases, inflation, measurement, and deflation. Also included is a USB interface. Measurement results are stored in Flash memory as a data log that can be uploaded to a computer via USB.

IV. DESIGNING OF WEBSITE

For patients to access our medical system they have to register themselves on the website named 'www.idoctormedical.in'. All the web pages are built in pure HTML using CSS and JavaScript and the server side connection is developed on PHP. The databases are stored in MySQL through WAMP Server.

The registration webpage where the patient needs to register before using the facilities of the webpage is divided into two pages. The first page requires you to fill in the general details about yourself. On the second page you need to fill all your medical history by filling a questionnaire. The user details will be stored in a database which will be fetched during login.

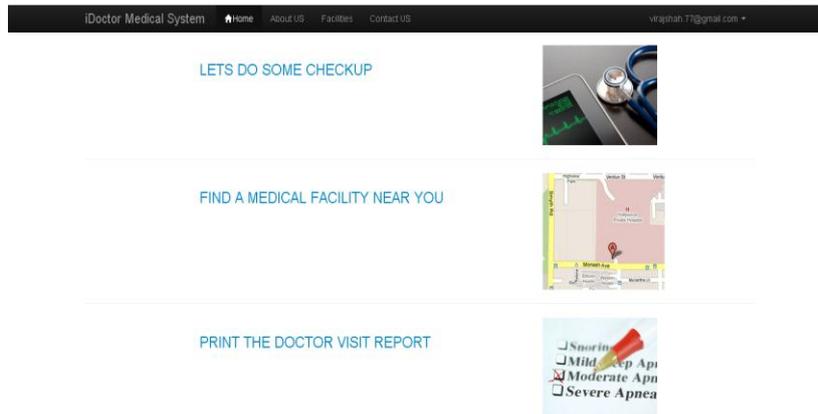


Fig. 3: Detailed Features

There is the login page where the patient can login after registering using username and password, where he can access his account and contact the required doctor or other facilities for help.

There is also an option where patient's recorded medical readings are analysed automatically and respective remedy is provided. During extreme conditions the system will through an alert message to consult the doctor or rush to hospital immediately [7]. For this an algorithm is designed which analyses the reading based on time of day and patient's age and states the whether the parameter is in normal range or not.

For the analysis, we have developed a database which is divided into eight different records ranged from extremely low to extremely high. The databases are created for the parameters based on gender, age and time of the day. Based on the details received by the user, the detailed analysis is created which looks similar as per the below mentioned images. Also for measurement of temperature for females, pregnancy is stated as additional criteria for analysis.

