

Design and development of Expert System For Newborns

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Abstract— *Computers making decisions in real-world problems. Artificial intelligence technology is providing various solutions in different areas like engineering, education and business. Medical diagnosis is one among them. Expert system belonging to AI technology helps to solve the problems.*

Expert system is a piece of software which uses databases of expert knowledge to offer advice or make decisions in such areas as medical diagnosis. Author have designed and developed an expert system especially for newborns.

Keywords—*AI,Expertsystem,If..Then rules,Knowledge base, Prolog,diagnosis*

I. INTRODUCTION

Artificial intelligence based system that converts the knowledge of an expert in a specific subject into a software code. This code can be merged with other such codes and used for answering questions queries submitted through a computer.

The expert system is a branch of AI designed to work within a particular domain. As an expert is a person who can solve a problem with the domain knowledge in hands it should be able to solve problems at the level of a human expert. The source of knowledge may come from a human expert or from books, magazines and internet. As knowledge play a key role in the functioning of expert systems they are also known as knowledge-based systems and knowledge-based expert systems. The expert's knowledge the given specific problems is called knowledge domain of the expert.

Expert systems have a number of attractive features:

- 1. Increased availability** Expertise is available on any suitable computer hardware. In a very real sense, an expert system is the mass production of expertise.
- 2. Reduced cost** The cost of providing expertise per user is greatly lowered.
- 3. Reduced danger** Expert systems can be used in environments that might be hazardous for a human.

4. Permanence The expertise is permanent. Unlike human experts, who may retire, quit, or die, the expert system's knowledge will last indefinitely.

5. Multiple expertise The knowledge of multiple experts can be made available to work simultaneously and continuously on a problem at any time of day or night. The level of expertise combined from several experts may exceed that of a single human expert .

6. Increased reliability Expert systems increase confidence that the correct decision was made by providing a second opinion to a human expert or break a tie in case of disagreements by multiple human experts. Of course, this method probably won't work if the expert system was programmed by one of the experts. The expert system should always agree with the expert, unless a mistake was made by the expert. However, this may happen if the human expert was tired or under stress.

7. Explanation The expert system can explicitly explain in detail the reasoning that led to a conclusion. A human may be too tired, unwilling, or unable to do this all the time. This increases the confidence that the correct decision is made.

8. Fast response Fast or real-time response may be necessary for some applications. Depending on the software and hardware used, an expert system may respond faster and be more available than a human expert. Some emergency situations may require responses faster than a human and so a real-time expert system is a good choice .

9.Steady, unemotional, and complete response at all times This may be very important in real-time and emergency situations, when a human expert may not operate at peak efficiency because of stress or fatigue.

10. Intelligent tutor The expert system may act as an intelligent tutor by letting the student run sample programs and by explaining the system's reasoning.

11. Intelligent database Expert systems can be used to access a database in an intelligent manner . The process of developing an expert system has an indirect

benefit also since the knowledge of human experts must be put into an explicit form for entering into the computer. Because the knowledge is then explicitly known instead of being implicit in the expert's mind, it can be examined for correctness, consistency, and completeness. The knowledge may then have to be adjusted or re-examined, which improves the quality of the knowledge.

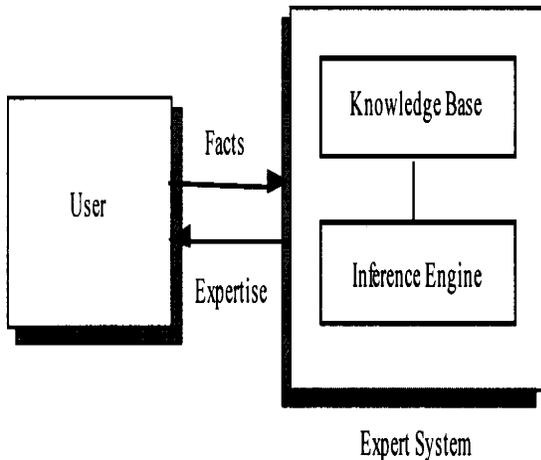


Fig.1 Components of Expert System

II.OBJECTIVES OF STUDY

The following objectives have been considered for the proposed system:-

1. To examine the existing expert systems for newborn babies.
2. To find out the delay in diagnosis of medical problem where experts are not available.
3. To examine the problems faced by baby.
4. To design and develop rule based system for particularly newborn babies.
5. To study probable reasons for the problem.
6. To provide diagnosis for the problem.

III.REVIEW OF LITERATURE

Earlier few of researchers have developed the expert systems for babies. Each system is having its own purpose.

1)PNS-It stands for Parental Nutrition Solutions. It was developed by Department of Medical Cybernetics and Artificial Intelligence , the Austrian Research Institute for Artificial Intelligence , and the Neonatal Intensive Care Unit (NICU) of the Department of Pediatrics of the University of Vienna. [3]It was developed for representing the clinical and theoretical knowledge about the composition of parental nutrition solutions for newborn infants treated at neonatal intensive care units (NICUs).

2)MVN-It stands for Mechanically Ventilated Neonates. It was developed by Jirapaet V.Firstly a prototype was developed and then developer studied its impact the clinical judgment and information access capability of nurses.[2]
3)Expert-system classification of sleep/waking states in infants-It was developed by Dr.C.A.Ho lzman,C.A.Pe rez and team members.[5] It will be used for automated classification of the sleep/waking states in human infants; i.e. active or rapid eye movement sleep (REM), quiet or non- REM sleep (NREM), including its four stages, indeterminate sleep (IS) and wakefulness (WA).The system which author wants to design & develop will accept various symptoms of a newborn and it will give the solution for the given problem. It will be a rule-based system. The rules will be related to different problems of a newborn such as cold, skin allergy, stomach ache etc. and the system will process the data based on the experts' knowledge stored in the system and then provide the best suitable answer.

