An Expert System for the Treatment of Cardiovascular Disease

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Abstract

Cardiovascular is a class of diseases that involve the heart, the blood vessels or both. Heart disease is one of the major causes of death. People with these diseases hardly get attention from medical experts because the experts are either very few in the hospitals or not available at all. When available, patients spend hours, days or even weeks waiting to be attended to or for their results to be out which may lead to death of a patient prior to medication. This situation makes it imperative for a better and more efficient way of monitoring a patient with this disease even when these basic equipment and manpower are lacking. These problems led to the development of an expert system for diagnosis of cardiovascular disease. The program developed interacts with users with questions regarding their problem and with answers draws inference on the type of disease the user is suffering from and makes prescriptions.
Keywords: Cardiovascular, Diagnosis, expert system, inference, knowledge based.

1. Introduction

The use of computer and technology in the fields of medicine in area of diagnosis, treatment of illnesses and patient pursuit has highly increased. Despite the fact that these fields in which the computer are used have very high complexity and uncertainty and the use of intelligent systems such as expert system have been developed in domain of heart disease risks such as smoke, cholesterol, blood pressure, diabetes, etc.

Cardiovascular disease also called heart disease is a class of diseases that involve the heart, the blood vessels (arteries, capillaries, and veins) or both. Heart disease is one of the major causes of death. This disease is common not only in old and middle aged people but also in young people. People with these diseases hardly get attention from medical experts because the experts are either very few in the hospitals or not available at all. When available, patients spend hours, days or even weeks waiting to be attended to or for their results to be out which may lead to death of a patient prior to medication. Facilities in these hospitals also have not helped in these situations as some of our hospitals lack basic equipment for carrying out laboratory tests. This situation makes it imperative for a better and more efficient way of monitoring a patient with this disease even when these basic equipment and manpower are lacking. These problems led to the development of an expert system for treatment of cardiovascular disease.

Clinical decisions are often made based on doctors' intuition and experience rather than on the knowledge-rich data hidden in the database. This practice leads to unwanted biases, errors and excessive medical costs which affects the quality of service provided to patients.

The main objective of this research work is to develop an expert system for the diagnosis and make drug prescription of cardiovascular disease. Other objectives include:

- ➢ To develop a system that will examine and diagnose patients (through question and answer) to check if cardiovascular disease is suspected.

- ➢ To design a system that will be able to get real results based on the knowledge from the expert system

- ➢ To create a system that will be able to recommend remedies and drugs to be taken in the treatment of a diagnosed cardiovascular disease.

- ➢ To build the platform for recording of results of the diagnosis and other patient information.

The expert system depicts the positive impact computer can have in medicine especially for the treatment of cardiovascular diseases. The system will help medical professionals in adding precision to their work when diagnosing a patient of cardiovascular diseases. An individual can also carry out a self-medicine check-up on himself to know his status and pursue a rapid medical treatment if necessary. Cardiovascular diseases can put one's health to irrecoverable risk but the discovery and invention for an expert system can solve the problem to an extent.

This project work is very important since there is shortage of qualified human experts and the cost of training and acquiring them is highly increasing. Computerized systems does not forget, get tired, work under stress or make mistakes as human experts sometimes do. It can as well benefit the rural areas where human experts cannot afford to stay. It can also be used for human teaching especially in the academic field.

2 Literature Review

A scholar discusses the value of Internet as a medium for expert systems development and he has explained the advantages and disadvantages of the expert system development [1]. [2] has explained a methodology of defining the confidence levels for computer-aided medical diagnosis according to the patient-doctor physical interaction. The extension of this AI methodology in the medical field via Internet will provide support to the physicians and improve the health of world population. Several papers have explained the benefits and challenges of using expert systems. [3] has proposed a medical decision support system to enable home doctors to take rapid action. [4] presented an Internet-based knowledge acquisition and management method to construct large-scale distributed medical expert systems. They have demonstrated that a medical Knowledge management system can be built upon three-tier distributed client/server architecture. The knowledge in the system is stored/managed in three knowledge bases. The maturity of the medical know-how controls the knowledge flow through these knowledge bases. [5] have explained the potential of artificial intelligence techniques particularly for Web-based medical applications.

According to [6] he proposed a design of the intelligent real-time hypertensive diagnosis expert system. They have described a medical network based on state of the art medical kiosk that addresses the problems of providing preventive and diagnostic health care. [6], also described a medical expert system for diagnosis in the domain of cardiological diseases. This medical expert system is developed by using a public domain rule based expert system (RES). [7] have proposed an integrated design of an intelligent Chinese Medical Diagnostic System (CMDS) Systematic development for digestive health for intelligent heart disease diagnosis. CMDS uses Web interface and expert system technology to act as human expertise and can diagnose a number of cardiovascular diseases. [8] proposed a telemedicine system to decrease cardiovascular disease risk in an underserved population

using an expert system. The system optimizes function by diagnosing any patient with cardiovascular diseases and minimizes cost.

