

Design and Development of Poultry Disease Classification with Certainty Factor Method

I Gusti Agung Ngurah Panji Palguna^{a1}, Luh Gede Astuti^{a2}

^aInformatics Department, Udayana University
Bali, Indonesia

¹panji_palguna@student.unud.ac.id

²lg.astuti@cs.unud.ac.id

Abstract

Expert systems in organizations aimed at adding value, increasing productivity and managerial areas that can draw conclusions quickly. Like with organizations that conduct livestock business that are very promising but necessary high vigilance against disease as well as highly poultry susceptible to various types of diseases caused by viruses or bacteria. To know the disease quickly made a system that is useful for detecting, so breeders can check their poultry without seeing a veterinarian for early detection. Permanent Veterinarian required for further treatment.

1. Introduction

Expert system is a computer program that contains knowledge from one or more human experts about a specific field. This type of program is the first time developed by researchers of artificial intelligence in the 1960s and 1970s and commercially implemented during the 1980s. The general form of expert system is a program created based on a set of rules that analyzes information (usually given by the user of a system) regarding a class of specific problems and analysis mathematical problem. Depending on the design, an expert system is also capable recommend a series of user actions to be able to implement corrections. This system utilizes the capability of reasoning to reach a conclusion.

Some time ago there was an outbreak of disease in poultry which is very disadvantage to livestock entrepreneurs because not a few of these birds must destroyed, which is caused by an infectious and dangerous disease. Poultry is a type livestock groups of birds that are used for meat or eggs, which consumers are increasing every day. Therefore, this business is an opportunity very good for business. However, in this business disease is one of the risks which is high and must always be faced. Anticipate to prevent and recognize symptoms dangerous diseases are very important. The process of recognizing quickly and precisely from attacks of this type of disease is very difficult because the symptoms are generally similar and appear same. However, there are usually a number of symptoms that are typical for each type of disease poultry, for example in chickens.

The main modules contained in the expert system are (1) Reception module knowledge (knowledge acquisition mode). This module is used to collect knowledge that the system will use to draw conclusions from a problem. This module is intended for experts to input their knowledge into system; 2) Consultation module. This module functions to collect information about the symptoms of the problem being faced by the user, then processed by the system. This module is intended for users to input problems encountered in the system; and 3) Module explanation (explanation mode). This module serves to explain the decisions taken by the system.

2. Research Methods

The research method used is the prototype method. Prototype is a method in developing systems that use approaches to make things the program quickly and gradually so that it can immediately be evaluated by the user. Prototype represent the product model to be built or simulate structure, functionality and operating system. In making prototypes we can apply UCD

(User Centered Design) that is suitable for IT (Technology Information) lay users. Characteristics of UCD (User-Centered Design), namely:

- a. Understanding the user and his needs.
- b. Focus on the user in the early stages of design and evaluate the design results.
- c. Identify, make documentation and agree on the purpose and purpose user experience.
- d. Repetition is almost certain. The designers never succeeded only in one process.

The concept of inference engine is done by using the production rule (if..then) the mechanism is through forward chaining and weight assessment using the Certainty model Factors (CFs). The concept of user intervention and dialogue are developed by making user friendly interface for easy filling of data and facts. Output which presented in the form of information on the confidence value of the type of disease diagnosed with attack, while the validity test of the diagnosis results is compared with experts (breeders). In addition, application development and development are used by PHP and MySQL as language tools in its construction.

Poultry are animals that have wings, two legs, and lay eggs classified as a family of birds (aves). The most developed poultry animal for livestock business is a type of chicken. Chicken livestock have a high profit and potential. In addition to meat and eggs that are always increasing in consumption, chicken is very fast turnaround his business. However, not a few losses experienced by breeders because chickens are vulnerable to exposure disease. Disease in chickens can be caused by viruses, bacteria, inner parasites, outer parasites, and fungi. Various types of diseases caused by bacteria and viruses in chickens (Rasyaf, 2009) are presented in Tables 1 and 2 below.