4)The Children's Hospital in Ottawa is using artificial intelligence to gather information on newborns with critical illnesses. The data collected is used to suggest treatment approaches and also to help predict and improve health outcomes. [4]Until now, these methods have only been used in adult medicine and this is one of the few approaches used on newborns. They use monitoring systems which are hooked up to each baby in the unit to collect and store data such as respiratory rates and heart beat rhythms. From this data, the technology can predict outcomes like chance for survival and the length of the hospital stay.

5)BABY an expert system that monitors new-born, intensive care unit, on-line patient data. [1]The system monitors the data, looks for significant patterns and suggests further evaluation. BABY also tracks the clinical status of the newborns and can answer questions about each patient.The system will help clinicians and computer scientists.

IV.SCOPE OF RESEARCH

The present study is confined to design and development of an expert system for newborn babies. It is very difficult to predict the reasons of particular problem of a baby as baby cannot communicate it like elder people. This particular system is developed for babies.The system will accept various symptoms of the baby. Based on symptoms, it will provide the diagnosis.It will also provide the reasons of the disease or problem.The system consists of knowledge base which consists of if..then rules.The system follows the steps as below:

- 1.Accept and validate the age
- 2.Accept the symptoms
- 3.Provide the diagnosis
- 4.Display the probable reasons

The system is developed using PROLOG(Programming in Logic) language which is the language for AI applications.

If..Then rules takes following format:-

Syntax: IF(premise) THEN(action)

Example:

1. If age between 0 to 12 months
AND runny nose
AND stuffy nose
AND sneezing

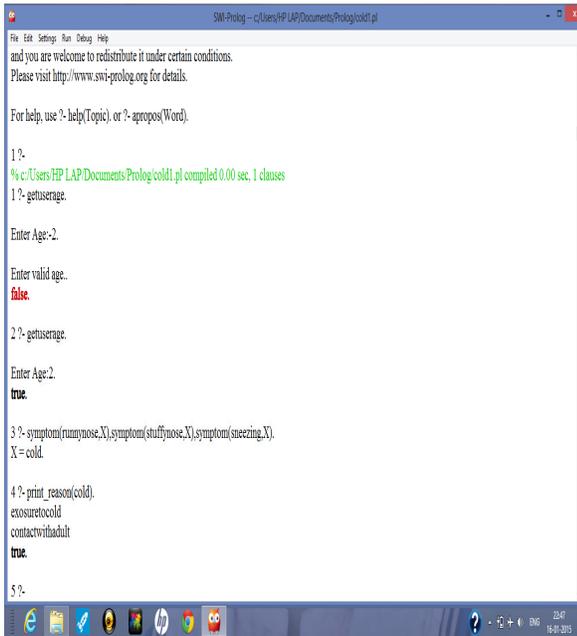
Then diagnosis is cold

2.If age between 0 to 12 months
 AND discomfort
 AND crying
 AND hard stool
 Then diagnosis is constipation

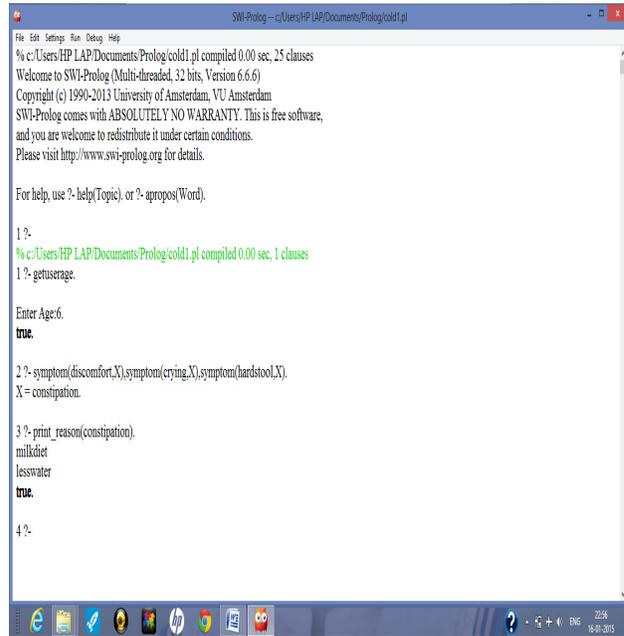
V. USE OF PROLOG LANGUAGE

Prolog is a declarative programming language. This means that in prolog, you do not write out what the computer should do line by line, as in procedural languages such as C and Java . The general idea behind declarative languages is that you describe a situation. Based on this code, the interpreter or compiler will tell you a solution. In the case of prolog, it will tell you whether a prolog sentence is true or not and, if it contains variables, what the values of the variables need to be.

Following are the sample screenshots of PROLOG language for developed system:-



Screenshot1-Result for example1



Screenshot2-Result for example2

VI. CONCLUSION

It will be helpful for differential diagnosis of a disease or problem. The system stores knowledge of expert doctors. It will be helpful to junior doctors, brothers or nurses for treatment of a baby. For the medical practitioners, who are working at remote places and not aware about latest technology, it is difficult for them to provide the treatment for babies who are suffering from complications.

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