

## Design and Rules Development of Online Children Skin Diseases Diagnosis System

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**Abstract.** There are varied common skin diseases that can infect children skin. If children skin had been infected by certain skin diseases, most of the parents or guardian will try to treat this infected skin on their own. However, sometimes this treatment was not suitable with that particular skin problem and can make it become worse. Besides, human habit tend to assume that certain skin diseases are not severe problem, and they tend to not seeing the medical expert in helping diagnose this skin diseases. One more problem with skin disease is it is quite hard to recognize the main cause. This occurs because the symptoms of different diseases are quite similar with each other. Thus in this paper, our objective is to develop a set rules that focus on diagnosing six common children skin diseases. In the near future, we will develop an Online Children Skin Diseases Diagnosing System that used the concept of expert system to assist parents or children in detecting the skin diseases and provide treatment suggestion.

**Keywords:** expert system, skin disease, diagnosis

### 1. Introduction

Skin diseases are diseases that may originate inside the body and manifest on the skin or start from the skin and manifest on the skin [1]. Some common skin diseases are eczema and rash can infected children and adults. For instances, Atopic Eczema can affects 2 in every 10 people in Malaysia and about 10% - 14% of children below the age of 14 [2]. If children skin had been infected by certain skin diseases, most of the parents or guardian will try to treat this infected skin on their own. However, sometimes this treatment was not suitable with that particular skin problem and can make it become worse. These cause disruption for children during their daily routine especially those children that started attending school.

Human habit tend to assume that certain skin diseases are not severe problem, and they tend to not seeing the medical expert in helping diagnose this skin diseases. One more problem with skin disease is it is quite hard to recognize the main cause. This occurs because the symptoms of different diseases are quite similar with each other. Therefore, one main issue in this paper is to ensure that the diseases can be detected on early stage and with this expert system it will assist parents or children in detecting the skin diseases and provide treatment suggestion.

In this research, we place our focus on common children skin diseases. The main objective of this research is to develop expert system for diagnosing the children skin diseases in near future. Currently, at this point, from the data analysis, the rules have been developed. There are six types of common diseases have been identified for this research; viral rash, eczema, impetigo, urticaria, chicken pox and fifth disease. As mention before, the mistake in diagnosing this skin disease can lead to more serious infection. Therefore, this research is important for user with the purpose to assist them in detecting the children skin diseases based on the given symptoms.

Section 2 provides the related works in expert system, while Section 3 briefly discusses the methodology. Section 4 discusses on design and development of the system and Section 5 discuss on expected result and output, while the last section draws our conclusions.

## 2. Related Work

Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviours that humans consider intelligent. Expert Systems (ES) is one of the artificial intelligence fields, and were developed by the AI community in the mid-1960s. According to Darlington [3], an expert system is a program that attempts to mimic human expertise by applying inference methods to a specific body of knowledge. Russel and Norvig defined expert system as an intelligent computer program that uses knowledge and inference procedures to solve problems that are difficult enough to require significant human expertise for their solutions [4].

One of the needs of expert systems in medical is for technical information transfer. Using traditional methods, expert help identified diseases with symptoms shown and transfer the information or result individually to the patients. Using expert systems, it generates results and appropriate advice too based on its knowledge base and reasoning mechanism. The knowledge acquisition process in developing expert systems facilitates in integration knowledge and experiences gathered from various experts. Besides, images can be integrated with the knowledge to make system more user friendly and help in giving more understanding in describing the symptoms.

Expert systems have been a highly active research field in the past few years as a mean of conducting medical diagnosis and recommending treatment [5]. There are many expert systems that were developed to diagnose diseases, prescribing drugs or provide suggestive treatment [6, 7, 8, 9]; but a few for skin diseases diagnosis. Rubin has designed an expert system 'Dermdx', to aid in the interpretation and diagnosis of biopsies of inflammatory diseases of the skin [10]. The system consists of an expert shell, which performs the inference, and a rule-base, which contains the knowledge with which the system operates. Güvenir and Emeksiz have developed an expert system for differential diagnosis of erythematous-squamous diseases incorporating decision by classification algorithm [11]. Samy and Alaa [12], had developed expert system that helps to help dermatologists in diagnosing some of the skin diseases.

