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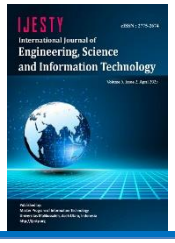

Application of Tsukamoto Fuzzy Logic in Expert System Application for Diagnosing Web-Based Skin Diseases

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Abstract

Skin health is essential for everyone. In addition to supporting someone who can reduce self-confidence, skin diseases can also interfere with a person's concentration in activities. An expert system is a system designed to be able to imitate the expertise of an expert in answering questions and solving a problem. The expert system will solve a problem obtained from a dialogue with the user. With the help of an expert system, someone who is not an expert can answer questions, solve problems, and make decisions that an expert usually makes. This needs to be anticipated and handled seriously, especially for types of skin diseases, some of which can be fatal, and some can even be classified as cancer. Experts are needed to diagnose each disease in this case, but consultation with experts requires costly funds. For this reason, this system is designed to help people diagnose skin diseases online, making it easier for sufferers to diagnose the diseases they suffer from by themselves. The method used is the fuzzy Tsukamoto method. Analysis of the introduction of the disease is carried out by identifying various symptoms of the disease. The types of diseases diagnosed include tinea versicolor [P001], scabies [P002], ringworm [P003], dandruff [P004], vitiligo [P005], pityriasis alba [P006], hives [P007], erythema multiforme [P008], acne [P009], keloids [P010], melanoma [P011], eczema [P012], boils [P013], measles [P014], psoriasis [P015], impetigo [P016], and herpes [P017]. Skin disease sufferers can diagnose their disease without consulting with a specialist directly. This system can be used as a substitute for a specialist in producing a diagnosis in the form of the name of the disease suffered by the system user (user). This system provides a solution for users regarding more economical disease diagnosis.

Keywords: *Diagnosis, Disease, Fuzzy Tsukamoto, Expert System, Symptoms.*

1. Introduction

Skin health must be considered because skin is the most vital part and reflects health and life [1]. Skin is a tissue that people overlook when something happens [2]. Then, they realize how important skin is for self-image [3]. Thus, skin in humans has a vital role; in addition to ensuring survival, it also has other meanings, namely race and a means of nonverbal communication between individuals [4]. Many skin diseases cause itching and discomfort for an extended period. Skin disease can cause skin function failure as severe as liver and kidney disease [5]

The role of specialist doctors is very much needed. Still, limitations hamper doctors' role in conducting disease consultations between doctors and patients because many patients are only handled by one or two specialist doctors [6].

The service sector using an expert system is expected to accelerate the diagnosis of skin diseases so that it can be easily identified the disease being suffered by a sufferer without having to deal with a doctor directly[7]. Seeing this, developing an expert system can help improve performance in the health sector [8].

Expert systems can be easily implemented into machine language and efficiently using fuzzy logic [9]. Fuzzy logic has become a fantastic research area because it bridges precise machine language with imprecise human language by emphasizing meaning or significance. It can be imagined that the fuzzy system is a human language translator machine so that it can be understood by machine language and vice versa [10].

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Early treatment is needed before consulting a specialist in skin diseases before the disease becomes severe [11]. In this case, a system is required to replace a specialist doctor in diagnosing early skin disease symptoms, considering the high cost of consulting a doctor [12]. This expert diagnostic system is very much needed in diagnosing early symptoms of the causes of skin disease; this expert system is made to make it easier for doctors to diagnose skin diseases patients suffer [13].
Based on the problem description, the research is interested in overcoming the problem in the form of a final assignment entitled "Application of Tsukamoto Fuzzy Logic in Expert System Applications to Diagnose Web-Based Skin Diseases." Hopefully, this system can help skin disease sufferers diagnose the disease.

2. Literature Review

An expert system is a system designed to be able to imitate the expertise of an expert in answering questions and solving a problem. An expert system will solve a problem obtained from a dialogue with the user [14]. With the help of an expert system, someone who is not an expert/specialist can answer questions, solve problems, and make decisions that an expert usually makes [15].

