EXPERT SYSTEM OF DENTAL AND DIAGNOSIS DISEASES USING FORWARD CHAINING METHOD BASED ANDROID

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Abstract

Computers are one of the most important parts in improving Information Technology. Lack of knowledge about dental and oral diseases can be overcome by an expert with his knowledge and experience. The purpose of making this expert system is to transfer knowledge possessed by an expert into the computer so that users save more time and cost. This system uses forward chaining method that is inference method using reasoning starting from the facts first to test the truth of the hypothesis. The case study of this system is done at Permata Cipondoh Clinic with android based with expert menu for knowledge management, The results show that the forward chaining method is appropriate for the diagnosis of dental and oral diseases, because in fact, the reasoning of a dental and oral disease expert leads to the symptoms experienced by dental and mouth disease and then obtained the type of dental and oral diseases.

Keywords: Artificial Intelligence, Expert System, Teeth and Mouth, Forward Chaining

1. Introduction

1.1. Background

Expert System is an attempt to impersonate an expert. Usually the Expert System is a decision-making software capable of achieving comparable performance levels of an expert in the field of special and narrow problems. The concept of expert systems is based on the assumption that expert knowledge can be stored and applied to the computer, then applied by others when needed. With the implementation of expert systems into computers, it can generate several benefits such as accuracy, speed, and can be accessed at any time so as to ease the tasks of the experts in their field. The mouth is an open space of food and water. Teeth are a very important organ and very vital existence. Therefore dental health is very important. The tracing method used is Forward Chaining, is the inference begins with the information available and only then will be obtained conclusion. The facts used in this study are the symptoms felt by the patient, while the conclusion is the result of disease diagnosis.

1.2. Problem Formulation

Based on the background that has been presented before, then the main problem is how to apply methods that are able to diagnose dental and oral diseases and provide solutions and information optimally.

1.3. Limitation Problems

In this study, the authors provide the restrictions of the problem as follows:

1. Diagnose symptoms of dental and oral diseases that commonly occur

in Indonesia with symptoms that often appear.
2. This Expert system application using JavaScript programming language.
3. Development of expert system using tree with forward chaining inference method.

1.4. Research Objectives

The purpose of this research is to build an expert system application using forward chaining method which is expected to accelerate in diagnose a disease type, especially dental and oral disease, so it can be easily known early prevention of the disease.

2. Literature review

2.1. Relevant Research Results

Research relevant to this research is research conducted by:

1. Research conducted by Desti Ikasari year 2016 entitled "Dental Expert System of Dental and Oral Disease Using Certainty Factor Method (Case Study at Puskesmas Campurdarat Tulungagung)", giving result that expert system of dental and mouth disease diagnosis can produce diagnosis of disease name , accompanying symptoms are summarized into 52 types of symptoms. This application also provides solutions on how to handle and treatments that match with the data of symptoms of the user's inputan disease.
2. Research conducted by Arie Pramadya Putra 2015 entitled "Design of Decision Support System for Web-Based Dental and Oral Disease Diagnosis Using Certainty Factor and Forward Chaining Method (At Puskesmas Mulyorejo Malang City)", giving result that application of system design decision support for Web-based dental and mouth disease diagnosis using certainty foctor and forward chaining methods at poor Poor Health Centers. Can help users detect early dental and oral diseases based on symptoms perceived, or arising from an accurate source of information.
3. Research conducted by Ertha Agustina Tristianil et al entitled "Dental and Oral Dental Disease Diagnostic System Using Forward Chaining Method (Case Study: RS.Brawijaya Malang)", gives result that expert system of dental and mouth disease diagnosis able to give appropriate answer with symptoms marked by facts. Of the three studies have a scope and target that is almost the same that diagnose a disease easily, quickly and efficiently are included with the way handling.

2.2. System Theory

A. Expert System

Expert system according to Widodo Budiharto et al (2014: 4) This field of science studies the process of building a system or computer that has expertise possessed by experts. With this system, the problems that should only be resolved by experts or experts can be solved by ordinary or lay people. For experts, expert systems help activities as assistants who seem to have a lot of experience.

