

DIAGNOSIS SYSTEM IN CHICKEN DISEASE USING FORWARD CHAINING METHOD

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Abstract

Chickens are animals that are mostly kept by the community both on a large and small scale traditionally. Because the population is large, the disease is also more complex, from mild disease to diseases that can be transmitted to humans so that it can cause death such as bird flu. Diseases in chickens such as Newcastle Disease (ND), Infectious Bronchitis (IB), Gumboro Disease and Flu. Problems about chicken disease faced requires a system to help in diagnosing diseases in chickens. Expert system is a system in which a variety of knowledge comes from an expert so that users can consult. Forward Chaining method is a method of searching or forward-looking where tracking begins with information that da and combine rules to produce an expected conclusion or goal. The study used 9 disease data, 34 symptom data and 20 cases of chicken disease. The results of the accuracy test get a value of 90%. The purpose of this study is: diagnosing chicken disease as a first step to applying artificial intelligence in the medical world, designing and applying systems. Based on the data, it can be concluded that the protyhepe expert system by implementing the Forward Chaining Method can help farmers and chicken owners in diagnosing chicken diseases.

Keywords: Chickens, Expert system, Forward Chaining.

SISTEM DIAGNOSA PADA PENYAKIT AYAM MENGGUNAKAN METODE FORWARD CHAINING

Abstrak

Ayam merupakan hewan yang paling banyak dipelihara masyarakat secara tradisional baik besar maupun skala kecil. Karena populasinya banyak, maka penyakit juga lebih kompleks, dari penyakit yang ringan sampai ke penyakit yang bisa menular kepada manusia sehingga dapat mengakibatkan kematian seperti penyakit flu burung. Penyakit pada ayam contohnya *Newcastle Disease (ND)*, *Infectious Bronchitis (IB)*, *Gumboro Disease* dan *Flu*. Permasalahan tentang penyakit ayam yang dihadapi diperlukan sebuah sistem untuk membantu dalam mendiagnosa penyakit pada ayam. Sistem pakar merupakan sistem yang didalamnya dimasukkan pengetahuan yang berasal dari seorang ahli sehingga *user* dapat melakukan konsultasi. Metode *Forward Chaining* merupakan metode pencarian atau runut maju ke depan. Penelitian ini menggunakan 9 data penyakit, 34 data gejala dan 20 kasus penyakit ayam. Hasil pengujian akurasi mendapatkan nilai sebesar 90%. Tujuan penelitian ini adalah: mendiagnosa penyakit ayam. Berdasarkan hasil pengetahuan, bahwa sistem pakar dengan mengimplementasikan Metode *Forward Chaining* dapat membantu peternak serta pemilik ayam dalam melakukan diagnose penyakit ayam.

Kata kunci: Ayam, Forward Chaining, Sistem pakar.

1. INTRODUCTION

The development of technology today is undergoing many very rapid changes, along with the increasing and complex human needs. For example, computers that can be utilized in different fields such as Business, Health, Education, Psychology

and so on. Health is a valuable thing for all living things, not least by chickens.[1]. Artificial intelligence is often used in medical applications as a complementary solution to find solutions to medical problems. [2]

Chickens are the most widely kept animals in traditional both large and small scale. Because of its large population, the accompanying diseases are also increasingly complex, from mild diseases to sicknesses that can be transmitted to humans and result in death such as avian influenza. However, the emergence of the problem of disease in chickens is allegedly because of the carelessness of breeders who pay less attention to food nutri, cleanliness and so on. Diseases that often infect chickens example Newcastle Disease (ND), Infectious Bronchitis (IB), Gumboro Disease and Flu.[3].

