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The Application of the Certainty Factor method in Diagnosing Measles

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ABSTRACT

Health is the most important asset in life, if health is disturbed (sick) then one's activities will be disturbed. Measles is a highly contagious viral infection, transmission of the infection occurs by inhaling the saliva of a measles sufferer. The measles diagnosis expert system is a system designed as a doctor's aid to diagnose diseases with a dynamic knowledge base. The knowledge system in this system can be classified according to the symptoms experienced so that the user can conclude the disease. Certainty Factor is the method used by the writer to solve problems in this expert system, this system will display questions where the questions are in accordance with the symptoms that have been inputted by the admin (expert) so that the calculation results of these questions are obtained using the certainty formula In the system, login is only used by admins or experts where admin or experts can enter to edit data in the system.

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1. INTRODUCTION

Measles is a contagious disease that can be caused by a virus called paramyxovirus. Measles is also known as morbili or morbilia. Airborne transmission or direct contact with patients, characterized by fever, coughing of conjunctivitis (inflammation of the lining of the eye) and the appearance of red spots on the skin rash[1]. Although sometimes people take it for granted that measles is very dangerous if left untreated, this disorder can actually be very dangerous if it is treated incorrectly. The incubation period for measles is 10-14 days before symptoms appear. Immunity to measles is acquired after vaccination, active infection and passive immunity in an infant[2].

Previous research on Expert Systems to Diagnose Alopecia in Humans with the Certainty Factor Method ", states a technique used to manage uncertainty in decision making. When faced with a problem, it is often found that the answer is not completely certain[3]. The certainty factor (CF) method is a method that defines a measure of the capacity of a fact or rule, in expressing the level of confidence of an expert on a problem at hand, the centainty factor introduces the concept of belief or belief and disbelief or not[4].

2. RESEARCH METHOD

In carrying out this research, clear and structured stages are needed, in order to facilitate the process, it is necessary to make a diagram design such as the diagram below:

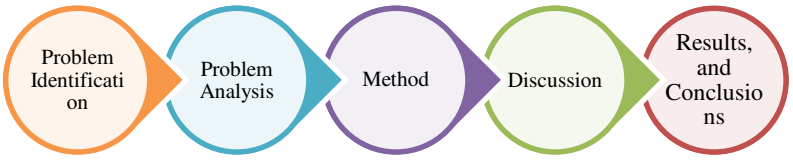

Figure 1. Diagram of Methods and Research Stages

In the stages of the research method, the author conducted interviews with experts to obtain symptoms of worms in livestock.

2.1. Basic theory

A. Artificial Intelligence

Artificial intelligence (Artifical Intelligence) is a field of computer science that utilizes computers so that they can behave intelligently, but along with the times, the role of computers increasingly dominates human life. Computers are no longer used as a calculating tool, more than that computers are faced with being able to be empowered to do everything that humans can do. This artificial intelligence is more permanent and its capabilities will never change as long as the program is not changed by the programmer[5].

B. Expert System

An expert system is a knowledge-based system, which is a system that mimics the reasoning of an expert in a particular field. This system uses human knowledge to solve problems that usually require expert expertise. The term expert system comes from the term knowledge-based expert system. This term arises due to solving expert system problems by imitating the performance of experts in answering questions and solving problems. With this expert system even ordinary people are able to solve problems that are complex enough to solve problems without the help of experts. For experts, expert systems are very helpful in their activities as highly experienced assistants[6].

C. Certainty Factor

In expressing the degree of confidence, a certainty factor uses a value that is used to assume an expert's degree of confidence in a data. This concept is then formulated in the basic formula as follows[7]:

CF[H,E] = MB[H,E] – MD[H,E]

Information :

CF = Certainty Factor (certainty factor) in hypothesis H which is influenced by fact E.

MB [H, E] = measure of belief (measure of belief) towards hypothesis H, if given E evidence (between 0 and 1).

MD [H, E] = measure of disbelief, (a measure of disbelief) against evidence H, if evidence E is provided (between 0 and 1).

H = Hypothesis.

E = Evidence (Events or Facts).

Certainty factor for calculation of single premise[8]:

CF [H, E] = CF [H] * CF [E]

Where :

CF [E] = Certainty Factor evidence E which is influenced by evidence E

CF [H] = Hypothesis Certainty Factor with the assumption of evidence is known with certainty, namely when CF [E, e] = 1

CF [H, E] = Certainty Factor hypothesis which is influenced by evidence e is known with Certainty

D. Measles

Measles is a highly contagious disease which can be caused by a virus called Measles Virus. Transmission through air or direct contact with patients. Measles is different from German

measles. Measles is a contagious disease that is more dangerous than German measles. The transmission of plain measles is faster than German measles[9].

3. RESULTS AND DISCUSSION

A value of 0 indicates that the user has no symptoms as stated by the system. The more the consultation user believes that these symptoms are indeed experienced by humans, the higher the percentage of confidence they will get. For example, the process of giving weight to each premise (symptom) to obtain a percentage of confidence for measles.

