

Evaluation and Performance of different Brain Parameters in terms of Values Using IPG

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Abstract — The healthcare problems are cumulative rapidly day by day and human being unnatural in terms of money for their routine checkup, as they do not have modest and free admission to their health inspection. Android-based request aims for an easy access and use for providing almost free of charge facility to manipulators. Therefore, the development of healthcare android-based application is basically essential. The early area of this study is the progress of android-based healthcare request which can suggest people to check their health-related complications on regular basis, which can recover their health. The application was developed in android effective system surroundings. A Google product, namely App Originator tool, which is a shortsighted block programming language, is useful to develop the system. The result shows that the system offers an easy and user-friendly boundary for end-users.

Keywords: - *Android, Body mass index, Google app, Healthcare, Maximum heart rate, Target heart rate.*

• INTRODUCTION

The Skilled System (SS), namely Computer assisted analysis for the coloured eye was proposed by which backings the population, exclusively for the action of Red eye infection. By using ES knowledge, eye specialist expertise is stored in computer in database. This ES diagnosis red eye syndrome and afford the treatment of it. It is ruled based ES. It everything like an ophthalmologist and it is not imperfect to only red eye sicknesses, but can extend to diagnose other diseases. A Web-based skilled system is anticipated by [2] to identify red eye ailment and to offer behavior with it. This system typically diagnose diseases of the eye, most generally classifies diseases where red eye is a general indication. In which red eye is a common indication. It is developed with a java

language. It has alluring and simple graphical interface. We can also analyze all types of red-eye illnesses by strengthening this expert system. Zubair et al. [3] planned an ES to analyze skin diseases. This system can diagnose almost 13 types of skin diseases. This system has an effective graphical user PR boundary. The system has been supported to the skin specialist, medical students of dermatology, and also the patients having some know-how of a computer. We can also diagnose all types of skin diseases by strengthening this expert system and programmed alarm ringing system is developed and its center of awareness is the interaction between doctor and patients. Normally, the patients do not recall their timing of the medicine dosage and they need an alarm system to be aware of their medicine's dosage. The depiction of medicines, date and time can be set by patients through an alarm. They received the warning through an email or messages, [4] there is a persistent disease known as diabetes mellitus increasing globally that is caused due to relative insufficiency of insulin. It produces a huge amount of glucose in blood that effects in the various diseases like blindness, renal or cardiovascular. Controlling diabetes properly reduced the extremity of disease. Huge costs have to be adjusted if we take support in actual diagnosis and treatment of diabetes from doctors. Therefore, android based diabetes management healthcare applications is developed, which helps in diagnosis and treatment of diabetes as well hypertension [5] In the following paragraph, we describe a review of some of the newest studies

carried out in the field of computer-assisted healthcare, with the focus on four issues, specifically (i) Blood Volume (ii) Calorie level (iii) Target heart rate (iv) Diabetes. A blood syndrome named polycythemia Vera happens when there is raise in the blood cells usually red blood cells and this thickness the blood. Its main cause is that it spoiled tissues and organs,[6]When there is a shortage of blood or fluid supply in a human body then it leads to the unsatisfactory amount of blood or it is not possible for a heart to pump. This condition is known as hypovolemic shock. [7] If the calorie intake is too low then it will lead to numerous human problems. The main problem, which the person faces, is that the muscle's mass gets smaller. The low-calorie intakes make you in energetic, impatient, and also happen nutrition insufficiency and drop in metabolic rate. Insufficient Calories also affect the functionality of vital organs of the body like brain and lungs. If the calorie intake is too large then it will cause tension on the body and there will be a chance of type 2 diabetes, heart diseases and cancer, [8]. If the maximum heart rate increases 90% of the usual range (i.e. 50 to 85) then can affect the body in a way that it painful joints and muscle, which will be hazardous to health and quite risky. However, also stimulating for the heart rate to come back to the usual range again [9]. The number of people diagnosis with diabetes is increasing slowly worldwide. Diabetes mellitus is a chronic disease that can cause bodily harm complications. The complications can affect the heart, blood vessels, nerves, kidneys, eyes and teeth. Whether, you have type1 and type2 diabetes you can use the remedies like: Decide healthy foods and check the weight frequently, do physical activity on a daily basis, take care of your cholesterol or blood pressure and keep it under control, also take care of your foot and teeth. These therapies can assist the patients to decrease the problems of diabetes, [10] There are several systems on the health-related content analysis in the context of opinion mining and sentiment analysis [11, 12], however, most of such studies are web based And address the user generated contents. The aforementioned health care systems are

