APPLICATION OF CERTAINTY FACTOR METHOD TO WEB-BASED EXPERT SYSTEM FOR CHICKEN DISEASE DIAGNOSIS

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ABSTRACT

This research aims to design an expert system to diagnose diseases in chickens. This system is designed to assist farmers in identifying diseases in chickens accurately and quickly. This expert system was built using the Certainty Factor method. Chicken disease data is collected from trusted sources, and rules are made to support the diagnostic process. This application is used to assist users in identifying chicken diseases based on the symptoms they input. This expert system is tested to see its ability to provide accurate and useful diagnosis for users. Therefore, this expert system of chicken disease diagnosis can be a useful solution in the field of animal husbandry.

Keywords: *Disease, Chicken, Expert System, Certainty Factor, Application*

1. INTRODUCTION

Indonesian chicken products have better market opportunities because they have characteristics that can be accepted by all levels of society; chicken meat is considered to contain lower cholesterol; and the price of chicken meat is relatively cheaper (compared to beef or goat meat) with easy access [1]. Which are easily available as they are spread across the country. That's why many people make chicken farming their business. To get good-quality and profitable chickens, breeders must know how to raise and care for chickens so they don't get sick [1]. The completeness of nutrition in the body of chickens greatly affects performance and is closely related to their health. Some chicken diseases have an economic impact because they can reduce the quality of good chickens, causing losses for farmers [2].

The main problem and toughest challenge in chicken farming is disease outbreaks, so management must be carried out efficiently and professionally. However, farmers usually only know the symptoms that occur in sick chickens without knowing what disease they are suffering from [2]. There are minimal veterinarians, and it takes a long time to treat chickens because the cages are far away.

Based on this, this problem can be solved with an expert system. An expert system is a computational system that uses information, facts, and reasoning techniques to solve problems that can usually only be solved by an expert in a particular field [3]. Therefore, an expert system was developed to diagnose diseases in chickens using the web-based Certain Factor Method, so that it can be accessed by chicken farmers online and can help chicken farmers easily diagnose diseases in chickens. This expert system is also expected to replace the role of an expert in treating chicken diseases [4].

2. METHODOLOGY

2.1. Expert System

An expert system is a computer program designed to make decisions made by an expert. When created, expert systems link rules of reasoning to the specific knowledge base of one or more experts in a particular field [5]. The main

purpose of an expert system is not to replace an expert's position but only to disseminate expert knowledge and experience [6]. The following is the definition of an expert system according to experts, among others:

1. An expert system is generally a system designed to inject human knowledge into a computer in order to solve problems that are often solved by experts.
2. An expert is someone who has specialist knowledge in a particular field, so an expert has special abilities and skills that are not known or not realized by other people in their field.
3. An expert system is a computer program that uses information, facts, and reasoning techniques to solve problems that can only be solved by an expert in the field [7].

2.2. Certainty Factor Method

The security factor is a way to get certainty from information. The combined level of confidence and mistrust is usually expressed by a single data value [8]. An expert, such as a farmer, can analyze existing data to gain certainty or uncertainty from the data. Implementation is done through devices such as computers, notebooks, and others. Disease diagnosis is usually done to help users treat and detect diseases early [9].

The certainty factor formula is defined as the following equation (1) :

CF[H.E] = MB[H,E] – MD[H,E] (1)

Equation Description 1:

CF = Certainty Factor in hypothesis H which is influenced by fact E.
MB = Measure of Belief (level of belief), is a measure of the increase in the confidence in hypothesis H influenced by fact E.
MD = Measure of Disbelief (level of disbelief), is the increase in distrust of hypothesis H influenced by fact E.
E = Evidence (events or facts).
H = hypothesis (guess).

Meanwhile, to calculate CF values that have more than 1 symptom by combining two or more rules, each of them produces the same conclusion but the uncertainty factor is different[10]. it is necessary to prove the combination with the following equation (2):

CFcombine(CF1, CF2) = CF1 + CF2 * (1-CF1) (2)

Equation Description 2 :

CFcombine = Certainty Factor combination.
CF1 = Certainty Factor for symptom 1.
CF1 = Certainty Factor for symptom 2.
CF1,CF2 = Certainty Factor value for symptoms 1 and 2.