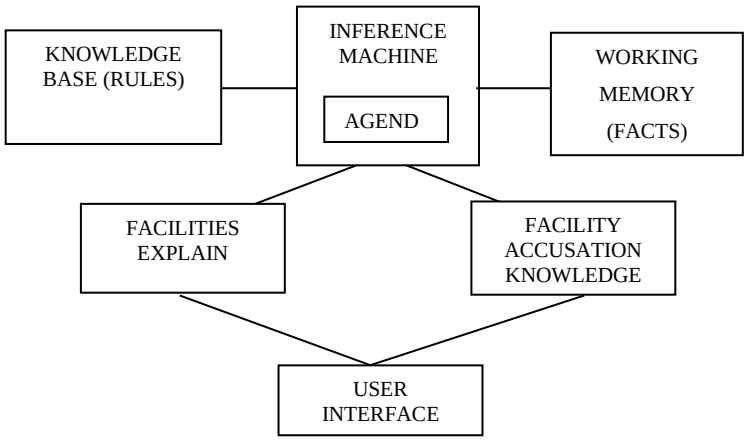

Fig 1. Expert System Architecture

DFD is a graphical representation of an information system describing the system data flows' components, the data's origin and destination, and data storage [16]. DFD is a tool for analyzing and designing information systems oriented towards data flow with a structured decomposition concept so system designers can easily communicate it to application program makers and users [17]. Logic is a science that systematically studies the rules of valid reasoning [18]. The logic commonly used in everyday life and scientific reasoning is dual-valued, namely logic in which each statement has two possible values: true or false [19].
Skin disease is related to the tissue covering the body's surface, such as skin that is often infected and mild [20]. Even though it is mild, if it is not treated seriously, it can worsen the sufferer's health condition.

3. Method

So far, the diagnosis of skin diseases has been done manually, where patients must go to a dermatologist as an expert to find out the type of disease and its treatment. In this case, a specialist doctor is an expert who diagnoses the type of disease by observing the patient's suffering. Then, based on observations of the disease and the symptoms experienced by the patient, the doctor draws conclusions about the disease and how to prevent and treat it. For this reason, the system that will be built replaces experts in diagnosing skin diseases based on symptoms for each type of disease.

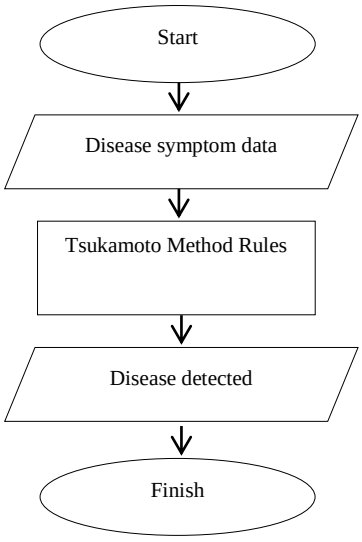

Fig 2. System Diagram Using the Fuzzy Tsukamoto Method

Description:

1. After entering the system, the user must select the symptoms of the skin disease they are suffering from
2. The data entered based on the selection is then processed based on the skin disease symptoms using the rules in Fuzzy Tsukamoto logic.
3. After all the disease symptom data has been input and the system has processed the data, the system will display the diagnosis results of the type of skin disease suffered by the patient as the final result.

4. Result and Discussion

Web-based expert system application with the application of Tsukamoto fuzzy logic to diagnose skin diseases at Cut Mutia Hospital is a replacement system for skin disease experts that patients with skin diseases can use to find out the skin disease they are suffering from based on the symptoms experienced by the patient. Each symptom is assessed based on a weighting that is given a value with the suitability of the set for each disease. This system is designed to help skin disease sufferers diagnose the type of skin disease they are suffering from online without having to go to an expert directly. The following is the ERD for diagnosing the disease.

