

First Aid Diagnosis Expert System Using the Certainty Factor Method

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Abstract

Accidents often occur suddenly and are not planned, which can result in injury. If an accident occurs, first aid must be carried out immediately before being given further assistance. The Indonesian Red Cross (PMI) is one of the institutions in Indonesia engaged in the health sector that can provide first aid in the event of an accident. However, often when an accident occurs, the victim is not immediately given help due to lack of information to the public. In this study, the authors made an application of the Certainty Factor method so that the public could recognize and know what to do with victims who had an injury or accident. This application is made to present the knowledge of an expert in approaching a problem, which is called an expert system. This expert system will display symptoms that can be selected according to the symptoms felt by the victim. The final results of this application obtained a value of 78% from the calculation using the Certainty factor method in bleeding diseases. From the tests carried out, it shows the beta test results obtained by a value of 58.25% indicating that the respondents strongly agree with the usefulness of the application system

Keywords: Expert System, First Aid, Certainty Factor, Diagnosis

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1. INTRODUCTION

An accident is an unplanned and unwanted event that disrupts the process of a regulated activity. Accidents can cause losses such as injury, illness, or material damage. Accidents can happen anytime and anywhere such as on the road, at school, at work, even at home. Victims who have an accident or injury need immediate help from paramedics or doctors. However, sometimes the distance from the place where the accident or injury was injured is quite far from the clinic or hospital, while the victim must be treated immediately so as not to cause further injury or injury. Therefore, it is necessary to take temporary help and care for victims of accidents or injuries before getting more perfect help from doctors or paramedics. This action is called First Aid which can be performed by people who are near the victim.

Based on the problem, an expert system application program was designed that was able to help the community in learning some of the symptoms and first aid measures. By utilizing Website technology, this study aims to build a "First Aid Diagnosis Expert System Using the Certainty Factor Method" which can be used by users using web-based computer or mobile devices.

2. RESEARCH METHODS

2.1. Certainty Factor Method

Certainty Factor (CF) is to accommodate the uncertainty of thought (inexact reasoning) of an expert proposed by Shortliffe and Buchanan in 1975. An expert (for example a doctor) often analyzes existing information with expressions with uncertainty, to accommodate this we use certainty factor (CF) to describe the level of expert confidence in the problem at hand (T. Sutojo, 2011). [1]

Certainty Factor is defined as the following equation:

$$\text{CF (H, E)} = \text{MB (H, E)} - \text{MD (H, E)}$$

$$\text{MB(H, E)} = \frac{\max[P(H|E), P(H)] - P(H)}{\text{Max}[1,0] - P(H)} \dots P(H) = 1$$

$$\text{MB(H, E)} = \frac{\min[P(H|E), P(H)] - P(H)}{\text{Max}[1,0] - P(H)} \dots P(H) = 0$$

Information:

- CF (Rule) = Certainty factor
- MB(H, E) = Measure of belief (measure of trust) to the H hypothesis, if given evidence E (between 0 and 1).
- MD (H, E) = Measure of disbelief (measure of distrust) of evidence H, if given evidence E (between 0 and 1).
- P(H) =Probability of the H hypothesis.P(H|E)=Probalance that H is true because of fact E.

2.2. First Aid

According to Cecep (2014) first aid is an effort of temporary assistance and care for accident victims before receiving more perfect help from doctors or paramedics. This means that assistance is not a perfect treatment or handling, but is only in the form of temporary assistance carried out by P3K officers (medical officers or lay people) who saw first. [2]

2.3. Expert System

According to Sri Kusumadewi (2003) expert system is an artificial intelligence technique that tries to adopt human knowledge to computers to solve problems as is usually done by experts. A good expert system is designed to be able to solve a certain problem by imitating the

work of the experts / experts. With this expert system, it can help the community in solving problems that actually can only be solved with the help of experts / experts. For experts, this expert system will also assist their activities as highly experienced assistants. [3]

2.4. Flow chart

Flow chart are steps to solve problems that are written in the form of a particular symbol which will show the flow of a program logically. Besides being needed as a communication tool, this flow chart is also needed as a documentation tool (Lamhot Sitorus, 2015: 14). [4]

2.5. DFD (Data Flow Diagram)

Data flow diagrams (data flow diagrams - DFD) are diagrams that use symbols to present entities, processes, data flows, and data storage associated with a system. Entities in DFD are external objects in the system being modeled (Dewi and Arnos, 2007: 79). [5]

2.6. ERD (Entity Relationship Diagram)

Entity Relationship Diagram (ERD) is a diagram used to design tables which will later be implemented in the database. ERD is formed based on 3 elements, namely entities, attributes and relationships (Feri and Fajri, 2015: 100). [6]

2.7. System planning

1. Flow chart

Flow chart or application system steps are in the image below. Image 2.1 is a system flowchart.

