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Expert System for Detecting TBC Disease Using Web-Based Fuzzy Mamdani Method (Lung TB)

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ABSTRACT

Along with advances in technology, the expert system greatly helps the performance of doctors in detecting diseases. The purpose of the expert system that was designed was to detect TB disease, this system was made to make it easier for users to find out TB disease information with symptoms experienced by people with TB symptoms. With the application of this expert system, it is expected to be able to overcome the problems experienced by doctors or experts in conducting consultations between doctors and patients. This system is designed using PHP programming with MySQL databases and the fuzzy mamdani method which helps build the system by assessing the input and output of the system implementation results. So resulting in an idea of the existing problem that the user can find out information on tuberculosis symptoms - symptoms experienced, while the admin can change the symptoms to be updated and replace the symptom code

1. Introduction

In the current era, technology that is developing very rapidly is no doubt, with the ability of these technologies, then made an expert system to detect Tuberculosis or commonly called TB. Which is a disease that is quite contagious and is caused by a bacterium called Mycobacterium Tuberculosis. In designing this system the writer uses the fuzzy mamdani method, because this method is very easy to understand and in accordance with human instincts. So using this method can help solve a problem and produce the right decision.

2. Literature review

In research that discusses the expert system to detect tuberculosis which is believed to be able to diagnose pulmonary TB disease and produce a diagnosis accuracy of 70.33% [1].
With an expert system can make it easier for people with TB symptoms to find out the symptoms that have been diagnosed [2]. Next on the research that discusses the Expert System for Detecting the Risk of Heart Disease Level, where there are accuracy results from the system test that can compare the system output with the results of specialist examinations by 80%, so that the system can assist in detecting TB disease [3]. In a study conducted by Widya Febriani, Gusnadi Widi Nurcahyo, Sumijan, the output of fuzzy calculations was that someone experienced symptoms of Rubella or normal. The value obtained from the calculation process using the Tsukamoto method is 6.00 [4].So in research that discusses the disease of diabetes miletus this disease is very deadly and therefore this system is very useful and helps severely experts [5]. Next on research that discusses. And from the level of testing the system has a different level of accuracy depending on the type of member function that is tested. While the hybrid algorithm has the highest level of accuracy, amounting to 99.99%. [6].

3. Research Methodology

3.1. Data collection

a. Study of literature

With this the author collects data from reference journals, books, articles that support the author in making the system.

b. Mamdani Method

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The Mamdani fuzzy method is a method that is very easily understood by human instincts and can help solve a problem effectively in order to produce a decision.
This method is used to get the output, it requires 4 steps:

1. plastic input and plastic output are divided into two plastic parts.
   a. Max method

   $\mu sf\ xi = \max \mu sf\ x, kf\ xi$

   With:
   $\mu s[xi]$ = fuzzy member value until the i-th rule;
   $\mu k[xi]$ = value of sensible members up to the i rule; 2

   b. Additive method (sum)
   This calculation formula is taken by doing bounded-sum.

   $\mu sf\ xi = \min(1, sf\ xi + \mu kf\ [xi])$

   With:

   $\mu sf\ x$ = fuzzy solution member values up to the i rule;
   $\mu kf\ x$ = fuzzy sensible member value i-th rule;

   c. Probabilistic Method
   This calculation formula is taken by performing a product of all fuzzy area outputs.

   $\mu sf\ xi = \min_{f0}(1, sf\ xi + \mu kf[xi]) - (1, \mu sf\ xi * \mu kf[xi])$

   With:

   $\mu sf\ x$ = fuzzy solution membership value up to i rule;
   $\mu kf\ x$ = fuzzy consequence membership value i-rule 24;

   Following are the data found in the system according to their function as input or output data system.

Table 1
TB symptoms data

NO	The symptoms	Disease	Weight
G1	Fever	P2	1
G2	Decreased body weight	P2	3
G3	Physically weakened	P2	1
G4	No appetite	Q1	1
G5	Coughing up phlegm for more than 3 weeks	P2	3
G6	Pain in the lungs	P2	5
G7	Reddish urine color	P2	3
G8	Shivering at night	P2	3
G9	Infection in other parts of the body	P2	3
G10	Pale skin	P2	3
G11	Out of breath	Q1	3
G12	Fever for more than 2 weeks	Q1	3
G13	Enlarged lymph nodes in the neck	P2	5
G14	Night sweats	Q1	3
G15	Bleeding cough	P2	3
G16	Stunted growth		

Information :
G = symptoms
- P1 = Child TB

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- P2 = adult tuberculosis
- Weight 1: usual symptoms
- Weight 3: moderate symptoms
- Weight 5: dominant symptoms

