Implementation of Expert System For Insomnia Diagnosis With Uncertainty Method

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Abstract: Insomnia is a complaint that often arises due to difficulty sleeping and sleeplessness resulting in impaired or decreased health of sufferers. Sufferers often consider insomnia trivial. The amount of costs incurred for consultation with a psychologist is the cause of patients rarely perform this insomnia examination. Implementation of an expert system to diagnose insomnia which is a system that seeks to adopt and apply human knowledge to the computer, so that the computer can solve problems as is commonly done by experts, and a good expert system is designed to solve a particular problem by mimicking the work of experts. Therefore, researchers are interested in implementing /building an expert system to diagnose insomnia by using web-based uncertainty methods. With the expert system, insomnia sufferers do not need to come to a psychologist to know the symptoms of insomnia because the sufferer can open the expert's web system and can diagnose by selecting the symptoms felt, on the form of diagnosis of these symptoms obtained from the psychologist as an expert and the relationship of these symptoms. By using certainty method, experts provide several options according to the felt by the squeaker, the system works based on the rules / rules provided, the calculation of certainty value to divide the level of insomnia into several parts. This level divided into 3 levels, namely mild insomnia, moderate weight. In addition, the application also provides advice to treat insomnia according to the level of diagnosis results.

Keywords: Technology, Expert System, Insomnia, Uncertainty

1. INTRODUCTION

The development of technology moved very fast from the past to the present, especially in the field of computer technology. Various products ranging from software and hardware had been widely produced to support the needs of consumers. Implementation of the technology had also expanded many ranging from education, agriculture, health, industry and various other fields. This encouraged experts to develop computers in order to facilitate human work or even exceed human work capabilities. Artificial intelligence was a part of computer science that made machines (computers) do the job as good as the humans do. One of the theories or methods studied in the expert system was the uncertainty method of the method that concentrated on finding certainty in a certain problems. Expert system was one of the areas of artificial intelligence engineering that was quite in demand because its application in various fields both the field of science and business was very helpful in solving certain problems and very wide application. Many experts attempted to apply their expert knowledge in an expert system program intended to assist the public in solving a problem through the expert system. It was see on the application of psychology in diagnosing the symptoms of insomnia experienced by a teenager. In everyday circumstances, a person experiences symptom of insomnia. Insomnia was a symptom of abnormalities in sleep or maintaining sleep. Insomnia was not a disease, but a symptom that had several causes, e.g., emotional abnormalities, physical abnormalities, the use of medication, disturbances from the area near to noisy residence, the influence of weather. Insomnia often occurred at both young and old ages and often arose along

with emotional disorders, i.e., anxiety, nervousness, depression, or fear (Abdi and Taahipour, 2018)). It often happened because:
1. Dependence on certain drugs.
2. Work at night.
3. Erratic working hours.
4. Jet lag or dizziness.

Therefore, with the development of expert systems, people are facilitate to know the types of insomnia symptoms with uncertainty methods applied to the expert system either in diagnosing or in finding problems. The uncertainty method was the method that studies the extent of probability person experiences insomnia symptoms based on the data so that the system was able to infer or make decisions on to what extent the users or patients exposed to insomnia symptoms.

2. METHOD

This study begins by searching for literature related to the topics discussed including insomnia symptom data, cause of insomnia data, insomnia solutions, determining methods according to data, making decision tables, calculating the probability of insomnia, creating an insomnia expert system. The research steps can be seen in figure1 as follows:

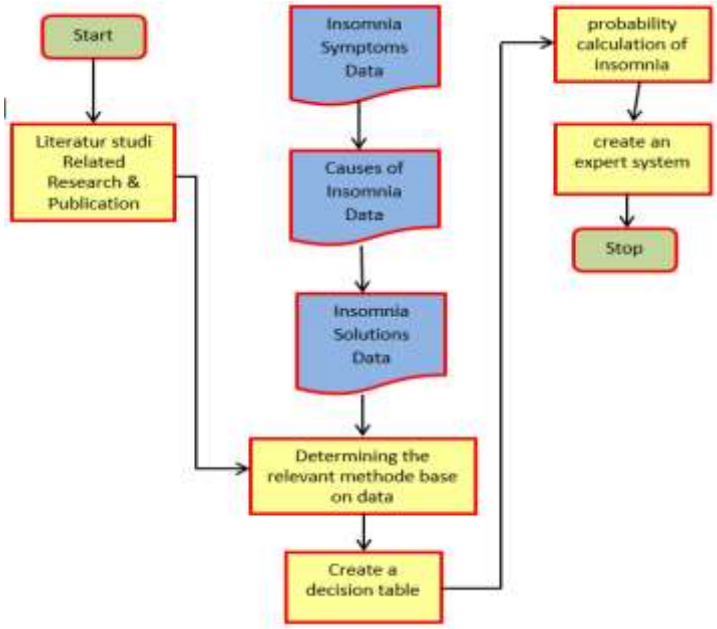

Figure 1 : The Research Steps

3. RESULTS AND DISCUSSION

3.1. Problem Analysis

The expert system to build is a system that represents the skill or ability of an expert in a particular field that intended to assist the user in solving the problem faced. The expert system of insomnia is an expert system that intended to be able to detect the symptoms of insomnia experienced by sufferers based on the complaints experienced. Therefore, an expert's expertise in designing the program needed. In other words, a programmer needs to move or implement an

expert's description to a system in order for the system to work properly and correctly in diagnosing insomnia.

