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Expert System Diagnosis of Skin Disease in Cat with Forward Chaining Method

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ABSTRACT

An expert system on cat skin is a system that is intended for cat owners in which there are several problems that often occur based on observations of complaints that often occur for cat owners, from these problems I have conducted a research on several doctors to find solutions to some of the problems that I have researched, from the various problems that I have found I propose to create an expert system for skin diseases in cats with a Web-based forward chaining method. This forward chaining method is expected to make it easier for users to find out what skin diseases are being experienced by cats based on the rules that have been applied in the form of choices from various questions that have been presented to the user to achieve the goal in the form of output results (Consultation Results Report). So in the consultation report the user can find out what skin disease is being suffered by the cat and there are also consultation results that encourage the user to follow up for a direct consultation with the doctor.

1. Introduction

It is deeply regretted lack of knowledge about basic ways and techniques of caring for cats which include help first, equipment, techniques for caring for cats and information about the cat to be cared for. Guard environmental cleanliness is often a thing that ignore it for cat nurses because it can makes the cat sick.[1] the difficulties faced by cat owner is a lack of knowledge and awareness about how to care for a cat. Veterinarians can be solution however, to do consultation and treatment no small fee is required. Therefore, it is necessary a system that can help the community in take care of the cat [2]. One of the organs in a cat's body that protects against disease is the skin. Changes in the skin will be a benchmark for health for cats in general and can be used as a sign of a disease in the cat's organs. In accordance with the data taken from the research results [3].

Public understanding of skin diseases in cats is still low. Many people still rely on the expertise of experts manually. So that the cost borne by the community is quite expensive and in terms of time it is also less efficient. Costs for treatment to the veterinarian is very expensive and the presence of veterinarians is still very few.[4] The initial symptoms of skin disease are sometimes not so visible and not so bothersome, therefore sometimes the cat looks fine so the owner doesn't really care. If the skin disease has attacked more than 40% of its body, it can be ascertained that the cat has had a secondary infection.[5]

The health shown in the cat's skin makes the owner not know it and feel like a normal cat. This if done regularly can cause death and even make the cat die. Therefore, cat diseases must be responded to quickly and appropriately by those who own the cat [6].This problem is that the cat owner does not know about the initial diagnosis of the disease on the cat's skin when asked a question by the doctor, and does not know what symptoms the cat is showing. Therefore, a website will be made using the Forward Chaining Method by utilizing a data driven website that will make broad and not deep decisions. The method that starts with a

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collection of facts using rules, and processes up to the goal or not even until the goal and has reasons that are in accordance with the existing facts is the Forward Chaining Method [7].

2. Method

2.1 Forward Chaining

A reasoning that starts based on facts to reach a conclusion [8]. The Expert System must be equipped with a method that can provide or produce an output value for the facts suffered by the patient. One of the methods that can be used is the Forward Chaining method. Forward Chaining is a knowledge search technique that starts from the state of the or facts to then produce a conclusion (conclusion) based on these facts.[9]

2.2 Backward Chaining

Backward tracking that starts the reasoning from the conclusion [8]. Backward chaining is the opposite direction of the forward trace (forward chaining). The search process starts from the goal, namely the conclusion that becomes the solution problems faced. Inference engine looking for rules in the knowledge base whose conclusion is the desired solution achieved, then from the rules that obtained, each conclusion is traced back the path leading to that conclusion.[10]

2.3 Development Model

The e-commerce software development method to be used in. This research is a spiral method. In general, the spiral method has five phases[11].

2.4 Needs Analysis

The author starts with several stages of skin disease problems that often occur in cats. then do research on solutions and handling Then the author designs a website-based expert system that is expected to run well. The software that the author uses in making this website is a PHP Native web script, and bootstrap with a MySQL database.

2.5 Design

the design phase decides how the system will operate in terms of the hardware, software, and network infrastructure that will be in place; user interface, forms, and reports to be used; and the specific programs, databases, and files that will be needed.[12]

2.6 Program Code Generation

The design must first be implemented into the system. The results of this stage are expected by the system in accordance with the design that has been made.

