Medical Expert System for Diagnosis & Locating Possible Carriers of Infectious Diseases

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ABSTRACT

This document gives Infectious Diseases should be prevented, diagnosed with simple steps and quickly. As it is very much contagious use of technology in diagnosis/tracing will be very helpful to save lives, economy and prevent chaos happening around us. If it is not diagnosed on time, it can lead to many health problems and these problems may become the cause of death. These problems may become worse due to the scarcity of ventilators, hospitals and health facilities. In an effort to address such problems, studies made attempts to design and develop expert systems which can provide advice for physicians and patients to facilitate the diagnosis and recommend treatment of patients. This review paper presents a comprehensive study of medical expert systems for diagnosis of various disease patients. It provides a brief overview of medical diagnostic expert systems and presents an analysis of already existing studies. Which will help to trace the possible carriers and do their tests using technology.

Keyword: - Include Artificial intelligence, Expert system, Medical knowledge, Location, Infectious Disease, Symptom, Rule, Patient, Carrier, GPS.

1. INTRODUCTION

Artificial Intelligence is defined as brainpower exhibited by an artificial unit. It is a division of computer science dealing with sharp behavior, knowledge. Research in artificial intelligence is anxious with producing machines to computerize jobs requiring sharp actions. Examples include capability to answer diagnostic and user question, speech and facial recognition [4]. Artificial intelligence is separated into two categories. These two categories are conventional artificial intelligence and computational intelligence. Conventional artificial intelligence includes machine learning and statistical analysis. Computational intelligence includes neural networks and fuzzy systems. The other applications of artificial intelligence are automation, computer vision, artificial creativity, expert system and knowledge management [6]. The rest of the paper is organized as follows. Section 2 provides a brief introduction to Expert System, Fuzzy expert system, artificial neural network and neuro-fuzzy technique. Section 3 provides introduction to medical expert system and medical knowledge. Section 4 describes the structure of medical expert system. Section 5 describes the working of medical expert system. Section 6 presents the related work and a comparative analysis of existing studies. Finally, the discussion is concluded in Section 7.

2. EXPERT SYSTEM

Expert System is one of the most common applications of artificial intelligence. It is a computer program that simulates the decision and actions of a person or an association that has specialist facts and experience in a particular field. Normally, such a system contains a knowledge base containing accumulated experience and a set of rules for applying the knowledge base to each particular situation. The major features of expert system are user interface, data representation, inference, explanations etc. Advantages of expert system are increased reliability, reduced errors, reduced cost, multiple expertise, intelligent database, reduced danger etc. Disadvantages of expert system are absence of common sense and no change with changing environment.[9].

A Fuzzy Expert System is a group of membership functions and rules. These functions and rules are used to reason about data. Fuzzy expert systems are oriented toward numerical processing. It takes numbers as input, and then translates the input numbers into linguistic terms like Small, Medium and large. Then the task of Rules is to map the input linguistic terms onto similar linguistic terms describing the output. Finally, the translation of output linguistic terms into an output number is done [9].
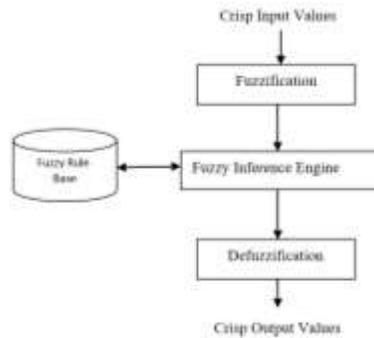
Fig -1 Fuzzy Expert System

2.1 Artificial Neural Network

Artificial Neural Network helps doctors to understand complex clinical data across a large number of medical applications. In medical application, the task is on the basis of the measured features to allocate the patient to one of a small set of classes. An artificial neural network is a computational model that tries to report for the parallel nature of the individual brain. An artificial neural network is an arrangement of extremely interconnecting processing elements operating in parallel. These elements are stirred by biological nervous systems. As in environment, the connections between basics largely find out the network function. A subgroup of processing part is called a layer in the network. The primary layer is the input layer and the final layer is the output layer. Between the input and output layer, there may be extra layers, called hidden layers [10].
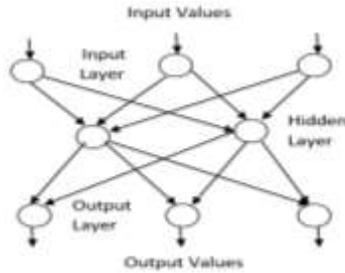

Fig. 2: A typical Neural Network

2.2 Neuro-fuzzy System

A Neuro-fuzzy System is a fuzzy system that uses a learning algorithm inspired by neural network theory to determine its parameters by processing data samples [14].

