Journal Mantik
Volume 3 Number 3, November 2019 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Hepatitis Disease Diagnosis Expert System Using Certainty Factor

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ARTICLE INFO

Article history:
Received: 24 Aug2019
Revised: 24 Sep 2019
Accepted: 11 Oct 2019

Keywords:
Hepatitis, Expert System, Certainty Factor

ABSTRACT

This study discusses how to apply the method of Certainty Factor in the world of health, especially in diagnoas disease that resembles an expert and build intelligent systems sebauah based systems. The object of this study is hepatitis. various pemasalahan were encountered in the community such as lack of experts in the field of this disease and the high cost to the doctor. However, the issue of concern is the development of technology that has entered the digital age. This research resulted in an expert system which adopts the ability of an expert. The results of this study are expected to help the community in the diagnosis of hepatitis and soon overcome.

1. Introduction

Problems often occur at this time are still many laymen who lack an understanding of health and late tackles. In case of health problems against them, then they are entrusted to a specialist. For that we not only need to know the cause of the disease, but it is important to know quickly the illness and how to overcome that illness had no effect. The role of a doctor or an expert in hepatitis disease prevention are indispensable but often hampered by the limited number of doctors. So need an appropriate solution as an expert system that can act in accordance with the ability of an expert. With the expert system is expected to help the problems above. Hepatitis disease so that patients can be addressed. An expert system is a system that is designed to mimic the expert knowledge required so that they can complete the job as done by the experts as the process of diagnosis to determine the cause observed by a system based on the symptoms that occur. In this study the authors will use Certainty Factor as a method and implement into an expert system. Certainty method Factormembuktikan belief event or fact based on the evidence or expert judgment. Certainty Factor uses the value to assume a degree of faiths an expert to the data.

2. Theory

a. Understanding Certainty Factor

certainty Factor(CF) is to accommodate the uncertainty of thought (inexact reasoning) an expert. An expert (such as doctors) often menaganilis information with phrases such as "may", "likely", "almost certainly".

Certainty Factor (CF) illustrates the size of the certainty of a fact or rule. Certainty Factor notation is as:

CF [h, e] = MB [h, e] - MD [h, e] .... (1)

with:
CF [h, e] : Certainty Factor
MB [h, e] : Measure of confidence in the hypothesis h, if given the evidence e (between 0 and 1).
MD [h, e] : Size distrust of evidence h, if given the evidence e (between 0 and 1)

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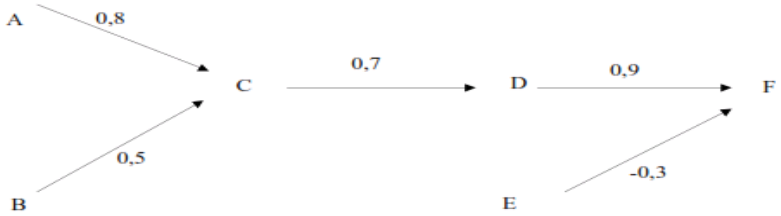
By derived as follows:
The basic form of a rule certainty factor formula If E then H is as follows:

CF (H, e) = CF (E, E) * CF (H, E)..... ..... (2)

Where :
CF (E, E) : *certainty Factorevidence* E-influenced ileh evidence e
CF (H, E) : *certainty Factor* hypothesis assuming the evidence known with certainty, that is when the CF (E, e) = 1
CF (H, e) : *certainty Factor* hypotheses influenced by evidence e

If all the evidence and antecedent known with certainty then the formula into a CF (H, e) = CF (H, E).

In the diagnosis of a disease, the relationship between the symptoms of the hypotheses are often uncertain. It often happens some rules generate a hypothesis and a hypothesis become evidence for other rules. The condition can be described as follows:



Picture 1, Reasoning certainty factor

b. Certainty Factor calculation

The following is an example of a logical expression that combines evidence E = (E1 and E2 and E3) or (E4 and E5 not) Symptoms of E will be calculated as:

E = max [min (E1, E2, E3), min (E4, -E5)]

For the value of E1 = E2 = 0.8 0.9 0.3 E3 = E4 = E5 = -0.4 -0.5
The result is :
E = Max [min (E1, E2, E3), min (E4, -E5)]
= Max (0.3, -0.5)
= 0.3

