Eye Disease Detection System Use Forward Chaining Methods

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Abstract. Expert system for the diagnosis of eye diseases in humans using forward chaining method aims to trace the symptoms that are displayed in the form of questions in order to diagnose the type of disease with the software. Expert system software can recognize the type of eye disease after consultation with answering some of the questions that is displayed by the application of an expert system and can infer some kind of eye disease suffered by the patient. Data recognizable disease customize the rules are made to able to match the symptoms of eye disease and give value to determine the percentage of the value of the patient’s disease type approach

1. Introduction

The eye is the most important and sensitive senses in human life. Often we overlook complaints about vision and assume the complaint can disappear by itself. Of course this complaint is an early symptom of eye disease. Eye disease is an eye disorder that can affect vision. Vision clarity or visual acuity range from full vision ability to no vision at all. If sharpness decreases, vision becomes blurred or can cause blindness.

Artificial intelligence (AI) is defined as the intelligence shown by an artificial entity. One branch of Artificial Intelligence is an expert system. An expert system is software that is specifically designed based on artificial intelligence, serves to record and duplicate expert abilities.

The expert system can contribute to medical personnel as a reference material to determine the possibility of eye disease suffered by patients and their solutions. Whereas for the general public is used as a guide to take actions that must be taken if you know how likely it is to suffer eye disease.

Forward Chaining is a reasoning that starts from the fact to get a conclusion from that fact [1-3]. Forward Chaining is usually said to be an inference strategy that starts from a number of known facts. Search is done using rules

Formulation of the problem How to design a web-based expert system that can diagnose eye diseases in humans using the forward chaining method. Scope of problem is given the extent of the problems that exist, the limitations of the problem in this system are: Making this expert system based on common and clinical symptoms that are often experienced by a person and not based on laboratory test results. The system only addresses eye diseases, including nearsightedness, farsightedness, cataracts. The application is web based and can be accessed through local hosts. Using the Forward Chaining method to inference conclusions. The purpose of this research is to create an expert system that can be used to diagnose eye diseases and can provide convenience to the wearer. There are
benefits obtained from the implementation of this thesis: Provide knowledge about nearsighted eye disease, farsightedness, cataracts to the wider community. To provide convenience for users and experts to diagnose eye diseases.

2. Methodology
Data requirements that will be used to build expert system applications to detect eye disorders using the Forward Chaining method.

2.1. Knowledge acquisition
Acquisition of knowledge is the collection of data from an expert into a computer system or program [4]. Data collection in the making of this system was obtained from interviews from the Meliala Series Optical Entrepreneurs. Eye disorders can be distinguished including: nearsightedness, farsightedness, cataracts.

Nearsightedness (Myopia) (P1), Symptoms that cause farsightedness:
- The habit of seeing melee continuously.
- Reading while lying down.
- Reading in a place with less lighting.
- Read too long without resting.
- Less consuming vitamin A foods.
- Too long working on the computer.
- Watch television too close
- Play games with large TV and close range

2.2. Knowledge Representation
The knowledge that has been described, is represented in a form that can be processed by a computer[5-7]. In this expert system the representation of knowledge uses a production rule model. And in implementing parts of the inference engine, where this step is made using the inference method, namely Forward Chaining and using Bread First Search data search method.

Representation of knowledge using a model of production rule (Production rule) is a rule that provides a formal way to present recommendations, direction, or strategy. The rules can be classified into two, namely the first degree rule and the meta rule, where the first rule is only a simple rule consisting of antecedents and consequence[8-14]. While the meta rule is a

Rule 1:
IF the habit of seeing melee continuously (G1) AND Reading while lying down (G2) AND Reading in a place with less lighting (G3) AND Reads too long without resting (G4) AND Less consume vitamin A (G5) foods AND Too long working on the computer (G6) AND Watch television too closely (G7) AND Playing Games with large and close monitor (G8) THEN THE nearsightedness (Myopia)

![Figure 1. Flowchart of Search Techniques](image)
Figure 1 is a flowchart of a search technique that describes the data search process starting from Symptom 1, going down to G2 and then looking for those parallel to G2, namely G3 and G4, after there is no more parallel, then the search continues down that is G5 and continues parallel to G6, G7, G8 to completion, namely Disease 1 (P1).

2.3. Analysis of Brainware Needs

Brainware or thought tools are key figures in improving hardware and software development, without the action of brainware, the development of a computer system will not be as perfect as expected. This expert system requires 2 brainware levels, including: Administrators have an obligation to control activities related to system administration. Administrators have a very important role in the system. Non Admin (User) The user acts as a system user. Users have limited access rights to the system. Some examples of access rights owned by users include using expert systems, filling in guest books, viewing news.

2.4. Analysis of Input Needs

Input requirements needed for the needs of expert systems include:
- Enter questions and symptoms.
- Enter therapy or solutions that are not yet in the system.
- Enter data Enter the name, address, gender, occupation, in the guest book
- Change the link, Change the name of the link and url if it changes.

Analysis of Process Needs The peruses needed for this expert system are: The process of processing answers from users. The answers that have been entered by the user are processed by an expert system in accordance with the available rules.

Analysis of Output Requirements. Data output from this system is the name of the disease from the symptoms seen by the user. The output data obtained from the input is then processed by the engine that uses the FC method so as to produce an output that is a conclusion from the results of the consultation.

