

UTILIZATION OF THE CERTAINTY FACTOR METHOD TO DIAGNOSE EYE DISEASES

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ABSTRACT

In Indonesia, the number of people with eye disease increases every year. The blindness rate of the population in Indonesia is around 1.2% of the total population. People with this eye disease have problems ranging from mild to blind spots. The main causes of blindness are cataracts, corneal disorders, glaucoma, refractive errors, dry eyes, retinal disorders and nutritional disorders. Conjunctivitis, macular degeneration, diabetic retinopathy and other diseases that affect the eyes. As vision, it is necessary to keep the function of the eye from decreasing. As a person ages, the accommodation ability of the eye also decreases. The causes include sitting too long in front of a computer or staring at a cellphone screen for too long, reading a book at a distance that is not within a normal healthy distance, or the presence of dirty air and solar radiation. This can cause a decrease in eye function. The author aims to develop an expert system for diagnosing eye diseases using the Certainty Factor Method in the process of analyzing and solving problems, this method is expected to be able to provide accurate diagnostic results or almost resemble the results of an expert. From the results of the system analysis process above, it can be seen that based on the symptoms of eye disease that have been inputted above, the results of the diagnosis of the patient were diagnosed with eye disease with the type of Dry Eye Disease with a Certainty Factor confidence value of 95.63%. data related to eye disease, the following conclusions can be drawn: 1. The PHP programming language and MySQL database can build a system for diagnosing eye disease using the Certainty Factor method. 2. Based on data on symptoms of eye disease using the Certainty Factor method, the results for conjunctivitis were 93.16%, dry eyes 95.63%, cataracts 82.74%, glaucoma 82.74%, retinal disorders 82.74%, corneal disorders 91.60%. Based on these results the greatest confidence value is in the type of dry eye disease, so the patient is diagnosed with eye disease with this type of dry eye disease with a Certainty Factor confidence value of 95.63%. 3. The certainty factor method can be applied to diagnose eye diseases.

Keywords : Eye disease, Certainty Factor, PHP and MySQL

ABSTRAK

Di Indonesia jumlah penderita penyakit mata meningkat setiap tahunnya. Angka kebutaan penduduk di Indonesia berkisar 1,2% dari total penduduk. Penderita penyakit mata ini mempunyai masalah mulai dari titik ringan hingga titik buta. Penyebab utama kebutaan adalah katarak, kelainan kornea, glaukoma, kelainan refraksi, mata kering, kelainan retina dan gangguan gizi. Konjungtivitis, degenerasi makula, retinopati diabetik, dan penyakit lain yang menyerang mata. Untuk penglihatan perlu dipastikan fungsi mata tidak menurun. Seiring bertambahnya usia, kemampuan akomodasi mata juga semakin menurun. Penyebabnya antara lain terlalu lama duduk di depan komputer atau terlalu lama menatap layar ponsel, membaca buku dengan jarak yang tidak dalam jarak normal sehat, atau adanya udara kotor dan radiasi matahari. Hal ini dapat menyebabkan penurunan fungsi mata. Penulis ini bertujuan untuk mengembangkan sistem pakar untuk mendiagnosa penyakit mata dengan menggunakan metode Certainty Factor, metode Certainty Factor dalam proses analisis dan penyelesaian masalah, metode ini diharapkan mampu memberikan hasil diagnosa yang akurat atau hampir menyerupai hasil seorang pakar. Dari hasil proses analisis sistem di atas terlihat bahwa berdasarkan gejala penyakit mata yang telah dimasukkan di atas, hasil diagnosa pasien terdiagnosis penyakit mata kering dengan nilai kepastian Faktor Kepastian sebesar 95,63%. Hasil penelitian yang dilakukan sangat menambah pengetahuan dan wawasan, dengan mengumpulkan data-data yang berkaitan dengan penyakit mata, maka dapat diambil kesimpulan sebagai berikut: 1. Bahasa pemrograman PHP dan database MySQL dapat membangun sistem diagnosa penyakit mata dengan menggunakan Kepastian Metode faktor. 2. Berdasarkan data gejala gangguan mata dengan metode Certainty Factor diperoleh hasil sebesar 93,16% untuk konjungtivitis, 95,63% untuk mata kering. katarak 82,74%, glaukoma 82,74%, kelainan retina 82,74%, kelainan kornea 91,60%. Berdasarkan hasil tersebut, nilai keyakinan paling besar terdapat pada jenis penyakit mata kering, sehingga pasien



terdiagnosis jenis penyakit mata kering dengan nilai kepastian Faktor Kepastian sebesar 95,63%. 3. Metode kepastian factor dapat diterapkan untuk mendiagnosis penyakit mata.

