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Application of The *Certainty Factor* Method to Detect Android Based *Rheumatoid Arthritis*

Agus Iskandar
Informatics Study Program, Universitas Nasional, Jakarta, Indonesia
Email: agus.iskandar1949@gmail.com

Abstract

A system designed to assist in providing the final knowledge of rheumatoid arthritis that occurs. the expert system here imitates or is similar to an expert in knowing and detecting the initial symptoms of what is happening. This system was built using Android which can be installed by the user, this system helps in dealing with conditions that occur in rheumatoid arthritis. From the research conducted to produce an android-based expert system for the final diagnosis of conditions using the Certainty Factor method, it can provide information about 5 types of rheumatoid arthritis diagnoses, 10 symptom data, provide information about causes to suggestions for final treatment. The results of testing using the Alpha Test on 15 participants were obtained to install the expert system first on mobile phones, the answer option "Fit" was obtained which had a percentage value of 0.54 or like 54%, and was also carried out where testing used Black Box testing which showed the result value according to the reference site

Keywords: *Certainty Factor; Expert System; Hardware; Alpha Test; Android*

1. Introduction

The development of this technology occurs very rapidly. With technology can help human activities. One technology that can help human activities is expert systems. The basic concept of an expert system is to transfer the knowledge possessed by an expert or experts into a computer program or system. With this technology, it can make it easier for humans to know or increase knowledge about the topic or problem at hand and need experts to answer the problem. One of the benefits of this technology is in the field of Health. In this study will create an expert system that is used to detect the disease Rhematoid Arthritis. This disease called rheumatism is often not realized by the public which leads to the purchase of medicines to relieve pain without knowing whether they really have rheumatic disease or not. Common symptoms that are felt include pain in the knee or other limbs. Therefore, this study will conduct research on the application of Certainty Factor method to detect Android-based Rhematoid Arthritis. This study did not escape from seeing some references from previous research. In a study conducted by hariyanto and Henny (2020), the results showed that the Expert System created can be used as early detection and as a solution for joint diseases [1]. Then the research conducted by Hairani, et al (2019) obtained the results of testing studies that have been conducted that the forward chaining inference method can diagnose types of rheumatic diseases [2]. In addition, research conducted by Marbun, et al (2018) obtained results that implement an expert system by adopting the Certainty factor method and later can help doctors find out the diagnosis of joint bone disease and find out the handling solution [3]. In the research conducted by Kesumaningtyas and Reti (2020) also obtained results that the system or application made is very helpful in the lack of Information Systems at the Health Center IV kecematan IV Koto better for the Future [4]. Not only that, the research conducted by Al Fatri H and Eviyanti (2022) also conducted research on expert systems using the certainty factor method with the results of the research, namely the website used as a tool to diagnose the right early bone disease so that people with bone disease quickly get treatment [5]. From several comparative journals above, the purpose of designing this system is to be able to help system users, especially those who experience symptoms of

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rheumatoid Arthritis in overcoming, analyzing, diagnosing, knowing the condition of the symptoms that are felt to be quickly resolved if knowing the source and solution of the symptoms felt.

2. Research Methodology

Research methodology is a way that is arranged in a clear sequence and sequence can be used to collect data or information in conducting research in accordance with the object under study [6].

2.1. Research Stages

Research Stages are levels of a research activity in which these stages are carried out in a structured, coherent, logical and systematic manner [7]. namely by testing in black box testing and alpha testing, finally, there is a final result where an expert system can be used, it can be installed on an Android cellphone.

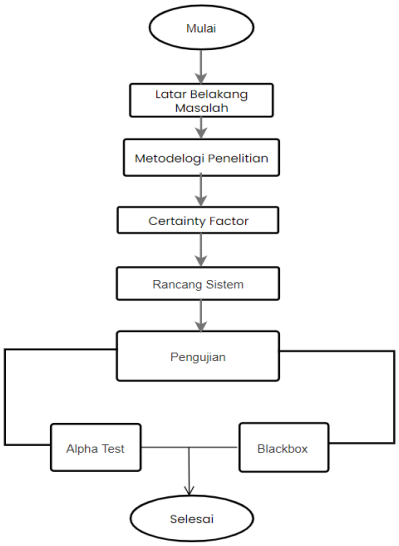

Figure 1. Research Stages

In Figure 1 above are the stages of the research, namely background, research methodology, certainty factor method, making a system build, testing the system in two ways, namely by testing black box testing and with an alpha test and the finished system can be used on Android mobile phones.

2.2. Expert System

An expert system is a system that is in a computer that can imitate or match the abilities of an expert. Experts here are people who have expertise, special knowledge that can solve problems [8]. According to another understanding that sophisticated expert systems can be improved by adding to the knowledge base or set of rules [9]

2.3. Metode Certainty Factor

Metode Certainty Factor is the clinical parameter value to indicate the degree of confidence [10]. Another understanding of the understanding of the certainty factor method is a method for measuring certainty about facts that describe the belief of an expert in the problem at hand [11]. The level of confidence that has been determined where the user is given a choice of answers that have the following weights:

Table 1. Confidence Value Level

No	CF User	Information
1	0.2	Very Unsuitable
2	0.6	Not Suitable
3	0.8	Suitable
4	1	Very Suitable

Here's how to manually calculate the certainty factor algorithm to find the CF value:

Table 2. How to calculate manually from the Certainty Factor Algorithm

Selection	CF User	CF Role	conclusion
Not suitable	0.6	0.5	0.30
Not suitable	0.6	0.7	0.42
Suitable	0.8	0.7	0.56
Suitable	0.8	0.9	0.72

