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Expert System for Diagnoses New Castle Disease in Kacer Bird Using Certainty Factor Method

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ABSTRACT

Newcastle Disease in Kacer Birds one of the causes of death largest in Kacer Birds. Affected Newcastle Disease in Kacer Birds will experience some strange things such as, bird's head the Kacer Birds shakes left and right, the bird is circling, the wings of the Kacer Birds seem to descend, the body trembles, it is often difficult to breathe, birds like coughing, and decreased appetite. Breeders often mishandle the diseases suffered by birds Kacer Birds. The process of diagnosing the type of disease that birds suffer from Kacer Birds should have been done by an expert in his field. To facilitate the process of diagnosing Newcastle Disease in Kacer Birds, an expert system program was created using the certainty factor method as a method in diagnosing Newcastle Disease in Kacer Birds. The expert systems used to detect damage or diagnose a disease whose symptoms have a possible value or weight obtained from the expert. The results obtained from this expert system application are in the form of reports on the results of diagnosing Newcastle Disease in Kacer Birds which can help farmers in diagnosing Newcastle Disease appropriately. So, with this expert system, it can convince breeders to provide handling to Kacer Birds.

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1. Introduction

Newcastle Disease (ND) [1] is a disease that attacks the nerves, digestion, and respiratory tract of birds. Newcastle Disease is caused by the Newcastle Disease virus [2]. Newcastle Disease in Kacer Birds one of the causes of death largest in Kacer Birds. Affected Newcastle Disease in Kacer Birds will experience some strange things such as, bird's head the Kacer Birds shakes left and right, the bird is circling, the wings of the Kacer Birds seem to descend, the body trembles, it is often difficult to breathe, birds like coughing, and decreased appetite

The virus can snake throughfood, drink, air, cage fixtures and direct touch. Kacer birds affected by Newcastle disease will experience some strange things such as, the head of the Kacer birds often shakes left and right, the bird is circling, the wings of the Kacer birds appear to be down, the body trembles, it is often difficult to breathe,the bird like coughing, and decreased appetite.

Prevention and treatment of the Kacer birds in case of Newcastle disease, by maintaining the cleanliness of the cage every day, always give new drinking water, provide nutritious and clean feed. Treatment of Kacer Birds affected by Newcastle Diseaseby isolating the sick Kacer bird to be away from other Kacer Birds [3].

The method used in this research is the Certainty Factor (CF) Method. This method can solve the problem of disease in kacer birds by determining the type of disease with an accuracy level of determining the disease. Determination of accuracy in question is the level of accuracy of a disease that is infected in the kacer bird. [4] [5]. The expert in question is a person who has special skills and can solve problems that ordinary people cannot solve [6, 7]

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2. Method

An expert system is also a computer system that functions to match or resemble the ability to make decisions from an expert or experts. The expert system consists of 2 main components, namely a knowledge base that contains knowledge and an intelligence machine that projects conclusions [8]. Artificial intelligence systems can do various jobs such as and as well as those done by humans even capable of being better than those done by humans themselves, buatan intelligence systems can have various forms, namely, robotics systems, natural language systems, visual systems, sound systems, expert systems and comprehension systems [9].

The expert system is created with the aim of being able to solve a problem that is quite complicated and can only be solved by an expert / expert. The creation of an expert system is not to replace the experts themselves but rather an expert system that is made to be used as an experienced assistant [10]. The implementation of an expert system into a computer, canproduce several benefits such as accuracy, speed, and can be accessed at any time so as to ease the task of experts in their fields. The expert system is seen as a way of storing the knowledge of experts in a particular field in the field of computer [11] .

2.1 Certainty Facto

Certainty Factor (CF) was put forward by Shortliffe and Buchanan in 1975 to accommodate the uncertainty of an expert's Inexact reasoning. An expert, (e.g. a doctor often analyzes information that ada with expressions such as "maybe", "most likely", "almost certainly" [12]. To accommodate this using Certainty Factor (CF) to describe the level of confidence expert on the problem at hand, this method is perfect for expert systems that diagnose something uncertain [13] [14]. The 'Net Belief' Method Proposed By E.H Shortliffe And B.G Buchanan [15].

$$MB\ (H,E) = (Max[P(H|E), P(H)] - P(H) \quad \text{.....1}$$

$$Max\ [1,0] - P(H)$$

$$D\ (H,E) = (Min[P(H|E), P(H)] - P(H) \quad 2$$

$$Min[1,0] - P(H)$$

$$CF(rule)=MB(H,E)-MD(H,E) \quad \text{.....3}$$

Where :