2.5. System Design

Software design is very necessary because the design is the first step in how the program will be created and poured into programming languages. In this software design, the system consists of two main parts, namely how to develop (Develover) and the consultation section (Consulation). This development is used to build expert systems, such as in terms of making a rule-based knowledge base, while the consultant's part is used by laypeople to communicate with expert systems. For more details, the design of expert system software can be seen in Figure 2.

![Interface](image)

**Figure 2. Software Architecture**

The knowledge base is a representation of knowledge from a person or expert that is needed to understand the problem that is subsequently gathered, coded, organized and described in another design form into a systematic one that can later show intelligence. This knowledge base consists of basic elements, namely the rule base.
Inference Machine is the core of expertise that contains patterns and ways of thinking of the reasoning of a system that is used by an expert, where later the inference machine will act as an expert used to analyze in solving a problem.

Inference provides a facility that is used to communicate between users or laypersons and systems, the facilities provided seek information from tracking problems until solutions are found.

Results are the results of the conclusions or solutions of the consultations conducted by the system. The system designed serves to facilitate users in knowing the name of the eye disease suffered. Where the user must first enter the consultation menu and answer the questions given by the system to get the final result.

3. Results And Discussion

3.1. System Testing

After the system implementation process is complete, an expert system program is ready to be used. Before that testing is needed for the ability of this program. This test is also useful to find out errors that occur due to the coding process of the program. System testing is carried out from the question and answer process with the system and the output will be compared with the existing knowledge base based on the respective rules and if the output is the same then it can be concluded in this test the expert system is working as the system design is made. Here are some examples of system testing results:

Trial of nearsighted eye disease:
If habits see melee continuously
And read in places with poor lighting
And read while lying down
And read too long without resting
And you consume less food with dietary A
And watch television too closely
You work too long in front of the computer
And playing games with large TVs and dean distances
Then nearsightedness

Solution:
a. The first step is, try remove the glasses that you use if you feel that you don't need it, like when you are in a bed room and not doing any activity, of course. You can used it if you can still see clearly even without wearing glasses.
b. Then, you can train your eyes to see a distance object with or without using glasses.
c. Next you can train your eyes to see moving objects. For example, when you are on the highway, you can observe people, motorbikes or passing cars around you. Look and watch every move.
d. Minus eye can also be cured with betel leaves, the method is very easy. We only need 2 betel leaves, then wash the betel leaves and paste them in your eyes every time you sleep.
e. If you are accustomed to working in front of a computer, try every 25 minutes, take time to get out of your seat maybe to just take drinking water and try to look out the window or outside the house, look at the environment around you.
f. Do as periodic to clean your eyes, if necessary, you can use eye sunglasses so that the eyes are protected from dirt and bacteria.
g. Use a helmet or glasses when you drive a motorcycle to prevent dust from the eye.
h. Consuming carrots, vegetable soup, carrot juice and so on that supply vitamin A

Trial of nearsighted eye disease:
If the headache is more pronounced if you look closely in a few minutes
And vision is uncomfortable, especially when focused views are certain to be long-term, such as watching television
And the eyes get tired quickly when reading at close range
And Far vision becomes blurred after a long period of close sight
And run away when you look far and near, especially if the degree of hypothermia is high (3.00 to 6.00 D)

Then Nearsightedness

Solution:

a. If you use glasses or lenses, you can open them. Next you look straight up over your eyebrows. Hold the position for 3 seconds. Then look down beyond your body for 3 seconds. Do it from top to bottom for 7 times.

b. Make your view as far as possible to the left for 3 seconds and do the same thing to the right for 7 times.

c. Blink your eyes to rest your eyes. Turn your eyes while looking straight at the roof. Blink your eyes again and rotate the manta ball to the left with your eyes closed.

d. Do not forget to clean your eyes, if necessary, you can use eye drops so that the eyes are protected from dirt and bacteria.

Cataract eye disease trial:

If the eyes are often runny 
And itching in the eyes 
And at night the eyes begin to weaken and are unable to see 
And you can't hold back glare 
And you have experienced trauma due to an accident that hit the part around the eye 
Descent factor 
And health problems, for example diabetes is identified 
And the eyes without protection are exposed to sunlight for quite a long time 
You have had eye surgery before 
And the eyes are blurred, gloomy or like a shadow of cloud or smoke 
And sensitive to light 
You need bright light to read or when you are active 
And there is a circle of light when looking at the light 
And often change glasses or contact lenses because of the inconvenience 
And colors fade or tend to turn yellow when viewing 
And double view if you see with one eye 
Then cataract

Solution:

a. Don't smoke

b. Eat food with balanced nutrition

c. Protect your eyes from sunlight

d. Maintain general health.

4. Conclusion

The conclusions that can be drawn from this research are:

a. Admin can do the process of adding, editing, deleting data for types of diseases, symptoms, and solutions in the knowledge base so that information can develop in accordance with the development of eye diseases in humans so that later the system will be able to provide appropriate information.

b. An expert system to diagnose eye diseases in humans has been able to provide information to the user regarding the type of disease based on the symptoms given.

c. This expert system can display diagnostic results that are accompanied by a solution of the disease and trace the symptoms of the illness.

d. Expert system method created by the forward chaining search process to identify the type of eye disease in humans.

e. The system can only recognize and diagnose the type of eye disease in the truth table of the disease.
f. Some symptoms of eye disease can infer the type of eye disease according to the highest percentage. The higher the percentage value of the search results, then indicates the type of eye disease suffered by eye disease patients.

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