



Expert System to Diagnose Diabetes Using Web-Based Fuzzy Mamdani Method

Mohammad Alfiandy¹, Iwan Wahyudin², Winarsih³

Universitas Nasional, Jl. Sawo Manila, Pasar Minggu, Jakarta Selatan, 12520

Email: Alfiandy3@gmail.com, iwan_wyd@yahoo.com, winarsih@civitas.unas.ac.id

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ABSTRACT

The aim of the system maker is to diagnose diabetes using a web-based fuzzy Mamdani method that is useful for detecting diabetes. Diabetes is also diabetes or diabetes. If the disease is not treated with proper treatment, it can cause various dangerous complications, and can even threaten the lives of sufferers. Implementation of an expert system to diagnose diabetes using web-based fuzzy mamdani aims to explore the symptoms displayed in the questions - questions in order to be able to diagnose various types of diabetes. This is from a research is a web-based expert system that can detect whether someone has diabetes what type. Based on testing the accuracy of the system, it can be concluded that with the fuzzy mamdani method is more accurate what type of diabetes. By using the PHP programming language with a MySQL database method the expert system used is fuzzy mamdani which is one part of the fuzzy inference system which is useful for drawing conclusions or the best decision in an uncertain problem, the Mamdani fuzzy concept is very flexible and has tolerance for inaccurate data based on language natural.

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1. Introduction

In this journal I want to implement an expert system of fuzzy mamdani that aims to detect diabetes in the elderly and offspring that I really want to make a web that is very easy to access because I want all Indonesian people who have diabetes can access my website[1]. This website wants to make it easier for doctors to handle diabetes even though this website is very simple to use and the data collection is easy to understand, I am here using the MySQL database as well as the PHP program language.[2]

2. Literature Review

The calculation of purchases and sales using fuzzy mamdani, provides a value of sales and purchases[2]. Anthropometric measurements of diabetes in adults who have been severely affected by diabetes[1]. The calculation steps for selling eggroll using a very precise fuzzy mamdani metedo[3]. The selection of students who excel in achieving scholarships is very interested in new students using the mamdani fuzzy method[4]. Calculation of land area to be sold to buyers and land calculation is very precise this process uses the fuzzy mamdani method[5]. Urinary stones in pigs using the fuzzy mamdani method are very accurate predictors[6]

3. Research Methods

3.1 Planning

This design is for a process that runs in stages, this planning for the expert system that I want to make.

3.2 Data collection

After the system is analyzed, the system to be developed requires data to be inputted into the system. Before inputting the required data, it is first collected by the researcher, this stage the researcher conducts a literature study that is reading books, artikers and journals that can support the process of completing research work, in order to meet the data requirements needed.

Table 1.
List of symptoms

NO	The symptoms	Disease	Weight
G001	Urinating a lot	Q001	5
G002	Taste thirsty	P002	5
G003	Weight loss	P002	1
G004	Taste Like the Flu and Weak	P002	3



NO	The symptoms	Disease	Weight
G005	Blurred View	Q001	3
G006	Difficult Wounds That Cure	P002	5
G007	Red and swollen gums	Q001	1
G008	Dry and itchy skin	P002	1
G009	Easily Infected	Q001	1
G010	Itching on the Pubic	P002	5
G011	Hunger That Can't Be Explained	Q001	5
G012	Increased Blood Glucose	P002	1
G013	Dehydration	Q001	3
G014	Dry eye	P002	5
G015	Dry Mouth	Q001	5
G016	Confused	P002	5
G017	Cannot Hold Pee	Q001	1
G018	High blood pressure	P002	1
G019	Depression	Q001	3
G020	Feeling tired and lethargic	P002	1
G021	Tingling in the legs	Q001	1

Information:

Q001 = Type 1 Diabetes

P002 = Type 2 Diabetes

G = Symptoms

Weight 1 = Common Symptoms

Weight 3 = Moderate Symptoms

Weight 5 = Dominant Symptoms

3.3 Expert system

Activities undertaken by researchers so far have been to find out and recognize the expert system for diagnosing diseases more deeply and gather information needed to support this expert system.

3.4 Mamdani Motode

The Max-Min method is often used by the fuzzy Mamdani method to get output, it requires 4 stages:

- Input variables and output variables are divided into one or more fuzzy sets.
- The implication function used is Min.
- Rule Composition

There are three methods used in inferring fuzzy systems, namely: max, additive and probabilistic OR (probor).