either web-based recommendation systems or intelligent expert systems. Consequently, there is a need to develop an android-based easy to use 10 application that can help the users to monitor their daily basis health-related activities for keeping them healthy. As the use of Android mobile phone is extremely growing and the people have an easy access to it so from that we found an idea to make an application on Android phone that will assist people in a better way to focus on their health related problems and also to sustain their health on a regular basis just on an Android phone. Now the basic features for our mobile android application of health care are (1) Input values (2) data storage (3) Multimedia support (pics, Animation, charts). We develop a self-help tool in which we add multiple applications related to health. Our application provides four modules and in each module, we ask some inputs like age, height, weight, gender from users from which the essential output is produced. E.g. if the user needs to check his/her target heart rate(THR) range before doing any exercise he/her could easily get the higher and the lower limit of THR so that he cannot exceed this edge and will get maximum benefits from his exercise. Secondly, the calorie level application determines calories of the body and also offers a chart which contains information about calories in some common foods. Thirdly the blood volumes also get inputs from the user and deliver the output that how much blood is in the human body. Fourthly and last the diabetes application is the application that supports the user to check if their blood glucose levels are normal, pre-diabetes or diabetes. So in short we combine all these modules in one application which is mostly the android phone application i.e. healthcare app. The proper and timely medical care is one of the main factors for healthy life. Therefore, the growth of the android-based health-care application can support and helps patients to keep themselves healthy. The existing android applications lack many main features needed on a daily basis. This is what we address in this work.

- **Existing System**

Web-based ES: - These are the applications that are offered on different websites and we discuss them below

- **Blood calculator**

This health tool will take following inputs from user e.g, gender, height and weight to calculate how much blood is in the human body. The user can give input with two possible measurements metric or English, but a result is available in liters as in this situation it is the desirable unit. The amount of blood is the provided according to the inputs

- **Calorie Calculator**

The Mifflin-St Jeor Equation calculates the Basal Metabolic Rate using following formula,

$$\text{BMR} = 10 * \text{weight}(\text{kg}) + 6.15 * \text{height}(\text{cm}) - 4.9 * \text{age}(\text{y}) + 5 (\text{man})$$

$$\text{BMR} = 10 * \text{weight}(\text{kg}) + 6.15 * \text{height}(\text{cm}) - 4.9 * \text{age}(\text{y}) - 162 (\text{woman})$$

Calories needed to maintain your weight equal to the BMR value, multiplied by an activity factor

- **Target Heart Rate (THR)**

This presentation will allow you to get extreme profits from your workout and exercise safely by describing pulse rate (in beats per minute).It also has a target heart rate zone that ranges from low to vital i.e., (50 to 82) % of MaxHeart Rate.

How it works: - It works on the formula

$$206.9 - (0.67 * \text{age}) = \text{Maximum heart rate, (MHR)}$$

$$\text{Max HR} - \text{Resting heart rate} = \text{Heart rate reserve (HRR)}$$

$$\text{HRR} * 50\% = \text{training range\%}$$
$$\text{Training range\%} + \text{Resting heart rate} = \text{The Short end of the THR zone}$$

Above the formula is used to find the low end of the THR zone.

$$\text{The High end of the THR zone: } 206.9 - (0.67 * \text{age})$$

$$= \text{Maximum heart rate (MHR)}$$
$$\text{MaxHR} - \text{Resting heart rate} = \text{Heart rate reserve (HRR)}$$

$$\text{HRR} * 85\% = \text{training range\%}$$
$$\text{Training range\%} + \text{Resting heart rate} = \text{High end of THR zone}$$

We can find the high end of the

target heart rate zone from the above formulas. Max heart rate and the Resting heart rate are separated through HRR. Preferred output (THR) is obtained from the input values age, resting heart rate and intensity level.

- d. Diabetes**

There are two types of blood glucose level i.e, Fasting blood glucose level or Random blood glucose level and the user has to select from one of these. Dissimilar choices are given from where the user selects his/her blood glucose value, and then chooses unit which is either in mm ol/l or mg/dl. British uses the first unit i.e. mm ol/l and Americans uses the second unit i.e mg/dl. By giving inputs, the user gets the ideal output. It is very important test which detect diabetes and also examine either diabetic patient's disorder is in control. After every 2.5 to 5.5 months it is approval that a diabetic patient should take on this test

These above-mentioned claims do not have any storage of data so that we cannot make a record of the values that we have calculated. So that the user cannot make a contrast of his past and future standards in order to maintain his health.

