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GOAT DISEASE DIAGNOSIS WITH THE CERTAINTY FACTOR METHOD

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ABSTRACT

System expert diagnosis disease goat this web- based designed For help breeders in identify goat disease in a way more fast and accurate.Using Certainty Factor method , system This can determine level certainty of diagnosis based on symptoms inputted by the user and provide diagnostic results and level certainty in form percentage . Research This covers design in implementation system , start from collection of disease and symptom data goat until testing system use Black Box method . Testing show that system functioning in accordance with specifications set and capable give results accurate diagnosis . Manual and system test results to a number of test cases show consistent Certainty Factor value , with accuracy system by 96.67% of the system This prove its potential as reliable solution For increase efficiency and effectiveness diagnosis disease goat , giving benefit significant for breeders in maintaining livestock health they .

ARTICLE INFO

Keywords :

Goat Disease Diagnosis expert system, Certainty Factor, System expert diagnosis

1. Introduction

Farm goat is one of the sector important in economy agriculture in Indonesia. Goats No only provide animal protein sources in the form of meat and milk, but also plays a role in empowerment economy public rural areas . Although Thus , livestock goat often faced with various problem health livestock that can bother productivity and well-being breeders . Diseases in goats can cause decline quality and quantity production , even death livestock , which in the end harm breeders in a way economy .

In many area , livestock breeder often not own adequate access to service health professional animal . Limitations This result in breeders depend on experience personal or knowledge that is not standardized in diagnose and treat disease goats . Therefore that , it is needed A capable system help breeders in diagnose disease goat with fast , accurate , and easy accessed .

System expert is one of the technology that can overcome problem this . System expert capable imitate the process of taking decision from a expert with using existing knowledge base programmed . The Certainty Factor (CF) method is often used in system expert For handle uncertainty in diagnosis. CF allows system give estimate level belief to the diagnosis based on existing symptoms , so increase accuracy and reliability to the results provided .

From research previously , Hidayat, T. (2018) in his research entitled " Expert Diagnostic System " Disease Cattle with the Forward Chaining Method", Research This develop system expert For diagnosis disease cattle with use forward chaining method . Research results show that system expert can help breeders in diagnose disease with more fast compared to manual consultation , although level its accuracy Still influenced by the completeness of the entered symptom data . According to Amin, S. (2019), in his research entitled " Application Diagnosis Chicken Diseases Using the Certainty Factor Method", Research This apply Certainty Factor method in system expert For diagnose disease in chickens . The results show that CF method can handle uncertainty in diagnosis and providing level beliefs that can help users in take decision . System This succeed increase diagnostic accuracy of up to 85%. And according to Ima Apriliya and Ida Wahyuni (2017), in his research entitled " System Diagnosis Diseases in Goats Using the Forward Chaining Method", research This For know diagnosis disease goats , researchers make system expert with apply forward chaining method . In the research This type diseases that can diagnosis as many as 16 diseases with the tests used that is testing accuracy with test data for 16 diseases with level accuracy by 100%.

Based on research previously , can concluded that implementation system expert with various method can give significant benefits in diagnosis diseases in various sector livestock and agriculture . The Certainty Factor method, in particular , shows potential big in increase diagnostic accuracy with consider uncertainty information . Therefore that , research This will develop system expert For diagnosis disease goat use Certainty Factor method with hope can give solution practical and effective for breeders goat .

2. Theoretical basis

2.1. Mammals

Mammals is class vertebrate animals characterized by the following characteristics typical like existence mammary glands used For breast-feed his children , their existence hair and fur that covers part or all of the body all over body , and structure jaw as well as ear middle typical . Mammals own system circulation covered blood with the heart consists of from four space , and most of it mammals nature viviparous , namely give birth to children who have develop in body its parent , although There is some that lay eggs like monotremes (Apriliya & Wahyuni, 2017).

2.2. Goat

Goat is animal mammals that are included in family Bovidae and subfamily Caprinae , which also includes sheep . goat is animal livestock being raised For various objectives , including as source meat , milk, skin , and fur . Goats known Because his abilities adapt with various environment , including difficult areas unreachable and barren . Male wild goat and female own horn a pair , but horns on goats male more big . Generally , goats have beard , forehead convex , tail rather to above , and most of them hairy straight and rough (Apriliya & Wahyuni, 2017 .

