Web Based Cattle Disease Expert System Diagnosis with forward Chaining Method

Ahmad Zamsuri, Wenni Syafitri, Muhamad Sadar
Universitas Lancang Kuning, Pekanbaru, 28265, Indonesia
Telp. 0811 753 2015
e-mail : ahmadzamsuri@unilak.ac.id, wenni20@gmail.com, sadarzen@unilak.ac.id

Abstract
Cattle is one of the livestock who have high economic potential, whether for livestock, cattle seed, or even for food stock. Everything that comes from Cattle is a treasure for example the Milk, the Meat, and Cattle-hide. The factor that cause Cattles to die is the spread of disease that could crock up the Cattle's health. So that the Expert system is needed to utilize and analye the Cattle's disease so it could detect the disease without going to the veterinarian. Forward chaining method is one of the correct method in this expert system wherein began with Symptoms to determine the illness. From this matter, we built a web based expert system application on Cattles disease to ease the disease detection and showing the brief information about the Cattles itself.
Keyword: Expert System, Web, Forward Chaining

1. INTRODUCTION

Indonesia has high potential livestock for example dairy cattle and beef cattle, Livestock breeding products are growing and concentrated in the development area of the production center. With large amounts of production, the need for animal protein in Indonesia is increasing with increasing public awareness of the importance of nutritional intake. Therefore, the health of livestock raised by farmers is essential to meet the nutritional needs and in addition to income for the livestock owners themselves. Of the various types of livestock that many reared by rural breeders are Cattles.

This paper discusses the techniques of reasoning, namely problem-solving techniques by presenting problems into the knowledge base, and making reasoning to find solutions. Reasoning to find solutions to livestock is a method of knowledge-based approach, to study and solve problems based on data collected and stored.

Application Cattle disease detection is a useful software for designing an expert system application program, which is able to provide an accurate diagnosis of the likelihood of cattle suffering from disease and how to treat it. By Using Mobile Android breeders can directly send the data- Cattle data to the server so that consumers can see the appropriate criteria of Cattles desired. From the description above, the authors are interested to build an application "Android Based Cattle Disease detection application design using Certainty Factor".

2. Theoritical Basis

The theory of this expert system consists of the definition of expert systems, expert system architecture, Mechanism of inference, explanation facility, comparison of expert system with Conventional system, and inference techniques.

2.1. The Definition of Expert system

Expert systems are computer-based applications that are used to solve problems as the expert thinks. Experts in question here are people who have special skills that can solve problems that

can not be resolved by the layman. For example, the doctor is an expert who is able to diagnose the illness suffered by the patient and can provide the solution of the disease.
Expert system is an artificial intellegence program that combines knowledge base (Knowledge Base) with inference system. This is a high-level specialization software section that seeks to duplicate the function of an expert in one area of expertise. This program acts as an intelligent consultant or advisor in a particular skill environment, as a result of a collection of knowledge that has been collected from several experts. Thus even a layman can tap the expert system to solve various problems that he faced.

2.2 Metode Certainty Factor

Certainty Factor introduced by Shortlife Buchanan in creating of MYCIN. *Certainty Factor* (*CF*) is a clinical parameter that given by MYCIN to show the certainty value. According to Giarrantano dan Riley [2]. *Certainty Factor* defined as:

$$CF(H, E) = MB(H, E) - MD(H, E)$$

Where:
CF (H,E) : *Certainty Factor* from hypotesis H affected by *evidence* E. The magnitude of CF range from -1 to 1. Value -1 shows absolute distrust, whereas 1 shows absolute trust.
MB(H,E) : *Measure of increased belief* to hypotesis H affected by evidence E.
MD(H,E) : *measure of increased disbelief)* to hypotesis H affected by evidence E
By exploring the results of interviews with experts, the value of CF (Rule) obtained from the interpretation of the expert to a specific CF value can be seen in table 2.1 below:

Tabel 1. Value CF Interpretation

Certainty Term	**MD/MB**
Do not know/None	0.2
Maybe	0.4
Most likely	0.6
Most certainly	0.8
Certainly	1.0

(Source : Turban and Frenzel, 1992) [3]

2.3 Cattle

Cattle are livestock as a source of meat, milk, labor and other needs. Cattle produce about 50% of the world's meat needs, 95% of milk needs, and 85% of skin needs. Cattles are from bovide families, such as bison, bull, buffalo (Bubalus), African buffalo (Syncherus) and Anoa.

2.3.1Type of Cattles

The types of cattle that are present in Indonesia today are the original Indonesian cattle and imported cattle. Of the types of cows, each has distinctive properties, both in terms of the outer form (body size, color of feathers) and from the genetic (growth rate). The types of cattle, among others, will be discussed

below:

1) Balinese Cattle
2) Simmental Cattle
3) Limousine Cattle
4) Brahman Cattle

2.3.2 Cattle Disease

The types of Cattle disease that will be discussed is :

1) Brucellosis
2) Infection Bovine Rinotracheitis
3) Johnes's Disease
4) Antrax
5) Mad cow disease
6) Bovine Viral Diarrhea

3. Analysis and Design

3.1 System Analysis

In the theoretical chapter chapter has described expert systems in diagnosing cow disease. In this final project the author will use Forward Chaining and Certainty Factor method, forward chaining is a reasoning that starts from the facts to get a conclusion (Conclusion) from that fact.