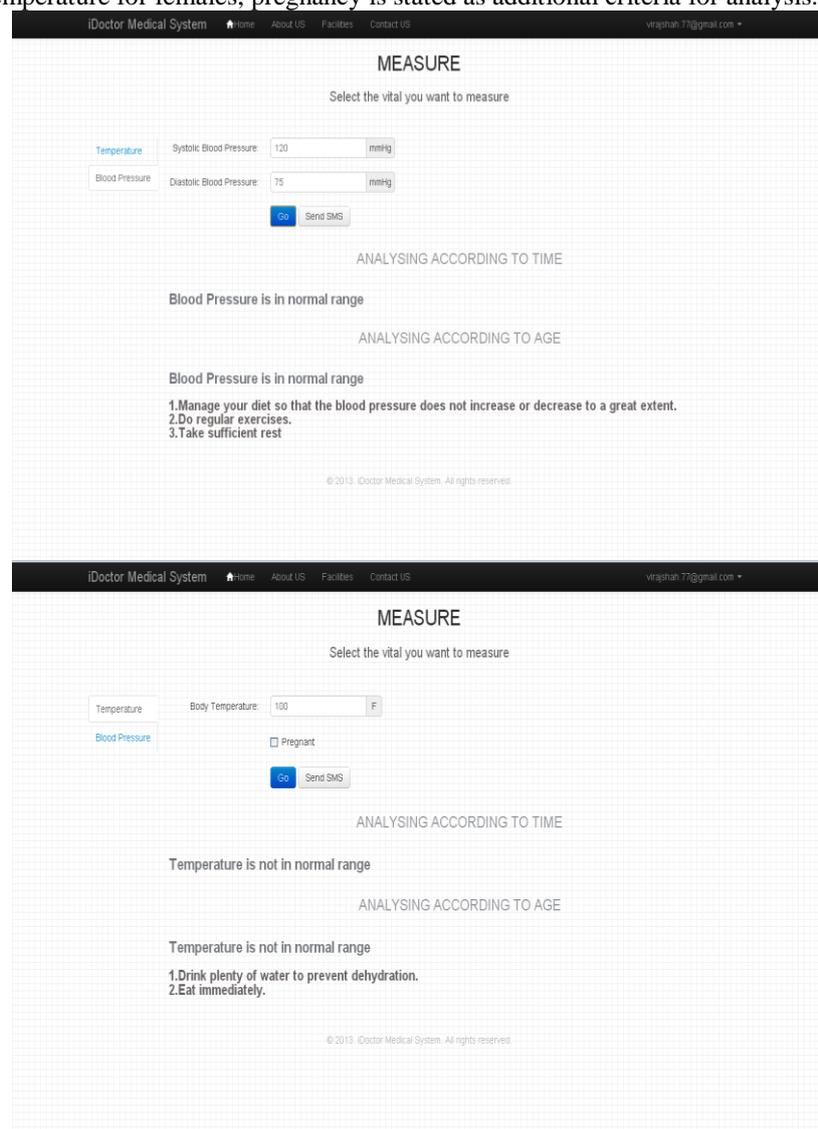


Fig. 4: Analysis of vital parameters

This is the page wherein the patient can map down the near-by doctor, clinic or hospital (In case of emergency). According to the pin-code of the area the patient is residing, the area becomes the centre point on the Google map and all the nearby hospitals, clinics and doctors are named down at the side of the map. Also the patient can enter the pin-code in case he is on domestic or foreign travel.

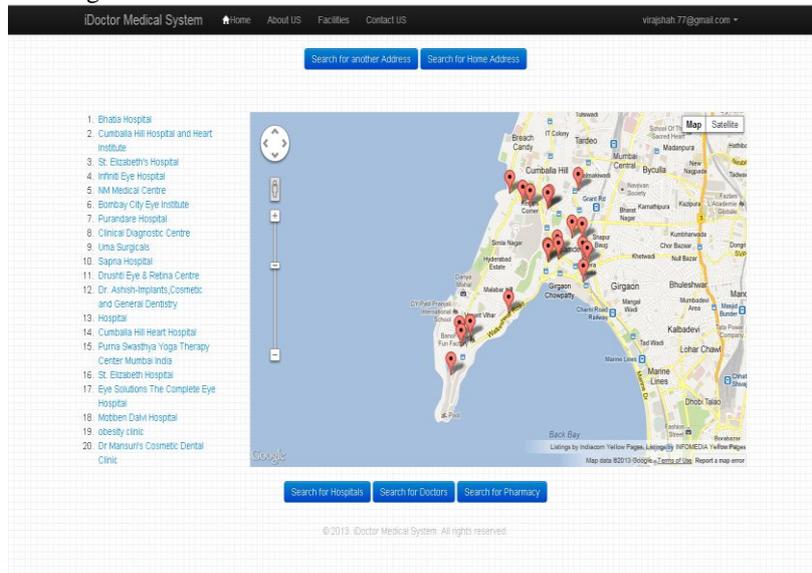


Fig. 5: Details of facilities based on user's home location

For the implementation Google Maps JavaScript API has been used for determining the details and plotting them on Google Maps. Two options are given to the user - one where his home pin code will be detected from the information provided during registration and second where the user can manually enter a zipcode or the name of the locality of the city he is travelling. When clicking on a link on the side of the map, all details will be visible to the user such as the name, address, contact details and working hours.