2.3. Goat Diseases

Livestock disease is a highly undesirable problem because it can cause losses for farmers. When livestock are sick, their production performance can decline. Dairy goats, which are a type of milk-producing livestock, are particularly susceptible to disease. Some common diseases in goats include mastitis, foot-and-mouth disease, and bloat (Christi et al., 2022).

2.4. Certainty Factor Method

Certainty Factor (CF) is one method in intelligence artificial used For handle uncertainty in system expert . CF is the concept used For presenting level belief or certainty to something hypothesis or conclusion based on proof or existing information (Dwi Meilani et al., 2022) .

3. Problem Analysis

3.1. Problem Analysis

Farm goat hold role important in economy Indonesian agrarian , contributing as animal protein sources and empowerment economy public rural areas . However , livestock farming goat face challenge big related health livestock , which can bother productivity and well-being the economy of livestock breeders . Diseases in goats No only lower quality and quantity production , but can also cause death livestock , which has implications for losses significant economic for breeders .

One of problem main issues faced breeders goat is limitations access to service health professional animals . In many area rural , services health adequate animals difficult accessed , causing breeders depends on experience personal or knowledge that is not standardized in diagnose and treat disease goat . Dependence This increase risk misdiagnosis and treatment , which can make things worse condition health livestock and enlarge loss economy .

3.1.1. Analysis Symptoms and Diseases Goat

Table 3.1.1. 1Symptom Data Table

Code	Symptom
G1	Goat looks lethargic .
G2	Do not want breastfeeding .
G3	Temperature body rising .
G4	Emit dirt liquid and smelly rotten .

Code	Symptom
G5	Swelling around the navel .
G6	Hot in the former piece rope navel .
G7	Around navel colored red .
G8	If her navel touched feel pain .
G9	Difficulty breathing .
G10	Tongue stretched out .
G11	Mouth Lots emit liquid .
G12	Mouth smelly sour .
G13	Always nervous .
G14	arise convulsions in some muscles , even until to whole body
G15	From the hole nose and anus go out fluid mixed blood .
G16	Pulse running fast .
G17	Body shiver .
G18	Lust Eat is lost .
G19	Diarrhoea with dirt mix blood .
G20	Gums and surfaces tongue blisters containing fluid clear .
G21	Tongue swollen and protruding to outside .
G22	Mouth gaping .
G23	Foamy mucus comes out .
G24	Heard snoring .
G25	Stomach goat enlarged .
G26	Absorb part substance food that should be For increase heavy body .
G27	Damage vital organ tissues of goats .
G28	Cattle the longer the condition increasingly worsening .
G29	Weak and thin body .
G30	Seirng scratching or rubbing his body .
G31	Skin scaly and dry on the face , ears , stomach , back , legs, etc base tail .
G32	Happen inflammation skin around mouth , eyelids eyes and genitals .
G33	Inflammation of the mammary glands in the mother goat .
G34	Coughing and difficulty breathing breathe .
G35	There is wound at the tip eye .
G36	udder goat swollen .
G37	Skin around udder If touched felt hot .
G38	Milk production stops or reduce .
G39	Sudden death .
G40	Between the fingers or nails are present spots red .
G41	Spots red all around mouth .
G42	There is damage to the intestines.
G43	There is liver damage .

(Source : Ima Apriliya & Ida Wahyuni, 2017)

3.1.2. Goat Disease Diagnosis Analysis

Input: Table 3.2. Disease Data Table

Code	Disease Diagnosis Goat
P1	Diarrhea
P2	Inflammation navel
P3	Smallpox mouth
P4	Hypocalcemia
P5	Inflammation Lymph

Code	Disease Diagnosis Goat
P6	Disease foot and mouth disease (FMD)
P7	Snoring (*Septicemia) Epizootic*)
P8	Flatulence (*Tympany*)
P9	Parasite worm heart
P10	Worm parasites bracelet
P11	Worm parasites stomach
P12	Worm parasites eye
P13	Scabies
P14	Dermatitis
P15	Pneumonia
P16	Inflammation mammary glands (*mastitis*)

