

Web-based Lobster Disease Diagnosis Expert System Using Certainty Factor Method

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ABSTRACT

In Jombang Regency, there are many sellers and breeders/cultivators of Lobster. In the process of breeding lobsters, usually lobster farmers will experience several problems, one of which is the emergence of disease in lobsters cultivated by lobster farmers. Prevention is a very effective step to minimize the risk of disease in farmed lobsters. If the Lobster is already affected by the disease, the costs incurred for Lobster cultivation will increase due to the additional cost of Lobster treatment. Lobster farmers need to know about lobster diseases and how to treat them if the cultivated lobsters are affected by diseases or pests. One of the efforts that can be done by Lobster breeders is by visiting Lobster disease experts (experts) which is not possible to do continuously because it requires a lot of time, energy and costs. From these problems, the author will create a website-based Lobster disease diagnosis expert system using the certainty factor method. With this application, it is hoped that it can help Lobster breeders in dealing with diseases in Lobsters that are kept, without having to visit an expert. In the author's research, accuracy testing was carried out based on 10 diagnostic samples, and calculated using k-fold cross validation, resulting in a system accuracy of 90%. Where the expert system that has been created is considered feasible.

Keywords: System; Certainty Factor; Lobster

INTRODUCTION

In this era of globalization, developments in the field of information technology are very rapid. Especially in the field of artificial intelligence. Artificial intelligence is a simulation of human intelligence that is modeled in a system and programmed so that it can think like a human / expert. One example of artificial intelligence is the Expert System (Asrul Abdullah, 2021).

In Jombang Regency, there are many Lobster sellers and breeders. In the process of breeding lobsters, usually lobster farmers will experience several problems, one of which is the emergence of disease in lobsters cultivated by lobster farmers. Prevention is a very effective step to reduce the risk of disease in farmed lobsters. If the Lobster is already affected by the disease, the costs incurred for Lobster cultivation will be more and more because of the additional cost of Lobster treatment. Lobster farmers need to know about lobster diseases and how to treat them if the cultivated lobsters are affected by diseases or pests. One of the efforts that can be done by Lobster breeders is to visit Lobster disease experts (experts) which is not possible to do continuously because it requires a lot of time, energy and costs.

An expert system is a system that adopts knowledge from experts / humans packaged into a computer system that is designed to be able to solve problems like an expert (expert). Expert systems are a branch of AI that makes specialized use of knowledge in order to solve problems at the human "expert" level. An expert is someone who has "expertise" in a particular field. That is, the expert has certain knowledge and skills that most people do not know and have. An expert can solve problems that cannot be solved by others (Trisnawati Sari Dewi, 2017). The components in the expert system are the user interface (UI), knowledge base (knowledge-base), knowledge acquisition (Database), inference engine (Inference Engine), explanation facilities (Explanation Facilities) (Heri Mulyono, 2020).

The theoretical framework explains the concepts and theories underlying the research conducted, and explains how these concepts and theories help answer the research questions posed, by meeting several other criteria such as describing relevant concepts and theories, explaining their relationship to the research, presenting the sources used, and presenting a clear and organized discussion of these concepts and theories. The Certainty Factor method is one method to prove the uncertainty of an expert's / expert's thinking, in order to anticipate this, someone usually uses the certainty factor method in describing the level of confidence of an expert / expert with the problem being faced. The results of the certainty factor method are in the form of a percentage, which is claimed. very. Suitable for the results of the program needed in a study (Idris Efendi, 2020).

The previous related research on farmer group management information systems that are used as references are as follows;

The first research was conducted by Enkan Ferifersi, Syarifah Putri Agustini Alkadri and Asrul Abdullah, with the title "Expert System for Diseases in Lobster Arowana Using the Web-Based Certainty Factor Method" (2021). The data used is Lobster arowana disease data as of 2015, with a total of 5 diseases and 14 symptoms. Aims to make it easier for Lobster arowana breeders to diagnose diseases in Lobster arowana using the Certainty Factor method in an expert system. Resulting in an accuracy of 75% (Enkan Ferifersi, 2021).

