Diagnose Expert System Dental Disease In Humans Method Using Dempster Shafer

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Abstract- Dental disease is one of the many health problems complained of by the people of Indonesia. Dental health is a reflection of human health. Lack of knowledge and limited sources of information on oral health have caused public awareness to maintain oral and dental health is still low .. The development of one of the fields of information technology namely artificial intelligence has been widely applied in various fields of life can be used as a solution to overcome this problem. In this study, the dental and oral disease expert system uses the Dempster Shafer method to control inferences that contain thought patterns and reasoning mechanisms used by experts in solving problems.

Keywords: Dental, Expert System, Dempster Shafer

1. Introduction

The development of one field of artificial intelligence information technology which has been widely applied in various fields of life can be used as a solution to overcome this problem. One branch of artificial intelligence that an expert system can be applied to create a system that can help people in knowing the oral health and can diagnose early prediction of dental and oral diseases experienced. Dental health is a reflection of human health. If the teeth in unhealthy conditions become smelly mouth and chew the food to be disrupted, disturbed digestion and ultimately damage the health. Toothache can also cause headaches and disrupt the activities of sufferers. Dental problems are left alone it will make the disease worse. Lack of knowledge about dental disease and the limited number of dentists in remote areas is a problem faced by people with dental disease. In this research, expert systems dental and oral diseases using Dempster Shafer method for controlling the inference that contain the mechanism of thinking and reasoning used by experts in solving problems. The solution to this problem is to build an expert system application to conduct an initial assessment of the likelihood of dental disease suffered. The expert system is a system that tried to adopt the expert knowledge to the computer so that the computer can perform an analysis of the phenomenon as was done by experts. One method of expert system that can be used to diagnose dental disease is a method of Dempster Shafer.

2. Theory

2.1 understanding Systems

According to (Hamim Tohari, 2013; 2) System is a collection or set of elements or variables are interrelated, interacting, and interdependent with each other to achieve the goal. In addition, the system can also be defined as a collection of objects that relate and interact with each other, as well as the relationships between objects can be viewed as a single entity that is designed to achieve the goals set.

2.2 Understanding Expert System

According to the journal (Micah Dayan Sinaga, Nita Sari Br. Sembiring, Cogito Smart Journal, Vol 2 No 2: 2016: 95) explains that the expert system is a branch of Artificial Intelligent (AI). Implementation of an expert system is widely used for commercial purposes because of the expert system is seen as a way of storing knowledge of experts in a particular field into the program so that the computer can give a decision and reasoning intelligently.

2.3 Dempster-Shafer method

Dempster-Shafer method first introduced by Dempster, who experimented with a range of probabilities the model uncertainty rather than as a single probability. Dempster-Shafer theory is representation, and propagation combination of uncertainty, where this theory has some characteristics that are institutif in accordance with the way of thinking of a master, but a strong mathematical basis. In general the Dempster-Shafer theory written in an interval: [Belief, plausibility]. Belief (Bel) is a measure of the strength of evidence in support of a set of propositions. If the value is 0 then it indicates that there is no evidence, and if the value of 1 indicates certainty.

Plausibility (Pls) will reduce the level of certainty of the evidence. Plausibility is worth 0 to 1. If you'll X', it can be said that $Bel(X') = 1$,

Mass function(M) the Dempster-Shafer theory is the confidence level of an evidence (symptoms), often referred to as evidence that the measure is denoted by (m). The goal is to link elements of the confidence measure θ . Not all direct evidence to support each element. For that we need the probability density function (m). Value'm not only defining the elements of θ , but also all subsetnya. So if θ contains n elements, then the subset θ is 2^n . The sum of all m in a subset of θ equals 1. In the absence of any information to select the hypothesis, then the value of:

$$m\{\theta\} = 1.0$$

$$m_3(Z) = \frac{\sum_{X \cap Y = Z} m_1(X) \cdot m_2(Y)}{1 - \sum_{X \cap Y = \emptyset} m_1(X) \cdot m_2(Y)} \dots$$

Where :

$m_3(Z)$ = mass function of evidence (Z)

$m_1(X)$ = mass function of evidence (X), which is derived from the belief an evidence value multiplied by the disbelief of such evidence.

$m_2(Y)$ = mass function of evidence (Y), which is derived from the belief an evidence value multiplied by the disbelief of such evidence.

3. Analysis

3.1 Data Analysis

Before the first diagnosis of dental disease and illness data obtained symptoms that exist on the teeth, are in the following table.

Table 1.
Dental Health Information

NO	Disease	Diseases code
1	Trench Mouth Infections (gums)	P01
2	Dental caries (tooth Hole)	P02
3	Pulpitis (inflammation of the dental pulp)	P03
4	Simplex Gingivitis (inflammation of gums red)	P04
5	tumor Teeth	P05
6	Fractures Tooth (Tooth crack)	P06

Table 2.
Data Dental Disease Symptoms

Code sympto m	The names of Symptoms	Value probability
G01	Dental Feels Pain	0.1
G02	Teeth throbbled	0.4
G03	Head feels dizzy	0.6
G04	Bad breath	0.4
G05	Swollen gums	0.1
G06	Pain when chewing	0.3
G07	Prolonged grate (the teeth)	0.4
G08	Reduced salivary fluid	0.1
G09	Gums bleed vulnerable	0.6
G10	The presence of plaque / tartar	0.2
G11	Teeth are not aligned	0.1
G12	Pain in the tongue	0.8
G13	Teeth look crooked fore	0.5
G14	The size of the teeth and jaws do not fit	0.5
G15	Their spots at the corner of the lips	0.4

4. Result

4.1. System planning

Designing the system in making an application is necessary, because with the system design, applications can be built according to the design have made, in addition to the design of the system also makes it easier to determine the flow of the application to be built. The stages are required in designing applications Expert System include the design of program structure, Use-case, Activity Diagram, and the design of the application.

a. Use-case

Use-case is a picture of the scenario of interaction between user and the system. A use-case diagram illustrates the relationship between actors and activities that can be done to applications like Figure 1 below.

Fig 1. Use-Case

5. Conclusion

From the analysis and discussion that has been presented, it can be concluded some conclusions as follows:

- From this research produced a new software on an expert system that is able to support the decision-making to diagnose dental disease by providing solutions of diagnosis.
- Expert systems diagnose dental disease in this study using Dempster Shaper to determine the level of certainty of a disease based on data selected symptoms, then the data in the process, then the output is in the form of advice or control given based on symptoms inputted.
- The accuracy of the calculation method is influenced by the selection of Dempster Shaper symptom data available on the consultation page.
- Facilitate the people especially those experiencing dental disease disease to find information more detailed and accurate information on dental diseases and disease control.

6. Reference

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