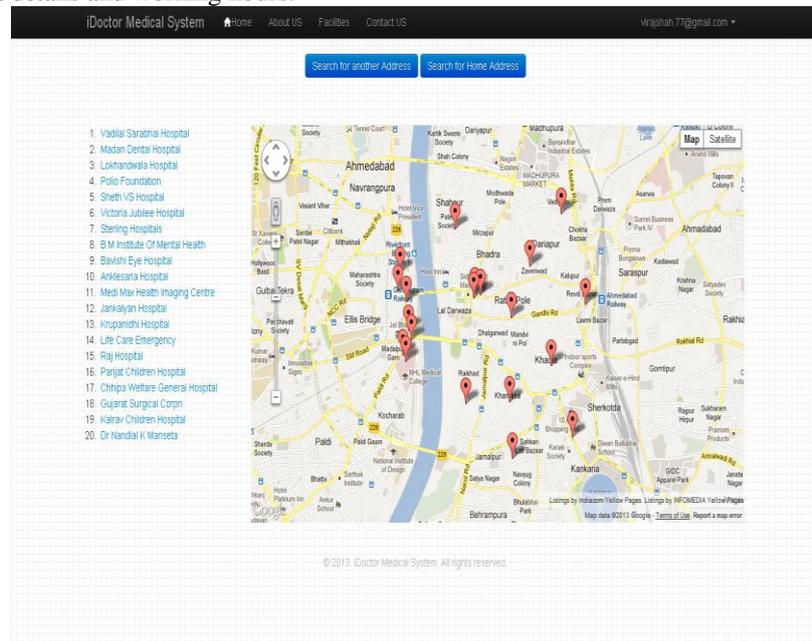


Fig. 6: Details of facilities based on manually entered zipcode

V. TESTING

The test plan approach that has been used in our project includes the following:

- **Design verification or Compliance test:**

These Stages of testing have been performed during the development or approval stage of the product, typically on a small sample of units.

- **Test Coverage:**

The design verification tests have been performed at the point of reaching every milestone. Test areas included testing of various services dividing each service into a module and then later integrating all the modules.

• **Test Methods:**

Testing of diverse features has been performed in “iDoctorMedical.in”. For each module, corresponding outputs were checked. For testing each module, the output produced from running the code was checked with the test data set.

• **Test Responsibility:**

The team members working on their respective features performed the testing of those features. Test responsibilities also included, the data collected, and how that data was used and reported.

Table 1 below summarizes the test cases performed during actual implementation of the system. Test cases cover user testing where individual scenarios like Register, Login were successfully tested. Also integration testing where combination of two or more scenarios were tested, which was also found to be successful.

Table I: Test Cases

Test case ID	Test case Name	Step Description	Expected Result	Actual Result	Pass/Fail
1	Register	Patient registers himself with his details.	Patient should register successfully.	Patient registers successfully.	Pass
2	Login	Patient provides his email address and password.	Patient should be logged in successfully.	Patient logs in successfully.	Pass
3	Measure	Patient enters required parameter in the textbox and click Go.	Patient should see the remedies for levelling the temperature or blood pressure levels.	Patient sees the remedies for levelling the temperature or blood pressure levels.	Pass
4	Medical facility	Patient finds out medical facilities around his locality or the address he enters.	Patient should see the medical facilities on the map.	Patient sees the medical facilities on the map.	Pass

• **Test Results**

Testing has successfully been carried out and the web service is now ready to be launched without any error

VI. CONCLUSION

The concept of measuring patient parameters with the help of a call service is one of its first kinds in the country. The aim is to provide service to the people who don't have a family or are in the state of an emergency. Depending upon the number and the location of the registered members, the service can be made available in different parts of the country. In an age where work is the top most priority for an individual, such a system would help in looking after the health of an individual and taking care of his well being.

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