(Source : Ima Apriliya & Ida Wahyuni, 2017

3.1.3. Inference Rules Analysis (Rules)

Table 3.3. Rule Table

Code	*Rule*
R1	IF **G1** AND **G2** AND **G3** AND **G4** THEN **P1**
R2	IF **G5** AND **G6** AND **G7** AND **G8** THEN **P2**
R3	IF **G1** AND **G9** AND **G10** AND **G11** AND **G12** AND **G41** THEN **P3**
R4	IF **G13** AND **G14** THEN **P4**
R5	IF **G3** AND **G15** AND **G16** AND **G17** AND **G18** AND **G19** AND **G39** THEN **P5**
R6	IF **G3** AND **G20** AND **G40** THEN **P6**
R7	IF **G9** AND **G21** AND **G22** AND **G23** AND **G24** THEN **P7**
R8	IF **G25** THEN **P8**
R9	IF **G18** AND **G26** AND **G43** THEN **P9**
R10	IF **G26** AND **G27** THEN **P10**
R11	IF **G26** AND **G42** THEN **P11**
R12	IF **G18** AND **G26** AND **G27** AND **G35** THEN **P12**
R13	IF **G28** AND **G29** AND **G30** AND **G31** THEN **P13**
R14	IF **G32** AND **G33** THEN **P14**
R15	IF **G3** AND **G18** AND **G29** AND **G34** THEN **P15**
R16	IF **G3** AND **G18** AND **G36** AND **G37** AND **G38** THEN **P16**

3.1.4. Data Analysis and Manual Calculation Using the Certainty Factor Method

The Certainty Factor (CF) method was proposed by Shortliffe and Buchanan in 1975.CF is clinical parameter values provided by MYCIN for show size belief . This theory develop simultaneously with manufacturing system MYCIN experts . The MYCIN development team noted that doctor often analyze existing information with expression like for example , perhaps , possibility big , almost sure . For accommodate matter This MYCIN team uses CF to illustrate level belief expert to current problem faced . There are several terms used in CF method , namely :

1. EVIDENCE , namely fact or supporting symptoms hypothesis , for example symptom disease .
2. HYPOTHESIS , namely results obtained from symptoms , for example disease .
3. CF [H, E] is the certainty factor of hypothesis H is influenced by the symptom (evidence) E. The magnitude of CF ranges from between –1 to with 1, The value –1 indicates distrust absolute whereas value 1 indicates trust absolute .
4. MB is size increase trust (measure of increased belief) , 0 <= MB <=1
5. MD is size increase distrust (measure of increased disbelief) , 0 <= MD <=1

Based on available data only MB and MD, of the five types formula mentioned , only formula-1 and formula-5 are appropriate with report task final consideration . These MB and MD values usually obtained from knowledge expert about how much typical symptom the For disease

certain . Based on secondary data study , MB and MD values for every symptom disease goat presented in the table

Certainty Value Table (MB and MD)

No	Disease	Symptom	MB Value	MD Value
1	P1	G1	1	0
2	P1	G2	0.8	0.2
3	P1	G3	0.6	0.4
4	P1	G4	0.4	0.6
5	P2	G5	1	0
6	P2	G6	0.8	0.2
7	P2	G7	0.6	0.4
8	P2	G8	0.4	0.6
9	P3	G1	1	0
10	P3	G9	0.8	0.2
11	P3	G10	0.6	0.4
12	P3	G11	0.4	0.6
13	P3	G12	0.2	0.8
14	P3	G41	0.2	0.8
15	P4	G13	1	0
16	P4	G14	0.8	0.2
17	P5	G3	0.6	0.4
18	P5	G15	0.8	0.2
19	P5	G16	0.8	0.2
20	P5	G17	0.8	0.2
21	P5	G18	0.8	0.2
22	P5	G19	0.8	0.2
23	P5	G39	0.2	0.8
24	P6	G3	0.6	0.4
25	P6	G20	0.8	0.2
26	P6	G40	0.2	0.8
27	P7	G9	0.8	0.2
28	P7	G21	0.6	0.4
29	P7	G22	0.6	0.4
30	P7	G23	0.6	0.4
31	P7	G24	0.6	0.4
32	P8	G25	0.8	0.6
33	P9	G18	0.8	0.2
34	P9	G26	0.6	0.4