CF (Rule) = certainty factor

MB (H,E) = measure of belief (measure of confidence) in hypothesis H, if given evidence E (between 0 and 1)

MD(H,E) = measure of disbelief, (ukuran ketidakpercayaan) terhadap

evidence H, if given evidence E (between 0 and 1) P(H) = probability of correctness of hypothesis H

P(H| E) = probability that H is true due to the fact of E

3. Result and Discussion

3.1 Data Description of the Research

Data description is an effort to display data so that the data can be presented properly and interpreted easily. In determining the diagnosis of Newcastle Disease in Kacer Birds, several types of data were used, including the level of Newcastle Disease, symptoms of the disease, and data on Kacer Birds affected by Newcastle Disease.

Table 1
Level of Newcastle Disease

Disease Code	Disease Name
P01	Mild Disease
P02	Moderate Disease
P03	Severe Disease

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Table 2
Symptoms of Newcastle Disease

No	Symptom Code	Disease Symptoms	Disease Code		
			P01	P02	P03
1.	G1	Birds jam chirping, tend to be silent uncharacteristically.	*		
2.	G2	Lethargic birds	*		
3.	G3	Disturbed/ irregular breathing of birds	*		
4.	G4	Birds like cough		*	
5.	G5	At night the breath is slitting			*
6.	G6	Birds are always thirsty so that drinking continuously accompanied by reduced appetite			*
7.	G7	The condition of the silent bird trembles irregularly			*
8.	G8	The plumage of the upper bird's head stands			*
9.	G9	Birds acting strangely and circling			*
10.	G10	Bird droppings are green with or without lenders			*

Table 3
Historical Data of Kacer Birds Affected by Newcastle Disease

No	Code Bird	Symptom										Name Disease
		G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	
1	MR-1							*	*	*	*	Severe Desease
2	MR-2	*	*		*		*			*		Mild Disease
3	MR-3	*		*	*		*					Mild Disease
4	MR-4		*	*						*		Mild Disease
5	MR-5	*			*		*		*	*		Moderate Disease
6	MR-6	*		*	*	*	*					Moderate Disease
7	MR-7		*			*	*	*		*		Severe Desease
8	MR-8	*	*	*	*		*					Mild Disease
9	MR-9	*			*	*		*				Moderate Disease
10	MR-10	*	*		*		*					Mild Disease
11	MR-11	*	*	*		*	*	*				Mild Disease
12	MR-12				*		*			*		Moderate Disease
13	MR-13	*	*		*					*		Mild Disease
14	MR-14	*				*	*					Moderate Disease
15	MR-15		*	*	*		*	*		*		Moderate Disease
16	MR-16	*			*		*			*		Moderate Disease
17	MR-17			*	*		*	*				Moderate Disease
18	MR-18	*	*				.			*	*	Severe Desease
19	MR-			*	*			*			*	Moderate

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	19													Disease
20	MR-20					*							*	Moderate Disease
21	MR-21	*												Mild Disease
22	MR-22	*	*			*	*	*	*			*			Moderate Disease
23	MR-23	*				*	*	*				*	*		Moderate Disease
24	MR-24	*	*			*		*			*		*		Severe Desease
25	MR-25						*					*			Moderate Disease
26	MR-26	*	*			*		*	*		*	*			Moderate Disease
27	MR-27	*	*			*	*	*				*			Moderate Disease
28	MR-28	*		*	*			*		*			*	*	Severe Disease
29	MR-29	*		*	*	*		*			*			*	Mild Disease
30	MR-30	*				*	*	.		*				.	Moderate Disease
31	MR-31			*		*		*		*				*	Severe Disease
32	MR-32	*		*				*				*		*	Severe Desease
33	MR-33	*				*		*							Moderate Disease
34	MR-34	*		*		*		*		*					Mild Disease
35	MR-35	*		*		*		*		*		*			Mild Disease
36	MR-36			*			*	*				*			Severe Desease
37	MR-37	*					*	*		*					Moderate Disease
38	MR-38							*			*	*			Severe Desease
39	MR-39			*			*			*				*	Severe Desease
40	MR-40	*						*			*			*	Severe Desease
41	MR-41						*	*							Moderate Disease
42	MR-42					*		*		*				*	Severe Disease
43	MR-43			*		*					*	*		*	Severe Disease
44	MR-44	*				*	*	*				*			Moderate Disease