According to the composition of the code, it can be divided into static objects and dynamic objects. Static objects refer to the part of the code that is output directly without changing. This object is usually the target source code that has undergone rigorous testing. Dynamic objects need to introduce special dynamic labels and be customized through variables or functions. When template analysis is driven by the template engine, the object needs to use the data model to complete the dynamic conversion of the dynamic object to the target source code.[13]

2.7 Testing

At this stage, activities are carried out preparation of the initial draft of the model, then conducted a limited trial, and then carried out more extensive trials. The two test activities were carried out in order to produce a design model final which is ready to be validated.[14]

2.8 Maintenance

At this stage the system does not rule out the possibility of a system undergoing changes when it has been sent to the user. Changes can occur if an error occurs and is not detected during system testing. The Waterfall model is the most used model for the development stage according to [15].

3. Result and Analysis

3.1 Expert System Algorithm

Algorithm as a user in an expert system for website-based cat skin disease diagnosis using the Forward Chaining method :

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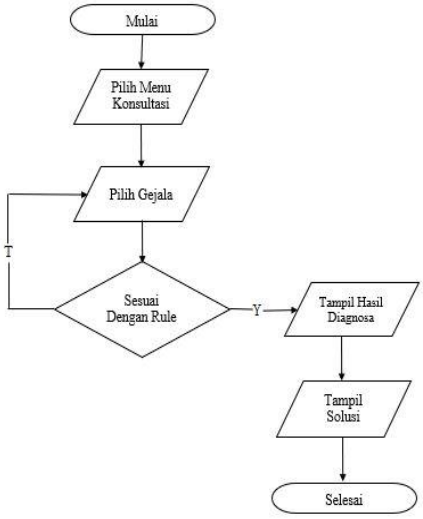

Fig. 1. Algorithm Design

3.2 Knowledge Base

Expert Table

The following is the Knowledge Base of the table of experts on diagnosing skin diseases in cats :

TABLE 1
KNOWLEDGE BASE SKIN DISEASES IN CATS

RULE	P	P	P	P	P	P	P	P	P	P	P
G001	X					X			X		
G002	X			X						X	X
G003	X			X			X	X	X	X	X
G004	X										
G005	X										
G006		X									
G007		X						X			
G008			X				X				
G009			X								
G010			X								
G011				X			X				
G012					X						
G013					X						
G014					X			X	X		
G015											X
G016					X						
G017						X					
G018							X				
G019							X				X
G020								X			
G021									X		
G022										X	X
G023										X	
SOLUSI	S	S	S	S	S	S	S	S	S	S	S

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Information :
Code P (Disease) = Diseases of the cat's skin.
Code G (Symptoms) = All kinds of symptoms of disease on the cat's skin.
Code S (Solution) = Is a solution for cat skin disease.
Code X = To show which symptoms exist in the expert system.
Rule 1:
If the hair loss is unnatural
and dry cat skin
and cats often scratch their bodies
and weakness and a red rash on the cat's skin
then the diagnosis of the disease is yeast
Rule 2:
If there are ulcers on certain body parts such as nose, legs,
and mouth
and landed on the cat's skin for a long time
the diagnosis is eosinophilic granuloma
Rule 3:
If it looks scaly
and redness and baldness due to hair loss in certain parts such as ears, head
and feet
Then the diagnosis of the disease is ringworm
Rule 4:
If the cat's skin is dry
and cats often scratch their bodies
and the presence of tiny particles in the cat's fur
then the diagnosis of the disease is dandruff
Rule 5:
If there are a lot of blackheads on the chin
and cat's mouth
and comedones cause abscess
and in some cases, hair loss
and swelling of the chin
and can cause secondary infection, the diagnosis of the disease is acne
Rule 6:
If the hair loss is unnatural
and secretes the oil glands actively, which results in the excretion of lilies the diagnosis of the disease is stud tail.
Rule 7 :
If the cat is often scratching
and looks scaly
and the presence of tiny particles in the cat's fur
and pale coat color and thinning of hair above the base of the tail
then the diagnosis of the disease is pijal
Rule 8 :
If the cat is often scratching
and landed on the cat's skin for a long time
and in some cases, hair loss
and swelling of the chin
and yellow crust around, neck edge of face
and ears
Then the diagnosis of the disease is scabies
Rule 9 :
If the hair loss is unnatural
and cats often scratch their bodies