No	Disease	Symptom	MB Value	MD Value
35	P9	G43	0.2	0.8
36	P10	G26	0.6	0.4
37	P10	G27	0.4	0.6
38	P11	G26	0.6	0.4
39	P11	G42	0.2	0.8
40	P12	G18	0.8	0.2
41	P12	G26	0.6	0.4
42	P12	G27	0.4	0.6
43	P12	G35	0.6	0.4
44	P13	G28	1	0
45	P13	G29	0.8	0.2
46	P13	G30	0.6	0.4
47	P13	G31	0.4	0.6
48	P14	G32	1	0
49	P14	G33	0.8	0.2
50	P15	G3	0.6	0.4
51	P15	G18	0.8	0.2
52	P15	G29	0.8	0.2
53	P15	G34	0.6	0.4
54	P16	G3	0.6	0.4
55	P16	G18	0.8	0.2
56	P16	G36	0.4	0.6
57	P16	G37	0.4	0.6
58	P16	G38	0.4	0.6

The data table of the rules above list connection between symptoms and diseases goat , complete with MB and MD values . This table will used in development system expert For help the disease diagnosis process goat based on symptoms experienced animals . With use table rule this , system expert can utilise MB and MD values for count level trust to the diagnosis of disease goat based on symptoms entered by the User .

Calculation of Certainty Factor Method

Certainty Factor calculation using formula as following :

CF=MB-MD

For some evidence one hypothesis defined as following :

MB[H|E 1]= MB(H|E 2)(1-MB(H|E1))

MD[H|E 1]= MD(H|E 2)(1-MD(H|E1))

Following is example calculation Certainty Factor method with symptom and disease data goats that have determined . In the example this , will calculate CF for scenario following This .

Example calculation if the user chooses symptoms of G32 and G33

Choice symptoms of G32 and G33

G 32 : Happen inflammation skin around mouth , eyelids eyes and genitals

G 33 : Inflammation of the mammary glands in the mother goat

Rule related to R 14: IF G32 AND G33 THEN P14

P 14 : "Dermatitis" disease

G32 symptoms related to Rule R14 have mark MB and MD certainty on P14

MB32 = 1

MD32 = 0.4

G33 symptoms related to Rule R14 have mark MB and MD certainty on P14

MB33 = 0.8

MD33 = 0.2

Calculation of CF = MB – MD, non- conjunction type (Formula-1)

Calculation MB :

MB[G32^G 33]= MB32+MB33(1-MB32)

=1+0.8 (1-1)

=1+0.8 (0)

=1

Calculation MD :

MD[G32^G 33]= MD32+MD33(1-MD32)

=0.4+0.2 (1-0.4)

=0.4+0.2 (0.6)

=0.4+0.12

=0.52

Calculation CF :

CF=MB-MD

CF=1-0.52=0.48

Based on the manual calculations , obtained the CF value is 0.48 with percentage 48%, resulting in a diagnosis of the type disease suffered goat the is “Dermatitis” with code P14 disease , So mark in accordance with table mark Interpretation of CF Values with level the “ Maybe ” belief listed in chapter 2 about Certainty Factor method .