Nama Penyakit	Nama Latin	Gejala
Gumboro	<i>Gumboro Disease</i>	Nafsu makan berkurang Tampak lesu Mencret keputih-putihan Tidur paruhnya diletakkan di lantai Duduk dengan sikap Membungkuk
Mareks	<i>Mareks Disease</i>	Napas cepat Muka pucat Sempoyongan Kaki pincang Sayap menggantung
Produksi Telur	<i>Egg Drop Syndrome 76</i>	Napas cepat Produksi telur menurun Kualitas telur jelek Mencret kehijau-hijauan

Figure 1. Poultry disease caused by a virus

Nama Penyakit	Nama Latin	Gejala
Tipus Ayam	<i>Fowl Typhoid</i>	<ul style="list-style-type: none"> - Nafsu makan berkurang - Bulu kusam dan mengerut - Diare - Kelihatan ngantuk dan bulu berdiri - Tampak lesu - Mencret kehijau-hijauan
Berak Darah	<i>Coccidiosis</i>	<ul style="list-style-type: none"> - Nafsu makan berkurang - Badan kurus - Bulu kusam dan mengerut - Produksi telur menurun - Mencret bercampur darah - Muka pucat
Salesma Ayam	<i>Infectious Coryza</i>	<ul style="list-style-type: none"> - Bersin-bersin - Produksi telur menurun - Kelopak mata kemerahan - Keluar nanah dari mata dan bau - Pembengkakan dari sinus dan mata

Figure 2. Poultry Diseases caused by Bacteria

Method of Certainty Factors (CFs)

CFs express confidence in events based on events or on expert judgment. There are several methods of using CFs to handle distrust in knowledge-based systems. One way to use 1.0 for absolute trust and 0 for definite errors. CFs are not probabilities, but introduce concepts of trust and distrust. CFs indicate size certainty of a fact.

$$CFs [h, e] = MB [h, e] - MD [h, e]$$

Information:

CFs [h, e] = Certainty factor

MB [h, e] = Size of trust or level of confidence in hypothesis h, if given evidence e (between 0 and 1)

MD [h, e] = Size of distrust or level of confidence in the hypothesis h, if given evidence (between 0 and 1)

3. Result and Discussion

System work flow diagram implemented as follows:

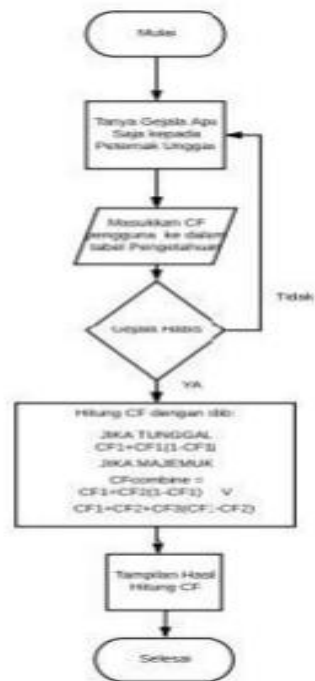


Figure 3. Flowchart of System

No	Nama Penyakit	Nama Latin	Gejala	Bobot
1	Tipas Ayam	<i>Fowl Typhoid</i>	Kulit berangam dan bulu berdat	0.85
			Bulu kusam dan mengkilat	0.4
			Diare	0.4
			Mencoret kehijauan-bijauan	0.4
			Badan kurus	0.25
			Tampak lesu	0.35
2	Berak Darah	<i>Coccidiosis</i>	Nafsu makan berkurang	0.25
			Mencoret bercampur darah	0.9
			Produksi telur menurun	0.5
			Bulu kusam dan mengkilat	0.45
			Muka pucat	0.4
			Badan kurus	0.35
3	Salmonia Ayam	<i>Infectious Coryza</i>	Nafsu makan berkurang	0.35
			Berisa-berisa	0.8
			Pembengkakan dari sinus dan mata	0.7
			Keluar darah dari mata	0.6
			Kelopak mata kemerahan	0.5
			Produksi telur menurun	0.4
4	Gamboro	<i>Circovirus Disease</i>	Diare	0.35
			Nafsu makan berkurang	0.3
			Tidak pernahnya turun ke bawah	0.85
			Didak membongkok	0.7
			Mencoret kepatis-patihan	0.6
			Tampak lesu	0.4
5	Marek	<i>Marek Disease</i>	Bulu kusam dan mengkilat	0.35
			Nafsu makan berkurang	0.2
			Suap menganting	0.8
			Kaki pincang	0.7
			Semprongan	0.6
			Muka pucat	0.4
6	Produksi Telur	<i>Egg Drop Syndrome 76</i>	Napas cepat	0.35
			Badan kurus	0.3
			Nafsu makan berkurang	0.3
			Kualitas telur jelek	0.9
			Produksi telur menurun	0.85
			Mencoret kehijauan-bijauan	0.5
Napas cepat	0.4			