3. MEDICAL EXPERT SYSTEM

A huge figure of expert systems is medical. The chief aim of this medical expert system is identification of possible carriers of the infectious diseases, quick testing and prevention of spread of the disease. A medical expert system is built up of programs and medical knowledge base. The information obtained from medical expert system is similar to the information given by proficient in that particular area [6].

Medical Knowledge of specialized doctor is vital for the growth of medical expert system. This knowledge is composed in two phases. In the first phase, the medical conditions of the disease and location history (GPS) are recorded during the formation of personal meeting with doctors and patients. In the second phase, a deposit of rules is formed where each rule contains IF part that has the symptoms, GPS locations and THEN part that has the Disease that should be realized [12].

4. STRUCTURE OF MEDICAL EXPERT SYSTEM

A medical expert system has the following components-

1) The Knowledge Base encloses location information with reference to Disease patients/carriers which are characterized as a set of if-then production rules. The knowledge base is analogue to the longstanding human memory. The whole sorting of production rules is prepared in the knowledge base. You may understand it with the help of example. A Disease which is highly infectious disease whose symptoms are persistent cough, fever. So it will be stored in knowledge base in the form of a rule which is as follow:-

INFECTIOUS DISEASE (Patient11, GPS1, Time1):-
Symptom (Patient, fever, GPS, Time),
Symptom (Patient, persistent_cough, GPS, Time),
Trace (Carrier11, Symptom_yes_no, GPS1, Time1),
Trace (Carrier21, Symptom_yes_no, GPS2, Time2),
Trace (Carrier31, Symptom_yes_no, GPS3, Time3),
Fig.3: Production Rule in Knowledge Base
Similarly in this way you can store maximum possible rules in the knowledge base.
The Fact Base contains facts which are applied to match in opposition to the antecedent part of rules stored in the knowledge base. The fact base is analogue to the instant human memory.
The foremost job of Inference Engine is to bring out the reasoning by connecting the rules with facts and deducing new facts.
The User Interface is used to correspond among user and expert system.
The Explanation Module permits the user to inquire the expert system how a finicky conclusion is reached and why a specific fact is desired.
The Developer Interface is used to alter the knowledge base is formed where each rule contains IF part that has the symptoms, GPS locations and THEN part that has the Disease that should be realized [12].

5. WORKING OF MEDICAL EXPERT SYSTEM

In the fig. 3 the simulation of medical expert system is presented. In the figure, P11 L1 C11…..C1N denotes the initial start of spread from first infectious disease patient or carrier. In general Pj1LjCj1……CjN denotes the "Pj" patient of location Lj. If the program has a positive answer to the location change of patient or carrier, it goes on with the same locations at same time of other near most people from that infectious disease patient. If a test from that possible carrier is negative, it jumps to the possible carrier of the next infectious disease patient or positive carrier location.

6. RELATED WORKS

In The Medical diagnostic Systems have undergone many changes and are using new techniques to generate better results. This section briefly summarizes some of the fuzzy logic, rule based and artificial neural network based medical diagnostic systems and presents a comparative analysis of various existing studies in following table.

