Expertise Diagnostic System

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Abstract – From the early time the most important thing for the people is their health. The current development in technologies is mainly focused on the use of these technologies by all people. There are systems developed which focus on the health of the people. In this process we are trying to develop a system which can be used for the benefits of the people related to their health. The purpose of 'Expertise Diagnostic System' is to suggest different medicines and diagnostic process of diseases from which the patient suffers. It also able to find that the person is suffering from low risk problems or high risk problems and suggest treatment according to that i.e. if a person is suffering from lower level problems than it suggest some medicine to them or if he is suffering from highly chronic diseases then it may suggest the name of the expertise doctors in that field. It can help in maintaining the customer relationship management (CRM) between the patient and doctors. In this project we are trying to build a system which is able to tell from which disease person is suffering and try to give reasons behind this. In this we make an expert system using fuzzy logic, forward and backward chaining mechanism etc.

Keywords - Knowledge base, Past user data, Expert system, Fuzzy logic, Reasoning, Natural Language Processing, Searching Techniques

I.   INTRODUCTION

One of the main components in life is health. Each and every one is concerned about their health but in today's busy life nobody is getting enough time to concentrate on their health due to which many health related problems are generated. Inspite of this also people are not getting enough time, due to some circumstances and because of laziness behaviour, they do not visit the doctors and due to which their health decline and they suffer from various problems. Even if the person is visiting doctors and he gets the treatment the next time he visit the doctors there are no data of him will be present for the same kind of problems. Here the expertise diagnostic system comes in picture. This system will be used by the person to take the medications of the diseases and will be able to know the reasons behind the illness. The person or even the doctor both of them can see their earlier diagnosis data which can help them in the diagnosis for the next time. The system will use the fuzzy logic and heuristic type of methods for the search of the problems. This system mainly focuses on the medications for the problems.

II. EVOLUTION OF EXPERT SYSTEMS

In the earlier days, the idea of Artificial Intelligence was emerged in 1950's which in further more days give an idea of making an expert systems which helps in decision-making in the fields where an expert advice or decision is required. For the medical field also the idea of expert system was generated and was came into use for the people and hospitals. CADUCEUS, MYCIN, PUFF, MIST-RAL, EYDENET, KALEIDOS were some of the expert systems used in past. Thus an Expert System is a system uses the human knowledge in a computer to solve the problems and take the decision and helps in decision-making.

2.1: Earlier Expert Systems:-
In the earlier days the expert systems were made on the basis of rules called as Rule Based Expert Systems. These Rule Based systems follow the 'IF-THEN' rules for the making the deductions or choices. For example –

- o   If heavy rain then don't go out.
- o   If no heavy rain then take umbrella to go out.
- o   If sunny then do not take umbrella to go out

In this first the expression is checked whether it is matching with the conditions on the left hand side and if the condition is true it process, otherwise it halts. In this Inference Engine works in 2 phases –

- o   Look for a rule match
- o   Perform action.

In past, the expert system applications mostly found with those who were highly skilled in programming.

2.2: Present Expert System:-
Presently most of the expert systems are still following the rule based structure of Expert System but now mostly considered with the internet that is they are mostly web based applications. Generally these expert systems uses the internet to access the datas and gives the results. In present days most of the expert systems uses the forward chaining method to diagnose the people but not able to tell why the person is suffering from the disease. So to access these expert systems one always need internet.

Present expert system's uses the Boolean logic to give the decisions. In Boolean logic the truth values of variables may be '0' or '1', it means that it can only be either true or false, it cannot handle the partial truth.

Forward chaining is the only method they use to predict the result through the inference engine. Forward chaining starts with the available data and uses inference rules to extract more data until a goal is reached.
There is no concept of unsupervised learning used in these systems which mark its limitations. Thus these expert systems can only be used if there is internet connection and are limited in using.

III. TECHNIQUES USED IN EXPERT SYSTEM

3.1 Fuzzy Logic Technique:-
Fuzzy logic is a technique in which the truth variables can have any value between '0' and '1'. Fuzzy logic can be used to handle the partial truth where the truth value may range between completely true or completely false.
The AND, OR, and NOT operators of boolean logic exist in fuzzy logic, usually defined as the minimum, maximum, and complement; when they are defined this way, they are called the *Zadeh operators*. So for the fuzzy variables x and y:

- •   NOT x = (1 - truth(x))
- •   X and y = min(truth(x), truth(y))
- •   X or y = max(truth(x), truth(y))

Nowadays, Fuzzy logic are used in Google search engine and in automobiles as automatic gear box and many other places.

3.2   Unsupervised Learning:-

There are more than thousands of diseases present in the world, therefore it is very much difficult to store the information related to each and every disease. In this case the concept of unsupervised learning comes in handy in the system. With the help of unsupervised learning the system may be able to find the solution of the problem which cannot be found in knowledge base.