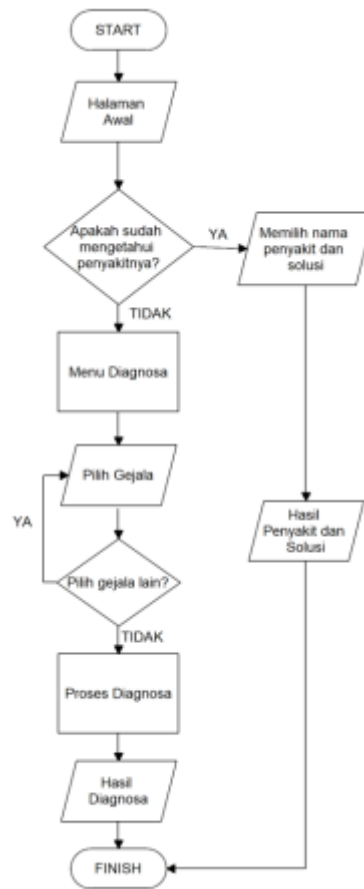


Image 2.1 Admin Flowchart

2. DFD (Data Flow Diagram)

Image 2.3 below is an application flow diagram

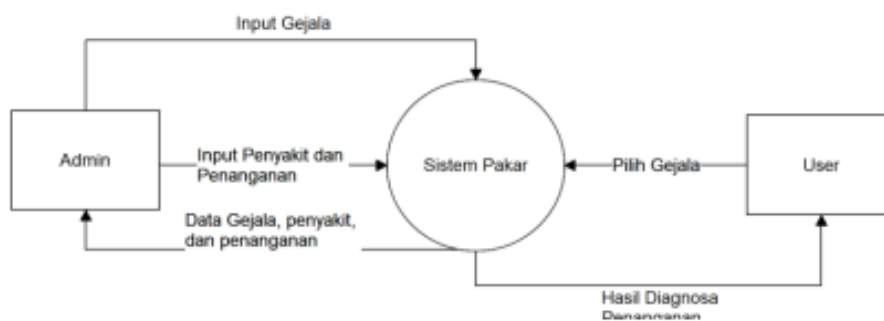


Image 2.3 DFD

3. ERD (Entity Relationship Diagram)

Image 2.4 below is a table design along with the attributes used in the system. The table consists of symptoms (symptoms_name (as primary key), symptoms_code), condition (id_condition (as primary key), condition), disease(code_disease (as primary key),

name_disease, detail_disease, suggestion_disease, picture), admin (id (as primary key), username, password), knowledge_base (id (as primary key), code_disease, name_disease, code_symptoms, mb score, md score), post (code_post(as primary key), name_post, detail_post, suggestion_post, picture), and result(id_result (as primary key), date, disease, symptoms, result_score).