4. Result and Discussion

4.1.1. FlowMap of the system to be designed

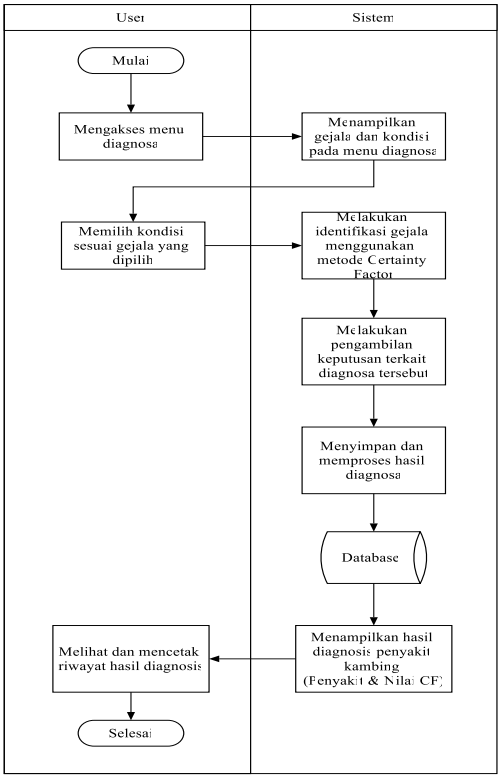

Figure 3.1. FlowMap of the system to be designed

4.1.2. DFD Design

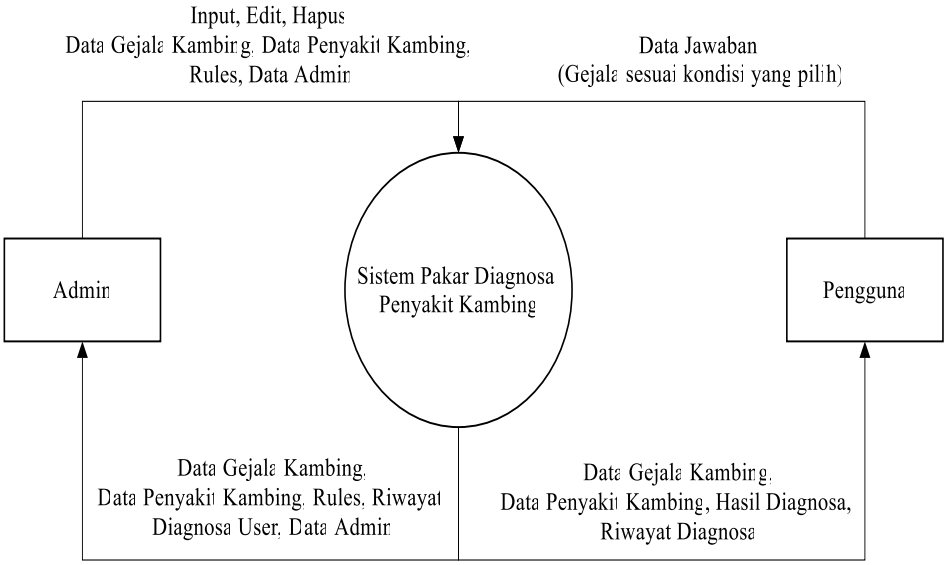

Figure 3.2 System Context Diagram

4.1.3. ERD Design

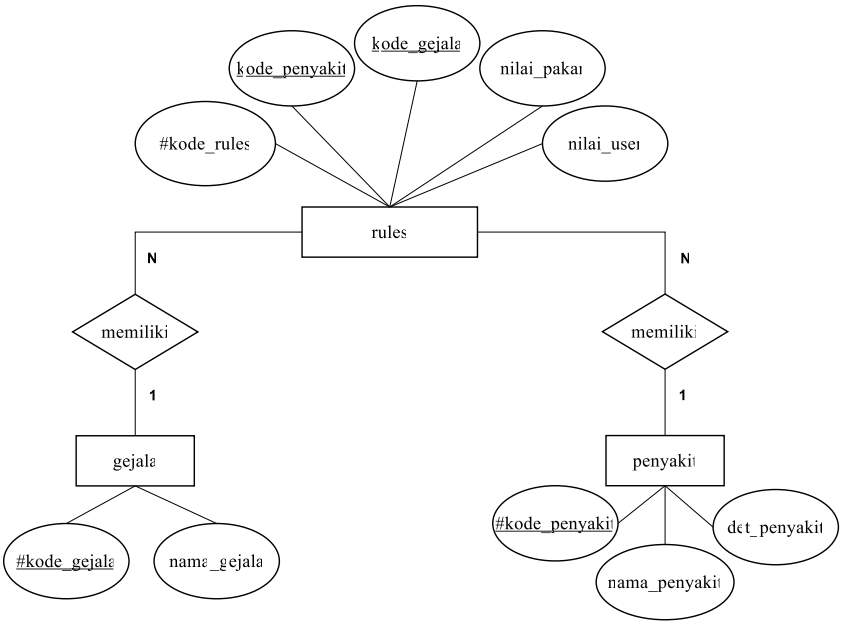

Figure 3.3. ERD Design of Analysis System .