The basic form of Certainty Factor formula of a rule if E then H is shown by the following formula:

CF (H, e) = CF (E, E) * CF (H, E)

Where :
CF (E, E): Certainty Factor evidence E is influenced by evidence
CF (H, E): Certainty Factor hypothesis assuming the evidence known to Sure, when the CF (E, e) = 1
CF (H, e): Certainty factor hypothesis influenced by evidence e

If all the evidence at the antecedent known with certainty, with the following formula:

CF (H, e) = CF (H, E)

Because CF (E, e) = 1.
Examples of cases involving a combination of CF:
IF cough
AND fever
AND headaches
AND sneezing
THEN influenza, CF: 0.7
with regard E1: "cough", E2: "fever", E3: "headache", E4: "bersinbersin", and H: "influenza" certainty factor value at the time the evidence was clear:

Journal Mantik
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CF (H, E) : CF (H, E1 ∩ E2 ∩ ∩ E3 E4)
: 0.7

In this case, the patient's condition is uncertain. Evidence E certainty factor which is influenced by the partial evidence e is shown with the following values:
CF (E1, e), 0.5 (50% of patients experienced cough)
CF (E2, e): 0.8 (80% of patients experienced fever)
CF (E3, e): 0.3 (patients experience headaches 30%)
CF (E4, e): 0.7 (sneezing patients experienced 70%)
so that
CF (H, e) = CF (H, E1 ∩ E2 ∩ ∩ E3 E4)
= Min [CF (E1, e), CF (E2, e), CF (E3, e), CF (E4, e)]
= Min [0.5, 0.8, 0.3, 0.7]
= 0.3
Then the value of certainty factor hypothesis is:
CF (H, e) = CF (E, E) * CF (H, E)
= 0.3 * 0.7
= 0.21

3. Method

The study design is a procedure conducted by researchers as a guide in his research. Here are the research design expert system diangnosa hepatitis using the method of Certainty Factor:

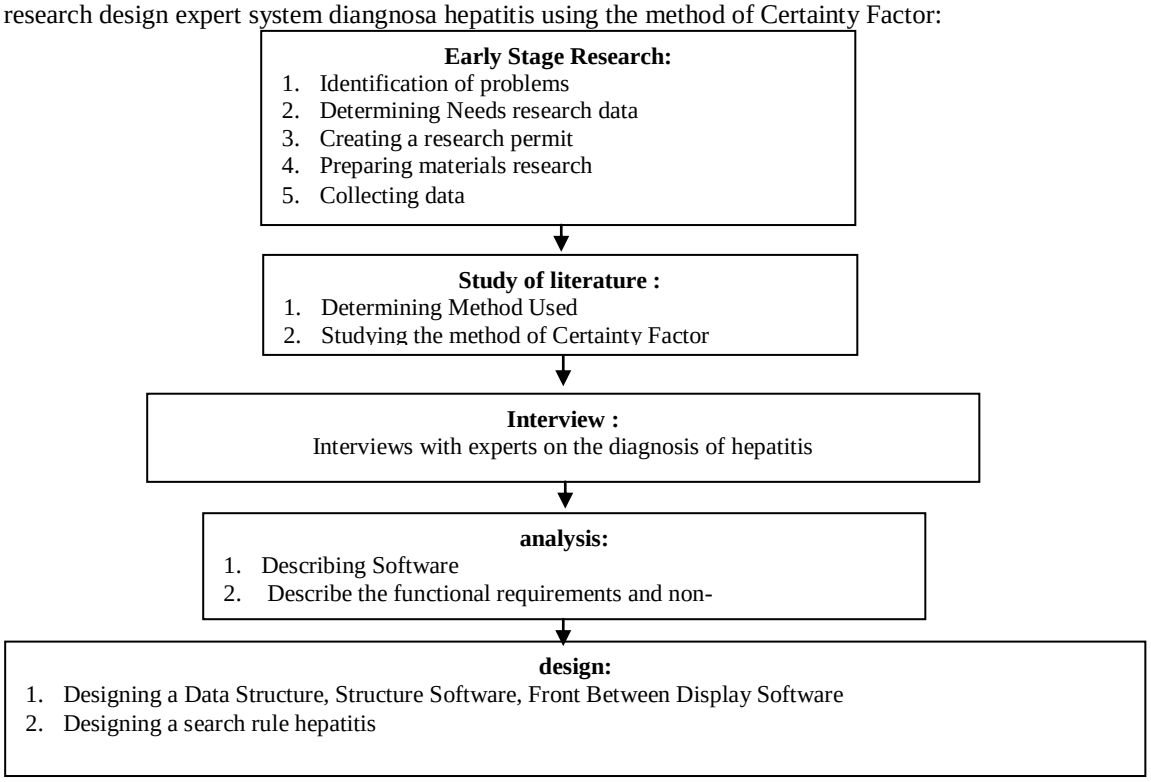

Figure 2, Tahapa Research

a. Early Stage Research

The initial phase of this study begins with identifying the problem and formulate the problem so that research could focus on the problems that will be solved by the data collection continued with the study of literature and interview techniques with specialists / doctors about Hepatitis.

b. phase analysis

Journal Mantik
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https://iocscience.org/ejournal/index.php/mantik/index

This stage is the stage of application of the method of Certainty Factor in menganlisis symptoms / data that have been collected to add our decision or recommendation that resembles a diagnosis of an expert or a doctor and to advise relief / prevention of disease.

c. Stage Design and Implementation

At this stage, the researchers conducted aplikais system design and construction of an expert system revamp convert analysis results at a later stage into intsrutions / coding computer programs. Selanjuntya entered into the system test phase after completion in the wake.

4. Discussion

a. Certainty Factor Analysis Method

The analysis of the Expert System built the (rule-based expert systems) which apply the method of Certainty Factor, Certainty Factor method is one method used to calculate the certainty factor in overcoming the difficulties in determining the symptoms of hepatitis.

Here is the formula method of Certainty Factor to mengansumsikan degree of certainty an expert to the data.

CF [H, E] = MB [H, E] - MD [H, E]
CF [H, E] = CF [H] CF [E]
CFcombine CF [H, E] 1.2 = CF [H, E] 1 + CF [H, E] 2 * (1CF [H, E] 1)
CFcombineCF [H, E] old3 = CF [H, E] old + CF [H, E] 3 * (1CF [H, E] old)

Logic method of Certainty Factor at the time of consultation with a system of systems, consulting users are given the option each has a weight as follows:

Table 1.
Confidence weights CF Expert

Term certainty	value CF
Very confident	1
Sure	0.7
Not sure	0.5
Not sure	0.1

Value of 0.1 indicates that the user does not experience symptoms such as queried by the system. When the user feels that the symptoms are experienced, the results will be the higher percentage of confidence. The process of calculating the percentage of convictions begins with breaking a rule that has a premise compound, into the rules that have a single premise. Then each rule his Certainty Factor calculated so that the value of each rule is obtained, will combine the value of Certainty Factor. For example, the process of assigning weights to each premise (symptoms) to obtain the percentage of convictions for hepatitis.

The first step, Experts set the value of CF for each of the following symptoms:

CFpakar (Fever) = 0.4
CFpakar (abdominal pain) = 0.4
CFpakar (vomiting) = 0.3

Then the user weight value determination. For example, the data serperti this dibwah:

Table 2,
weight of CF User Confidence

Code	Symptoms name	answer	CF user
G1	Fever	Very confident	1
G2	Stomach pain	Sure	0.7
G3	Throw up	Not sure	0.5

***rule* 1:** IF Fever = Very Confident = 1.0
AND Abdominal pain = Confident = 0.7
***rule* 2:** IF Fever = Very Confident = 1.0
AND Pain Peru t = Confident = 0.7
AND Vomiting = Less Confident = 0.5

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***rule* 3:** IF abdominal pain = Confident = 0.7

Step two rules are then calculated its value by multiplying CF CFuser with CFpakar be:

***rule* 1:** CF [H, E]$_1$ = CF [H (user)] 1 * CF [E (expert)] 1
= 1.0 * 0.4
= 0.4
CF [H, E] 2 = CF [H] 2 * CF [E] 2
= 0.7 * 0.4
= 0:28