Problems about chicken diseases faced needed the system to help in diagnosing diseases in chickens, according to [4] An expert system is a system that seeks to adopt human knowledge to a computer, in order for a computer to solve a problem as experts are accustomed to. Expert systems are a field of study in artificial intelligence that has existed for decades. [5]

Expert system is a system in which is included various knowledge derived from an expert so that users can consult. One of the methods used in creating expert systems is the Forward Chaining Method[6]. Expert systems can be used to diagnose toddler diseases, for example expert systems to detect chronic lung diseases suffered by infants. [7]

Forward chaining method is the methods in expert systems. [8]. According to Russell and Norvig, the Forward Chaining Method is a search method or forward-looking tracking technique where tracking begins with da information and the incorporation of rules to produce an expected conclusion or goal. [9]. The Forward Chaining technique is appropriate for early determination of the disease by tracking the symptoms suffered. [10]

Research conducted by [11] Using the Forward Chaining Method a method that begins by collecting a number of facts that exist later from the collection of facts eventually results in conclusions.

Based on the background and identification of the above problems, a detailing of the issue can be drawn, namely the need to create a system in order to help the community, especially chicken farmers to get a diagnosis of chicken disease based on the symptoms of the disease. The aim of this study is: diagnosing chicken disease as a first step to applying artificial intelligence in the medical world, designing and applying systems capable of diagnosing chicken disease.

2. RESEARCH METHODS

The forward chaining method is included in the program code to be used for tracing symptom rules so that it can be concluded the disease in chickens. Then proceed with testing of system functionality that has been created with the black box method to test system functionality. Testing of the forward chaining method is also done by comparing with

manual calculations with calculations in the system. The last stage is to implement the system so it tends to be utilized by the community, breeders. [12] Research by [13] diagnosed anemia using the Bayes Theorem Method and obtained a 90% accuracy score. Unlike the research conducted by [9] and [13].

Research conducted by [9]uses the Method of Forward Chaining however, using a different research object, namely a common disease in humans. Research by [9] conducted black box testing and did not get test results in the form of accuracy scores.

In this review, the authors will use the same method of Forward Chaining but using a different research object, namely chicken disease. The author will do the test in the type of accuracy value results.

2.1. Forward Chaining Method

Advanced reasoning methods that can be used in expert systems. In advanced reasoning, the rules are tested one after the other in a particular order. When each standard is tried, the will assess whether the circumstances are correct or wrong. Assuming the circumstances are correct, then the rule is saved then the next rule can be tested. This process will repeat until the entire basis of the rules is tested with various conditions[14].

2.1.1. Knowledge Acquisition

Knowledge acquisition is the activity of finding and collecting data derived from experts.

2.1.2. Representation of Knowledge

2.1.2.1. DFD Planning

Data Flow Diagram (DFD) is a data flow diagram that describes data in processes by the system. Data flow diagrams describe data flow notation in a system.[15]

This context diagram has a process that determines chicken disease with two entities, namely admin and user such as Figure 1.[13]

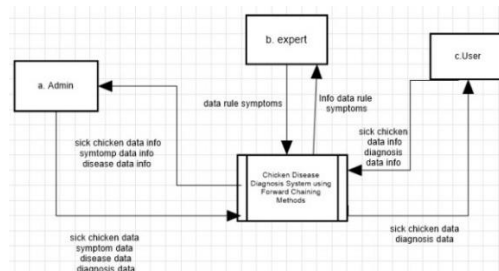


Figure 1. Context Diagram

2.2. Knowledge Base

The knowledge base is at the core of the expert system program because it is a representation of knowledge that stores the basis of rules and data

about chicken diseases. Figure 2 is a decision that is used as a reference in making tree rule decisions.

Symptom	Disease								
	P01	P02	P03	P04	P05	P06	P07	P08	P09
G01	✓								
G02	✓								
G03		✓							
G04		✓							
G05		✓							
G06	✓								
G07		✓			✓				✓
G08		✓				✓	✓		
G09			✓						
G10			✓				✓		
G11			✓						
G12			✓						
G13			✓						
G14				✓			✓	✓	
G15				✓					
G16				✓					
G17				✓					
G18					✓				
G19					✓				
G20						✓			
G21						✓			
G22						✓			
G23						✓			
G24						✓			
G25									
G26									
G27									
G28									
G29									
G30								✓	
G31								✓	
G32									✓
G33							✓		
G34									✓