Keywords : Penyakit Mata, Faktor Kepastian, PHP dan MySQL

1. Background Problem

In Indonesia, the number of people with eye disease increases every year. The blindness rate of the population in Indonesia is around 1.2% of the total population. People with this eye disease have problems ranging from mild to blind spots. The main causes of blindness are cataracts, corneal disorders, glaucoma, refractive errors, dry eyes, retinal disorders and nutritional disorders. Conjunctivitis, macular degeneration, diabetic retinopathy and other diseases that affect the eyes.

As vision, it is necessary to keep the function of the eye from decreasing. As a person ages, the accommodation ability of the eye also decreases. The causes include sitting too long in front of a computer or staring at a cellphone screen for too long, reading a book at a distance that is not within a normal healthy distance, or the presence of dirty air and solar radiation. This can cause a decrease in eye function. This writer aims to develop an expert system for diagnosing eye diseases using the Certainty Factor Method

2. THEORETICAL BASIS

In research (Adhar, 2017) entitled Implementation of an Expert System for Early Diagnosis of Web-Based Eye Diseases Using the Certainty Factor Method. In this research the expert system was designed using the certainty factor method. This system is designed as a web-based so that information can be accessed anywhere so that eye health can be handled quickly . In a study (Septiana et al., 2016) entitled Design of an Expert System for the Diagnosis of ISPA Using the Android-Based Certainty Factor Method. In this study, the researcher built an expert system using the Forward Chaining method to find a solution or the possibility of the disease being suffered by the user and using the certainty factor method to obtain confidence in the percentage of the disease suffered. In research (Latumakulita, 2012) entitled Expert System for Diagnosing Childhood Diseases Using Certainty Factor (CF). This research has built an expert system to diagnose children's illnesses by handling uncertainty factors using certainty factor (CF).



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3. Expert System Definition

Expert systems are part of Artificial Intelligence (AI), and were discovered by the AI community in the mid-1960s. The basic idea behind expert systems is to make it easier for experts who have specific knowledge to be transferred into a computer. This knowledge is then stored on the computer and can be retrieved by the user when needed. Furthermore, like consultations that occur in humans, computers can provide input and explanations (Sastypratiwi & Nyoto, 2020).

2.1. Expert System Components

An expert system is a program that can imitate human experts, must be able to do what an expert does. To set up the system requires several components as mentioned in the journal (Kurniawan, 2019), as follows:

1. User Interface (User Interface)

The interface is the mechanism through which the user and the expert system communicate. The interface takes information from the user and converts it into a system-acceptable format. The interface also receives from the system and presents it in a way that the user can understand.

2. Knowledge Base

The knowledge base contains elements of knowledge to understand and formulate when solving problems.

3. Knowledge Acquisition

Knowledge acquisition is the accumulation, transfer and transformation of expertise from knowledge sources to solve problems. that is entered into the computer. At this stage, those who have the ability to build a program try to understand the knowledge that will be provided in the knowledge base.

4. Inference Engine / Motor (Inference Engine)

This component has a thinking mechanism that experts use to deal with a problem. An inference engine is a computer program that contains methods used to determine decisions from the information available in the knowledge base

5. Workplace

Workplace is the memory used to record ongoing events.

6. Explanation Facility

Components that can support expert system functionality. This component serves to seek responses and inform about the behavior of the expert system from questions.

7. Knowledge Improvement

Experts have advantages in analyzing and being able to improve their performance and learn from their performance. This skill is very important in computer-based learning, because it allows the program to analyze the reasons for success or failure and explore whether the knowledge can be utilized in the future.