In accordance with the certainty factor terminology, the consultation user is given a choice of answers with each weight as follows:

1. Very sure: 1.0
2. Sure: 0.8
3. Sufficiently sure: 0.6
4. A little sure: 0.4
5. Don't know: 0.2
6. No: 0

Based on the results of consultations and interviews with experts, the following hypothesis values are obtained:

Table 1.Measles symptom information

No	kode	Gejala Penyakit	Nilai Pakar
1	G01	Demam mencapai 38-40°C	0.8
2	G02	Pilek	0.4
3	G03	Mata merah dan berair	0.2
4	G04	Sakit tenggorokan	0.2
5	G05	Batuk kering	0.2
6	G06	Bintik-bintik putih didalam mulut	0.8
7	G07	Nafsu makan menurun	0.8
8	G08	Muntah-muntah	0.2
9	G09	Bercak merah pada seluruh tubuh	0.8
10	G10	Diare	0.2

Efforts are made to describe the degree of certainty, then this concept is formulated in the basic formula as follows:

$$CF[H,E] = MB[H,E] - MD[H,E]$$

$$CF[H,E]1 = CF[H]*CF[E]$$

$$CFcombine = CF[H,E]1,2 = CF[H,E]1 + CF[H,E]2 * [1-CF[H,E]1]$$

$$CFcombine = CF[H,E]old,3 = CF[H,E]old + CF[H,E]3 * [1-CF[H,E]old]$$

From the rule base above, a certainty factor can be found to determine measles in that rule, then the CF value is calculated by multiplying the CFUser by the CFpakar to be:

$$CF[H,E]1 = CF[H]1 * CF[E]1$$
$$= 0.8 * 0.8$$
$$= 0.64$$
$$CF[H,E]2 = CF[H]2 * CF[E]2$$
$$= 0.4 * 0.6$$
$$= 0.24$$
$$CF[H,E]3 = CF[H]3 * CF[E]3$$
$$= 0.2 * 0.4$$
$$= 0.08$$
$$CF[H,E]4 = CF[H]4 * CF[E]4$$
$$= 0.2 * 0.2$$
$$= 0.04$$
$$CF[H,E]5 = CF[H]5 * CF[E]5$$
$$= 0.2 * 0.2$$
$$= 0.04$$

CF[H,E]6 = CF[H]6 * CF[E]6
= 0.8 * 0.8
= 0.64
CF[H,E]7 = CF[H]7 * CF[E]7
= 0.8 * 0.6
= 0.48
CF[H,E]8 = CF[H]8 * CF[E]8
= 0.2 * 0.4
= 0.08
CF[H,E]9 = CF[H]9 * CF[E]9
= 0.8 * 1
= 0.8
CF[H,E]10 = CF[H]10 * CF[E]10
= 0.2 * 0.6
= 0.12

The final step is to combine the CF values of each rule. Here is a combine CF[H,E]1 with CF[H,E]2 :

CFcombine = CF[H,E]1,2 = CF[H,E]1 + CF[H,E]2 * [1-CF[H,E]1]
= 0.64 + 0.24 * (1-0.64)
= 0.72old
CFcombine = CF[H,E]old,3 = CF[H,E]old + CF[H,E]3 * [1-CF[H,E]old]
= 0.72 + 0.08 *(1-0.72)
= 0.74 old2
CFcombine = CF[H,E]old2,4 = CF[H,E]old2 + CF[H,E]4 * [1-CF[H,E]old2]
= 0.74 + 0.04 *(1-0.74)
= 0.75 old3
CFcombine = CF[H,E]old3,5 = CF[H,E]old3 + CF[H,E]5 * [1-CF[H,E]old3]
= 0.75 + 0.04 * (1-0.75)
= 0.76 old4
CFcombine = CF[H,E]old4,6 = CF[H,E]old 4+ CF[H,E]6 * [1-CF[H,E]old4]
= 0.76 + 0. 64 * (1-0.76)
= 0.91 old5
CFcombine = CF[H,E]old5,7 = CF[H,E]old5 + CF[H,E]7 * [1-CF[H,E]old5]
= 0.91 + 0.48 * (1-0.91)
= 0.95 old6
CFcombine = CF[H,E]old6,8 = CF[H,E]old6 + CF[H,E]8 * [1-CF[H,E]old6]
= 0.95 + 0.08 * (1-0.95)
= 0.95 old7
CFcombine = CF[H,E]old7,9 = CF[H,E]old7 + CF[H,E]9 * [1-CF[H,E]old7]
= 0.95 + 0.8 * (1-0.95)
= 0.99 old8
CFcombine = CF[H,E]old8,10 = CF[H,E]old8 + CF[H,E]10 * [1-CF[H,E]old8]
= 0.99 + 0.12 *(1-0.99)
= 0.99 old9
$CF[H,E]_{old}$ * 100 = 0.99 * 100% = 99%

Thus it can be said that the calculation of certainty factors in measles has a 99% confidence level.

4. CONCLUSION

The certainty factor method can help create an expert system for early detection of measles. Representation of expert knowledge based on user-entered symptoms. By using VB.net 2008 and MySql programming as database, this application program is able to overcome the problem of early detection of measles with certainty factor methods.

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