Figure 2. Table rule decision

Table 1. Disease Table

P01	Avian encephalomyelitis (AE)
P02	Infectious Coryza (SNOT)
P03	Chickenpox
P04	Hellicopter Disease(HD)
P05	Infectious Bursal Disease(IBD)
P06	Chronic Respiratory Disease(CRD)
P07	Colibacillosis
P08	Salmonellosis
P09	Cholera

Table 1 above describes diseases arising from the symptoms shown in table 2 below:

Table 2. Symptom Table

G01	Paralysis
G02	decrease in egg production
G03	puffy eyes
G04	fishy eyes
G05	no appetite
G06	head to neck tremor
G07	dehydration
G08	dull fur
G09	Grayish-colored humpback
G10	respiratory disorders
G11	hump under the airway
G12	there are scabs
G13	blackish color
G14	diarrhea
G15	weak

- G16 abnormal hair growth
- G17 lazy to move
- G18 dirty cloacal area
- G19 peck the cloacal area
- G20 thin body
- G21 breathe open mouth
- G22 stuffy nose
- G23 snoring sound
- G24 mucus in the mouth
- G25 sometimes bloody urine
- G26 vomiting hair clots
- G27 inflamed eyelids
- G28 there is a melting of eye droppings
- G29 there is a nose melt
- G30 swelling of the next eye
- G31 inflammation under the skin
- G32 swollen joints and soles of the feet
- G33 diarrhea is green
- G34 special smelly dilute diarrhea

After creating a tree diagram, the next step is to convert the tree diagram into a rule of production. The method of production rules is usually written in the form of if(if-then). This rule can be said to be a relationship of two-part implications, namely the premise (if) and the conclusion(then) part. If the premise is fulfilled then the conclusion section will also be correct. [14]

Rule 1	IF paralysis AND decrease in egg production then AE
Rule 2	IF head to neck tremor AND decrease in egg production then AE
Rule 3	IF paralysis AND head to neck tremor then AE
Rule 4	IF puffy eyes AND fishy eyes AND no appetite then SNOT
Rule 5	IF fishy eyes AND dehydration then snot
Rule 6	IF fishy eyes AND dull fur then snot
Rule 7	IF Grayish colored humpback AND respiratory disorders then chickenpox
Rule 8	IF hump under the airway AND there are scabs then chickenpox
Rule 9	IF Grayish colored humpback AND blackish color AND there are scabs then chickenpox
Rule 10	IF diarrhea AND weak AND abnormal hair growth then HD
Rule 11	if diarrhea AND lazy to move AND abnormal hair growth then IBD
Rule 12	IF diarrhea AND weak AND lazy to move AND abnormal hair growth then HD
Rule 13	IF dirty cloacal area AND dehydration then IBD
Rule 14	IF dirty cloacal area AND peck the cloacal area then IBD
Rule 15	IF thin body AND dull fur AND breathe open mouth then CRD
Rule 16	IF breathe open mouth AND stuffy nose then CRD
Rule 17	IF mucus in the mouth AND snoring sound then CRD
Rule 18	IF dull fur AND diarrhea is green then cholera
Rule 19	IF diarrhea AND diarrhea is green then cholera
Rule 20	IF respiratory disorders AND diarrhea AND diarrhea is green then cholera
Rule 21	IF diarrhea AND swelling of the next eye AND inflammation under the skin then colibacillosis
Rule 22	IF swollen joints and soles of the feet AND dehydration AND special smelly dilute diarrhea then salmonellosis