The second research was conducted by Eka Putra, Yessy Asri Budi Prayitno and Andi Dahroni, with the title "Expert System for Identifying Eye Diseases with the Certainty Factor Method" (2019). The data used is eye disease data as of 2018. With total data of 4 diseases and 10 symptoms. Aims to make it easier to get information to people with eye diseases that are included in an expert system that can issue initial diagnosis results according to the symptoms. Resulting in an accuracy of 72.05% (Eka Putra, 2019). Based on the two research descriptions above, the author will create an expert system for diagnosing web-based Lobster diseases using the certainty factor method. The data that will be used is Lobster parasite data quoted by the author from the book Lobster control and pests, from the Ministry of Maritime Affairs and Fisheries (KKP) of the Republic of Indonesia..

METHOD

- Data collection

Data collection is an activity of searching and collecting information based on facts related to the research problem to be carried out, which can be done directly or indirectly. Looking for theoretical references must be relevant and appropriate to the research problem and used as a theoretical basis and research framework. References can be in the form of journals or theses related to the problems to be studied. Below is Lobster disease data quoted from the Lobster pest and disease control book from the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia (KKP).

- Data Analysis

Data analysis is the process of examining, processing data to be converted into information that is useful, interesting and can help in solving a problem.

- System Design and Design

System design and design is an activity carried out to produce / develop a system that was previously made with the aim of building a system in accordance with user needs. The system is designed using a flowchart system, Entity Relationship Document (ERD) and UML..

- Implementation and Coding

At this stage, the author will conduct experiments by applying or implementing the certainty factor method to the expert system to be created. The certainty factor method is a method that measures the level of trust in facts and rules aimed at exposing an expert's trust in the problem at hand. After the implementation process, is the system coding process. That is the process of processing code using a programming language. Code is a device that builds programs on computers.

- System Testing and Evaluation

- The next stage is system testing, which is testing to ensure that the system is able to function properly and has met user needs. system testing usually identifies such as performance and software problems. This test uses black box and white box testing. After testing, system evaluation is carried out. aims to find out the system can function as it should and if an error occurs, system improvements will be made.

RESULT AND DISCUSSION

The system created has met the expected system needs, starting from the input stage of symptoms, diseases and ways of handling for admins, as well as diagnosing diseases for users. implementation of systems that have been designed at the system design stage, in this stage contains a discussion of the system, how the system that is built will be implemented in the form of a website. In this implementation process, the website is built using software such as Google Chrome, Visual Studio Code for the coding process, PHP (Perl Hypertext Preprocessor), Xampp as a local server, MySQL for the database, and hosting to load it in the form of a website. The implementation results of this research are as follows;

- System Home Page
- System Login Page
- Admin Home Page
- Symptom Page
- Disease Page
- Knowledge Page
- Information Page
- Diagnosis Page

Table 1 Selected Symptom Data

Selected Data	Symptom	Conditions
G003	Breathing frequency, Increased (gaspings) and closer to the water surface	Convinced
G004	White spots on fins and gills	Uncertain
G005	White and brownish spots on fins, skin and gills, and excessive mucus	Very Sure
G006	In severe infections white bitterness similar to snow is accompanied by hemorrhage and blurred eyes, leading to blindness	Convinced

Table 2 Associated diseases and MB and MD values

Associated Diseases	Selected Data	MB	MD	CF Pakar(MB-MD)
Cryptocariasis	G003	0.8	0.2	0.8 – 0.2
	G005	0.8	0.0	= 0.6
	G006	0.8	0.2	0.8 – 0.0 = 0.8 0.8 – 0.2 = 0.6
Dactylogyriasis	G003	0.8	0.0	0.8 – 0.0 = 0.8
White Spot	G003	0.7	0.0	0.7 – 0.0
	G004	0.8	0.0	= 0.7 0.8 – 0.0 = 0.8
Trichodiniasis	G003	0.8	0.2	0.8 – 0.2 = 0.6