Table 1. Disease Table

Disease ID	Disease Name
P01	Pullorum Disease
P02	Fowl Cholera
P03	Bird Flu (Avian Influenza)
P04	Tetelo (Newcastle Disease)
P05	Fowl Typhoid
P06	Coccidosis
P07	Infectious Bursal Disease
P08	Infectious Coryza
P09	Infectious Bronchitis
P10	Lymphoid Leukosis

Table 2. Disease Symptoms Table

Disease ID	Disease Symptoms Name
GP01	Decreased appetite
GP02	Shortness of breath / gasping
GP03	Wet snoring breath
GP04	Sneezes
GP05	Cough
GP06	Pale eggshell
GP07	Dull and wrinkled fur
GP08	Diarrhea
GP09	Egg production decreases
GP10	Freezing

Table 3. Evidence Value

Uncertainty Term	CF
Definitely Yes	1.0
Almost Certain	0.8
Most likely	0.6
Maybe	0.4
Almost Maybe	0.2
Don't Know or Not Sure	0.0

2.3. Disease Data

In this study, disease data was used as input to an expert system which would later be used to diagnose disease in chickens. The Disease Table contains 10 facts about chicken disease, where each disease has an ID. The main function of this table is to inform the reader about an example of chicken disease.

Contagious conditions are conditions caused by organisms such as bacteria, contagions, fungi, or freeloaders. Multitudinous organisms live in and on funk bodies. They're generally innocuous or, indeed, helpful. But under certain conditions, some organisms may cause complaints. Funk have a multitudinous variant of symptoms associated with the complaint.

In disease diagnosis, the expert system in chickens in the number of eggs produced is a percentage disease by way of processing in machine inference by calculating the value of evidence from questions obtained from the multiplication of values rule a symptom.

2.4. Flowchart

A flowchart is a set of symbols that show or describe a series of program activities from start to finish, so that you can see how the program runs from the start of the program until the program is finished processing [11]

2.4.1. User Flowchart

The user flowchart design flow is shown in Figure 1.