Unsupervised learning is a technique finding the hidden structure in unlabeled data. In this technique the system will itself try to find out the solution to the unknown problems whose data will not be present in knowledge base. Clustering is one of the approach used in unsupervised learning.

IV. EXPERTISE DIAGNOSTIC SYSTEM

The purpose of 'Expertise Diagnostic System' is to suggest different medicines and diagnostic process of diseases from which the patient suffers. It also able to find that the person is suffering from low risk problems or high risk problems and suggest treatment according to that i.e. if a person is suffering from lower level problems than it suggest some medicine to them or if he is suffering from highly chronic diseases then it may suggest the name of the expertise doctors in that field.

In this we use the fuzzy logic technique instead of Boolean logic (IF THEN Rule) which is able to handle the partial truth. Instead of using the internet every time for accessing the applications this system allows the user to use the application without internet and if answer is not available by the system in that case only it uses the internet to find the solution using an unsupervised learning. It also suggests the name of the doctors in emergency in that area or the best doctor in the particular disease.

It will allow the user to enter the symptoms in their standard language (English) and gathers the data and start searching. Initially it will search in its past user data, if it found the solution here it will display the result on user interface otherwise it will go to knowledge base to search and if there also it does found then it will search through the internet for the solution.

This system can be used by the doctors as an assistant to retrieve the old data and treat the patient. It can be used by the new doctors also in the starting of their career.
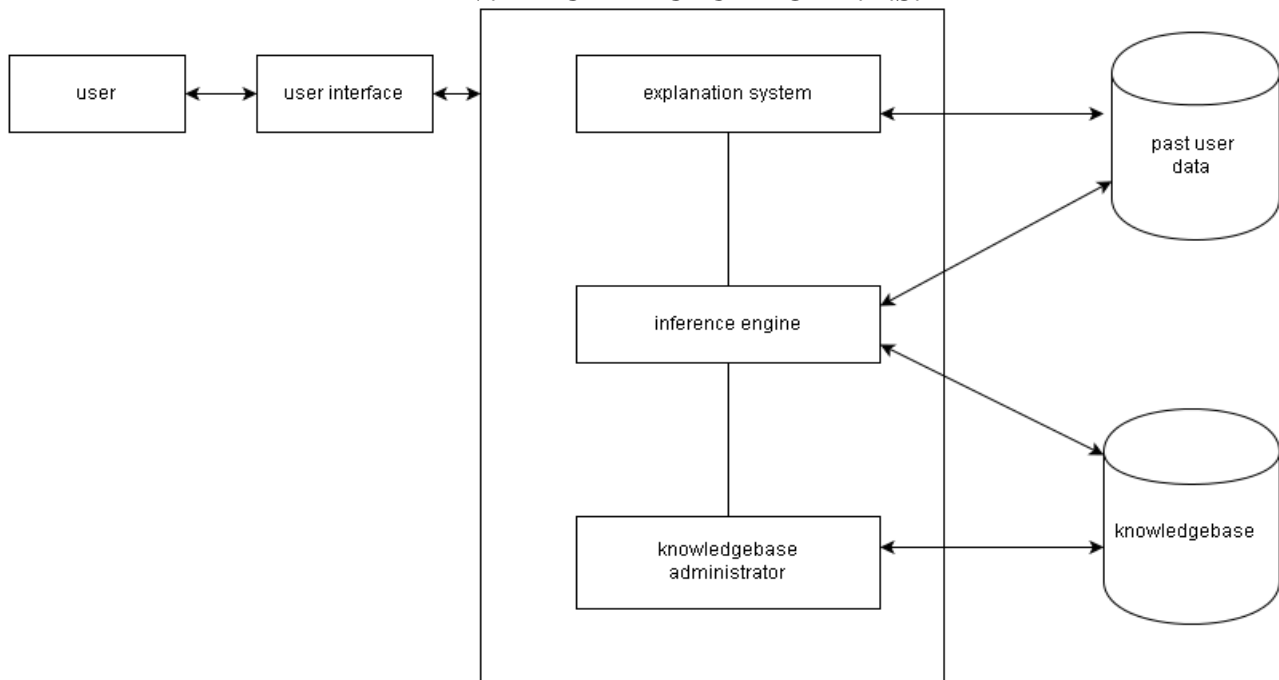
V. ARCHITECTURE OF E.D.S.

FIG 1: ARCHITECTURE DIAGRAM

The architecture diagram of the proposed system comprises of 7 blocks:

- **User**- user will enter the symptoms and get the result.
- **User interface**- it provides interaction between user and system.
- **Explanation system**-it gives explanation to disease from which patient suffers.
- **Inference engine**-it is used to extract data form knowledgebase and past user data as per query entered by user.
- **Knowledge base administrator**-it is responsible for updating knowledgebase.
- **Past user data**-it stores user's past data regarding their previous disease and diagnosing process.
- **Knowledge base**-it stores user's data.

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