Relationship description:

1. The RULES table has a Many to 1 relationship with the SYMPTOM table, where many rules can refer to one symptom.
2. The RULES table has a Many to 1 relationship with the DISEASES table, where many rules can refer to one disease.
3. The GEJALA table has a 1 to Many relationship with the RULES table.

d)Primary Key: 'symptom_code' in the Symptoms table.

e) Foreign Key: 'symptom_code' in the Rules table.

f) Each symptom can be associated with multiple rules in the Rules table. These rules link symptoms to diseases using the CF method.

4. The DISEASE table has a 1 to Many relationship with the RULES table.

g)Primary Key: 'disease_code' in the Disease table.

h)Foreign Key: 'disease_code' in the Rules table.

i) Each disease can be associated with multiple rules in the Rules table. These rules also link diseases to symptoms using the CF method.

4.2. System Implementation

Figure 3.4.User Home Page

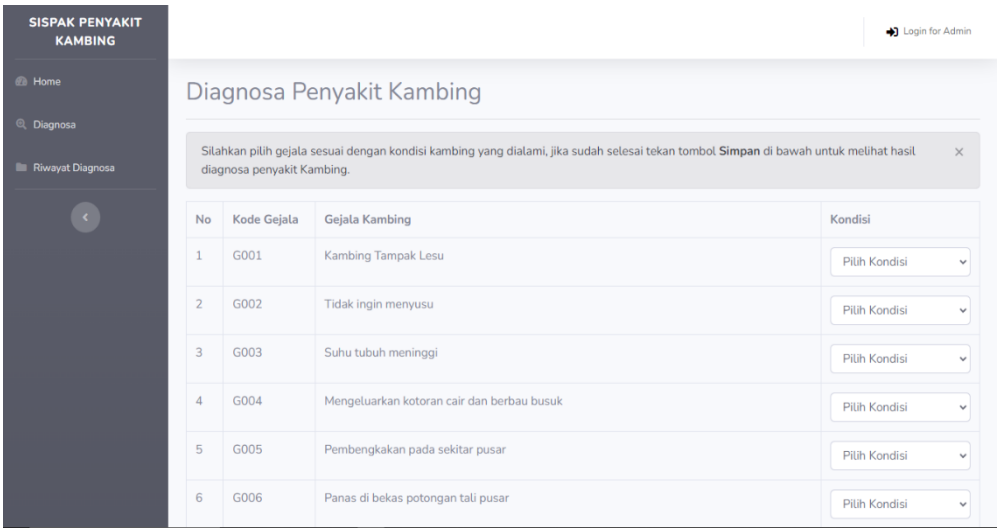

Figure 3.5.Page Diagnosis

Diagnostic Results Page

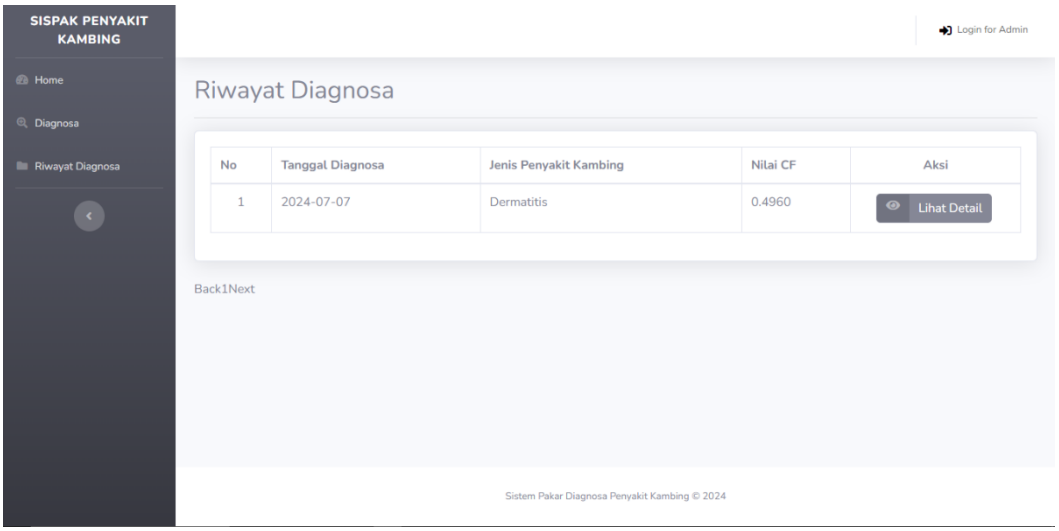

Figure 3.7.Diagnosis History Page

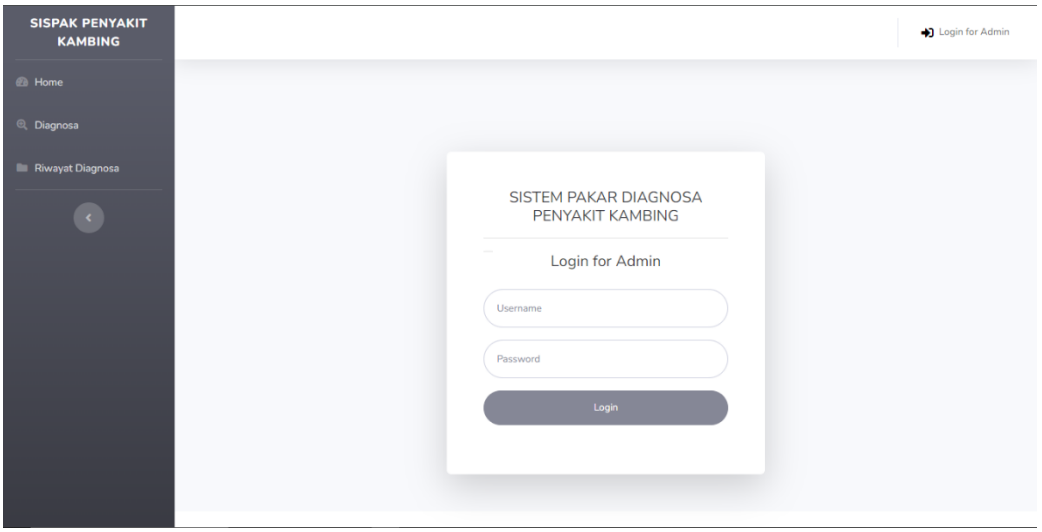

Figure 3.8.Admin Login Page

Figure 3.9. Admin Main Page

Figure 3.10. Goat Symptom Data Page

Figure 3.11. Goat Disease Data Page

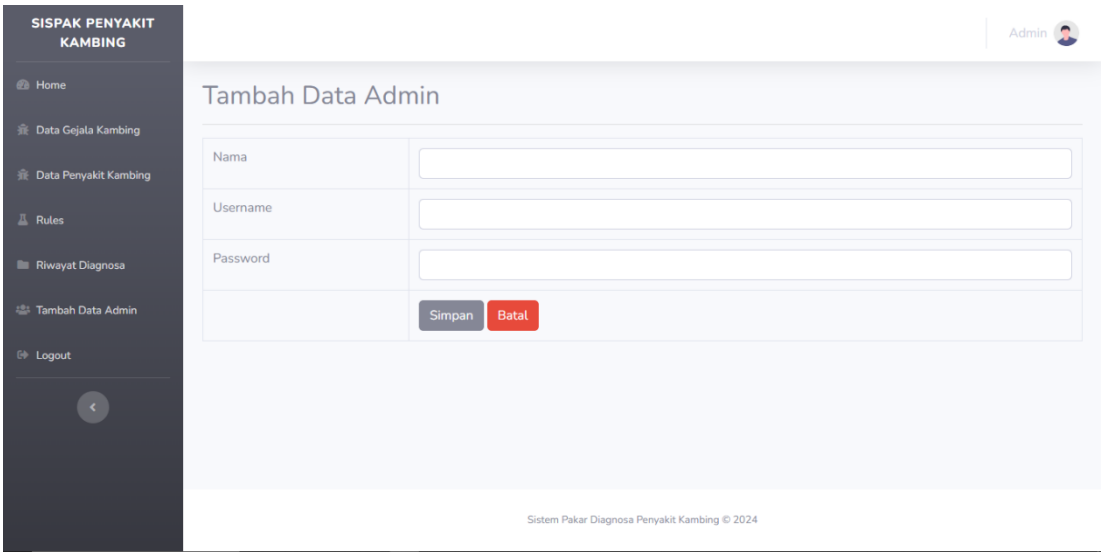

Figure 3.12. Add Admin Data Page

5. Conclusion