Meanwhile, according to Turban in Prasetyo (2015: 1) Expert system is a system that uses human knowledge entered into the computer to solve problems that are usually solved by the expert. Based on some opinions of experts mentioned above can be deduced that the expert system is a computer system that matches the decision-making ability of a specialist. The

word equals have a sense that the expert system is expected to work in all things as well as an expert.

B. Diagnosis

According to Webster in Silvia et al (2017: 36) "Diagnosis is the process of determining the essence of negligence or incompetence by examination and through the examination a careful study of facts to determine the problem". According to Hariman in Silvia et al (2017: 36) "Diagnosis is an analysis of the disorders or misappropriation of its symptoms." Meanwhile, according to Silvia et al (2017: 36) "... diagnosis is a way of analyzing a disorder by observing the symptoms that appear and from these symptoms sought the factors that cause the disorder earlier".

From the above explanation can be concluded that the diagnosis is a process to determine and observe the changes that occur through the signs or clinical symptoms are visible so that a cause can be known.

C. Diseases

Disease is an abnormal state of the body or mind that causes discomfort, dysfunction or difficulty affecting people affected, ordinary people consult with a doctor. (Ibrahim in Silvia, 2017).

D. Teeth and Mouth

Teeth are a human organ that is used as a digestive tool that is to chew food, as organ speech and as appearance.

"The mouth is the open cavity where the food enters and the water" (Ertha et al, 2017).

E. Forward Chaining

According to Giarratano in Andy (2013: 2) Forward chaining is basically data driven, which means the system starts with the initial set of elements in memory and keeps firing until no more rules can be applied or the goal has been reached.

In effect, this system will move forward from the present state to the state of destination.

F. Android

Android definition According to Yuniar Supardi (2017: 1) Android is a linux-based mobile operating system that includes the operating system, middleware, and applications.

3. **Method**

This research uses Inference Forward Chaining method, that is inference starts with available information and only then will be got conclusion. The facts used in this study are the symptoms felt by the patient, while the conclusion is the result of disease diagnosis.

4. **Results and Discussion**

4.1 Flowchart Design

This design is used to describe the flow of a program to be more simple so that the program can be more understandable.

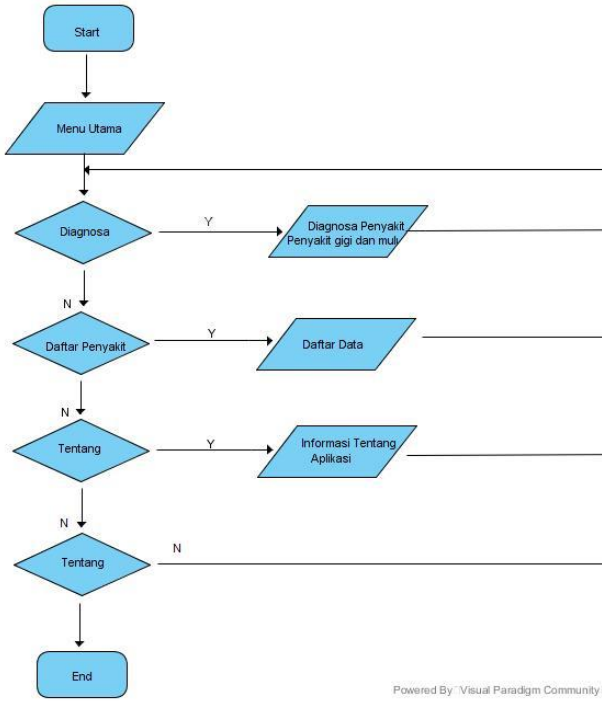

Figure 4.1 Flowchart manager

4.2 Use case diagram design

In this application, the user can consult, see the diagnosis, view disease data, and access the menu about.