3. System Development

Figure 1 is the flowchart of the design pattern that the system follows.
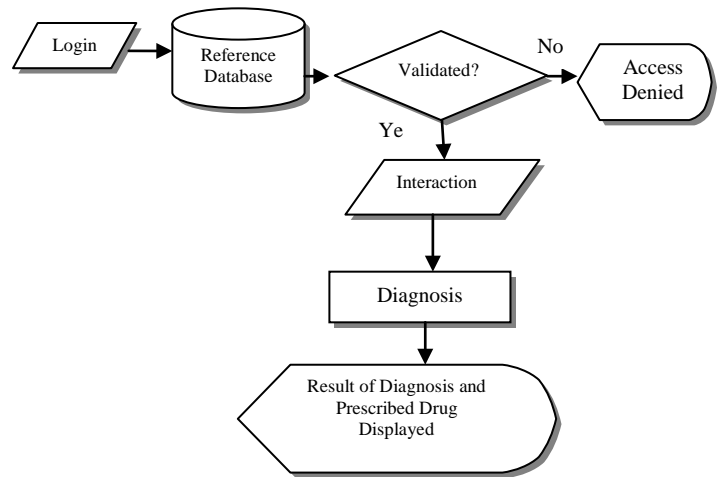

Fig 1: Flowchart of the developed system

From Figure 1, dataflow shows that when a user logged into the system, the user will perform an examination/diagnosis after which the result is displayed with respect to the user's response to the diagnosis questions; after which the system will recommend drugs and other things to do in order to remedy the situation.

3.1 System User Interface

This software was developed to enhance interactivity normally required in modern software development. The index page otherwise known as the home page is the first page of the system that comprises the login form for doctors (or for the private user). If access is granted you are taken to the user interface of the application, it is on this interface that the user supplies inputs that will be used to generate output for the system. Figure 2 is the main menu interface for the Expert System.
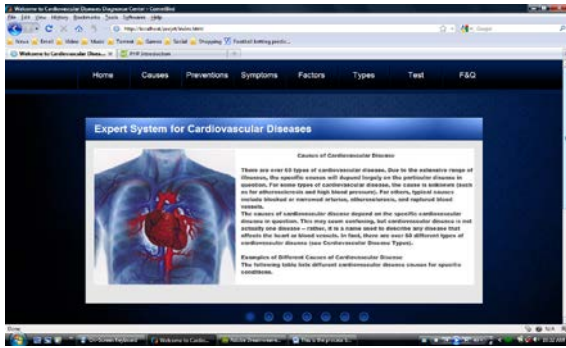
Fig 2: Main Menu Interface

Figure 2, the main menu interface serves as the center point in every structured program through which the user of the system is provided with several options to choose from. The menus are arranged in the horizontal menu bar that calls up a procedure when selected. Each menu item can be selected by using the mouse.

3.2 Input Form Interface

The input form provides avenue for the user to feed in data into the computer system. Two input forms were used in the cause of developing this application. They are: the Diagnosis form and the Add Patient record. Both of them were designed using controls as textboxes, labels, command buttons, checkboxes and panel. The figure 3 demonstrates how it is designed in this work.

`   Fig 3: Input Form Diagram for ESTCVD

3.3 Output Form Design

The output forms of the system were also designed using the necessary tools and buttons with many other controls to enable full description of the information from the system. The outputs of the system include the result of the diagnosis on the cardiovascular disease and that of patient records with treatment producers of each patient diagnosed with cardiovascular disease. The logic of the output form can be explained using a structured pseudo. The sample output forms are presented as shown in the figure 4 and 5.
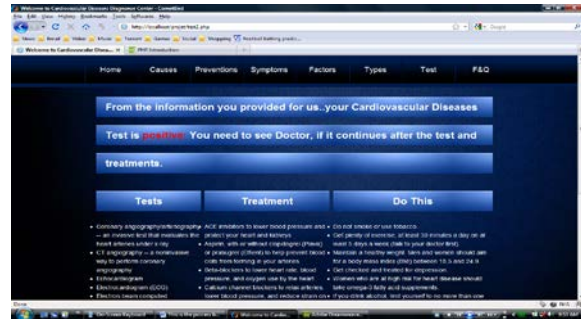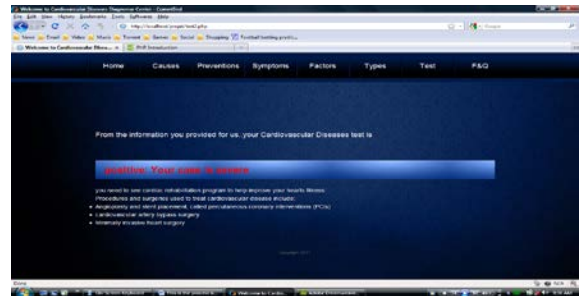

Fig. 4 Output result of the diagnosis.

Fig. 5 Output result of the patience record

4. System Requirement/specification

4.1 Hardware Requirement

This physical component of the computer system which is needed to implement the expert system for the treatment of cardiovascular diseases; these include the choice of minicomputer and their adapters. The new system will be best fitted in a computer system with high configuration.

➢ The system will need at least Pentium 111 or Intel 2 Dual processor.

➢ The system should have RAM (Random Access Memory) size of at least 512MB to 3GB memory.

➢ The system should have a minimum of 20GB hard disk free space.

4.2 Software Requirement

This refers to the necessary software needed for the easy take off of the new system, these includes the communication software, operating system, and application programs. The newly developed system will be best fitted for systems that have the following software's:

➢ Window 2000 to the latest widow 10 operating system. The system will not require other lower version of windows like window 95 or window 97.

➤ Web browsers like Google chrome, mozilla firefox, and opera

➤ MYSQL database.

5. Conclusion

The major point is that we have developed an expert system that will effectively diagnoses cardiovascular diseases and deduces the type of cardiovascular disease the patient is suffering from. This should make users use their stand-alone computer system to unravel some of tasks that look like impossibility before them without necessarily meeting a medical professional for diagnosis. The user can as well obtain more information from the Expert System on Diagnosis of Cardiovascular Diseases instead of expert advice that looks vague and limited to many occasions. This is possible since an expert system obtains its knowledge from human experts and put them together for making inferences.

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