3.2 Analysis of System Functional Needs

The development of this expert system application requires an analysis of the functional needs of the system to build. Where the functional needs of the system include:

- Input or Input, End user will answer the question listed on the application by selecting the multiple-choice answer.
- Process, the system will perform the calculation of each answer to the question, where each question has a specified weight. Calculations performed using the Uncertainty Method.
- Output, the system will display the results of the process in the form of a diagnosis and a solution to the problem in question.

3.3 Design System

In an expert system, it must be determined what to do and what to do with it. Then it must be determined what components will be use and arranged in the system that becomes a system required by the user.

3.3.1 Knowledge Engineering

Engineering knowledge to diagnose insomnia begun by collecting data on insomnia table 1.

Table 1. Symptoms

Symptom Code	Symptoms
GL001	Difficulty sleeping
GL002	Suddenly woke up at night
GL003	Wake up early
GL004	Feeling sleepy during the day
GL005	Feeling less or dissatisfied with sleep
GL006	Often gelisa when wanting to sleep
GL007	Feeling weak/tired/lethargic after waking up
GL008	Schedules for sleep & wake up are often irregular

The table above explained some of the symptoms associated with the insomnia experienced by person where symptoms related to several causes. The causes seen in table 2.

Table 2.Causes of Insomnia

Cause Code	Cause
PY001	Alcohol
PY002	Sounds or sounds
PY003	Temperatures
PY004	Smoking rooms
PY005	Disease
PY006	Medicines
PY007	Too many thoughts

Some of the symptoms and causes of insomnia above were the causes of insomnia from personal or a residential environment. By combining several facts of symptoms and causes through several questions, there several solutions that used to reduce or overcome the symptoms of insomnia experienced by sufferers. Here were some insomnia solutions that seen in table 3.

Table 3. Insomnia Solutions

Solution Code	Solution
SL001	Of course bedtime : Try to start sleeping at a set time sleep before 11pm and wake up in the morning
SL002	Exercise before bed : try doing light exercises for about 20 to 30 minutes a day try doing light exercises about 20 to 30 minutes a day about 5 or 6 hours before going to bed, exercise every day can help to sleep, try to do exercises
SL003	Avoid caffeine, nicotine, alcohol : Avoid caffeine-containing beverages such as coffee, or cigarettes and alcohol, as cigarette caffeine and alcohol can keep people awake from their sleep
SL004	Relax before bed: Do things that relax your brain to make it easier to sleep
SL005	Do not lie in bed if you do not feel drowsy: If you can't sleep, then don't force it to sleep because it will cause music until you feel tired.anxiety that can cause insomnia, try to do other things like reading, watching TV, or listening to
SL006	Set room temperature: Set the temperature of your room as you wish so that it can be easy to sleep.

From some of this knowledge, use for inputs or rules provided analysis on insomnia symptoms. The formation of rules for insomnia symptoms seen in table 4.

Table 4**.** Form Rules

Rules	Symptoms									Cause
	GL001	GL002	GL003	GL004	GL005	GL006	GL007	GL008	GL009	YP001 NP002
1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
3	Y	N	N	Y	Y	Y	Y	Y	Y	Y
4	Y	N	N	N	Y	Y	Y	Y	Y	Y
5	Y	N	N	N	N	Y	Y	Y	Y	Y
6	Y	N	N	N	N	N	Y	Y	Y	N
7	Y	N	N	N	N	N	N	Y	Y	N
8	Y	N	N	N	N	N	N	N	N	Y
9	Y	N	N	N	N	N	N	N	N	N
10	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
11	N	N	Y	Y	Y	Y	Y	Y	Y	Y
12	N	N	N	Y	Y	Y	Y	Y	Y	Y
13	N	N	N	N	Y	Y	Y	Y	Y	Y
14	N	N	N	N	N	Y	Y	Y	Y	N
15	N	N	N	N	N	N	Y	Y	Y	N
16	N	N	N	N	N	N	N	Y	Y	N
17	N	N	N	N	N	N	N	N	N	N

The table above described several forms of rules created after combining the data in table 1 and table 2 so that it linked some data into table 3 and table 4 where. Table 1 contained the data in the form of symptom types. Table 2 contained several causes. Table 3 contained several solutions.