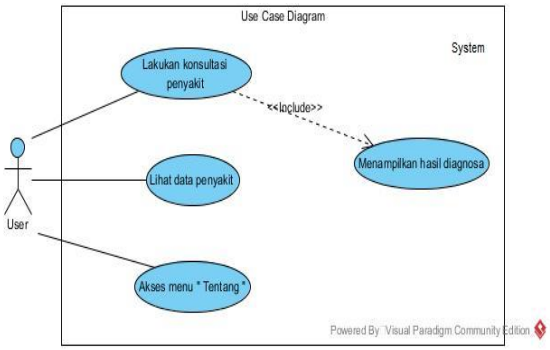

Figure 4.2 use case diagram of expert system

4.3 Rule Diagnosis Expert System Dental and Oral Disease

1. Rule 1

IF Bad breath
AND Gums swollen red & bleeding
AND Gingival braided, wounded echoes between teeth and gums
AND Enlarged lymph nodes in the head, neck or jaw
AND Fever
AND Pain gums
THEN Ulcerative Gingivitis Acute Necrosis

Solution:

- Dissolve a small amount of sea salt into a cup of warm water. Gargle gargle solution for 30 seconds then throw away. Repeat several times. Salt water will reduce swelling of the gums and pull the infection out of any abscess.
- Add gargle with this solution into your tooth brushing routine twice daily. Apply a little honey. Honey has a natural antibacterial and antiseptic content, so you can apply it to treat infected gums. After you brush your teeth, apply a little honey on the troubled gum area. Because honey has a high sugar content, you are not advised to use it too much and make sure to put it on the gum instead of your teeth.
- Gargle with Listerine. Excluding prescription mouthwash, Listerine has proven to be the most effective mouthwash to reduce plaque and gingivitis. It is recommended that you
- use it for 30 seconds twice a day. Although the essential oils contained in this fluid can cause burning in the mouth, most people can often adjust after a few days of use.
- Eat more vitamin C-rich foods and increase your vitamin D intake by basking in the sun at least 15 to 20 minutes twice a week and eating vitamin D-rich foods such as salmon, whole eggs and cod liver oil. Avoid the trigger Stress and cigarettes.

2. Rule 2

IF Bad breath
AND Nervous
AND Fatigue

AND Fever
AND Gums bleed easily
AND Lymph nodes under the jaw are often swollen
AND Chewing and swallowing food causes pain
AND The ends of the gums that lie between two teeth are eroded
THEN Trench Mouth

Solution:

- Do not smoke or use other tobacco products
  Perform a liquid diet (only eat liquid food), if necessary, during the first few days of treatment to minimize pain
- Avoiding spicy or very hot foods, which can irritate your tender gums
  Stay well hydrated
- Do not drink carbonated beverages or alcohol

3. **Rule 3**
   IF Cracked and reddish at the corners of the mouth
   AND Appears yellow, white or creamy spots in the mouth
   AND Slight bleeding if lesions are scratched
   AND Lesions resemble cheese
   AND Inside the mouth there is cotton
   AND Lost appetite
   THEN Oral Candidiasis
   Solution:

- **Eat** yogurt, consume yoghurt will help restore the natural balance of bacteria in the mouth and throat, thus reducing the risk of candida / fungus multiply.
- **Take** acidophilus pills. Acidophilus is one of the active cultures contained in yogurt, but it is also available in pill form. You can buy it without a doctor's prescription. This pill will also help restore the natural balance of bacteria in the mouth and throat.