3.2. Flowchart Design

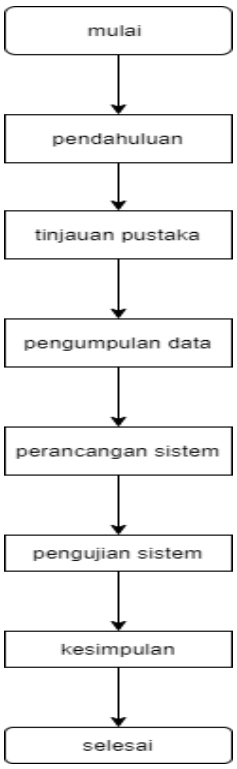

Figure 1. Research Flowchart

In the following figure, explaining that the existence of a research flowchart can help the writer to determine the flow of journal making to support the design of the system being made.

3.3. System Flowchart Design

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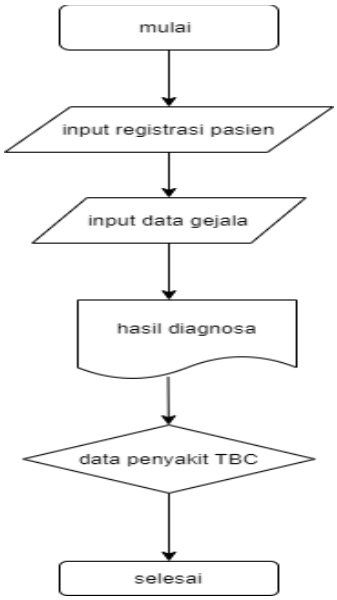

Figure 2. Flowchart System

This research begins with registration first after registering the user must input the symptoms experienced, then the results will be diagnosed, then the data will come out of the user who has made the diagnosis.

3.4. Use Case Diagrams

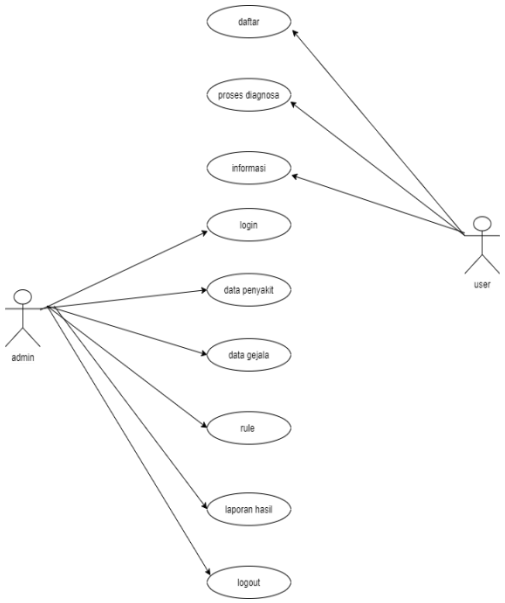

Figure 3. Use Case Diagrams

In the Use Case diagram above, the user can only register, process and information, while the admin logs in and checks user data to change all symptoms and solutions.

3.5. Activity Diagram

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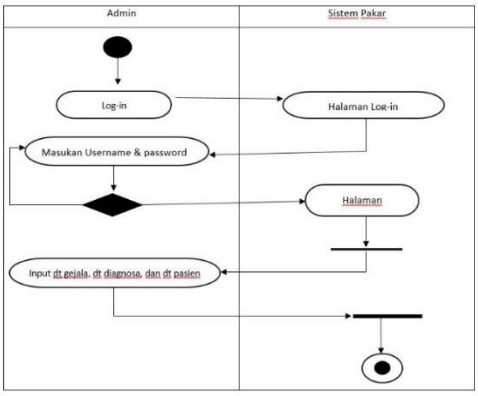

Figure 4. Admin Activity Diagram

Image admin activity diagram above to run admin activities correctly.

3.6. User Activity Diagram

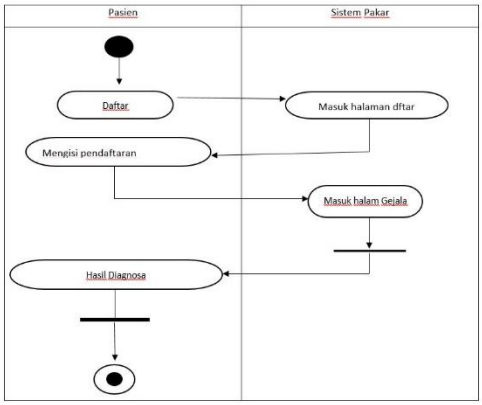

Figure 5. User Activity Diagram

The activity diagram above to show that the user can only list and see the results of the disease diagnosis.