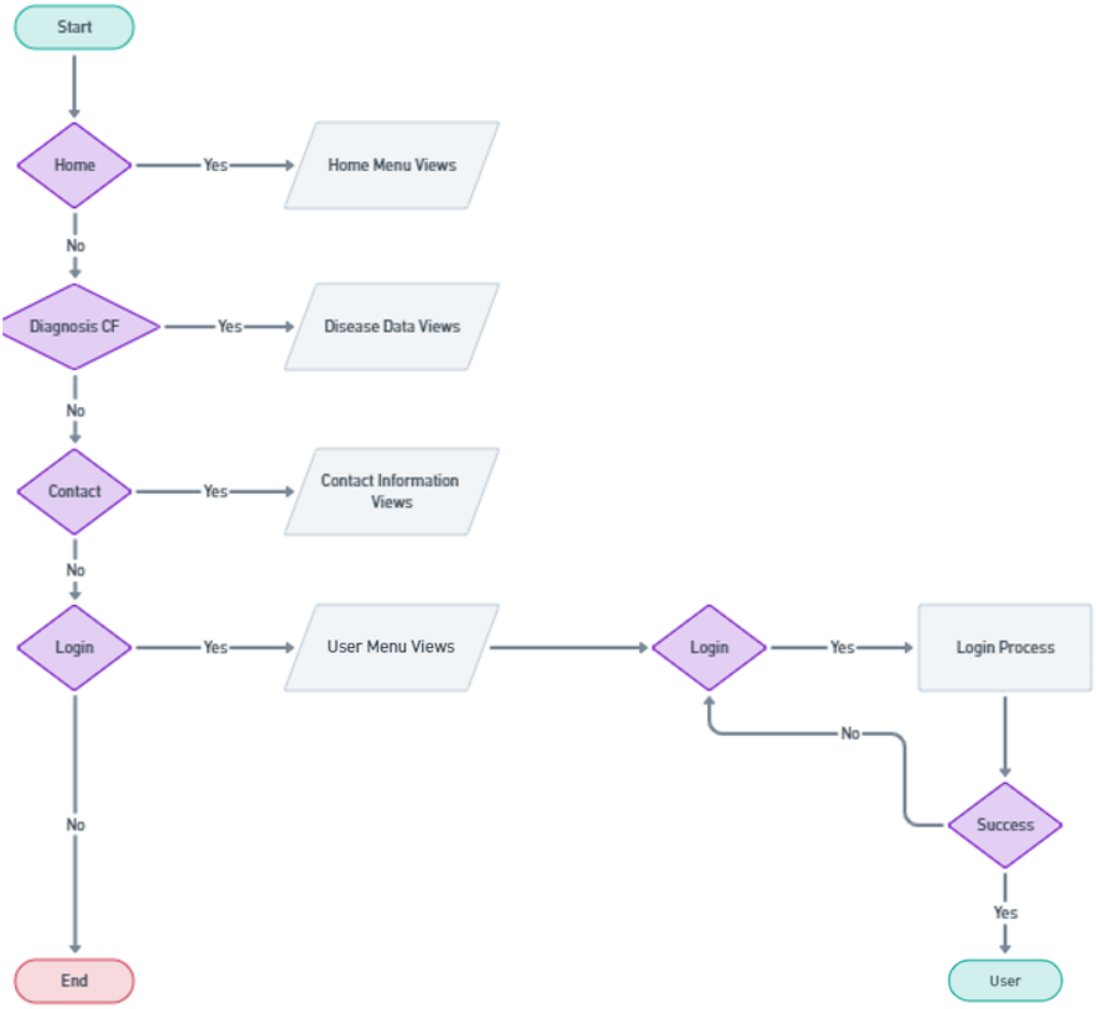

Figure 1. User Flowchart

This user flowchart begins with a home page containing a welcome greeting. Furthermore, in the process of diagnosing diseases in chickens, which contains a symptom diagnosis table, the user will select existing symptoms, which will then be processed according to the rules in the system. After processing is complete, information will appear on the results of the diagnosis of chicken diseases based on the selected symptoms

2.4.2. Admin Flowchart

The flow of the admin flowchart is shown in Figure 2. After the admin performs the login process with the username and password, the admin immediately enters the admin home page. After that, the admin can directly access the data, add data, edit data, and delete data on the Disease Diagnosis page, Symptoms page, and Solutions page. On the Diagnostics page, the system will display the names of chicken diseases. Furthermore, on the Symptoms page, the system will display the names of symptoms of chicken diseases and questions for each symptom that is present. On the Solutions page, the system will also display solution data for the prevention of disease symptoms. Then, in the last process, the administrator logs out to return to the user page.

3. RESULTS AND DISCUSSION

3.1. Implementation

The implementation stage is the application of the results of the system design that has been prepared beforehand into an application that is ready to run. Implementation of the development of an expert system for diagnosing diseases in chickens using the certainty factor method makes it easier for farmers and experts to determine diseases that attack chicken livestock [12].

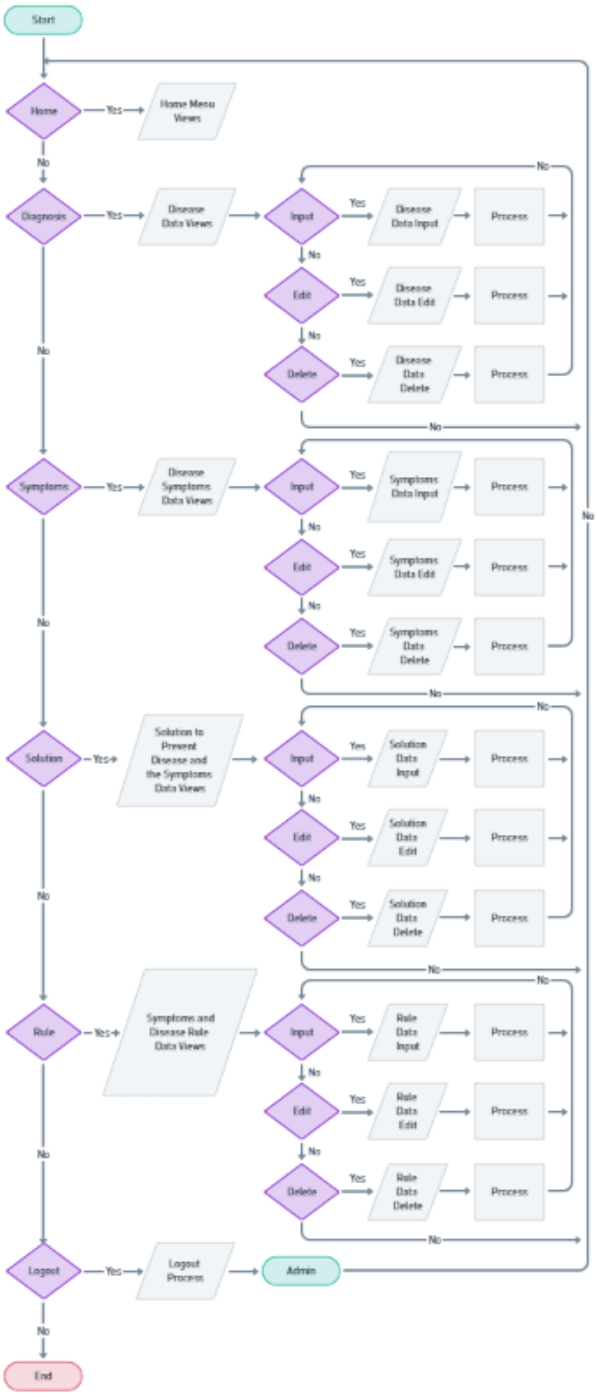

Figure 2. Admin Flowchart

3.2. Diagnosis / Consultation

In the diagnosis/consultation section, the user is used to identify diseases in chickens, by selecting symptoms. Can be seen in table 4.