The weight value (*Probability)* obtained from the number of symptoms divided by the total symptoms. Then the weight is obtained by the following probability formula [5].

$$P(E) = X/N \quad \text{..... 4}$$

P1 = Mild Disease

G1 = 30/50
= 0.6

G2 = 25/50
= 0.5

G3 = 10/50

P2 = Moderate Disease

G4 = 30/50
= 0.6

G5 = 15/50
= 0.3

G6 = 35/50
= 0.7

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= 0.2

P3 = Severe Disease

G7 = 20/50
= 0.4

G8 = 10/50
= 0.2

G9 = 25/50
= 0.5

G10 = 15/50
= 0.3

From the calculation process above, the probability value of each symptom is obtained based on the type of disease. Here is a table of probability values of each symptom by type of disease.

Table 3
Probability Values

Code Disease	Name Disease	Disease Symptoms	Weight
P1	Mild Disease	Birds jam chirping, tend to be quiet unlike usually.	0.6
		Birds seem lethargic	0.5
		Disturbed/ irregular breathing of birds	0.2
P2	Moderate Disease	Birds like cough	0.6
		At night the breath is slitting	0.3
		Birds like always thirsty so drink constantly continuously accompanied by reduced appetite	0.2
P3	Severe Disease	The condition of the silent bird trembles irregularly	0.4
		The plumage of the upper bird's head stands	0.5
		Birds acting strangely and circling	0.2
		Bird droppings are green with or without lenders	0.7

A bird (MR01) experiences symptoms from Newcastle Disease then here are 10 choices of symptoms that are in the Kacer Bird.

Table 4
Consultation

Symptom Code	Symptom-Based Questions	Answer
G1	Birds jam chirping, tend to be silent uncharacteristically.	No
G2	Birds seem lethargic	No
G3	Disturbed/ irregular breathing of birds	No
G4	Birds like cough	No
G5	At night the breath is slitting	No
G6	Birds are always thirsty so that drinking continuously accompanied by reduced appetite	Yes
G7	The condition of the silent bird trembles irregularly	Yes
G8	The plumage of the upper bird's head stands	Yes
G9	Birds acting strangely and circling	Yes
G10	Bird droppings are green with or without lenders	Yes

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Table 5.
Determination of Patient Weight Value

No	Information	Value
1	Do not	0
2	Not Sure	0.2
3	Less Sure	0.4
4	Pretty Sure	0.6
5	Believe	0.8
6	Very Sure	1

3.2 Troubleshooting Using the CERTAINTY FACTOR Method

There are 2 stages carried out in making a system that will be used in solving the problem of Newcastle Disease, namely:

a. Determine the value of the certainty factor on each problem and the value of the certainty factor of the patient's answer.
b. Carry out the process of calculating certainty factor.

3.3 Determine the value of the certainty factor on each problem and the value of the certainty factor of the patient's answer.

Table 7
Value data dialog certainty factor user

Symptom Code	Answer	Weight
G1	No	0
G2	No	0
G3	No	0
G4	No	0
G5	No	0
G6	No	0
G7	Yes	0,4
G8	Yes	0,5
G9	Yes	0,2
G10	Yes	0,7

3.5 Carry Out The Process Of Calculating Certainty Factor

The next step is to combine *the* Certainty Factor value of each rule.

$CF_{Combine}\ CF[H,E]_{7,8} = CF[H,E]_1 + CF[H,E]_2 * (1 - CF[H,E]_1)$
= 0.4 + 0.5 x (1-0.4)
= 0.4 + 0.3
= 0.7 … old1
$CF_{Combine}\ CF[H,E]_{7,9} = CF[H,E]old_1 + CF[H,E]_3 * (1 - CF[H,E]old_1)$
= 0.7 + 0.2 x (1-0.7)
= 0.76 … old2
$CF_{Combine}\ CF[H,E]_{9,10} = CF[H,E]old_2 + CF[H,E]_4 * (1 - CF[H,E]old_2)$
= 0.76 + 0.7 x (1- 0.76)
= 0.76 + 0.168
= 0.928 … old3

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$CF_{Combine}\ CF[H, E]Old_3$ x 100%
= 0.928 x 100%
= 92.8%

4. Conclusion

From the calculation results above using the certainty factor method, it can be seen that the level of confidence from the results of the diagnosis of Newcastle Disease (ND) in the first stone Magpie (MR01) is believed to suffer from severe disease with a percentage rate of 92.8%, so the Kacer Bird (MR01) is affected by Severe Disease.

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