- Max Method (Maximum)

Apply it to the output using the OR (union) operator.

$$\mu_{sf} [xi] = \max\{\mu_{sf} [xi], \mu_{kf} [xi]\} \dots (3.1)$$

- Additive Method (Sum)

Fuzzy area output.

$$\mu_{sf} [xi] = \min\{1, \mu_{sf} [xi] + \mu_{kf} [xi]\} \dots (3.2)$$

- Probabilistic Method OR (probor)

Fuzzy area output.

$$\mu_{sf} [xi] = (\mu_{sf} [xi] + \mu_{kf} [xi]) - (\mu_{sf} [xi] * \mu_{kf} [xi]) \dots (3.3)$$

- Affirmation (defuzzification) There are several methods of defuzzification in the composition of Mamdani rules, including:

- The Centroid (Composite Moment) Method
- Bisector Method
- Mean of Maximum (MOM) Method
- Largest of Maximum (LOM) Method
- The Smallest of Maximum (SOM) Method

4. Results and Discussion

4.1 Designing Research Flowchart

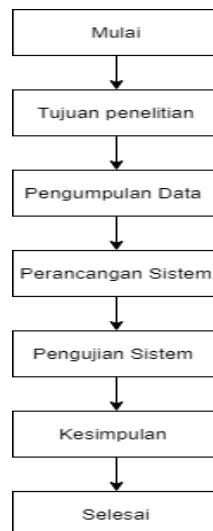


Fig 1. Research Flowchart

In Figure 1, it explains that there is a research flowchart where the first process is done. The purpose of the study is to find out diabetes research, the second stage of data collection where the authors look for readings related to an expert system for diagnosing diabetes, at the third stage the system design is conducted. doing the design of the design of the system that will be used to find information on diabetes, at the fourth stage of testing the system in which the criminal performs a testing system that is difficult to make. In the fifth stage, the research was summarized.

4.2 System Flowchart Design

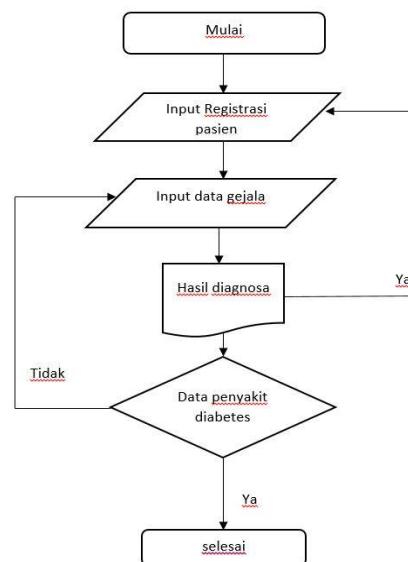


Fig 2. System Flowchart

In this study begins with registration first after registering the user must input the symptoms experienced will then come out the results of the diagnosis, then the data will come out of the user who has made the diagnosis.

4.3 Usecase Diagram

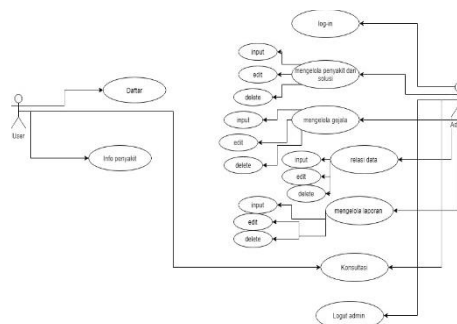


Fig 3. Usecase Diagram

From Figure 3 shows that the admin can add, delete, edit symptoms, diseases, relations, users, admin, articles, while the user can only diagnose and see the results of the diagnosis.

4.6 System Activity Chart

The arrows point to the sequence of activities that occur from start to exit.

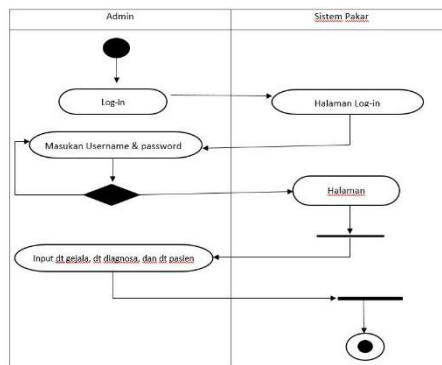


Fig 4. Admin Activity Diagram

Picture of Admin Diagram activity activity which is logged, page, enter username & password, page, input symptom data, diagnostic data, patient or user data.

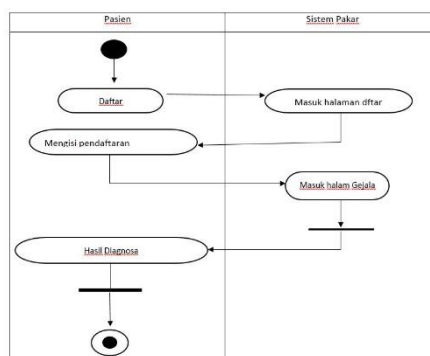


Fig 5. User Activity Diagram

Here Following is the User Activity Diagram contained in the User there is a Register, Enter Page Register, Register, Fill in the Diagnosis, Diagnosis Results.