Test results system above , conclusion testing on the system expert diagnosis disease goat use Certainty Factor method has proven accurate and consistent in give results diagnosis . Comparison small between results manual and system calculations show that system own greater precision high , possibility caused by use precision more decimals Good in calculation system . From the results comparison mentioned , there are error value of 3.33% indicates that calculation system approach results manual calculations with relative differences small . With accuracy amounting to 96.67% of test cases , systems This can help breeders in identify disease goat in a way efficient and precise . Doing testing more carry on with various test cases will ensure performance system remain optimal and accurate in various condition .

Reference

Afiifah , K.', Fira Azzahra, Z., Anggoro , AD, Redaksi , D., Akhir, R., & Online, D. (2022). Analysis of Entity-Relationship Diagram Techniques in Database Design : A Literature Review. INTECH JOURNAL, 3(1), 8–11.

Apriliya , I., & Wahyuni, I. (2017). Disease Diagnosis System in Goats Using the Forward Chaining Method. Journal Scientific Technology Asia Information , 11(2).

Christi, RF, Setiawan, R., & Alhuur , KRG (2022). Improvement Knowledge of Types of Diseases in Dairy Goats in Groups Cattle Azkia Raya and Mutual Cooperation in West Bandung Regency , West Java. Farmers: Journal of Community Services, 3(1), 25–29. https://doi.org/10.24198/fjcs.v3i1.37617

Dwi Meilani, B., Febrianti , H., Uttungga , R., & Teknologi Adhi Tama Surabaya, I. (2022). Implementation of the Certainty Factor Method in the Diagnosis Disease Stomach .

Ihsan, Lesmideyarti , D., Hidayati , Q., & Retno Nugroho, T. (2023). Design Web Server Infrastructure and Implementation for School Websites As Information and Communication Media at PJHI Balikpapan Middle School (Vol. 11, Issue 1).

