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Expert System Diagnosing Eye Diseases Using WEB-Based Forward Chaining Method

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ABSTRACT

Health is very important for humans and also very important for the health of the five human senses, especially the sense of sight, namely the eyes. Eyes are windows to the world, this sentence seems to be the most appropriate to describe how important eyes are to human life. Often people ignore disturbances or complaints about their sense of sight and people think these complaints can go away on their own. Of course these complaints are early symptoms of eye disease. Because the above treatment is rare with some of its limitations, it is considered less helpful in solving existing problems, finally the idea arises of how the public knows eye diseases and their causes and how to overcome these diseases experienced in the eye without having to be an expert.

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1. Introduction

Health is very important for humans and also very important for the health of the five human senses, especially the sense of sight, namely the eyes. Eyes are windows to the world, this sentence seems to be the most appropriate to describe how important eyes are to human life. Often people ignore disturbances or complaints about their sense of sight and people think these complaints can go away on their own. Of course these complaints are early symptoms of eye disease. One of the contributing factors is the lack of public knowledge about eye diseases, and how to deal with these diseases quickly and accurately. There are some things that should not be handled carelessly. For example, in overcoming eye disease, vision drops slowly without red eyes. The public must know for sure what eye disease the human sense of sight suffers from, only then can they make a decision on what action to take. Thus, finally eye clinics. Thus, finally the eye clinics began to open.

Understanding Expert Systems, According to Sri Hartati and Sari Iswanti in their book Expert Systems & Its Development (2008), some definitions of expert systems according to experts are as follows: According to Martin and Oxman (1988): Expert systems are computer-based systems that use knowledge, facts , and reasoning techniques in solving problems, which usually can only be solved by an expert in a particular field. According to Ignizo (1991): Expert System is a field characterized by a knowledge-based system (Knowledge Base System), allowing computers to think and draw conclusions from the conclusions of the rules. According to Turban and Aronson (2001): Expert system is a system that uses human knowledge entered into a computer to solve problems that are usually solved by experts.

The eye is the organ of vision that detects light. The simplest thing the eye does is simply to know whether the surrounding environment is light or dark. More complex eyes are used to provide visual understanding. Visual is the part of the central nervous system that gives organisms the ability to process visual details, as well as allowing the formation of several non-image photo response functions. The visual system detects and interprets information from visible light to construct a representation of the surrounding environment. The eye is the main tool of this system. Eye Disease (Sight Decreased Slowly Without Red Eyes) Cataract is any condition of cloudiness in the lens that can occur due to hydration (addition of fluid) of the lens, lens protein denaturation occurs due to both. Congenital cataracts are cataracts that begin before or soon after birth and the baby is less than 1 year old. Juvenile Cataracts Cataracts that are flaccid and occur in young people, which begin to form at the age of less than 9 years and more than 3 months. Juvenile cataracts are usually a continuation of congenital cataracts. Senile cataract is all cloudiness of the lens found in the elderly, i.e. above 50. Clinically, senile cataract is known as 4 stages, namely Incipient Cataract, cloudiness from the equatorial edge of the spokes to the anterior and posterior cortex (cortical cataract) Intumescent cataract. The entry of water into the slit causes the lens to become swollen and large which will push the iris so that the chamber of the eye becomes shallower than normal. Immature Cataract As a cloudy lens or cataract. Cataracts that have not penetrated the entire lens layer. Lens volume will increase due to increased osmotic pressure of degenerative lens material. Mature Cataract Opacity Mature cataract has affected the entire mass of the lens. This turbidity can occur due to the overall deposition. The entry of water into the slit causes the lens to become swollen and large which will push the iris so that the chamber of the eye becomes shallower than normal. Immature Cataract As a cloudy lens or cataract. Cataracts that have not penetrated the entire lens layer. Lens volume will increase due to increased osmotic pressure of degenerative lens material. Mature Cataract Opacity Mature cataract has affected the entire mass of the lens. This turbidity can occur due to the overall deposition. The entry of water into the slit causes the lens to become swollen and large which will push the iris so that the chamber of the eye becomes shallower than normal. Immature Cataract As a cloudy lens or cataract. Cataracts that have not penetrated the entire lens layer. Lens volume will increase due to increased osmotic pressure of degenerative lens material. Mature Cataract Opacity Mature cataract has affected the entire mass of the lens. This turbidity can occur due to the overall deposition.

Glaucoma is a disorder characterized by increased eye pressure, optic nerve papillary atrophy, and a narrowing of the visual field. In glaucoma there will be weakness of eye function with visual field defects and anatomical damage in the form of excavation (reverberation) and degeneration of the optic nerve papilla, which can end in blindness. Glaucoma Classification: Primary Glaucoma Glaucoma of uncertain etiology, where there is no abnormality that causes glaucoma. Simple Glaucoma In simple glaucoma, daily eye pressure is high or more than 20 mmHg. As a result of high pressure, papillary atrophy will form accompanied by glaucomatous excavation.

Anemia ratinopathy In anemia, there may be changes in superficial and deep bleeding, including papilledema. These retinal symptoms are due to the severe anoxia that occurs in anemia. Anoxia will result in retinal infarction, so it is not uncommon to find a patch of cotton exudate. The more severe the anemia, the more severe retinal abnormalities will occur. Diabetic Retinopathy Diabetic retinopathy is a retinal disorder (retinopathy) found in people with diabetes mellitus. Retinopathy due to diabetes mellitus in the form of aneurysms, dilated veins, bleeding and fatty exudates.