The method of certainty factor aims to predict the value of cow disease uncertainty, through reasoning for symptoms experienced by animals, and also with suggestions or information required in connection with the prediction of the diagnosis. So to deal with the uncertainty values in cow disease based on symptoms in this system in conducting the diagnostic process using Certainty Factor (Certainty Factor).

From the analysis of the problems that have been done, the authors can build applications that can perform the diagnosis of cattle disease by transferring the knowledge that experts have into the computer system.

In developing this expert system required knowledge and information obtained from several sources, ie from experts, as well as books about existing cattle disease. So it can solve problems that can not be solved by most people, or can solve problems in a more efficient way. Therefore the scope of the discussion of cattle disease will not deviate from the knowledge of the experts. The system to be built is an expert system-based application to diagnose cow disease in general by using Forward Chaining method. This application aims to help the community or cattle ranchers to be able to make a diagnosis of cow disease and how to treat cattle disease

3.2 Production Rules

Production rules are one of the many forms of knowledge representation Used in the development of expert systems. Representation of knowledge with the rules of production, Basically a rule (rule) in the form of IF-THEN.

The following is a reprentation of expert system application knowledge to diagnose Cattle illness with production rules. The production rules are outlined below:

a. Rule 1
IF High Fever
AND Weak Body
AND Weight Loss
AND Have an abortion
THEN Brucellosis

b. Rule 2
IF Have an abortion
AND Nerve Disorder
AND Reproduction Disorder
AND Diarrhea
AND Death
THEN Infection Bovine Rinotracheitis

c. Rule 3
IF Weight Loss
AND Diarrhea
AND Milk Production Decreased
AND Trembling body
AND Death
THEN Johnes's Disease

d. Rule 4
IF Hard to breathe
AND Death
AND Darker Eyes
AND Depretion
AND Rapid Breathing
AND Increase Pulse Rate
AND Seizure spasm
AND Stagger
AND Out of Saliva
THEN Antrax

e. Rule 5
IF Milk production decreased
AND Fetal infection
AND Respiratory system disorders
AND Decreased Appetite
THEN Mad cow desease

f. Rule 6
IF Diarrhea
AND Death
AND Experiencing appetite decreased
AND Experiencing Blood Out Of The Nose
THEN Bovine Viral Diarrhea

3.3 Model To Calculate Certainty Factor from Rule
There are two stages of the model that are often used to calculate the level of confidence (CF), of a rule is as follows:

3.3.1 By Digging out the results of interviews with experts.

By extracting from the results of interviews with experts, the value of CF (Rule) is derived from the interpretation of the term 'from experts' to the value of MD / MB Specific.

Table 2. Value MD/MB

Certainty Term	Interpretation Value MD/MB
Do not Know/There is no any	0.2
Maybe	0.4
Most likely	0.6
Almost definite	0.8
Certainly	1.0

(Source : Turban and Frenzel, 1992) [3]

3.3.2 Manual calculation of CF Value

Difficulty in writing this final task is the process of determining the value of certainty or certainty factor symptoms of cow disease. Because in the medical field there is no standard provision of cervical disease certainty value. In this study, the determination of certainty factor figures for each of the symptoms of cow disease, the order is based on the main symptoms of the disease to n symptoms. *CF[h,e] = MB[h,e] - MD[h,e]*

With :

CF[h,e] = Certainly Factor
MB[h,e] = Size of Trust to Hypothesis H MD[h,e] = Size of Unbelief The first case example on the main symptoms of Brucellosis disease can be seen in Table 3 Tabel 3. Keputusan Symptoms Disease Brucellosis

Disease	Disease CF Value	Symptoms	Symptoms CF Values
Brucellosis	0.04	High Fever	0.5
		Body Weakness	0.2
		Body Weight Loss	0.3
		Have an Abortion	0.6

Certainty Value On High Fever Symptoms

MB(h,E1) = (CFsymptoms-CFdisease)/(1-CFdisease)
= (0.5-0.04)/(1-0.04)
= 0.46/0.96
= 0.479
MD(h,E1) = (0.04-0.04)/(0-0.04)
= 0
CF(h,E1) = MB(h,E1)-MD(h,E1)

= 0.479 – 0
= 0.479

Value of Certainty In Symptoms of Weak Bodies

MB(h,E2) = (CFsymptoms-CFdisease)/(1-CFdisease)
= (0.2-0.04)/(1-0.04)
= 0.16/0.96
= 0.166
MD(h,E2) = (0.04-0.04)/(0-0.04)
= 0
CF(h,E2) = MB(h,E2)-MD(h,E2)
= 0.479 – 0
= 0.166

Certainty Value On Symptoms Weight Loss

MB(h,E3) = (CFsymptoms-CFdisease)/(1-CFdisease)
= (0.3-0.04)/(1-0.04)
= 0.26/0.96
= 0.270
MD(h,E3) = (0.04-0.04)/(0-0.04)
= 0
CF(h,E3) = MB(h,E3)-MD(h,E3)
= 0.270 – 0
= 0.270