2. 2 Certainty Factor Method



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Certainty Factor (CF), which is usually implemented in expert systems, is a mechanism for evaluating whether a fact is clear or confusing. This approach is suitable for expert systems that make uncertain diagnoses. Shortliffe Buchanan added a certainty factor during the production of MYCIN. A clinical parameter value called the Certainty Factor (CF) is provided by MYCIN to indicate how trustworthy something is (Septiana et al., 2016).

Certainty Factor

is defined as the following equation (Septiana et al., 2016):

$$CF(H,E)=MB(H,E)-MD(H,E) \dots \dots \dots 2.1$$

Information :

CF (H, E) : Certainty Factor from hypothesis H which is influenced by evidence (evidence) E. The magnitude of CF ranges from -1 to 1. A value of -1 indicates absolute distrust while a value of 1 indicates absolute trust.

MB (H, E): a measure of increased belief in hypothesis H which is influenced by symptom E.

MD (H, E): a measure of increased disbelief towards hypothesis H which is influenced by symptom E.

The basic form of the certainty factor formula is an IF E THEN H rule as shown by the following equation:

$$CF(H,e) = CF(E,e) * CF(H,E) \dots \dots \dots 2.2$$

where:

CF (H, e) : hypothesis certainty factor that is influenced by evidence e.

CF (E, e) : certainty factor evidence E which is influenced by evidence e.

CF (H, E) : hypothesis certainty factor assuming the evidence is known with certainty, that is when $CF(E, e) = 1$

If all the evidence on the antecedent is known with certainty then the equation will be:

$$CF(E,e)= CF(H,E) \dots \dots \dots 2.3$$

In its application, CF(H,E) is the certainty value given by an expert for a rule, while CF(E,e) is the confidence value given by the user for the symptoms he is experiencing.



2.3 . Application of the Method

The method used in this research is using the Certainty Factor method. The steps of this method are as follows:

1. Calculate the CF value with the following formula:

$$CF_{\text{expert}} * CF_{\text{user}}$$

2. Combine CF 1.1 with CF 1.2 with the following formula:

$$CF_{\text{combine}} (CF_1, CF_2) = CF[h_1, e_1] + CF[h_1, e_2] * (1 - CF[h_1, e_2]) = CF_{\text{old}}$$

Then combine CF old and CF[h1,e3]

3. Confidence percentage = CF combine * 100%

Sample cases:

A patient has symptoms of eye disease with user and expert belief values as shown in the table below:

Table I. Cases of Patient Symptoms

| code | Symptom | User Trust | Expert Trust |
|------|---|---------------|---------------|
| G01 | Red eye | Certain | Sure enough |
| G02 | Itchy eyes | Sure enough | Sure enough |
| G03 | Swollen eyes | Certain | Sure enough |
| G04 | Eye discharge | Certain | Sure enough |
| G07 | Pain in the eye area. | Sure enough | A little sure |
| G10 | Watery eyes | Sure enough | A little sure |
| G11 | Gritty or lumpy | A little sure | A little sure |
| G13 | Glare when looking at car headlights, the sun, or lights. | Certain | Sure enough |
| G17 | Decreased vision at night. | A little sure | A little sure |

4. Results



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From the results of the system analysis process above, it can be seen that based on the eye disease symptoms that have been entered above, the patient's diagnosis results were diagnosed as dry eye disease with a Certainty Factor confidence value of 95.63 % .

5. Conclusion

From the results of the research carried out, it greatly increases knowledge and insight, by collecting data related to eye disease, the following conclusions can be drawn:

1. The PHP programming language and MySQL database can build a system for diagnosing eye diseases using the *Certainty Factor method* .
2. Based on data on symptoms of eye disorders using the *Certainty Factor method* , the result of conjunctivitis was 93.16%, dry eyes 95.63%. cataract 82.74%, glaucoma 82.74%, retinal disorders 82.74%, corneal disorders 91.60% . Based on these results, the greatest confidence value is in the type of dry eye disease, so the patient was diagnosed with a type of dry eye disease with a *Certainty Factor* confidence value of 95.63% .
3. Method *certainty facetor* can be applied to diagnose eye diseases

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