In this research, Online Children Skin Diseases Diagnosing System will provide diagnosis module and treatment module as main modules. In addition this system will be designed as web based platform to deliver system information to their respective online user.

## 3. Methodology

In this research, our methodology that been used is Knowledge Engineering (KE) methodology. This methodology is suitable for this project because it support many types of knowledge based system and consist of special translator that able to control forward chaining mechanism and back forward chaining mechanism.

This methodology consists six phases, however only five phases applied in this research which are problem assessment, data and knowledge acquisition, development of a prototype system, development of a complete system, evaluation and revision of the system [6]. Integration and maintenance of system phase which is the final phase was not applied because this project only involved in the process of system development and those maintenance tasks are depend on organization that uses this system.

In problem assessment phase, research on children skin diseases in general had been done. Besides, other step is to analysis and determines the problems that involve in manual diagnosis method on children skin diseases. This is because it can help in determining the objective of project, target user and scopes of system.

In data and knowledge acquisition phase, the information about the children skin diseases such as symptoms, treatment, advices had been collected from various sources. However, main sources were gathered via interview method from one of the expert in skin problems. The purpose of this interview is to gather knowledge from reliable sources that have experience in diagnosing children skin problem and diseases. Set of rules based on the symptoms and diseases will be stored in knowledge based and retrieve by forward chaining technique.

Before developing the prototype system, the system will be represented by system architecture (Figure 2) and context diagram (Figure 3). Besides, suitable tool will be chosen before developing the expert system. This prototype need to be developed to get feedback on the expert system prototype from user thus can fix error, add and enhance their functionality when developing the real expert system. Prototype system development helps knowledge engineer ensure the process of developing complete expert system will be smooth without much hassle and error.

During development of a complete system phase, there will be a complete system developed. The main work of this phase is adding data and knowledge into database of system. User interface will be developed to deliver information to user. The user interface will be design as user friendly and easy for user to obtain information from system.

In evaluation and revision of the system phase, a fully complete of Online Children Skin Diseases Diagnosing System is tested and evaluated to ensure that the system can function well. This test is important to ensure the system will fulfill the development objective and requirement for end user. Therefore, in next stage, when all of the phases complete, the output will be complete Online Children Skin Diseases Diagnosing System.

## 4. Design and Development

### 4.1. Architecture and Context Diagram Design

The architecture of design of Online Children Skin Diseases Diagnosing System consists of two main part; administrator and user as shown in Figure 1. The system administrator is an expert where in this research is an children skin expertise that we have interviewed before, while, the user is either parents or children. From expert we obtain the information such as type of diseases and the symptom disease. The rules will be generated from this information. All the generated rules store in knowledge base. Then the user (parents or children) will input the symptom and then the system will retrieve the related rules and post the suggested solution.

System functionality design for Online Children Skin Diseases Diagnosing System in this paper is presented in context diagram shown in Figure 2.