The code shows the Unique ID of the Symptom Data so that it can be used for Expert calculations later. Then in the condition column, the input that must be carried out by the user is in the form of a certainty value for the symptoms suffered by the chicken[13].

Table 4. Diagnosis / Consultation Table

No	Code	Symptoms	Condition
1.	G001	Decreased appetite	Definitely Yes
2.	G002	Shortness of breath / gasping	Almost Certain
3.	G003	Wet snoring breath	Almost Certain
4.	G004	Sneezes	Definitely Yes
5.	G005	Cough	Maybe

Table 5. Diagnosis

Symptoms	MB	MD	Result
Decreased appetite	0.4	0.2	0.2
Shortness of breath / gasping	0.4	0.2	0.2
Wet snoring breath	1.0	0.2	0.8
Sneezes	0.8	0.2	0.6
Cough	1.0	0.0	1.0

3.3. Diagnosis / Consultation Result

CF(Expert) = MB – MD

MB : The measure of increased belief (measure of increased belief) MD : The measure of increased disbelief (measure of increased disbelief).

Example:

If your confidence (MB) for the symptoms of vaginal discharge for lime diarrhea is 0.8 (almost certain)

And your distrust (MD) of the symptoms of Diarrhea is whitish for Lime Defecation is 0.2 (Almost Likely)

Then: CF(Expert) = MB – MD (0.8 - 0.2) = 0.6

Where is your certainty value for the symptoms of whitish Diarrhea for Lime Defecation disease is 0.6 (Most Likely)

Diagnostic results obtained show that chickens suffer from Newcastle Disease at 0.73% (0.7312). Newcastle Disease is also called Pseudovogel pest Rhaniket, Pheumoencephalitis, Tortor Furrens, and in Indonesia it is popularly known as tetelo [14]. This disease was first discovered by Doyle in 1927 in the area of Newcastle on Tyne, England. Vaccination must be done to obtain immunity. The type of vaccine we use is ND Lasota, which we bought from PT. We do the first ND vaccination by administering it through eye drops on day 2. For the next vaccine administration, we do it by intramuscular injection in the chest muscle [15].

4. CONCLUSIONS AND SUGGESTIONS

4.1 Conclusions

Based on the design of an expert system for diagnosing diseases in chickens using the course factor method that has been carried out, the authors draw several conclusions: this system can provide information to chicken farmers about diseases in chickens based on symptoms that arise due to disease attacks, and this system can also display treatment solutions for chickens that are being attacked by disease and display the presentation value of the course factor method.

Based on the results of testing the manual calculation process, the value of the course factor for six diseases with 31 symptoms resulted in an error of 0%. So for a comparison of the results of the calculation of the system factor and the manual calculation, the course factor is 100% the same.

The results of testing on users and experts, from 10 users, were that 34% of users strongly agreed, 44% agreed, 18% disagreed, and 4% disagreed. And in testing the experts, the results obtained were a comparison of manual calculations, system calculations, and calculations from experts, where the expert calculation stated that the percentage of 2 diseases with 10 symptoms was 100%, while in the expert system diagnosing chicken diseases, it showed a percentage of 67.744% in gumbro disease with a total of 5 symptoms. And a percentage of 69.706% in Mareks disease with a total of 5 symptoms.

Functionally, this expert system can run well after testing using the Black-Box testing method to carry out tests where the system runs according to expectations or in accordance with the objectives when the expert system for diagnosing diseases in chickens is run.

4.2 Suggestions

The suggestions that need to be developed in the future so that this application is better for users of disease diagnosis applications in chickens using the certainty factor method are the addition of new symptom data and new disease data related to chicken diseases if there is a discovery of a new type of disease. Adding a discussion form as a medium of interaction for users and experts in further system development, this system can be converted into an Android-based expert system for diagnosing chicken diseases and further developed so that the calculations in this expert system become more accurate.

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