

The Diagnosis Of Some Tweens Childhood Diseases In A Prolog Expert System

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ABSTRACT

An expert system to diagnose the main childhood diseases among the tweens is proposed. The diagnosis is made taking into account the symptoms that can be seen or felt. The childhood diseases have many common symptoms and some of them are very much alike. This creates many difficulties for the doctor to reach at a right decision or diagnosis. The proposed system can remove these difficulties and it is having knowledge of many childhood diseases. The proposed expert system is implemented using SWI-Prolog.

Keywords: Diagnosis, Symptoms, Knowledge Base, Expert System

I. INTRODUCTION

An expert system is a set of programs that manipulate knowledge to solve problems in a specialized domain that requires human expertise.. The main components of expert system are knowledge base and inference engine. Knowledge base contains the domain knowledge needed to solve the problems in the form of rules. The rules are a popular paradigm for representing knowledge. Inference engine is the code at the core of the system which derives conclusions from knowledge base through inference or reasoning. The major features of expert system are user interface, data representation, inference, explanations, coping with uncertainty and advantages of expert system are fast response, increased reliability, reduced cost, reducing errors, multiple expertise, intelligent database, reduced danger. There are also some disadvantages of expert system. Disadvantages are absence of common sense, no response in exceptional cases, and no change with changing environment.

1.1 Medical Expert System

The main aim of any medical expert system is the diagnosis and treatment of diseases. 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 doctor or expert in that particular area. Our medical expert system has main childhood diseases in its knowledge base. The user or patient is asked to answer with YES or NO, If a particular symptom appears or not. In the end, based on user's or patient's answers, the name of the disease is

displayed on the screen. A limitation of this medical expert system is that only symptoms entered by the programmer in the knowledge base are available. It does not think and learn by itself. Therefore the knowledge base needs to be updated any time with new symptoms and new diseases.

1.2 Childhood Diseases

The main childhood diseases are asthma, type 1 diabetes, cystic fibrosis and duchenne muscular dystrophy. Asthma can first appear as a cold or respiratory infection. What is actually happening is an inflammation of the lungs and airways which lead to the symptoms like wheezing, breathlessness, chest tightness, nighttimes or early morning coughing. Type 1 diabetes occurs when a child's pancreas no longer produces insulin, the body must be helped to make and regulate insulin. The symptoms of type 1 diabetes are increased thirst and frequent urination, extreme hunger, weight loss, fatigue, irritability or unusual behaviour, blurred vision and yeast infection. Cystic fibrosis is a life-threatening illness affecting the lungs via thickening mucus. The pancreas is also affected causing problems with the body's digestive system. The symptoms of cystic fibrosis are salty tasting skin, persistent coughing with and without phlegm, frequent lung infections, wheezing or shortness of breath and poor growth or weight gain. Duchenne Muscular Dystrophy is the most common form of muscular dystrophy affecting children, exclusively boys. It causes muscle break down leading to weakness and, eventually, an inability to walk. The main symptoms of duchenne muscular dystrophy are

delay in walking, frequent falls, large calf muscles, difficulty in getting up from a lying or sitting position, weakness in lower leg muscles and waddling gait.

II. PROPOSED SYSTEM

A Rule based expert system has the following components-

- 1) The Knowledge Base contains information about childhood diseases which are represented as a set of if-then production rules. The knowledge base is analogue to the long term human memory. The total ordering of production rules is done in the knowledge base.

Consider the following example: Asthma is a childhood disease whose symptoms are wheezing, breathlessness, chest tightness, nighttimes or early morning coughing. So it will be stored in knowledge base in the form of a rule which is as follow:-

Disease (Child, asthma):-
Symptom (Child, wheezing),
Symptom (Child, breathlessness),
Symptom (Child, chest_tightness),
Symptom(Child,
night_or_early_times_coughing).

Another examples are as given below:-

Type 1 diabetes is a disease whose symptoms are increased thirst and frequent urination, extreme hunger, weight loss, fatigue, irritability or unusual behaviour, blurred vision and yeast infection. So it will be stored in knowledge base as follow:-

Disease (Child, type_1_diabetes):-
Symptom (Child, increased_thirst),
Symptom (Child, extreme_hunger),
Symptom (Child, weight_loss),
Symptom (Child, fatigue),
Symptom (Child, irritability),
Symptom (Child, blurred_vision),
Symptom (Child, yeast_infection).

Cystic fibrosis is a disease whose symptoms are salty tasting skin, persistent coughing with and without phlegm, frequent lung infections, wheezing or shortness of breath and poor growth or weight gain. . So it will be stored in knowledge base as follow:-

Disease (Child, cystic_fibrosis):-
Symptom (Child, salty_tasting_skin),
Symptom (Child, persistent_coughing),
Symptom (Child, frequent_lung_infections),
Symptom (Child, wheezing),
Symptom (Child, weight_gain).

Duchenne Muscular Dystrophy is a disease whose symptoms are delay in walking, frequent falls, large calf muscles, difficulting in getting up from a lying or sitting position, weakness in lower leg muscles and waddling gait.. So it will be stored in the knowledge base as follow:-

Disease(Child,
duchenne_muscular_dystrophy):-
Symptom(Child, delay_in_walking),
Symptom(Child, frequent_falls),
Symptom(Child, large_calf_muscles),
Symptom(Child, difficulties_in_getting_up),
Symptom(Child,
weakness_in_lower_leg_muscles).