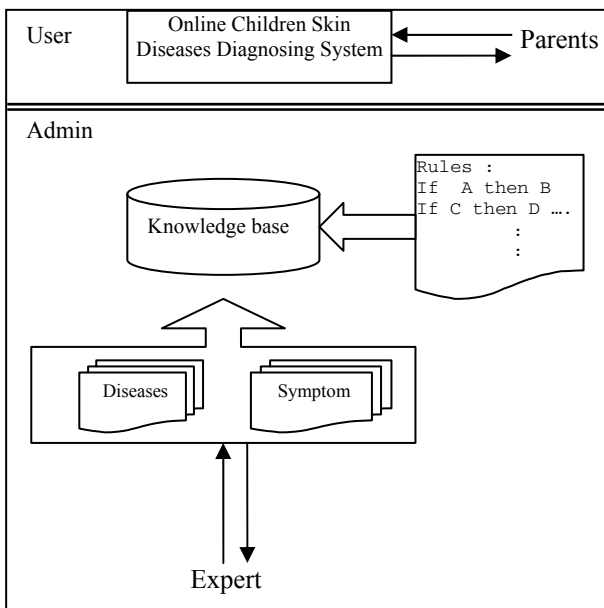


Fig. 1. Online Children Skin Diseases Diagnosing System Architecture

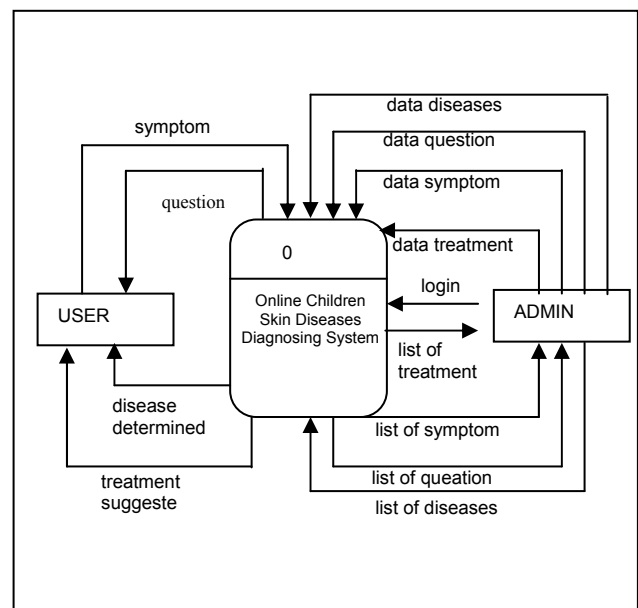


Fig. 2. Online Children Skin Diseases Diagnosing System Context Diagram

### 4.2. Knowledge Representation

The Online Children Skin Diseases Diagnosing System knowledge based was developed using rules. The set of rules used IF / THEN structure where the information contained in the IF related to other information contained in the THEN part. Knowledge representation helps in creating the rules. Knowledge and facts in the knowledge base will be translated into form of knowledge representation. There are six types of rules based on seven types of common children skin diseases, as shown in Table 1. The diseases are Viral Rash, Eczema, Urticaria, Impetigo, Fifth Diseases, Hand Foot and Mouth Disease and Chicken Pox.

Table 1. Set of rules for six common children skin diseases

Rule	Diseases	Symptoms
1	Viral Rash	IF fever THEN rash is normal red with blanches pressure
2		IF rash is normal red normal red with blanches pressure THEN Viral Rash
3	Eczema	IF extreme itchy THEN rash is normal redness
4		IF rash is normal redness AND dry skin THEN Eczema
5	Urticaria	IF extreme itchy THEN rash is red circular with center
6		IF rash is red circular with center THEN Urticaria
7	Impetigo	IF common itchy THEN rash is honey coloured
8		IF rash is honey coloured AND superficial blister THEN Impetigo
9	Fifth Disease	IF fever THEN rash is lacy red
10		IF rash is lacy red AND slapped check THEN Fifth Disease
11	Hand Foot and Mouth Disease	IF fever THEN rash is painful with tiny red spot
12		IF rash is painful with tiny red spot AND blister in mouth, hand and foot THEN Hand Foot and Mouth Disease
13	Chicken Pox	IF common itchy AND blister with liquid AND headache and fever THEN Chicken Pox

## 5. Expected Result and Output

The expected result of this system will produces a diagnosis system which able to help user recognize children skin diseases and provide advises or treatments about children skin diseases. Users only need to answer few questions by selecting an answer and the system will generate output results. Besides, administrator can login into system and manage the information in the Online Children Skin Diseases Diagnosis System.

## 6. Conclusion

In this paper, a set of rules has been developed for helping user diagnosing six possible children skin diseases. In future, completed system will be developed and help user diagnosing and determining skin diseases and give suggestive treatment more faster and convenient way by using online system. Besides, it also can provide some useful information about skin diseases to users. We also hope it will be an alternative for user to obtain related information on children skin diseases, symptoms and its treatment.

## 7. Acknowledgement

The authors would like to thanks Universiti Tun Hussein Onn Malaysia for the financial support.

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