Figure 4. Weight of each symptom and its correlation with disease

As for the user interface section, a menu showing is displayed several types of symptoms can be chosen (Figure 3). Users can determine the symptoms found in poultry. This symptom input is a premise for reasoning will be conducted on a knowledge base with a production rule that has been constructed. On generally, expert systems are developed using the LISP or Prolog language (Tsai et al., 1994). However, along with the development of tools that can be used for expert system development, several tools are already widely available with diversity and convenience offered (winexsys, shell, and so on). Language construction tools used in this study is PHP which is intended for ease in dissemination through the website.

System Implementation

a. Admin page

The Admin page is managed by an Expert in charge of inputting symptoms, knowledge and illness data from observations obtained. Can add, change, and erase symptoms, knowledge, and illness.

Id Gejala	Nama Gejala	Actions
22	Kualitas telur jelek	Add Delete
21	Nafas Cepat	Add Delete
20	Sengapongan	Add Delete
19	Kaki Pincang	Add Delete
18	Sayap Menggantung	Add Delete
17	Mencoret Kaput-palihan	Add Delete
16	Duduk Membungkuk	Add Delete
15	Talar paruhnya turun ke bawah	Add Delete
14	Kelopak Mata Kemerahan	Add Delete
13	Keluar Nanah dari Mata	Add Delete
12	Pembengkakan Siku dan Mata	Add Delete
11	Bermin-bermin	Add Delete

Figure 5. Admin page Symptoms List

Id Pengetahuan	Kode Penyakit	Id Gejala	MB	MD	Actions
38	F	21	0,4	0	Add Delete
37	F	4	0,5	0	Add Delete
36	F	9	0,85	0	Add Delete
35	F	22	0,9	0	Add Delete
34	E	7	0,3	0	Add Delete
33	E	21	0,3	0	Add Delete
32	E	10	0,4	0	Add Delete
31	E	20	0,6	0	Add Delete
28	E	19	0,7	0	Add Delete
27	E	18	0,8	0	Add Delete
26	D	7	0,2	0	Add Delete
25	D	2	0,25	0	Add Delete

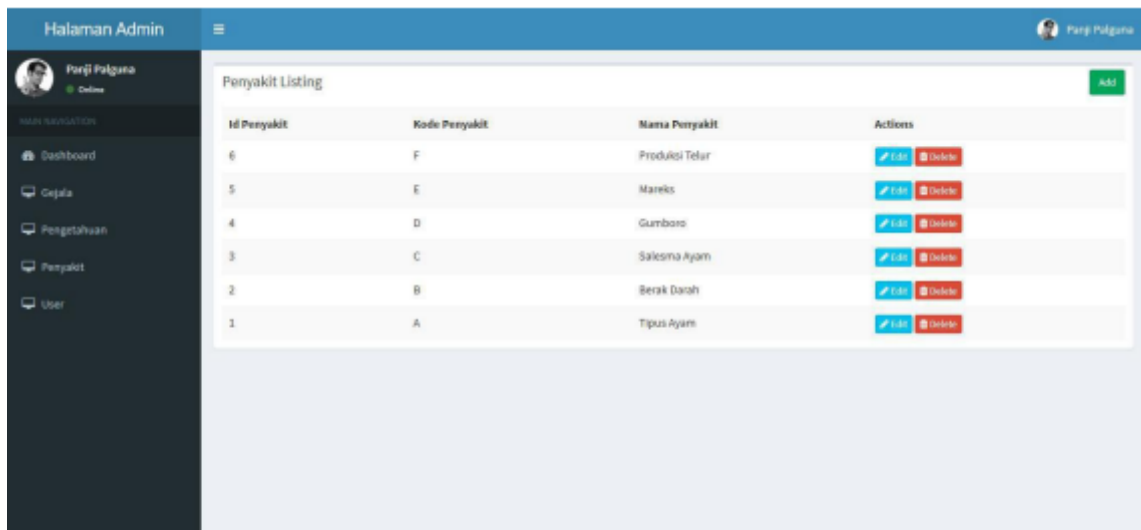
Figure 6. Admin page Knowledge List



The screenshot shows the 'Halaman Admin' interface with a sidebar menu and a main content area titled 'Users Listing'. The table contains the following data:

ID	Password	Username	Email	Name	Photo	Actions
11	S2y5105tjPH3tgrLJLlRgrb3vMNP5kai6vRMEtLb1IK5y4lD69G7P2Ce	wit	wit@gmail.com	Wiantari	default.png	Edit Delete
10	S2y510542gh6Wb8DFgDU7AB0j2lucvDhw3j9dZ7H2QuwCQHwH05vD5	wiantari	wiantari@gmail.com	Ni Wayan Wiantari	default.png	Edit Delete
9	S2y5105m@zDQ5ANvH4K25vFBQcufF0wb75A2qHkacck8uzk2BA28	wahyuguna	wahyuguna@gmail.com	wahyu	default.png	Edit Delete
8	S2y51054tHwKndRmRUd5KMyRluJQ3tEWD6nHuu7Uf4jTY96RmWTFGc	allindrawan	allindrawan@unud.ac.id	All Indrawan	default.png	Edit Delete
5	S2y5105jZ3PnRkglL3H8McWvnywWFEcHmG23Bu7FvVdH5Dk36J0440	niwayanwiantari	wiantari@outlook.co.id	wiantari	default.png	Edit Delete
4	S2y510547sebnESqtaHuzqRISvWuM98RmpuJc65vX883Zhuu70MuJ0q2	parjiPalguna	parji_palguna@outlook.co.id	Parji Palguna	default.png	Edit Delete
3	S2y51056XvHd5n8tghk4tazq9FD84W54gD3H5y8Dy58Q5vmpqjTK0yQs	petankode	info@petankode.com	Petani Kode	default.png	Edit Delete
1	S2y5105HEq2v8E5R5JmY4TfRy4zVc0d3kx70r04y05mU0BxwPQHk	arianta	arianta_pargo@yahoo.co.id	Arianta Pargo	default.png	Edit Delete

Figure 7. Admin page Users List



The screenshot shows the 'Halaman Admin' interface with a sidebar menu and a main content area titled 'Penyakit Listing'. The table contains the following data:

Id Penyakit	Kode Penyakit	Nama Penyakit	Actions
6	F	Produksi Telur	Edit Delete
5	E	Mareks	Edit Delete
4	D	Gumboro	Edit Delete
3	C	Salesna Ayam	Edit Delete
2	B	Berak Darah	Edit Delete
1	A	Tipus Ayam	Edit Delete

Figure 8. Admin Page Disease List

b. Users Page

Farmers can choose symptoms on this page, by selecting symptoms, the system will guess what illnesses suffered by poultry, for further treatment if needed.



Figure 9. Initial Display The User page displays the Login / Register for use the system



Figure 10. List of Symptoms that the User Must Choose



Figure 11. CF Calculation Process



Figure 12. CF Calculation Results

4. Conclusion

Design of Poultry Disease Classification has been built with the Certainty Method Factor. As for the web pages presented there are 2 types, namely admin pages and pages user (user). Admin can add / change knowledge base, symptoms and disease. Users can find out what diseases are suffered by poultry based symptoms obtained, the user can also know the process of calculating the value of certainty factors to get the disease suffered by poultry.

The advantages of implementing an expert system for disease diagnosis very much depends on the results of calculating the level of confidence in supporting the process inference (reasoning)

of data and facts stored in the knowledge base. Method certainty factors can provide accurate results from calculating weights for conclusions resulting diagnosis. The use of CFs is very easy to determine weight given, and calculated based on facts that appear as symptoms which need to be considered in this Cfs method is giving weight values to symptoms caused will affect the amount of conclusions obtained. Not closes the possibility for further development of the Cfs method with a combination of rules more complex so that the complexity of the diagnosis can give more results satisfying

5. Suggestion

The suggestion that I can convey is that this system can be developed for more poultry diseases, because there is an admin page that makes it easy for Experts to manage the knowledge base.

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