The rule then calculates the value of the CF expert/role with the CF user using the equation. With the formula, if you get a CF value (H, E) is [9]:
CF(H,E) = CF(E) * CF(Rule)
CF(H,E) = CF(User) * CF(Rule)

The final stage is the combination of CF values for each rule with a combination of CF 1 to CF 4 with the equation, here's how to calculate manually :

a) CF(A) = CF(1) + CF(2) * [1 – CF(1)] = 0.35 + 0.49 * (1 – 0.35) = 0.546
b) CF(B) = CF(3) + CF(A) * [1 – CF(3)] = 0.49 + 0.42* (1 – 0.49) = 0.464
c) CF(C) = CF(4) + CF(B) * [1 – CF(4)] = 0.81+ 0.64 * (1 – 0.81) = 0.2755

In the final result with the highest certainty factor method is 0.546

3. Results And Discussion

3.1. Use case Diagrams

Use case is a depiction process carried out to show the relationship between the user and the designed system [12]. Understanding the use case method according to others is a description of the interaction between one or more actors who play a role in the information system [13]. From an understanding of the use case diagram, it can be seen the use case diagram of the Application of the Certainty Factor Method for Detecting Android-Based Rheumatoid Arthritis Disease

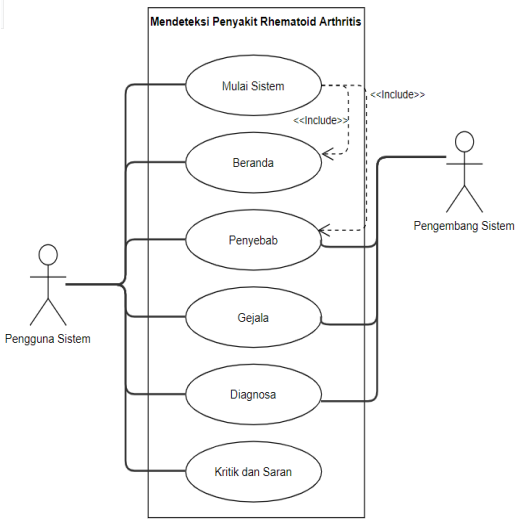

Figure 2. Use case Diagrams

In Figure 2 above, it can be seen that system users can start the system, enter the homepage, causes, symptoms, diagnoses, criticisms, suggestions, and system developers can view and edit the cause menu, symptom menu, and diagnosis menu.

3.2. Implementation

In figure 3, the main menu display shows the about menu, diagnosis menu, symptoms menu, related articles menu, expert response menu.

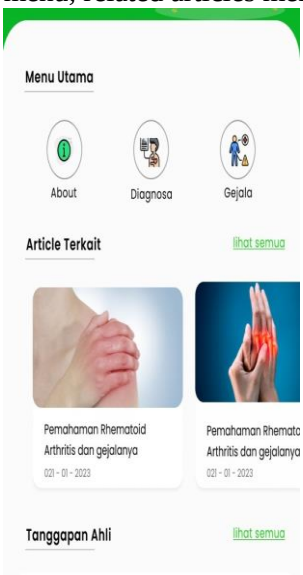

Figure 3. Main Menu Display

Figure 4. Display About Menu

Figure 5. Diagnostics Menu

Figure 6. Diagnostic Results menu

3.3. Alpha Test Testing

Alpha testing is a test of a project in the form of an application carried out by a group of end users will record the location of errors that occur in the application and will later notify the developer of the project if there are still errors [14]. Another understanding of alpha test testing is testing to ensure that the tested application can run smoothly without any bugs[15]. For testing the system using the alpha test is done to 20 people or 20 respondents to assist in testing this expert system and given a list of related questions. This test has 5 items of questions with answers not very suitable, not suitable, suitable, very suitable, can be seen as Table 4

Table 4. Alpha Test Testing

Statement	Very Unsuitable	Not Suitable	Suitable	Very Suitable
Is this system useful for the user	0			8
Is the main menu display can be understood		1	9	10
Is the information about the about menu, menu diagnosis, symptom menu, related article menu, expert response menu can function entirely	0	2	10	8
This system is interesting to use	0	1	15	4
The end result is helpful and easy to diagnose	0		16	4

Based on the above results, the percentage of the assessment of the system can be obtained, namely:

STC (VERY UNFITABLE) : $0 / 100 * 100\% = 0$
TC (NOT MATCHED) : $4 / 100 * 100\% = 0.04$
C(FIT) : $62 / 100 * 100\% = 0.62$
SC (VERY FITABLE) : $34 / 100 * 100\% = 0.34$

For the answer "Very Suitable" has the largest percentage value of 0.34 or 34%, Based on the answer choices "Fit" has a percentage value of 0.62 or 62%. That it can be concluded that this application is feasible to use and suitable for use

4. Conclusion

The Expert System is a system to help users find out skin health conditions, a system designed to assist in providing the final knowledge of rheumatoid arthritis that occurs. the expert system here imitates or is similar to an expert in knowing and detecting the initial symptoms of what is happening. This system was built using Android which can be installed by the user, this system helps in dealing with conditions that occur in rheumatoid arthritis. From the research carried out, it produced an Android-based expert system for final diagnosis of conditions using the certainty factor method which can provide information about 5 types of rheumatoid arthritis diagnoses, 10 symptom data, provide information about the causes to suggestions for final treatment. The results of testing using the Alpha Test on 15 participants were obtained to install the expert system first on mobile phones, the answer option "Fit" was obtained which had a percentage value of 0.62 or like 62%, and testing was also carried out using Black Box testing which shows the result value according to the reference site.

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