- 2) The Fact Base contains facts which are used to match against the antecedent part of rules stored in the knowledge base. The fact base is analogue to the short term human memory.
- 3) The main task of Inference Engine is to carry out the reasoning by linking the rules with facts and deducing new facts.
- 4) The User Interface is used to communicate between user and expert system. It is the method by which the expert system interacts with the user.
- 5) The Explanation Module enables the user to ask the expert system how a particular conclusion is reached and why a specific fact is needed.
- 6) The Developer Interface is used to modify the knowledge

III. WORKING OF PROGRAM

In Figure 1, we present the simulation program. S1 D1 denotes the first symptom of first disease. In general Si Dj denotes the “i” symptom of “j” disease. If the program has a positive answer to the symptom, it goes on with the symptoms from that disease. If only one symptom from that disease is negative, it jumps to the first symptom from the next disease.

IV. RESULTS

This Prolog expert system is successfully implemented and results are taken. It is applied on many children and its results are 80% correct. For example Asthma is a disease whose symptoms are wheezing, breathlessness, chest tightness, night or early times coughing. In this Prolog expert system, First the user or child enters his or her name (suppose name is Jimmy) then the user or child is asked to answer with YES (y) or NO (n), If a particular

symptom appears or not. (Here user or child will reply YES (y) to the symptoms wheezing, answers, the name of the disease is displayed on the screen (Asthma).

V. CONCLUSION

The proposed medical expert system is dealing with child's health and an approximate

breathlessness, chest tightness, night or early times coughing.) In the end, based on user's or child's diagnosis of a certain disease is established. However, the knowledge base needs to be constantly updated with new symptoms and diseases. Symptoms already available in knowledge base are not 100% correct because different doctors have different opinions and there are anomalies in medicines.

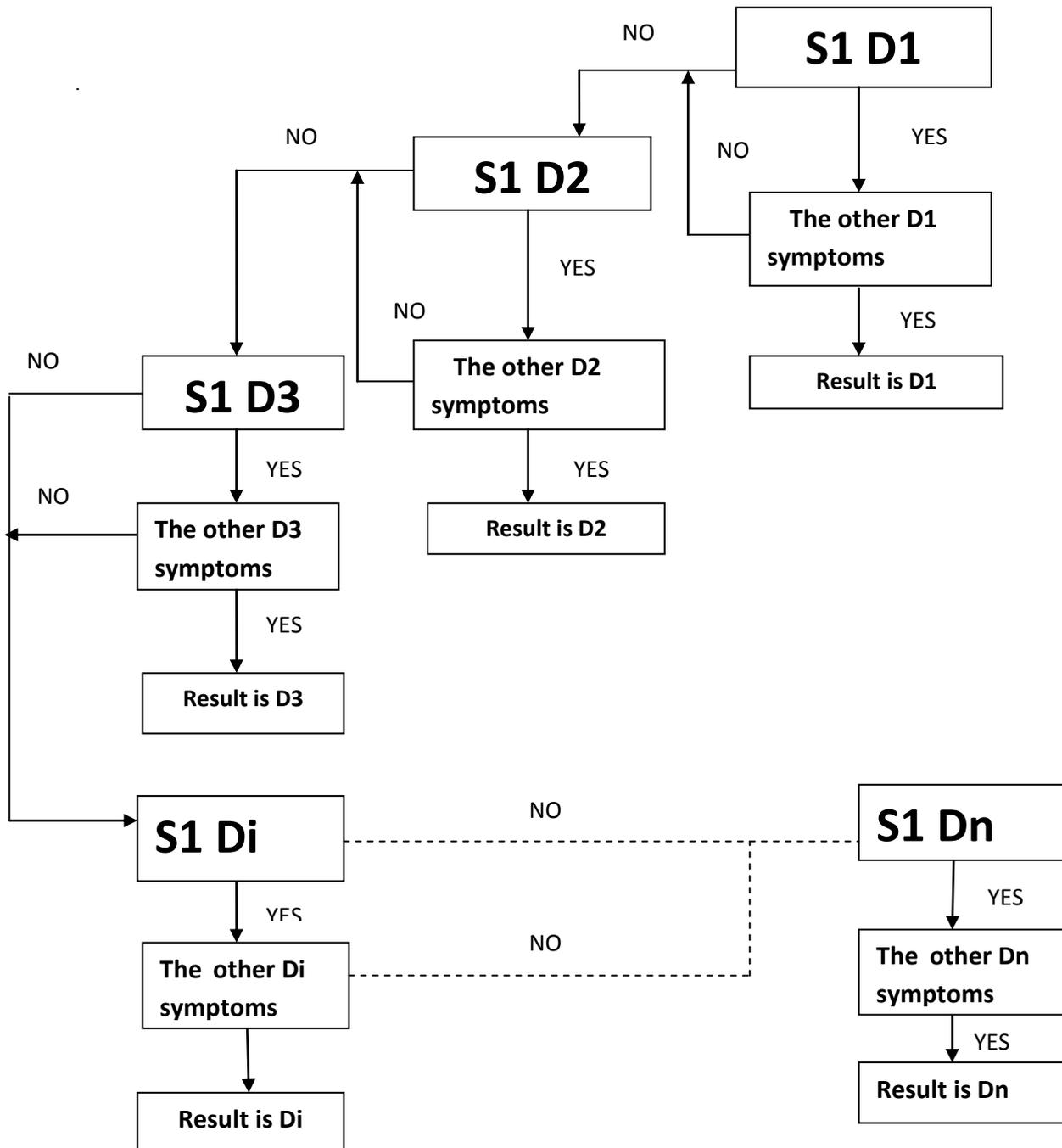


Fig 1: Working of Medical Expert System

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