Certainty Value In Symptoms Abortion

MB(h,E4) = (CFsymptoms-CFdisease)/(1-CFdisease)
= (0.6-0.04)/(1-0.04)
= 0.56/0.96
= 0.583
MD(h,E4) = (0.04-0.04)/(0-0.04)
= 0
CF(h,E4) = MB(h,E4)-MD(h,E4)
= 0.583 – 0
= 0.583

CFcombination (CF1, CF2, CF3, CF4) = CF(h,E1)
+ CF(h,E2) + CF(h,E3) + (1-CF(h,E1))
CFkombinasi = 0.479 + 0.166+0.270+0.583+(1-0.479)
= 0.521 * 1.498
= 0.710

Then the calculation value of the formula 4 above shows that the value of certainty Brucellosis cow disease with the level of certainty 0.710. After the process will appear the value of CF, which based on the calculation of MB and MD values of the selected symptoms. And the result of the diagnosis process isCFdisease is 0.710 and

The condition of the degree of CF is **almost certain**

4. Implementation

System implementation phase is a design translation phase based on the results of analysis into a particular programming language and application of software built in the real environment. Adapaun implementation discussion consists of software builder, builder hardware, implementation constraints and interface implementation.
From the description of matters relating to the expert system, then the diagnosis of cow disease by using certainty factor based on this android, so it needs to be implemented with the following explanation:

A. Main Interface

Gambar 1

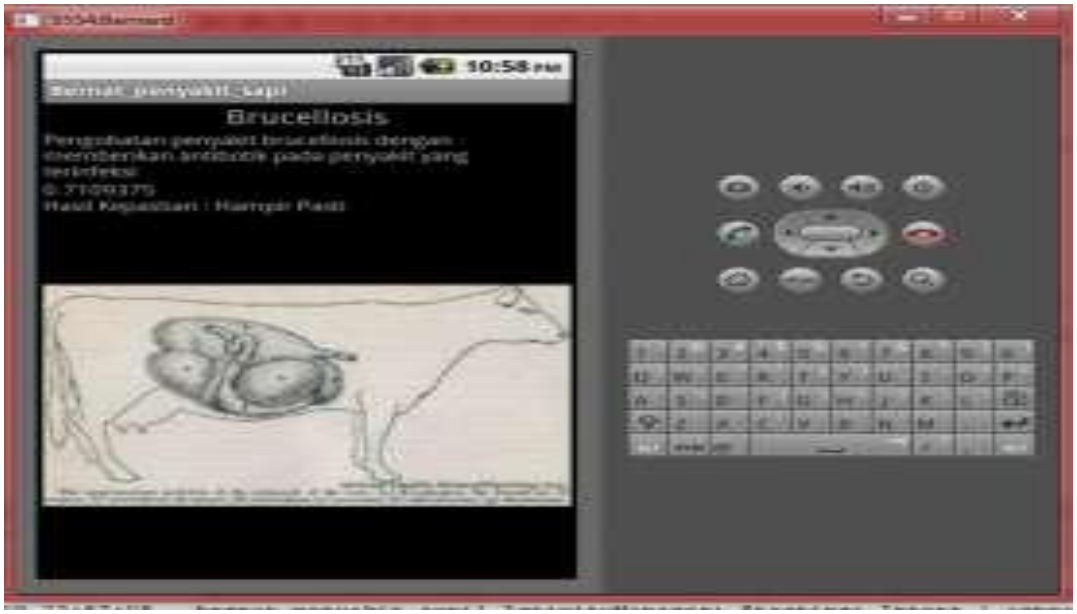
1. Main Interface
This screen explains the forms of cow disease checks, cow disease form and treatment forms, cattle's symptoms formulations and form about.

B. Consulation Interface
This screen is a screen of consultation on the cow disease check form, on the screen of the celebration where the user is asked to answer the questions indicated about the symptoms experienced by the cattle. The Question screen can be seen in Figure 2 below.

Gambar 2. Consultation Interface

C. Consultation Result Interface

On the Screen of the Consultation Result is a screen containing the results of the results of the deaf, based on the user's choice in answering the questions indicated about the symptoms experienced by the farm animals.



Gambar 3. [1] [2] [3] [4] [5] [6] Consumer Results Menu Screen Display

5. Conclusions and recommendations

Conclusion of design result from user Expert systems to diagnose cow disease are:

1) The prototype of this expert system has been completed covering various aspects of cow disease. Rules that have been made have been in accordance with the expert system, expert system prototype is designed to be easily operated by the user (user friendly)
2) Prototype of this expert system has been using forward chaining and certainty factor, which is used as a knowledge base in asking questions to farmers.

Suggestions that can be given for Development of this expert system, in order to be more useful and effective in diagnosing cow disease in android are:

1. The addition of new rules or rules about cow disease on the knowledge base, to improve accuracy in diagnosing.
2. Can be added various kinds of new cow disease, so the type of disease and symptoms disease can update the latest data with automatic update online.

6. Reference

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