4. **Rule 4**
   IF Swelling of the gums
   AND Pain when opening mouth
   AND When chewing causes pain
   AND Appears pus
   AND It's hard to chew food
   THEN Periodontal Abscess
   Solution:

- **Chewing** on garlic, Garlic has anti-inflammatory properties and natural antibiotics that make it very effective to treat dental abscesses. Garlic helps to reduce pain and prevent the spread of infection. Put a fresh garlic clove in your mouth and smash it with your teeth. Chew until the pain subsides. Spit and gargle with warm water. To reduce the residual odor, you can add a few drops of clove oil to warm water. Another option is to mix half a teaspoon of garlic powder with a bit of table salt and apply it directly to affected teeth. Let stand for 10 minutes, then gargle with mouthwash. You can also rub garlic oil on affected teeth. Repeat one of these treatments 3 or 4 times a day for several weeks.
- **Gargling** with salt water, Salt has antiseptic and antibacterial properties that can help reduce inflammation, reduce pain, pull out infections and prevent bacterial growth in the mouth, which is helpful in overcoming tooth abscess. Add 1 teaspoon of salt or fine salt into a glass of lukewarm water. Mix until the salt dissolves completely. Gargle with this solution. Do it 2 or 3 times a day to clear the infection and reduce discomfort and pain.

5. **Rule 5**
   IF Inflammation of the tongue
   AND Smooth tongue surface
   AND The tongue is red and white
   AND Allergy to toothpaste and mouthwash
   AND Difficulty chewing, swallowing & talking
   AND It's hard to chew food
   THEN Glossitis
   Solution:

Stop certain habits, such as: Smoking, Consuming alcoholic beverages, Eating colorful candies, Sharpening sharp teeth. If these habits are stopped, the glossitis will surely recover by itself.

6. **Rule 6**
   IF Bad breath
   AND Fever
   AND Lost appetite
   AND Small wound around (diameter 1-5 millimeters)
   AND Gums are bright red
   AND Many open wounds are white and yellow
   THEN Gingivostomatitis
   Solution:

- **Apply** a docosanol cream that can be purchased without a prescription. Oral herpetic cream containing docosanol, also known as alcohol behenyl, has been approved by the FDA for use in oral herpes treatment. Docosanol relieves the discomfort caused by oral herpes and is generally reported to speed up the cure of herpes. Use this medicine by gently rubbing it on the skin affected by mouth herpes at most five times a day.
- **Apply** a little milk. Soak cotton balls in milk and apply on the mouth herpes to ease the pain. Better still, if you feel the signs of tingling that usually feels before the mouth herpes appear, immediately use cold milk. This can help speed up direct healing from the beginning. Full cream full cream is best used for this treatment.

7. **Conclusion**
   From the results of research that has been done, there are some conclusions that can be put forward as follows:
   1. By using Forward Chaining method in this android based expert system can diagnose dental and mouth disease and its solution.
   2. With this program is expected to help the general public to solve the problem of diagnosing dental and oral diseases.
   3. The solution withdrawal for each problem is based on the relationship between questions and solutions stored in the knowledge base.

8. **Bibliography**

[1] Budiharto, Widodo and Suhartono, Derwin. 2014. Artificial Intelligence Concepts and Application. Jakarta :Andi Publisher

[2] Lie, Andy et al. 2013. Expert System To Diagnose Dent Disease with Bayes Theorem. Journal. Jakarta :Bina Nusantara University

[3] Murad, Silvia.A et al. 2017. Expert System Diagnosis Facial Skin Diseases at Edelweiss Medical Center Clinic Using Java Netbeans and MySQL. JUTIS Journal of Informatic Engineering Vol.5 No.1 April 2017. Tangerang: Sheikh-Yusuf Islamic University

[4] Supardi, Yuniar. 2017. Collection of Final Project and Thesis with Android. Jakarta : PT.Alex Media Komputindo

[5] Tristiani, Ertha.A et al. 2017. Dental and Oral Disease Diagnosis Experiment System Using Forward Chaining Method (Case Study: Brawijaya Hospital Malang). Journal. Malang: Politeknik Negeri Malang

[6] Valentine, Hervica.M et al. 2015. Expert System Design Early Diagnosis of Dental and Oral Disease Using Dempster Shafer Method. Journal. Pontianak: University of Tanjungpura

[7] Wibowo, Prasetyo.A. 2015. Expert System To Diagnose Television Damage With Forward Chaining Method Using PHP and MySQL. Essay. Semarang: Semarang State Universi