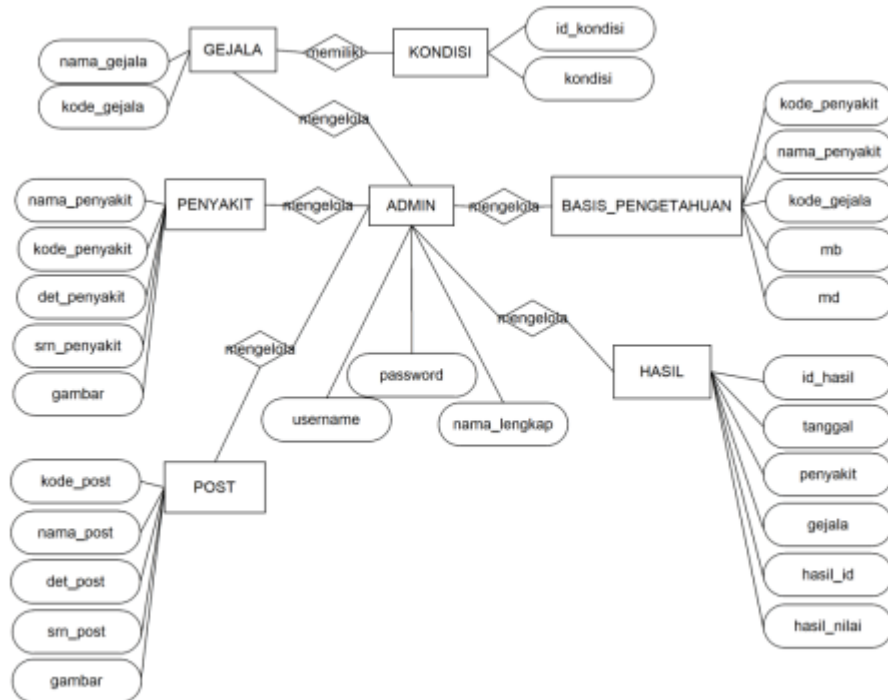


Image 2.4 ERD

4. Layout Design

Image 2.5 to Image 2.7 below is a system layout design

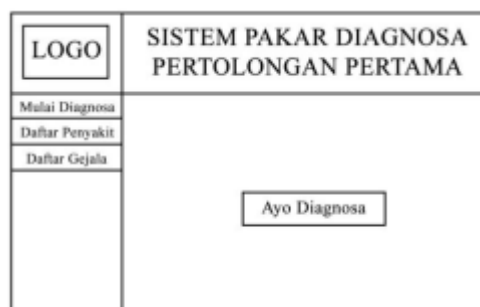


Image 2.5 Application Home Page Design

LOGO	SISTEM PAKAR DIAGNOSA PERTOLONGAN PERTAMA
Mulai Diagnosa	1. Pertanyaan 1 ? <input type="radio"/> Tidak <input type="radio"/> Tidak Tahu <input type="radio"/> Sedikit Tahu <input type="radio"/> Cukup Tahu <input type="radio"/> Tahu <input type="radio"/> Sangat Tahu
Daftar Penyakit	2. Pertanyaan 2 ? <input type="radio"/> Tidak <input type="radio"/> Tidak Tahu <input type="radio"/> Sedikit Tahu <input type="radio"/> Cukup Tahu <input type="radio"/> Tahu <input type="radio"/> Sangat Tahu
Daftar Gejala	3. Pertanyaan 3 ? <input type="radio"/> Tidak <input type="radio"/> Tidak Tahu <input type="radio"/> Sedikit Tahu <input type="radio"/> Cukup Tahu <input type="radio"/> Tahu <input type="radio"/> Sangat Tahu
	4. Pertanyaan 4 ? <input type="radio"/> Tidak <input type="radio"/> Tidak Tahu <input type="radio"/> Sedikit Tahu <input type="radio"/> Cukup Tahu <input type="radio"/> Tahu <input type="radio"/> Sangat Tahu
	5. Pertanyaan 5 ? <input type="radio"/> Tidak <input type="radio"/> Tidak Tahu <input type="radio"/> Sedikit Tahu <input type="radio"/> Cukup Tahu <input type="radio"/> Tahu <input type="radio"/> Sangat Tahu
	<input type="button" value="Enter"/>

Figure 2.6 Diagnosis display design

LOGO	SISTEM PAKAR DIAGNOSA PERTOLONGAN PERTAMA						
Mulai Diagnosa	HASIL						
Daftar Penyakit	Penyakit yang dialami serta penanganan yang harus dilakukan :						
Daftar Gejala	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 33%;">Penyakit</th> <th style="width: 33%;">Penanganan</th> <th style="width: 33%;">Persentase</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Penyakit	Penanganan	Persentase			
Penyakit	Penanganan	Persentase					
	<input type="button" value="Diagnosa Lagi ?"/>						

Figure 2.7 Result display design

3. RESULTS AND DISCUSSION

3.1. Implementation

1. Application Home Page View



Image 3.1 Application Home Page View

In image 3.1 is the application's Home page. there are names, application descriptions, and there are application menus such as the diagnosis menu, diseases, symptoms, knowledge, post information, and information.