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and in some cases, hair loss
and swelling of the chin
and certain bodies look bald
then the diagnosis of the disease is fungus fall
Rule 10 :
If the cat's skin is dry
and cats often scratch their bodies
and restless
and unusual hair appearance
then the diagnosis of the disease is lice
Rule 11 :
If the cat's skin is dry
and cats often scratch their bodies
and thinning of hair above the base of the tail
and restless and licking at the feet or scratching the ears or the base of the tail
Then the diagnosis of the disease is allergic dermatitis

3.3 Decision Tree

Symptoms Caused By Skin Diseases In Cats:
G001 : Unnatural hair loss
G002 : Dry cat skin
G003 : Cats often scratch their bodies
G004 : Weak
G005 : Red rash on cat's skin
G006: Ulcers on certain body parts such as nose, feet, and mouth
G007 : Staying on the cat's skin for a long time
G008 : Looks scaly
G009 : Redness
G010: Baldness due to hair loss in certain parts such as ears, head and legs
G011 : The presence of small particles in the cat's fur
G012 : A lot of blackheads on the cat's chin and mouth
G013 : Blackheads cause abscess
G014 : In some cases, hair loss, and swelling of the chin
G015 : Licking on feet or scratching ears or base of tail
G016 : May cause secondary infection
G017 : Actively secrete oil glands, where it results in wax excretion
G018 : Pale fur color
G019 : Thinning of hair above the base of the tail
G020 : Yellow crust around face, neck and ears
G021 : Certain body looks bald
G022 : Restless
G023 : Unusual hair appearance
Skin Diseases In Cats:
P001 : Yeast
P002: Eosinophilic granuloma
P003 : Ringworm
P004 : Dandruff
P005 : Feline acne
P006 : Stud tail
P007 : Pijal
P008 : Scabies
P009: Mushrooms fall out
P010 : Lice
P011 : Allergic dermatitis
Below is the decision tree of the cat skin disease expert system:

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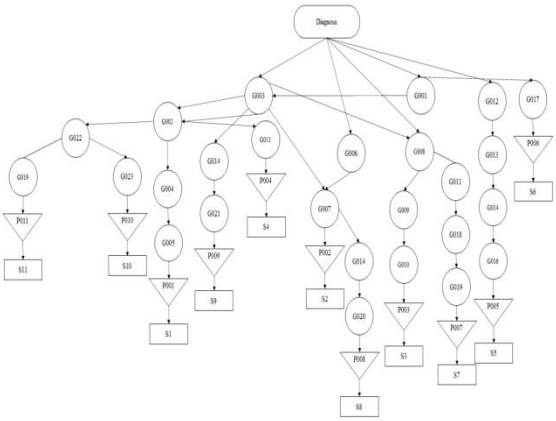


Fig. 2. Decision Tree

3.4 Use case diagrams

Usecase Diagram of Running System

Here is a use case diagram for a running system:

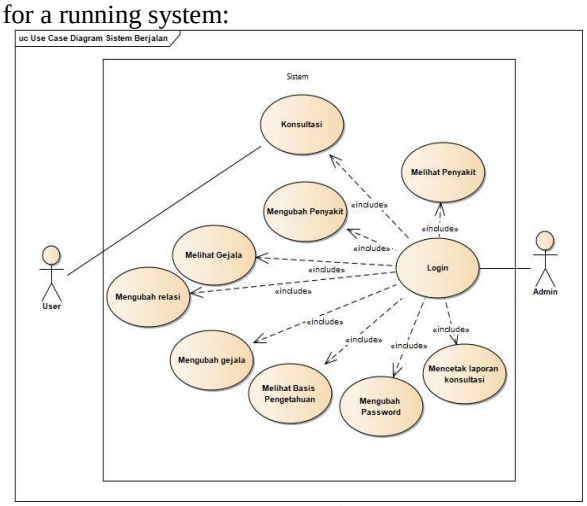


Fig. 3. Usecase Diagram of Running System

3.5 Activity Diagrams

Here is a picture of an activity diagram:

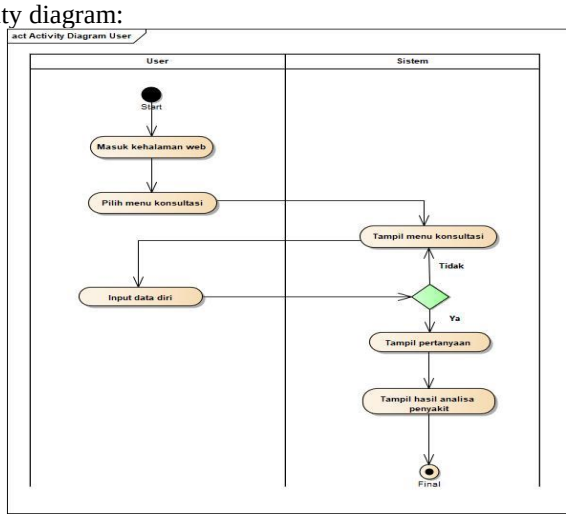


Fig. 4. User Activity Diagram

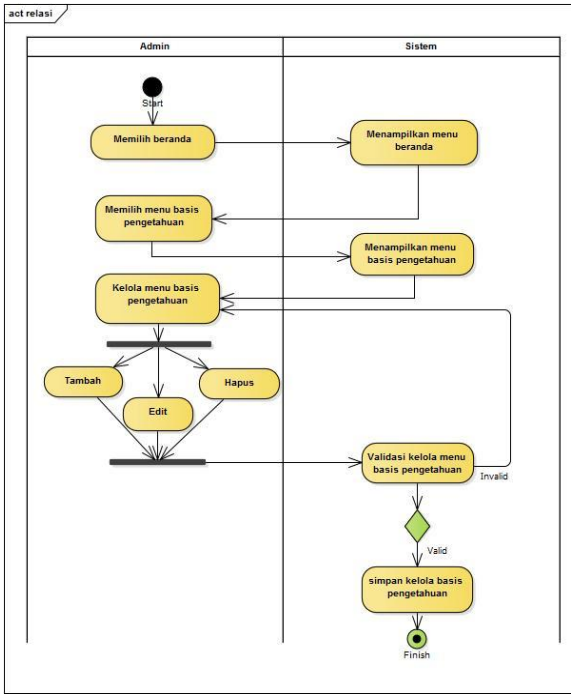
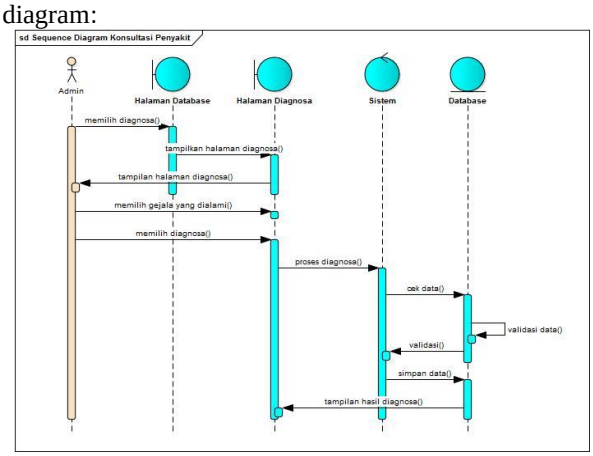


Fig. 5. Knowledge Base Activity Diagram

3.6 Sequence Diagrams

Here is a picture sequence diagram:



Figu 6. Sequence Diagram

3.7 Package Diagram

Here is a picture of the package diagram:

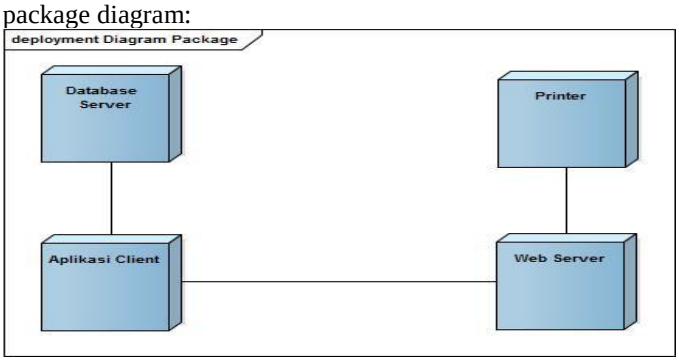


Fig 7. Diagram Package

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3.8 User Interface

Consultation Data Page Display

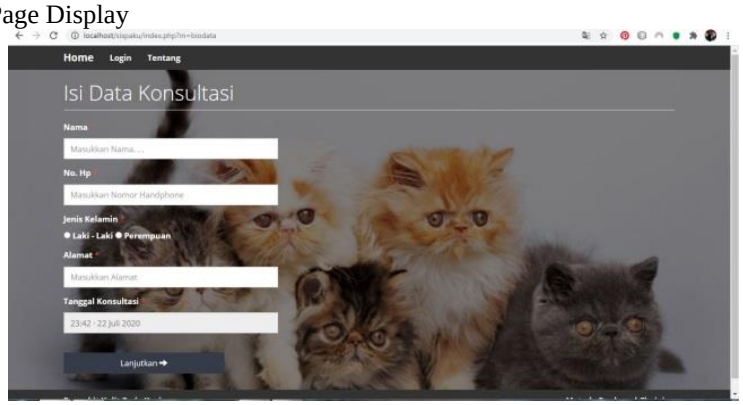

Fig 8. Consultation Data Page Interface

Fig 9. Login Page Interface

Fig 10. Disease Page Interface

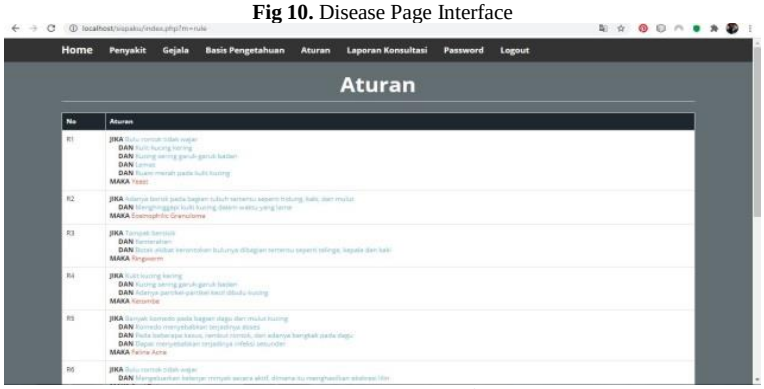

Fig 11. Rules Page Interface

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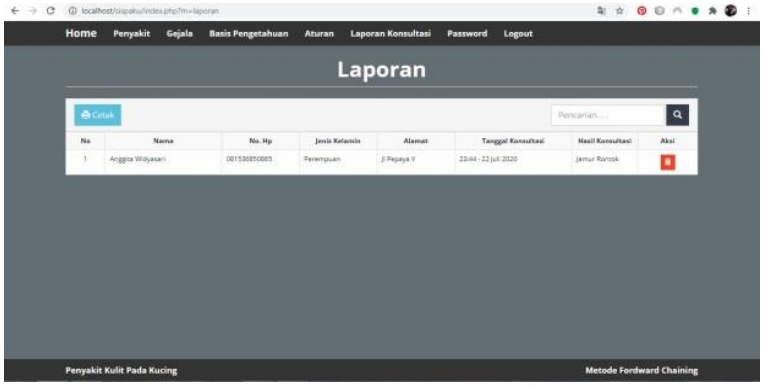

Fig 12. Consultation Report Page Interface

4. Conclusion

The conclusions that can be drawn from the study of an expert system for skin diseases in cats are:

a. Easy to use because this expert system is website-based.
b. With this expert system, it makes it easier for cat owners to find out about diseases and symptoms and can find solutions on the website-based expert system.

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