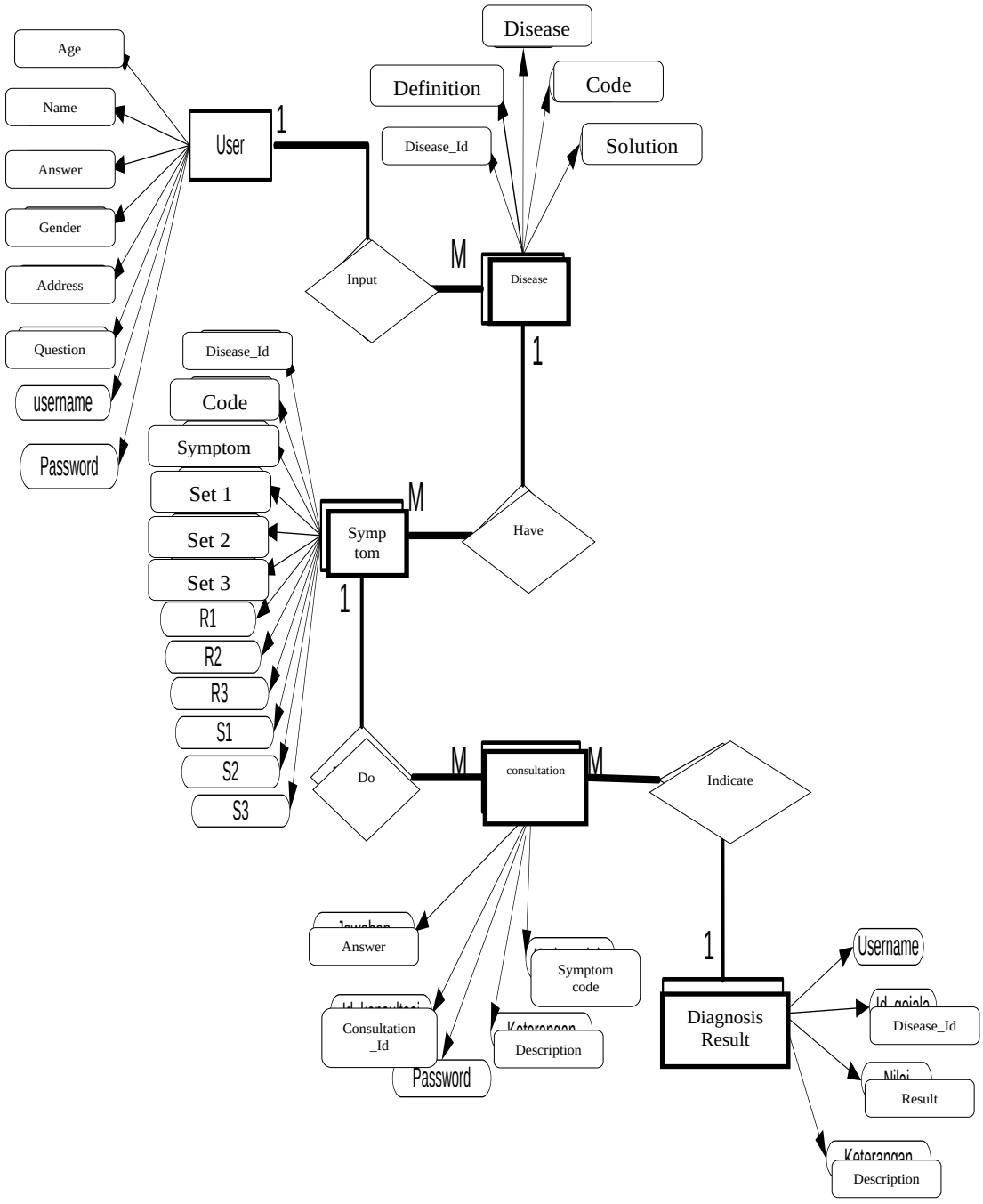

Fig 3. ERD (Relationship Entity Diagram)

In this display, the user can see the results of the expert system's conclusions for diagnosing types of skin diseases.