Latifatul Fadzilah, L. (2022). System Information Guidance Counseling Website -Based (SI-BK). National Technology Seminar Information and Communication , 149–160.

Munazilin , A., & Santoso, F. (2020). ANALYSIS AND DESIGN OF A WEBSITE-BASED COMMUNICATION FORUM FOR IBRAHIMY UNIVERSITY POSTGRADUATE STUDENTS. Journal Innovation Research , 1, 1488–1494.

Novria , R., Kurniawan, B., & Suryanto . (2022). Application Booking Food at Bebek and Ayam Tekaeng Use PHP and MySQL . Journal Informatics and Computers (JIK), 13, 15–16.

Qolby Novyanti , D., Amalia Nursyabani , R., Abdussalaam, F., & Piksi Ganesha, P. (2022). Planning system information accountancy Cash receipts and disbursements at Star Glam Bandung. Journal Scientific Accounting and Finance , 4(11), 4893–4903. https://journal.ikopin.ac.id/index.php/fairvalue

Sandikapura , MT, & Sukendar , EM (2018). Subsystem Information Payment of Semester Fees at Mitra Kencana College of Health Sciences Campus 2 Tasikmalaya . JUTEKIN, 6(2), 41–50.

Sapriadi , S., Hayati, N., Eko Syaputra , A., Septi Eirlangga , Y., Manurung , KH, & Hayati, N. (2023). Expert System for Learning Style Diagnosis Student Using the Forward Chaining Method. Journal Information and Technology , 5(3), 71–78. https://doi.org/10.60083/jidt.v5i3.381

Syahputri , K., Irwan , M., & Nasution, P. (2023). The Role of Databases in Information Systems Information Management . Journal Accountancy Finance and Business , 1(2), 54–58. https://jurnal.ittc.web.id/index.php/jakbs/index