Mohammed Abbas Kadhim, M. Afshar Alam, Harleen Kaur [9] build up a fuzzy expert system for judgment of back pain disease based on the experimental examination symptoms using fuzzy rules. The user has to key in parameters such as body mass index, age, gender of patient and experimental examination symptoms for this fuzzy expert system. On the basis of these parameters, this fuzzy expert system makes suitable judgment of back pain disease and gives some medical suggestion to the patient. The accuracy achieved from this fuzzy expert system was 90%.
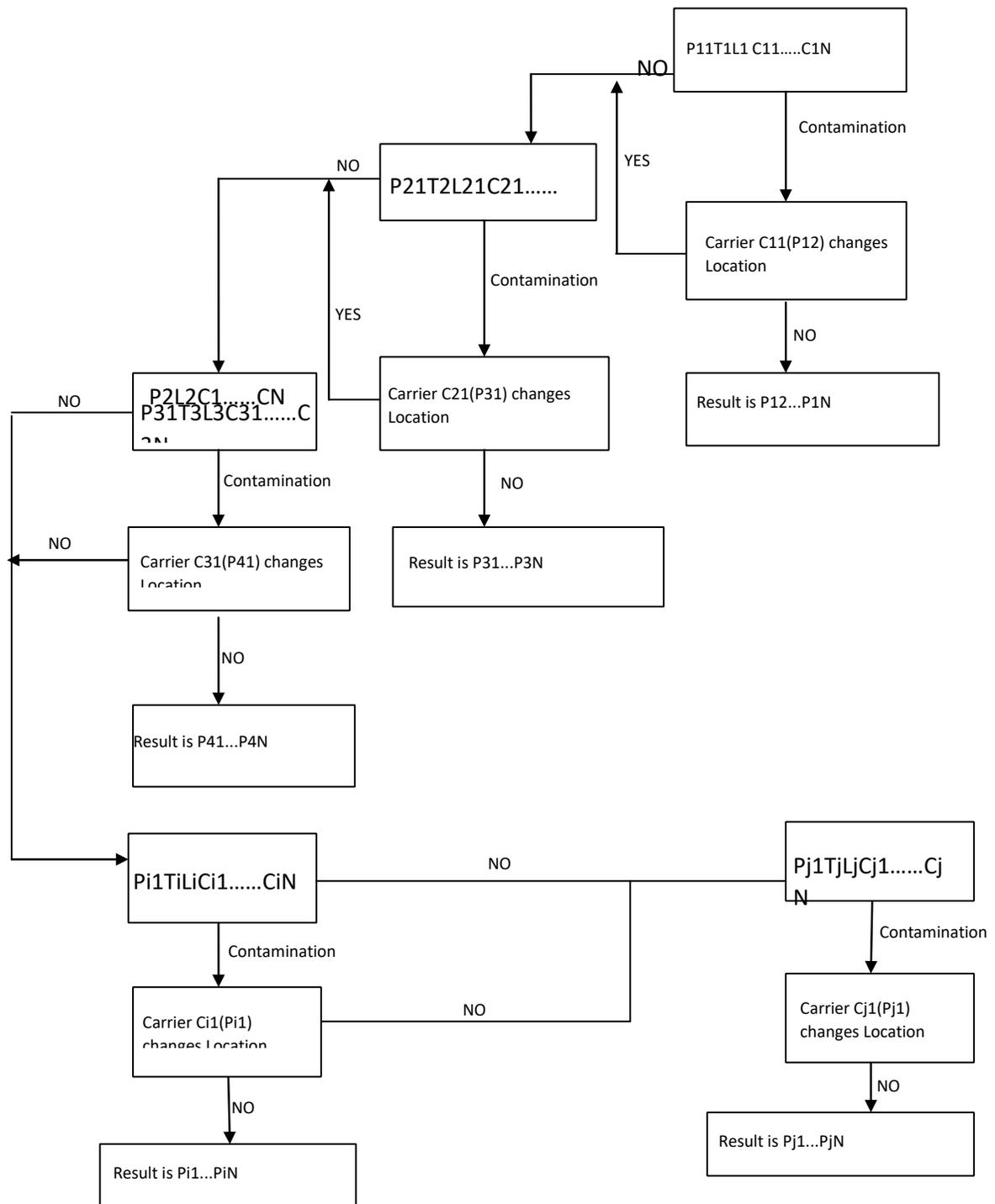
Fig. 3: Working of Medical Expert System

7. CONCLUSIONS

This review paper describes infectious disease diagnosis & carrier locator expert system in medical diagnosis and evaluates the contributions made by different researchers. Some researchers have evaluated their medical expert systems in hospitals from the experts and retrieved various parameters like accuracy and precision. Using these parameters, they have calculated the performance of their expert systems. The accuracy and

other parameters of expert system depend on the knowledge base. The knowledge base should have relevant knowledge. There should be stress on knowledge acquisition, a stage in which knowledge is gathered. So performance of expert system depends on all these factors. One can increase the performance of expert system by making knowledge base more accurate and very little work is done using neuro-fuzzy, ANN and fuzzy logic in medical diagnosis. So we will go for these in medical diagnosis.

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