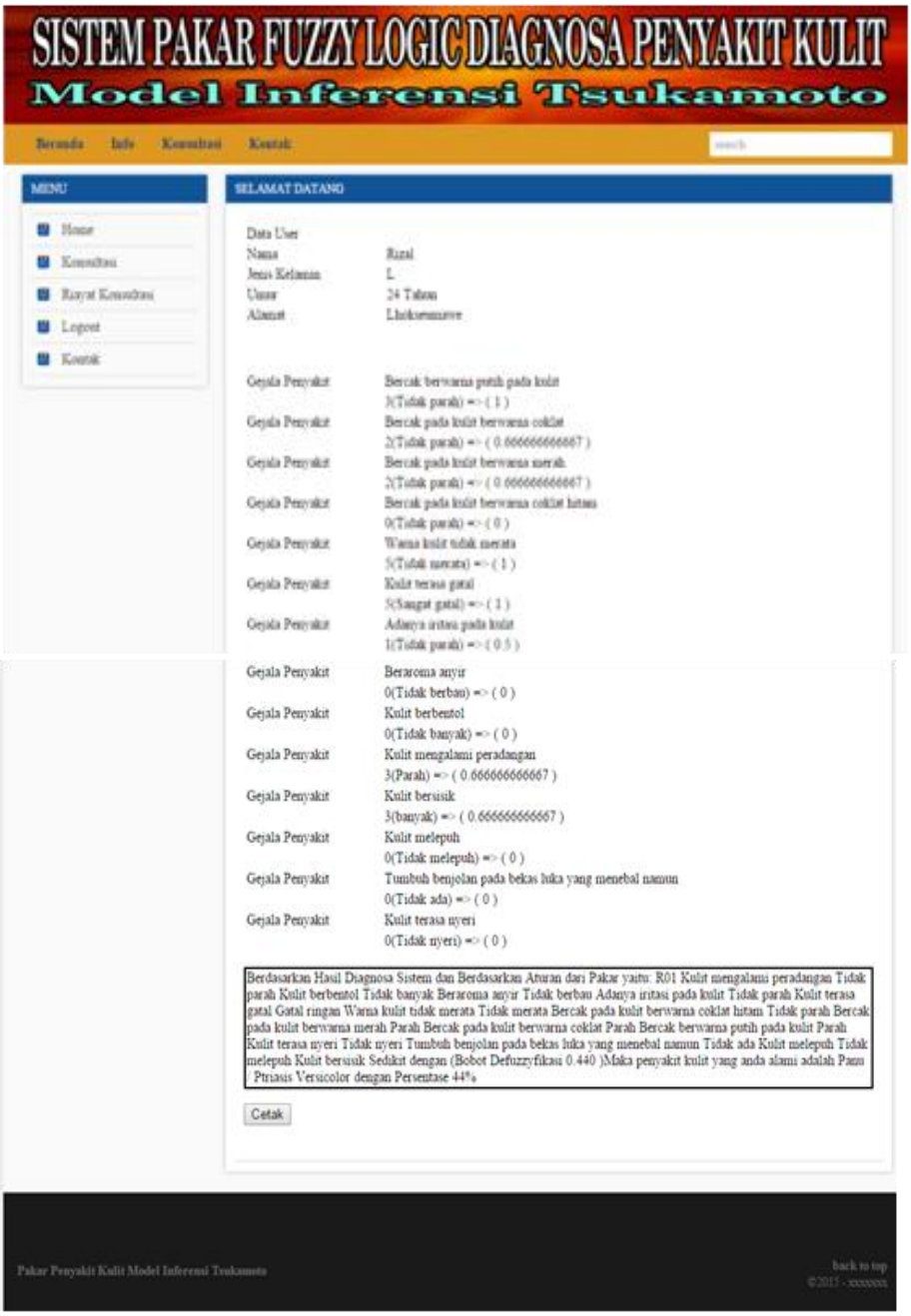

Fig 4. Diagnostic Result Display (Indonesia)

5. Conclusion

The conclusions obtained from this study are as follows:

1. Skin disease sufferers can diagnose their disease without having to consult with a specialist directly.
2. This system can be used as a substitute for a specialist in producing a diagnosis in the form of the name of the disease suffered by the system user (user).
3. This system provides a solution for users regarding more economical disease diagnosis.

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