Figure 3. Rules IF-Then

2.3. Flowchart Forward Chaining Method

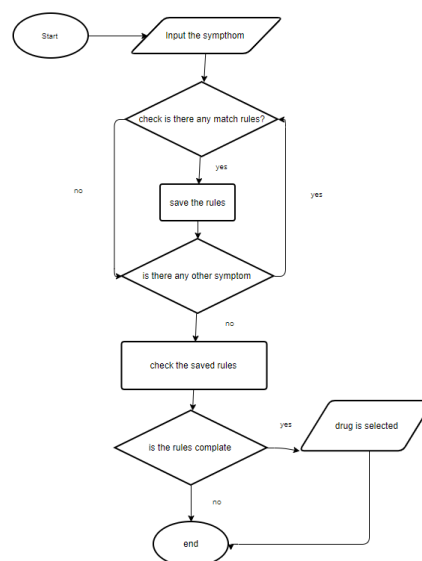


Figure 4. Flowchart Forward Chaining Methods

Forward chaining is a method that based on data or facts leading to the conclusion [16]. The operation of forward chaining starts with input the facts into working memory, then match the fact with known rules [17]. Defining the structure of data control rules written in the structure of If - Then and given a number of rules to distinguish the rules with each other. If the data is match, then the rule is executed and operation stopped when no more rules can be executed [16]. Flowchart of forward chaining method shown in Figure 4.

3. RESULTS AND DISCUSSIONS

3.1. Disease diagnosis results page

Research and prototypes of this expert system were made as one of the auxiliary media to diagnose chicken disease based on the input of disease symptoms. This study uses symptom input based on interviews with experts, namely veterinarians. Expert system to simplify and speed up the diagnosis process needed by chicken owners or chicken farmers.

- a. Insaning the symptoms of the disease
 - Paralysis
 - decrease in egg production

And it can be seen that the symptoms of the disease include rule 1 that get the results of diagnosis of Avian en-cephalomyelitis (AE).

IF paralysis AND decrease in egg production then AE

- b. Input of disease symptoms into the system

Can be seen in figure 5 and figure 6 is an input of symptoms that can be inputted by chicken farmers using the Forward Chaining Method.

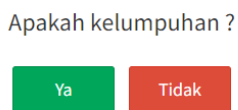


Figure 5. Input of Disease Symptoms

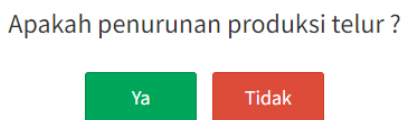


Figure 6. Input of Disease Symptoms

- c. Disease diagnosis results page

In figure 7 is the result of a diagnosis of the disease after inputting the symptoms of chicken disease. on this page there is information about the symptoms of the disease, the rules of the disease, the results of diagnosis and treatment



Figure 7. Disease Diagnosis Results Page

3.2. Testing

a. Accuracy Testing

Accuracy testing is performed to find the percentage of accuracy in the classifier process against the tested data. Accuracy rate calculated using formulas[18]

$$Accuracy = \frac{\sum match}{\sum tp} \cdot 100\% \tag{1}$$

$\sum match$ = the correct number of classifications
 $\sum tp$ = amount of data testing

Conducting other tests by testing 20 cases, after testing, 18 cases were produced. From the test, the amount of accuracy is as follows

$$Accuracy = \frac{\sum match}{\sum tp} \cdot 100\% \\ = \frac{18}{20} \cdot 100\% \\ = 90\%$$

b. Blackbox Testing

After the expert system is successfully built, further testing is carried out with a black box to test the functionality of the system. Based on tests conducted with trials of the system involving prospective users, including chicken farmers, animal health extension and animal experts, all functions on the system have functioned in accordance with the expected so that it can be used by the user. The black box tests that have been done are presented in the conclusions on table 3.

Table 3. Black Box Test Results

No	Input	Expected Results	Output	Conclusion
1	Login	The system can log in to the system	Get into the system	Succesfully
2	Symptom data	The system can store symptom data	Symptom data successfully saved	Succesfully
3	Disease data	The system can store disease data	Disease data successfully stored	Succesfully
4	Data on disease diagnosis results	The system displays the diagnostic results	The diagnosis result was successfully displayed	Succesfully
5	User data	The system displays user data	User data information	Succesfully

4. CONCLUSION

Based on the results of research that has been done, it can be concluded that the expert system prototype by implementing the Forward Chaining Method that can help farmers and chicken owners in diagnosing disease results. The study used 20 case data. The results of the accuracy test get a value of 90%.

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