Tabel 3 Condition (Symptom Confidence Level)

Symptom Confidence Level	Weight (CF User)
Very Confident	1
Convinced	0.8
Fairly Sure	0.6
Less Sure	0.4
Don't Know	0.2
No	0

Tabel 4 CF User

Selected Symptoms	Condition	CF User
G003	Convinced	0.8
G004	Don't Know	0.2
G005	Very Confident	1
G006	Convinced	0.8

At this stage, the CF value of each possible disease will be calculated. To calculate the CF value with a single permis/symptom (single permis rules) using the formula:

$$\text{CF symptom} = \text{CF[user]} \times \text{CF[expert]}$$

If more than 1 symptom is selected per possible disease, then use the formula:

$$\text{CF combine} = \text{CF old} + \text{CF symptoms} \times (1 - \text{CF old})$$

(Idris Efendi, 2020)

- Cryptocariasis
 - CFg003 = CFuser × CFpakar
 = 0.8 x 0.6
 = 0.48
 - CFg005 = CFuser × CFpakar × CFg005
 = CFuser × CFpakar
 = 1 x 0.8
 = 0.8
 - CFg006 = CFuser x CFpakar
 = 0.8 x 0.6
 = 0.48
 - CF combine = CF old + CFgejala × (1 - CF old)
 = 0.48 + 0.8 (1 - 0.48)
 = 0.48 + 0.8 (0.52)
 = 0.48 + 0.416
 = 0.896
 - CF combine = CF old + CFgejala × (1 - CF old)
 = 0.896 + 0.48 (1 - 0.896)
 = 0.896 + 0.48 (0.104)
 = 0.896 + 0.04992
 = 0.94592 x 100%
 = 94,592% (dibulatkan 95%)
- Dactylogyriasis
 - CFg003 = CFuser × CFpakar
 = 0.8 x 0.8
 = 0.64 x 100% = 64%
- White Spot
 - CFg003 = CFuser × CFpakar
 = 0.8 x 0.7
 = 0.56
 - CFg006 = CFuser × CFpakar
 = 0.2 x 0.8
 = 0.16
 - CF combine = CF old + CFgejala × (1 - CF old)
 = 0.56 + 0.16 (1 - 0.56)
 = 0.56 + 0.16 (0.44)
 = 0.56 + 0.0704
 = 0.6304 x 100%
 = 63,04%
- Trichodiniasis
 - CFg006 = CFuser × CFpakar

$$\begin{aligned} &= 0.8 \times 0.6 \\ &= 0.48 \times 100\% = 48\% \end{aligned}$$

From the above calculations, it is concluded that the result of diagnosing the disease suffered by the user is Cryptocariasis (Marine White Spot) with the highest CF value, amounting to 0.9459 (94.5%). And other possible diseases are: Dactylogyriasis (0.64) / 64%, White Spot (0.6304) / 63.04% and Trichodiniasis (0.48) / 48%. Application development using the RAD (Rapid Application Development) method. In black box testing is a system test on software aimed at measuring the quality of software carried out with users and experts. From these tests, no errors were found in the application. In addition, accuracy testing was carried out using the K-Fold Cross Validation method, resulting in an accuracy of 90%. Where this expert system application is considered feasible to use.

CONCLUSION

Based on research conducted by the author on the Lobster Disease Diagnosis Expert System, it can be concluded that this integrated system is able to minimize human error, and can help Lobster breeders and sellers in diagnosing Lobster disease. The application of the Certainty Factor method to the Lobster Disease Diagnosis Expert System produces an accuracy value of 90%, where the accuracy results are good enough to be used in an expert system. The results of software testing that focuses on the functionality side (blackbox testing) of the application are functioning properly.

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