***rule* 2:** CF [H, E] 1 = CF [H] 1 * CF [E] 1
= 1.0 * 0.4
= 0.4
CF [H, E] 2 = CF [H] 2 * CF [E] 2
= 0.7 * 0.4
= 0:28
CF [H, E]$_3$ = CF [H] 3 * CF [E] 3
= 0.5 * 0.3
= 0:15

***rule* 3:** CF [H, E]$_1$ = CF [H] 1 * CF [E] 1
= 0.7 * 0.4
= 0:28

Third step, Mengkombinasikana / merger between CF value of each rule. Here are combined CF 1 CF 2:

***rule* 1:** CFcombineCF [H, E] 1.2 = CF [H, E] 1 + CF [H, E] 2 * (1-CF [H, E] 1)
= 0.4 + 0.28 * (1-0.4)
= 0:56$_{old}$
= 0.56 * 100 = 56%

***rule* 2:** CFcombineCF [H, E] 1.2 = CF [H, E] 1 + CF [H, E] 2 * (1-CF [H, E] 1)
= 0.4 + 0.28 * (1-0.4)
= 0:56$_{old}$
CFcombineCF [H, E] old, 3 = CF [H, E] old + CF [H, E] 3 * (1-CF [H, E] old)
= 0.56 + 0.15 * (1-0.56)
= 0.63$_{0ld2}$
= 0.63 * 100 = 63%

***rule* 3:** CFcombineCF [H, E] 1.2 = CF [H, E] 1 + CF [H, E] 2 * (1-CF [H, E] 1)
= 0.28 + 0 * (1-0.28)
= 0:28$_{old}$
= 0:28 * 100 = 28%

Thus has been the result of any rule of the symptoms experienced by the user, namely:

Table 3.
Results of Value Every Rule

rule	Score	Information
1	56%	Less Confident Experienced Hepatitis A
2	63%	Very Confident undergo hepatitis B
3	28%	Not sure you have the disease Hepatitis C

It can be concluded from the above data that is based on the presenting symptoms are experienced hepatitis B rated percentage of 63%.

b. draft System

Use-case picture the scenario of human interaction with the system such as the figure below:

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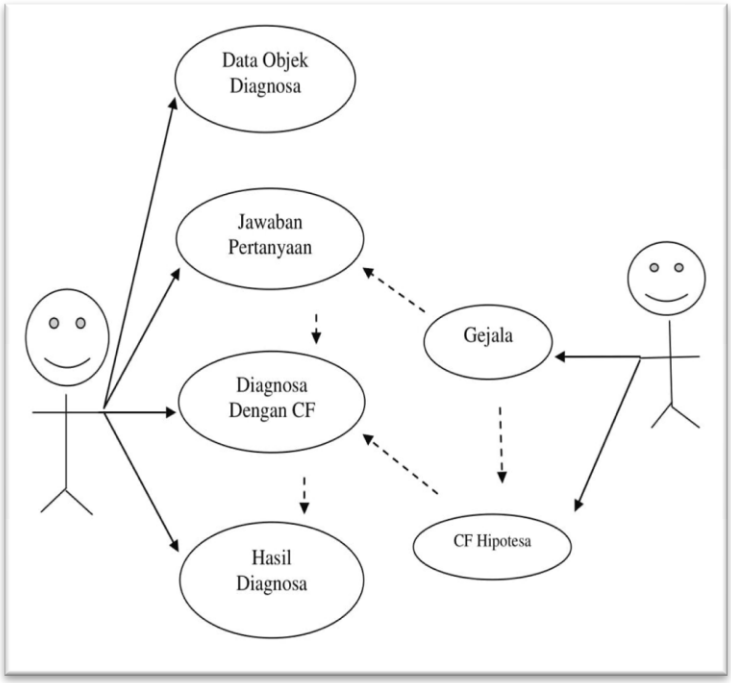

Figure 3. *Use Case Diagram.*

Activity Diagram , The diagram shows an activity stream. In the diagram below, the indicated flow global system which can be seen streams or processes in the system such as the following figure:

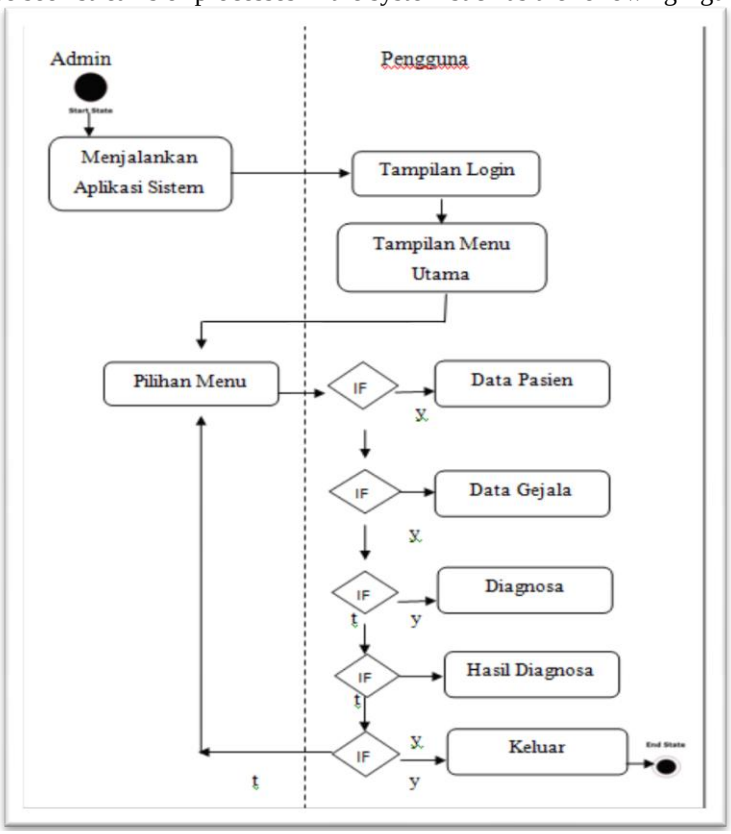

Figure 4. Activity Diagram General

Journal Mantik
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This form is a form of consultations / diagnostics are used to select hepatitis to perform diagnostic process and get results. users who perform diagnostics can select multiple symptoms that may be experienced. After answering the question in the system presented in the form of selection and then press the check button diagnostic results will appear after sestem symptoms have finished counting.

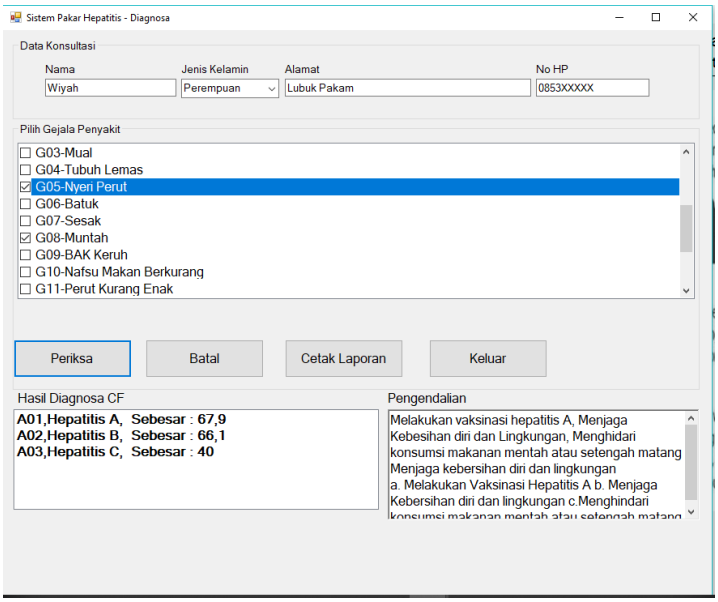

Figure 5. Display Centainty Consultation Form Factor

5. Conclusion

From the analysis and discussion that has been presented, it can be concluded some conclusions as follows:

a. An expert system to diagnose hepatitis in this study using a certainty factor for determining the level of certainty of a disease based on data selected symptoms, then the data in the process, then the output is in the form of advice or control given based on symptoms inputted.
b. The accuracy of the calculation method is influenced by the selection of certainty factor symptom data available on the consultation page.
c. Facilitate the public particularly with hepatitis to seek more detailed information and accurate information on hepatitis and control.

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