4.4 Level of accuracy

Following to calculate the accuracy level accurately using the formula below:

$$\text{Accuracy} = \frac{\text{atchmatch}}{\Sigma tp} \times 100\%$$

Information :

$\Sigma match$ = number of correct classifications



Σtp = amount of testing data

4.6 System Interface

Design of expert diabetes diagnosis system display using web-based fuzzy mamdani method can be seen from the following explanation:

a. Home Display



Fig 6. Home Display

Display Home can be seen by the user and admin and the user here directly gives instructions for diagnosing diabetes.

b. Register View

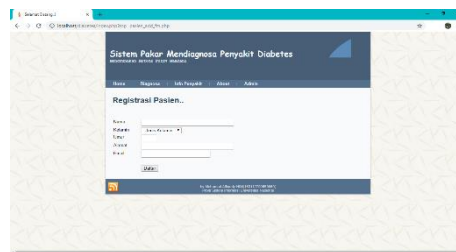


Fig 7. Display Regist

Here the registration display is only for users to register.

c. Display Consultation Form

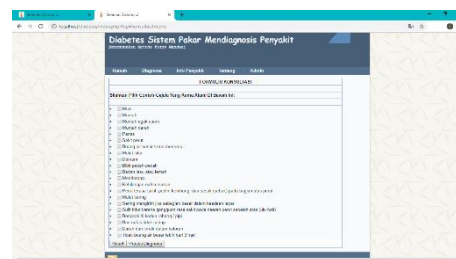


Fig 8. Display Consultation Form

After registering the user immediately consult and fill in the symptoms "found in diabetes.

d. Display Diagnostic Results

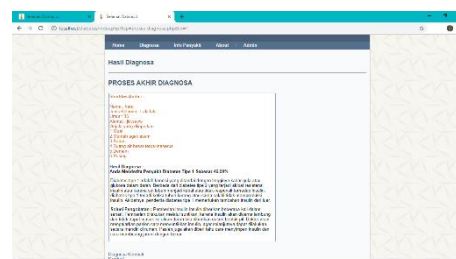


Fig 9. Display Diagnostic Results

Here the user immediately knows what type of diabetes he is suffering from and immediately gets the solution and how to treat it.

e. Admin Log-in Display

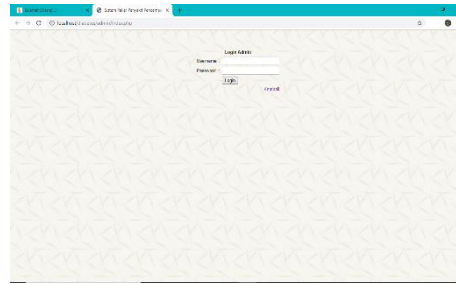


Fig 10. Admin Log-in Display

The admin login page is the main page for administrators to access the system.

f. Display Home Admin

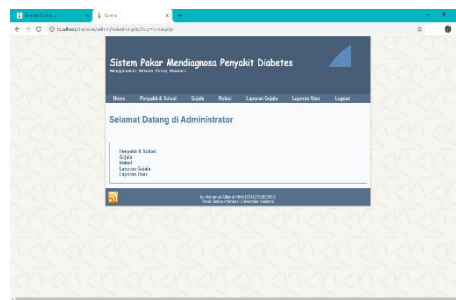


Fig 11. Display Home Admin

The main admin page image is the page that appears after a successful login process.

g. Disease Data Display

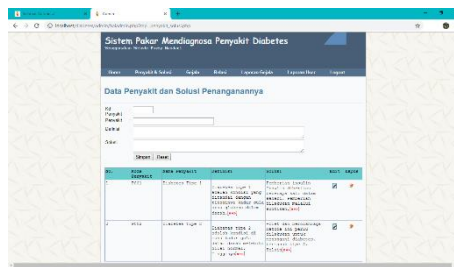


Fig 12. Disease Data Display

Disease data input page is used for inputting disease data in acute respiratory infections.

h. Display Data Symptoms

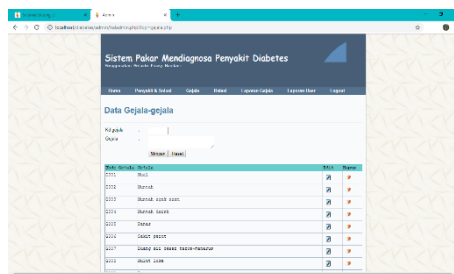


Fig 13. Display Data Symptoms

Symptom data input page is used for inputting symptom data contained in each disease.

i. Rule Data Input Page



Fig 14. Display Data Input Relationships

The data input rule image is used to set the rule for the process of defuzification and the formation of sets of each assessment variable.

j. Display User Data Reports



Fig 15. Display User Data Reports

The results report page displays the results of diagnoses made by the patient such as the identity of the diagnose and the illness he suffered.

5. Conclusion

Expert system of diabetes diagnosis Able to provide solutions for handling diseases that have been diagnosed in the system, and can immediately consult a doctor despite knowing the symptoms.

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