4. Results and Discussion

4.1 Home Page Menu

Figure 6. Home Page Menu

The following is the home page to enter as admin or user.

4.2 User Registration Page Menu

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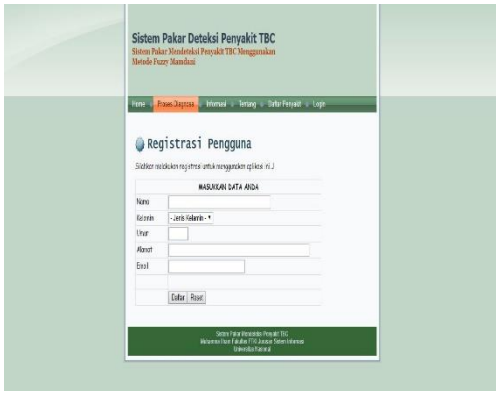

Figure 7. *Menu* User Registration Page

Users must register first before carrying out the diagnostic process

4.3 Diagnosis Process Display Page Menu

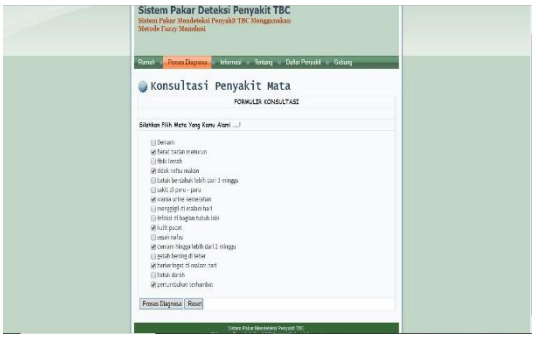

Figure 8. Display the Diagnosis Process

After the user registers, the diagnosis process list will display a list of disease symptoms to select symptoms. Next is the output page for diagnosis results

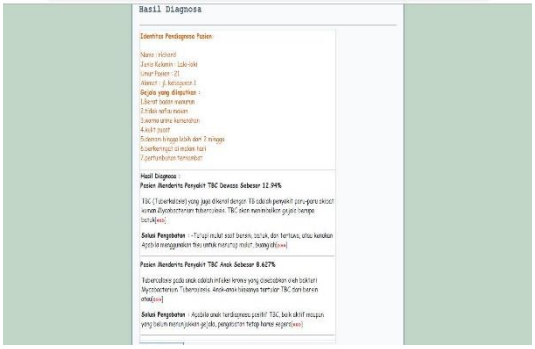

Figure 9. Display the diagnosis output

After the user inputs the symptoms they experience, the output of the disease the user will experience will come out

4.4 Admin Login Page Menu

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Figure 10. *Menu* Admin Login page

4.5 Disease Data And Solutions Menu Menu

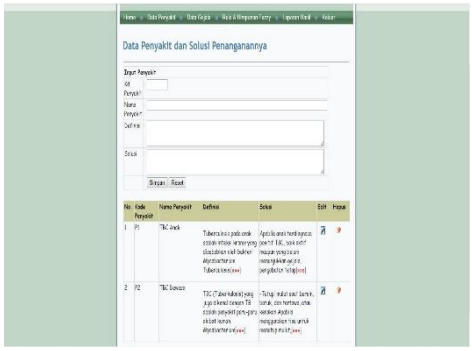

Figure 11. *Menu* Disease Data Page

In this view you can change and delete disease data

4.6 Data Admin Menu Menu Symptoms

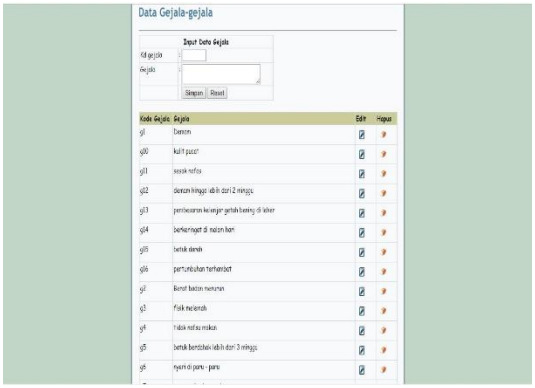

Figure 12. Symptoms Page Menu

In this view the admin can change and delete symptoms data

4.7 User Data Reports Menu

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Figure 13. User Data Reports Menu

In the admin user data report menu can find out the user who has diagnosed the system

5 Conclusion

With the PHP and MySQL programming languages and the Mamdani method a system is designed that can help the process of detecting diseases. This expert system can be used as a medium of application in knowing the symptoms and the process of diagnosing tuberculosis in order to facilitate doctors and experts in consulting patients especially tuberculosis sufferers.

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