

Designing a New Framework for the Patient Affected with Heart Problem

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Abstract

According to recent research healthcare is becoming more expensive and less accessible for general public. Cellular phones and GSM networks are considered as cheapest and most accessible means of communications, so they can be used as one of the best devices in creating healthcare systems. During recent years several commercial tools are introduced to monitor and improve health. Each of the present pieces of software in the field of heart diseases accounts for a separate task. In present work we try to define a new frame work and software that can cover all kinds of heart disorders is an ideal for patients and that they can use it with the least know-how and effort. We designed the software so, that it should be easy to use, independent from any operating system and hardware of cell phone, independent from place as well as it can predict heart attack and in case of emergency, immediately send the alarm.

Keywords: Mobile healthcare, GSM, ECG signal, heart attack, visual data, predict, software, java.

1. Introduction

Recent research suggests that healthcare is becoming more expensive and less accessible to the general public. This is partly due to the increase in the population of elderly people and the advancement of medical technology, but it is also caused by an increase in the rate of medical and administrative costs [1,2,3]. Moreover, many of patients (e.g. those with cardiovascular) undergo stress when they visit a doctor, so that the result of their tests may be abnormal. This may result in the doctor's wrong diagnosis, lengthening the treatment time or wrong prescription.

At present, cellular phones and GSM networks are of the cheapest and most accessible means of communication, which, owing to hardware developments (processors and high memories) they have experienced during recent years, can be used as one of the best devices in creating healthcare systems[4,5,6,7]. By creating mobile-based healthcare systems, one can reduce healthcare costs to a large extent. It would also be possible to perform the patient's medical examinations whenever he is willing, with the least degree of stress. In many societies, where specialized medical manpower is not accessible, creating mobile-based systems can help overcome the shortage of medical man power [8,9].

In the past few years several commercial tools have been introduced to help patients by monitoring and improving their health. Wii Fit is an example of a patient-centered healthcare product, which motivates the users to exercise and monitor their health. This is a cheap alternative for going to the gym and can be used at home at any time by the user. By using Wii Balance Board different types of exercises can be undertaken such as calculating Body Mass Index, doing yoga and push-ups. However, Wii Fit has certain disadvantages. The current version of Wii Fit is not integrate with Wii Connect24, which allows the user to connect to the internet, and send and receive information. Also Wii Fit is less convenient because it is importable.

Some pieces of software have so-far been prepared for training such diseases as diabetes, hepatitis, AIDS and malaria [10]. Some other pieces of software were also prepared for remote health monitoring, in which the patient's vital information is received and transmitted to a server, by some sensors. The transmitted information is then studied and the result is sent to the patient [11]. Furthermore, due to the fact that in the present century one of the most fatal diseases is heart disorder, a lot of efforts have been made to develop hardware equipment for mobile-based treatment [12,13] and pieces of software have been produced for diagnosing the disease and monitoring the patient's heart beat rhythm via ECG, which is regarded as a great achievement in this area [14,15,16]. Unfortunately, these innovations have the following defects.

The type of person (depends on knowledge of person) is also considered as one of the biggest deficiencies of the above systems. Of other deficiencies of these pieces of software are such defects as dependence on a specific operant system or hardware, expensive prices, mono-functionality, not being user-friendly, benefiting from old-fashioned methods in reception and transmission of information, failure in visualizing the patient's data, and failure in up-to-date prediction of the disease in future.

2. Aims and Scope

Each of the present pieces of software in the field of heart diseases accounts for a separate task. The patient is to learn how to install and use different pieces of software. The existence of software covering all kinds of heart disorders is an ideal for patients, so that they can use it with the least know-how and effort. Developing such software calls for an appropriate framework. A powerful framework, in addition to technical issues, should have a view on psychological issues too, to be most effective when being materialized [8,17,18]. The most important parts required by a cardio-vascular patient and his treating doctor are:

- 1-To control the patient's vital signals (round the clock, if necessary), including blood pressure, glucose, weight, heart rate [15,19].
- 2- Recording cardiac symptoms via ECG [16].
- 3- Recording the patient's psychological symptoms [10,20].
- 4- Design and application of the existing hardware, in such a way that the patient can go on his routine life without being hospitalized [15,21,22].
- 5- Online monitoring the recorded signals [14,23].
- 6- Transmitting information to the treating doctor and receiving the instruction.
- 7- Visualizing each patient's data [24].
- 8- Making an alert system to alarm the emergence of hazardous symptoms like heart attack [25,26].
- 9- A system for predicting heart attacks [27,28].