2. Method

2.1 Method of collecting data

In this study, in order to obtain appropriate data and objective results, the authors used primary data collection methods, namely;

a. Interview

The interview method is by conducting a question and answer session with an eye expert or specialist about the types of eye diseases with slowly decreasing vision without red eyes. In this study the authors conducted the first interview with Dr. Kelvin Alim, SpM at KL Clinic which is located at Grand Aries Niaga Blok E1 No. 1M – 1N Jalan Taman Aries, Kembangan – Meruya, West Jakarta. The second interview, the author conducted an interview with Dr. Indra Wiryawan, SpM at Aini Eye Hospital, which is located at Jalan HR. Rasuna Said Kuningan, Jakarta 12920.

b. Literature or Reference Studies

Literature study is a method of searching and collecting data by looking for references or theoretical materials needed from various sources of discourse related to the preparation of the thesis.

2.2 Forward Channing

Forward chaining is a tracing process that begins by displaying a collection of data or convincing facts towards a final conclusion. Forward traceability starts from the premises or input information (if) first then leads to conclusions or derived information (then) or can be modeled as follows:

IF (input information)
THEN (conclusion)

Input information can be in the form of data, evidence, findings, or observations. While the conclusion can be a goal, hypothesis, explanation, or diagnosis.

2.3 Backward chaining

Backward chaining is a tracing process in the opposite direction of forward chaining. The process of tracing back reasoning begins with the goal / goal then traces back the path that will lead to that goal, looking for evidence that the condition part is fulfilled.

3. Results and Discussion

3.1 Problem Analysis

Prior to the development, it was very difficult for patients to see a specialist because of the limited work schedule of an expert doctor, patients had to make a referral letter first and had to make an appointment before having a consultation. This causes patients to want a quick way to find out the disease they are suffering from

3.2 Troubleshooting Proposal

a. Knowledge Acquisition

Knowledge acquisition is the process of retrieving information and data regarding all types of diseases and the symptoms that arise when diagnosed with the disease.

TABLES 1.
SYMPTOMS OF EYE DISEASE

Code	Symptom
G001	Vision goes down slowly without bloodshot eyes
G002	Faint view
G003	Dazzled
G004	Eyes hard as stone
G005	Damage to the location of the retina
G006	Cloudiness of the lens
G007	Head dizzy
G008	One eye
G009	Appears in early childhood or adulthood
G010	The size of the minus glasses that have changed
G011	No pain
G012	Retinal bleeding
G013	Decreased peripheral vision
G014	Double vision
G015	Diabetics
G016	Sometimes visual acuity remains normal
G017	Acute diabetes
G018	Headache

Code	Symptom
G019	Leakage of blood vessels flowing in the eye
G020	Blurred vision
G021	Infected with rubella virus after blood check
G022	Smoky vision
G023	Attacking one eye or two
G024	Sensitive to light
G025	Difficult to see small objects
G026	<40 years old
G027	The presence of a Halo (there is a rainbow around the visible light source)
G028	Eye fluid barrier
G029	twilight blind
G030	Totally blind
G031	Family ancestry
G032	Retinal vascular disorders due to high blood pressure
G027	The presence of a Halo (there is a rainbow around the visible light source)

TABLE 2.
TYPE OF EYE DISEASE (DECREASED VISION WITHOUT RED EYE)

Code	Disease
P001	Congenential Cataract
P002	Rubella Cataract
P003	senile cataract
P004	Complex Cataract
P005	Diabetic Cataract
P006	Secondary Cataract
P007	Juvenile Cataract
P008	Simple Glaucoma
P009	Primary Glaucoma
P010	Diabetic Retinopathy
P011	Proliferative Diabetic Retinopathy
P012	Pigmentous Retinopathy
P013	Hypertensive Retinopathy

b. Knowledge Representation

Representation of knowledge used is the representation of knowledge with the method of Rules or Production System. Production rules are written in the form of if – then (if – then). The if – then rule relates the antecedent to the consequences that lead to it. The form of the structure of production rules in the following examples:

1). IF premise THEN conclusion
2). IF action THEN reaction
3). IF condition THEN action

With this structure, this bone disease detection system can use production rules with an IF structure, THEN diagnosis. So according to the if – then production rules, the premise on the facts must be true. Likewise, symptoms that refer to conditions that cause disease or that encourage further examination.

TABLE 3.
EYE DISEASE DECISION

G/P	P001	P002	P003	P004	P005	P006	P007	P008	P009	P010	P011	P012	P013
G001	X	X	X	X	X	X	X	X	X	X	X	X	X
G002	X	X	X	X	X	X	X	X	X	X	X	X	X
G003	X	X	X	X	X	X	X						
G004								X	X				
G005										X	X	X	X
G006	X	X	X	X	X	X	X						
G007								X	X				
G008										X	X		
G009												X	X
G010	X	X	X	X	X	X	X						
G011								X	X				
G012										X	X		
G013												X	X

G/P	P001	P002	P003	P004	P005	P006	P007	P008	P009	P010	P011	P012	P013
G014	X	X	X										
G015				X	X	X	X						
G016								X	X				
G017										X	X		
G018												X	
G019													X
G020	X												
G021		X											
G022			X										
G023				X									
G024					X								
G025						X							
G026							X						
G027								X					
G028									X				
G029										X			
G030											X		
G031												X	
G032													X

4. Conclusion

Based on the results of research conducted on eye diseases using an expert system with the forward chaining method, the following conclusions can be drawn: An expert system has been successfully designed to diagnose eye disease using a website-based forward chaining inference method.

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