Android Based ES

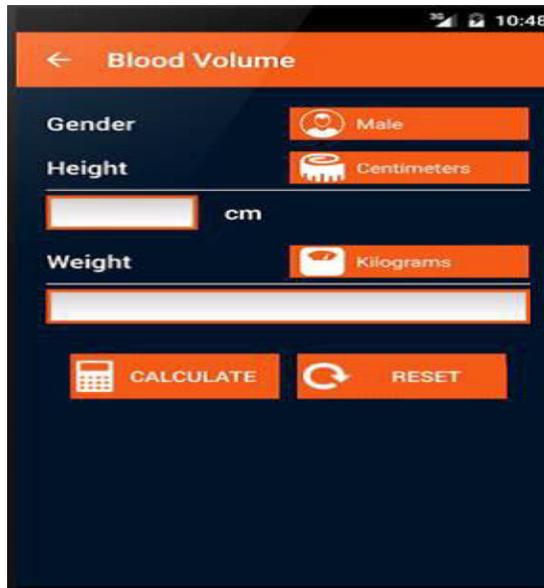


Figure:1. A Blood Volume Calculator

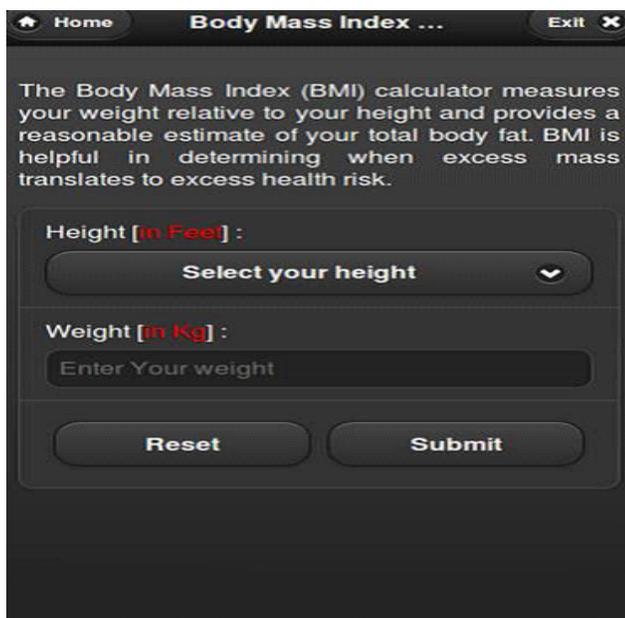


Figure: 2. BMI Indicator

• **Methodology**

Specifications for the programmer: The programmer is a small, portable, mobile based application that can be installed on any Bluetooth allowed smart mobile phones/ medicines. The programmer has a touch screen display for data entry, blue tooth connectivity

for device software design. Detailed specifications for PATIENT PROGRAMMER are given in next section.

Patient Programmer: - This is an Android based App which will run on any smart mobile with Android OS.

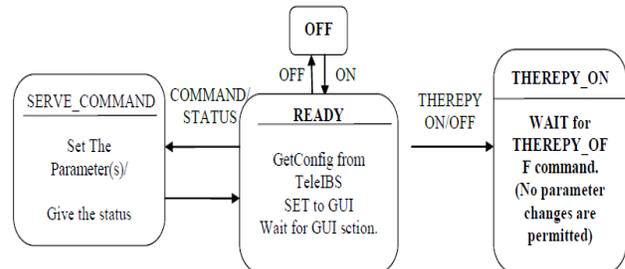


Figure: 3. STATE MACHINE for PATIENT PROGRAMMER

Software Requirement Specification:- PATIENT PROGRAMMER will be getting/setting info to the IPG via intermediate device called as External Interface Unit (EIU) which will convert data from Bluetooth to Low Level Radio Frequency signal. Following structures will be required on Patient Programmer.

- To find/set the Therapy status of IPG – On/Off
- To find/set the Parameter Value (Left/Right) – Active Group (W, X, Y, Z)/ Amplitude/ Pulse Width/ Rate
- Alert/Set you when you essential to check the status of the IPG battery (Set the time of day)
- Change therapy settings (Clinician will set up the therapy settings you will be able to adjust depending on your specific therapy requirements)
- Reset therapy settings (Sets back to original/default settings)
- To find the battery status of Implantable Pulse Generator (IPG) - OK or Battery-operated near End of Service.

IV. Results and Discussion

Patient Programmer (PP) is designed to work with Implantable Pulse Generator (IPG) of Deep Brain Stimulator. PP sends various commands in predefined format to IPG to generate pulses of required Frequency, Width and Amplitude. Following screens are developed to give functionality of PP. First screen (Figure. 4) is a Welcome screen which flashes for 2 seconds and tells that PP software is starting. During this time it connects to IPG via Serial Port Bluetooth communication. Else give warning message. After welcome screen, Login screen (Figure. 5) of PP comes up which gives facility to Login to IPG. During login process, PP software authenticates the user and also downloads all information from IPG to PP. It displays current settings of IPG on Main Screen (Figure. 6).