10- Permanent instruction utilizing the latest scientific findings.

11- A system for communication with health-care centers and urgencies when necessary.

12- Tracing the patient by GPS and GSM network.

Any of the above-mentioned parts can be considered as one component of the intended framework. One of the objectives of the project is to develop a piece of software with all above-mentioned capabilities. Though at present there are some pieces of software for monitoring the patient's heart beat, they are restricted to some certain telephone lines. This research also aims at developing a piece of software to be used with all receivers with different operant systems. With regard to the independence of "java" from any certain operant system, "j2me" has the appropriate potential to achieve the mentioned objectives [29].

One of the challenges of the design within this system is the application of appropriate hardware being of a smaller size and therefore portable by the patient round the clock, so that he can go on his routine life without trouble [30]. Here, this question can be posed as to whether the present pieces of software are appropriate for application in this system or some new software should be designed.

In many hospitals, equipped with mobile-healthcare systems, they dress their patients-at risk with clothes equipped with various sensors, so that they can receive the information, sent by the sensors, via wire-less receivers installed in different parts of the hospital. When necessary and in case of any accident for the patient alarms are automatically sounded [31]. This method is possible only in limited situations. Putting on special clothes may irritate the patient and moving within a limited area may affect the patient's routine life.

This research aims to use equipment which does not limit the patient within certain areas. To achieve this goal, using wireless sending-receiving devices does not seem appropriate, because it is not possible to install the equipment in all places the patient may go. The research also aims at finding a way for getting rid of special clothes for patients-at risk. Although the existing pieces of software have alarming systems, these systems have not so far had the possibility of informing the patient's place while announcing the danger. This is one of their deficiencies, because finding the patient to provide him with medical urgencies within the first minutes of heart attack, plays a crucial role in the patient's survival.

One of the cases, being paid special attention in this research, is to collecting and transmitting such information as hear beat graphs, or ECG. How to transmit the information is of paramount significance. Many of the existing pieces of software transmit the data via SMS, which is not a suitable method while transmitting the graphs. It will be tried to utilize an amalgam of GPRS and SMS to transmit the data. Moreover, this idea that graphs be transmitted in the form of vector image and within a textual file instead of transmitting them in the form of graphical files will also be verified. In case of failure, the transmission of information in the network peak hours or the data loss will also be scrutinized and appropriate solutions will be introduced. Of other objectives of the project is to visualize the data after collecting them, and to possibly predict heart attack thereupon.

3. Case Studies

There are a good number of complexities in this study, owing to the existence of varied technologies and human factors. This research aims to present within a dynamic framework a piece of software which includes all needs of a cardiac patient within cardiology ward.

Besides, it aims at finding a way for modeling, on the basis of the information obtained about patients, in order to predict heart attacks.

3.1 Description of Case Study

To study the issue, physicians' and patients' requirements will be detected and then the appropriate model will be designed, employing modeling methods. The designed model will be materialized via J2me. In this study, upon verifying methods of information transmission, the appropriate instructions for a permanent mutual communication [12,13] between the server and the patient on one hand and the server and the doctor on the other, will be introduced. One important part is to visualize patient's data and to find a solution to foresee heart attacks.

4. Data Collection and Research Methodology

The appropriate research design is formulated in detail below.

4.1 Exploratory Research

This research has the primary objective of developing the framework and software. Therefore providing the further understanding of the problem is more in-depth theoretical perspective. The research methodology for the present study has been adopted to reflect these realities and help reach the logical conclusion in an objective and scientific manner. The study will mainly include analysis of concepts, theories and approaches.

