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MODELLING EXPERT SYSTEM FOR LUNG DISEASE

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Abstract. One of the vital organs in humans is the lungs. Lungs infected with the disease and not or late diagnosed can cause fatal conditions that have the potential to cause death. The rapid development of artificial intelligence, especially the expert system, is one of the solutions for the early diagnosis of respiratory diseases, especially in the lungs. By applying the forward chaining method that analyzes the facts given by the user to determine the diagnosis results, the expert system for lung disease that was built focused on six lung diseases that are common in Indonesia.

Keywords. *Decision Tree, Expert System, Forward Chaining, Lung Diseases*.

1. Introduction

The respiratory system is a system in living things that have uses to take or absorb oxygen, provide oxygen and then remove carbon dioxide from the body out of the body. The respiratory system in humans consists of the nose, pharynx, larynx, trachea or trachea, bronchi and lungs. The lungs are one of the vital organs of humans that function to help humans breathe, if there is a disturbance in the lungs of humans will be able to regain fatal, can even cause death. In 2013, the period prevalence of Acute Respiratory Infection (ARI) based on diagnosis of health personnel and population complaints was 25.0 percent [1], this indicates that the rate of disease in human respiratory organs, especially in the lungs is still quite high in Indonesia.

The progress of science and communication technology has spread to various fields of life, one of them is in the field of health, one of the developing fields is the field of artificial intelligence. An expert system is one branch of artificial intelligence that learns how to adopt the way an expert thinks and reasons in solving a problem and making decisions based on existing facts. This expert system is expected to be able to diagnose and determine what type of pulmonary disease is experienced based on the symptoms suffered. The application of expert systems in the field of health one of them is the use of expert systems for heart disease [2]. An example of the application of artificial intelligence in the field of respiratory organ health is a knowledge base for diagnosing possible diseases based on the length of the shortness of breath of toddlers and children who are also used to assist medical personnel [3]. Application of an expert system that is combined with fuzzy can also be used to detect and determine the level of asthma [4].

In this study the focus of lung diseases to be diagnosed were emphysema, pneumonia, lung cancer, bronchitis, tuberculosis (TB), and bronchial asthma. The method used to build the knowledge base and expert system uses the forward chaining method.

2. Material and methods

The process of building a knowledge base is by means of surveys and interviews with experts in this matter are specialist doctors to obtain knowledge and be supported by other sources such as literature books on lungs and their diseases. Sources can be used as documentation that can be learned and processed structurally into a knowledge base. From these results obtained symptoms

- symptoms of the disease and the weight of each of these symptoms. After the knowledge base is built, the system is designed and then a trial is carried out which will be validated by experts.

2.1 Diseases of the lungs

From the results of the knowledge base development process, there were six diseases and eighteen symptoms. Data on lung diseases and their symptoms are shown in Table 1 and Table 2.

TABLE 1. TYPES OF LUNG DISEASE CODE

Code	Disease Name
P1	Bronchial Asthma
P2	Bronchitis
P3	Emphysema
P4	Lung Cancer
P5	Pneumonia
P6	Tuberculosis (TBC)

TABLE 2. DISEASE SYMPTOMS OF LUNG DISEASE CODE

Code	Disease Symptoms
G1	Out of breath
G2	Cough with phlegm
G3	Decreased body weight
G4	Wheezing
G5	Phlegm is grayish-gray or green yellow
G7	Pain in the chest
G8	Coughing up blood
G9	Easy fatigue
G10	Prolonged cough at night and cold weather
G11	Chest feels tight
G12	Fever
G13	Lips and nails become blue or gray
G14	Not excited to do physical activities
G15	High fever
G16	Sweating easily
G17	Nausea, vomiting and diarrhea
G18	Day and afternoon fever
G19	Sweating at night

2.2 Forward Chaining Tree Diagram

Forward Chaining is a method of tracking in the future, which begins with the facts given by the user and then searched for in the knowledge base and then searched for rules that are in accordance with the facts [5]. After that a hypothesis is held to get a conclusion [6]. Based on the knowledge base that has been obtained then designed a tree diagram for the expert system [7] as shown in Figure 1.

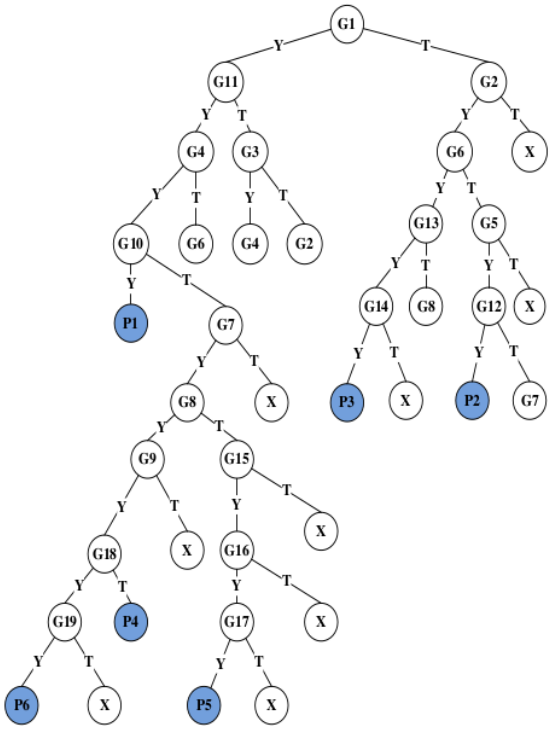

Figure 1. Expert system Tree Diagram

3. Experiment Results and Discussion

Based on data on lung disease and its symptoms that have been built into tree diagrams for expert systems, a knowledge base of disease data can be built along with the solution of each disease as shown in table 3.

Table 3. SOLUTION CODE ON EVERY LUNG DISEASE

Code	Solution	
	Prevention	Treatment
S1	Avoid factors that trigger asthma, such as cold temperatures.	Provision of drugs that help loosen the respiratory tract, eg ventolin inhaler, nebuleser (salbutamol gas).
S2	Maintain cleanliness	To reduce fever and feeling unwell use aspirin, acetaminophen
S3	Get used to a healthy lifestyle	Giving antibiotics
S4	Exercise regularly	Get plenty of rest and drink
S5	Eat healthy and nutritious food	Bronchodilator
S6	Avoid smoking and passive smoking	Mucus secretion

In Table 3 shows the prevention and treatment at every lung disease.

Display of expert system applications for diagnosis of lung disease as shown in Figure 2 and Figure 3.

Figure 2. Display diagnosis page on the application.

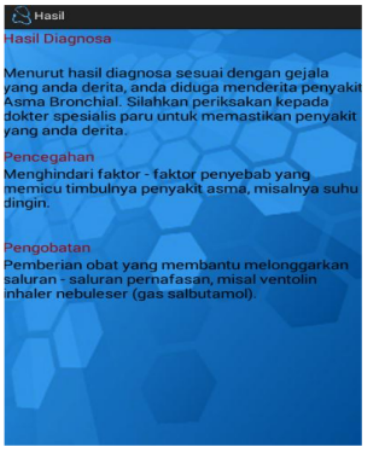

Figure 3. Display diagnosis results page on the application.

4. Conclusion

In this paper the expert system that is built is shown for the initial diagnosis of human respiratory organs, especially the lungs so that they can get a faster diagnosis. The limitation of the expert system that is made is the number of diseases that still focus on the six common diseases, so it is necessary to add a knowledge base for other lung diseases. Based on the experiments and validations that have been carried out by experts, the expert system application for pulmonary disease has gone well with satisfactory performance, with an easy to understand user interface.

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