2. Admin Page Views

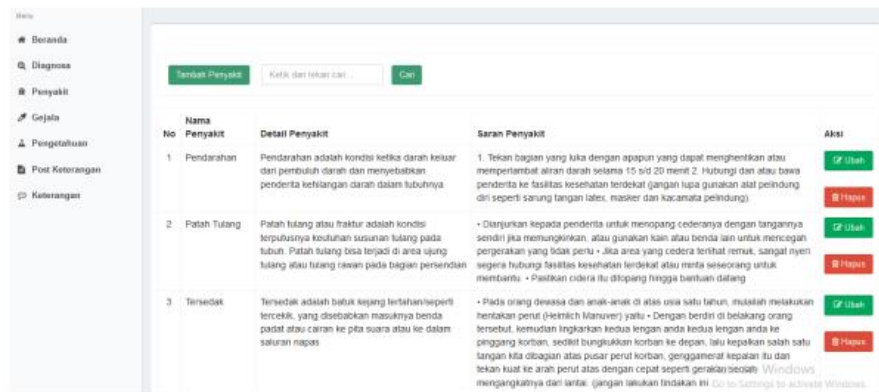


Image 3.2 Admin page

Image 3.2 is the admin page. On the admin page, there is a table of names, details, and suggestions for what to do according to the disease being experienced, there are also facilities for searching, adding, changing, or deleting disease data as needed through the buttons provided.

3. User Display

a. Diagnosis page



Image 3.3 Diagnosis Page

Image 3.3 is a diagnosis page. On this page functions to carry out the process of diagnosing the disease according to the symptoms that arise or are felt. On this page there are options ranging from sure yes to definitely no for every symptom, there is also a button to carry out the diagnosis process according to the symptoms that have been selected.

b. Result page



Image 3.4 Result Page

Image 3.4 is a result page. On this page, there is a description of the name / type of disease that is suffered, the value in the form of a percentage, pictures / illustrations of the disease, details of the disease, suggestions for what to do according to the disease being experienced, and there is also information on the possibility of other diseases being experienced.

c. Post page



Image 3.5 Post Page

Image 3.5 is a page display of post page. On this page there is data on the description of the image, name, details, and advice on each disease

3.2. Testing

The test results in this study are the data validation test. As for more details, see table 4.1 below:

Table 4.1 Running Time Results

No	Gejala Yang Dialami	Hasil Diagnosa Sistem	Hasil Diagnosa Pakar	Validitas
1	Timbul Luka dan Mengeluarkan darah	Pendarahan	Pendarahan	Valid
2	Perubahan Bentuk tulang, nyeri, pembengkakan, jatuh atau terbaring dengan	Patah Tulang	Patah Tulang	Valid

	posisi tidak simetris			
3	Batuk dan kesulitan Bernapas atau berbicara	Tersedak	Tersedak	Valid
4	Gelisah, detak jantung meningkat, berkeringat, dan gemetar	Panik atau histeri	Panik atau histeri	Valid
5	Kulit terasa panas, kulit memerah, kulit kering atau lembab, kehilangan kesadaran, mual dan muntah, dan panas tinggi	Sengatan Panas	Sengatan Panas	Valid
6	Pusing, kehilangan kesaran, sakit kepala, tidak ingat saat kejadian, penglihatan kabur, mual dan muntah	Gegar otak	Gegar otak	Valid
7	Menggigil, pucat, dan kedinginan	Hipotermia	Hipotermia	Valid
8	Kesakitan di bagian perut, mual dan muntah	Keracunan	Keracunan	Valid
9	Gerak menyentak pada salah satu tangan atau tungkai, tidak bisa mengontrol tubuh, kehilangan kesadaran, pusing	Kejang atau epilepsi	Kejang atau epilepsi	Valid
10	Gelisah, mual dan muntah, pucat, kehilangan kesadaran	Panik atau histeris	Syok	Tidak Valid
11	Nyeri, pembengkakan, memar dibagian otot dan sendi	Patah Tulang	Nyeri otot atau keseleo	Tidak Valid

Based on the table above, accuracy testing has been carried out with 11 samples of disease data and the resulting accuracy value is 81.8% which indicates that this expert system is functioning properly according to expert diagnosis.

4. CONCLUSION

Based on the research and development of the application of the First Aid Diagnostic Expert System Using the Certainty Factor Method that has been done, it can be concluded that:

1. This expert system application is built in accordance with the system design that has been made including flow diagrams, DFD, ERD, and application display designs. Making this application using the PHP programming language.

2. The study has succeeded in designing and applying the certainty factor method to the Expert System for First Aid Diagnosis Using the Certainty Factor Method using 29 symptoms and 11 diseases.
3. From the test results to users and experts as many as 6 respondents consisting of 5 respondents from users and 1 respondent from experts covering aspects of system design obtained the highest value of 58.25% (Very Good), aspects of system suitability obtained the highest value of 54% (Good), and the results of the validity test obtained a value of 81.8%.

5. SUGGESTION

Based on the results of the conclusions that have been described, the following suggestions can be taken:

1. It is necessary to periodically update the knowledge base.
2. Added more data.
3. Added additional features to make the application more attractive.

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