Figure: 4. Welcome Screen Figure: 5. Login Screen
Main Screen displays Patient and IPG information downloaded from IPG on main screen. It also displays Active Group and parameter's values for that group in IPG for Left and Right Hemisphere. Therapy can be Put On/Off by pressing Gray/Red color round button, one can only view settings of all parameters. For changing the values of the settable parameters, one has to go to Settings Screen (Figure. 7) by pressing Settings Button on main screen. Settings Screen will display Current Active Group. By using drop box, one can change any of the other

groups as Active Group. Settings corresponding to that selected group will be displayed.



Figure: 6. Main Screen

For example, Figure 7 displays Group B as active group. Pulse rate for the group is common so displayed at top. PP User can change parameters for the selected hemisphere only. In that hemisphere also, only parameter per pulse can be changed. For example, here only Left hemisphere's parameters can be changed. In Pulse1, Pulse Amplitude is settable and in Pulse 2 Pulse width is settable. Whenever any of the parameter is changed, Red colour button will appear next to the control (Figure. 8 and 9). If the changed parameter is effective then one has to press SAVE PARAMETERS button to make it permanent else one can press Red Button to cancel the change. Another button, SET DEFAULT can be used to set the value of all parameters to default values, set by Clinician using Clinician Programmer. One can come to main screen by pressing BACK button. Some advanced features can be accessed via Advance Screen (Figure. 10) which one can access by pressing Advance button on main panel. This screen is password protected (Figure. 11). Again password will be asked before entering into Advanced Screen for avoiding unauthorized access to advanced function. Some advanced features can be accessed via Advance Screen (Figure. 10) which one can access by pressing Advance button on main panel.

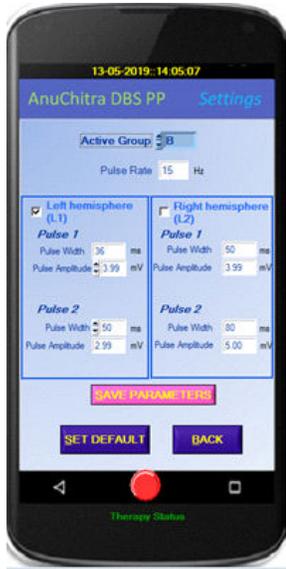


Figure: 7. Settings Screen



Figure: 8. PA Change for Pulse 1



Figure: 9. PW Change for Pulse 2

This screen is password protected (Figure. 11). Again password will be asked before entering into Advanced Screen for avoiding unauthorized access to advanced function. For communication between IPG and PP, proper commands have been defined and implemented. Since the hardware is not available for testing, a simulator (Figure. 9) is designed as per the testing requirement.

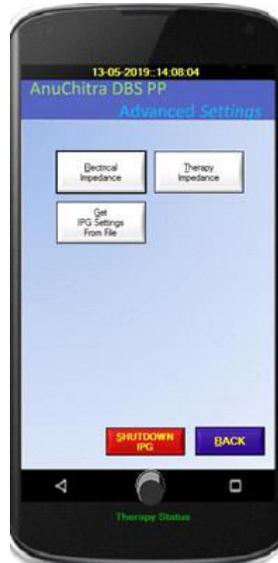


Figure: 10. Advance Settings Screen



Figure: 11. Authentication Screen



This SIMULATOR depicts the current status of IPG. It shows who is logged in, PP or CP with user name and password. It also displays Battery Status. It shows which group is active and Therapy is ON or Off. It displays IPG info such that ID, IMF, Model Implant time etc. It also displays full Patient Info viz. name, ID DOB, Gender, Physician Name, Diagnosis and Notes. Then it displays all groups full information like, Pulse Rate (Editable or Not), Group is Configured or Not, Soft Start is Enabled or Disabled, Cycle is On or Off, Mode is set as Voltage or Current, Then it displays Left and Right Hemisphere is set or Not. PA and Pw details of both

the pulses are displayed. Facility to quit the system is by pressing Quit button on right-top corner of the screen. PP has been fully tested with the Simulator. All control and features are working fine. Once the hardware is ready, system will be tested with the actual system in due course of time.

V. Conclusion

This system is import substitute of USA based M/s Medtronic make Patient Programmer. We have projected a simple, portable, easily configurable mobile based App as an extra to handle many hardware related issues. This system will have high reliability, security, portability and availability as compared to hardware equivalent of PP. (Justification is provided for this in the result section)

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