4.2 Primary Data

Required Data was collected through direct interviews (e.g. patient, Doctors, nurses and etc.), by raising questionnaires and experimental results.

Secondary Data: Secondary data is already available and published. It could be internal (which originates from the specific field or area where research is carried out e.g. publish brochures, official reports etc.) and external source of data (originates outside the field of study like books, periodicals, journals, newspapers and the Internet). There are three main sub-groups of secondary data: documentary data, survey based data and those compiled from multiple sources. Among these sub-groups the researcher will mainly use documentary data and multiple resources. The research will be based on both primary data and secondary data sources.

5. Core Research Methodology

This study will undertake and apply (1) quantitative research, which includes data collection (e.g. Internet based survey), scale development and scale validation procedures, and employs structural equation modeling (SEM) to test these hypotheses (2) qualitative research, which includes the literature review in regard to agents, companies, governmental and nongovernmental organizations. In order to develop hypotheses related to a set of antecedents and consequences explore proper effects of research.

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Նոր ծրագրային մոտեցումների մախազծում սրտանոթային հիվանդություն ունեցողների համար

Ի-Շյան Հվանգ և Դ. Բեյբուտյան

Ամփոփում

Ըստ վերջին հետազոտությունների արդյունքների առողջապահությունը դառնում է ավելի թանկ և ոչ հասանելի համըրությանը: Բջջային հեռախոսները և GSM ցանցերը համարվում են ամենատեղի և առավել մատչելի կապի միջոցներ: Հետևաբար, առողջապահության համակարգում նրանք կարող են ծառայել որպես լավագույն սարքավորումներ: Վերջին տարիների ընթացքում առաջարկվել են որոշ կոմբեքցիոն սարքավորումներ, որոնք թույլատրում են վերահսկել և քարելավել հիվանդի առողջական վիճակը: Սրտի հիվանդությունների ոլորտում ամեն մի ծրագիր օգտագործվում է եզակի խնդրի լուծման համար: Ներկա աշխատանքում փորձել ենք որոշակիացնել աշխատանքի այնպիսի շրջանակներ ու ծրագիր, որոնք կկարողանան ծածկել սրտի աշխատանքի բոլոր տիպի անկարգավորվածությունները: Հիվանդների համար դա կլինի իդեալական այնքանով, որ նրանք կկարողանան այն օգտագործել մինիմալ ուսուցման և ջանքերի գնով: Ծրագիրը գրված է այնպես, որ այն լինի հեշտ կիրառելի, ամկախ ցանկացած օպերացիոն համակարգից և բջջային հեռախոսի կառուցվածքից: Այն պետք է ամկախ լինի տեղից, ինչպես նաև կարողանա կանխագուշակել սրտի կաթվածը, իսկ արտակարգ պատահարի դեպքում միանգամից ազդանշան տալ:

Разработка новых структурных решений для больных с сердечно-сосудистыми заболеваниями

И-Шиан Аванг и Д. Беибутян

Аннотация

Согласно последним исследованиям медицинское обслуживание становится более дорогостоящей и менее доступной для широкой общественности. Сотовые телефоны и GSM-сети считаются самыми дешевыми и наиболее доступными средствами коммуникации, поэтому они могут быть использованы в качестве одной из наиболее эффективных устройств при создании системы здравоохранения. В последние годы были предложены ряд коммерческих инструментов по контролю и улучшению здоровья. Каждая из существующих программ в области заболеваний сердца рассчитана на решение отдельной конкретной задачи. В настоящей работе мы попытались определить новые рамки работы и программного обеспечения, которое может охватить все виды сердечных заболеваний и является идеальным для пациентов, так что они могут использовать его легко и без специальной подготовки. Мы составили программное обеспечение таким образом, чтобы оно было простым в использовании, независимым от операционной системы и устройства сотового телефона, а также от географического местоположения. Оно также может предсказать сердечный приступ, а в случае чрезвычайной ситуации незамедлительно подать сигнал тревоги.