3.3 Insomnia Probability Calculation

The calculation of probability for insomnia symptoms was a calculation that used the formula of the bayes theorem:

$$x = (\mathrm{p}(\mathrm{E} \mid \mathrm{Hi}) * \mathrm{p}(\mathrm{Hi}))/(\sum\nolimits_{}(k = 1)\text{^}n\text{▒}\ [\![p(E \mid Hk) * p(Hk)\ ]\!]\ ) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

- It applied to the case below.
- A patient consulted a doctor for sleeping problems. After a series of interviews, the doctor suspected that the patient was likely experiencing insomnia symptoms based on the probability value:
- The probability of experiencing insomnia symptoms due to the difficulties to sleep; p (difficulty in sleeping insomnia) = 0.8.
- Probability of the patient experiencing insomnia regardless of any symptoms; p(insomnia) = 0.4.
- Probability of the patient experiencing insomnia symptoms due to sudden waking at night due to hearing a sound or sound; p (suddenly awakened at night|sounds or sounds) = 0.3.
- The probability of the patient experiencing insomnia due to sound or sound regardless of any symptoms; p(sounds) = 0.7.
- Probability of the patient waking up early due to medications; p (woke up early|medicines) = 0.9.
- The probability of the patient experiencing insomnia due to medication regardless of any symptoms; p(drugs) = 0.5
- The probability of the patient experiencing insomnia due to difficulty sleeping was

$$P(insomnia \text{ I } difficulty\ sleeping = (\text{P(insomnia I difficult sleeping)} * \text{P(Insomnia))/}$$
$$(\text{P(insomnia I difficulty sleeping)} * \text{P(insomnia)} + \text{P(suddenly wakeup at night)} *$$
$$\text{P(sound of sound)} + \text{P(Early wakeup))} * P(Drugs) \quad \ldots(2)$$

$$P(insomnia \mid difficulty\ sleeping)$$
$$= ((0.8) * (0.4))/((0.8) * (0.4) + (0.3) * (0.7) + (0.9) * +(0,5))$$
$$= 0.32/0.98 = 0.327$$

Therefore, the probability of the patient getting insomnia is 0.327 based on some symptoms and causes that have been calculate based on the formula of the Bayes theorem.

3.4 System Flowchart

This process was taken when the user run a decision-making application**.** flowchart images were:

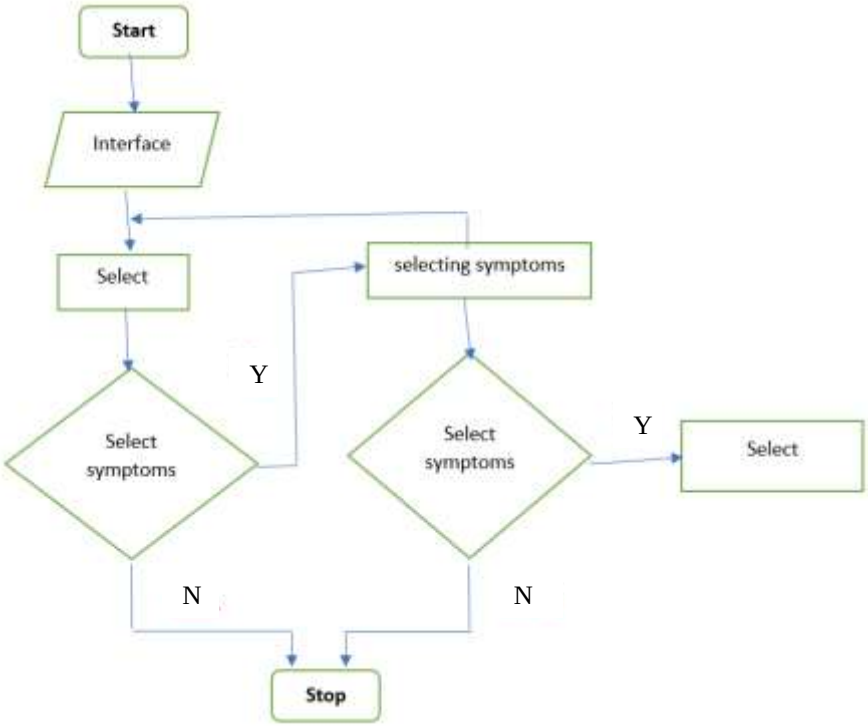

Figure 2. Flowchart

3.5 Implementation

The description of the steps of the implementation of this system.

3.5.1 Main Menu Form

This expert system was built to diagnose insomnia symptoms The symptoms were displayed on the main menu containing the button for the diagnosis processes that answered questions. The button was use to describe the program and symptoms of insomnia. The display seen on figure 3.

Figure 3. Main Menu

3.5.2 Form Diagnosis

In this form, the users saw diagnosis. The form of diagnosis consisted of several symptoms that had been select in order to be able to find out the causes of the insomnia symptoms.

Figure 4: Form Diagnosis

4. Conclusion

According to the discussions above, Insomnia is not a disease but a complaint arising from sleeplessness or insomnia, these results in impaired health or decreased quality of health. Sometimes this is considered trivial so that people who often insomnia do not do the gauze or consult a psychologist. In addition, the cost factor to the psychologist is a consideration. Methode uncertainly here serves to find the truth based on the rules that exist. This expert system is built to facilitate the user without going to a psychologist then the user can find out if he or she is insomniac or not based on the choice of symptoms in the expert system.

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