

Expert System to Diagnose Problems Acne Whitening Method Using the Base Case Reasoning

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Abstract-Lack of knowledge about the problem of acne for the people who do not know how to Prevent early steps to Prevent acne more inflamed. This system can help doctors to Facilitate patient diagnosis and can save the patient's medical records for the consideration of the results of diagnoses of new problems that will come. Therefore, this study aims to produce an expert system for diagnosing problems acne on the face using the case base reasoning method. The algorithm used for the CBR method is the Nearest Neighbor Retrieval Algorithm for Determining the value of disease symptoms weighting based on: if the symptoms of the selected disease will be the same value of 1 and if the symptoms chosen are not the same will be value of 0 to the symptoms of old disease cases.

Keywords: Acne, Case Base Reasoning, Nearest Neighbor Retrieval Algorithm

1. Introduction

Life is inseparable from bahayannya diseases that interfere with any life that exists in nature. Indirectly life and the disease goes hand in hand with time lived. For that reason, life lived by every person or community requires a sistempakar to overcome the disease early. The system will help to facilitate the public or people suffering from the disease can do diaknosa own. Because kebanyakan we know someone only entrust their disease naturally by way of direct encounter with the specialist or his own doctor to treat diseases they experienced. If every person who has the disease do so will lead to a long Antria for many patients and the cost is more expensive. Due to the specialist or physician practices have time constraints and limited working hours a bit of an expert or doctor sepesialis that exist today. With that era, the rapid development of technology today, pemanfaatan computer capabilities in managing and storing information can be dimanfaatkan to help people memproleh information. The technology dimaatpaatkan one satunnya ie expert system is a computer program that reasoning and present some expert knowledge to solve problems or provide solutions to existing problems. The method used in this research is the method *Case Base Reasoning* which is a method that does reasoning by case basis memanfaatkan long way to make the solution of the new cases, Agardapat assist in the assessment for a system that accurately mendaptkan. This system will release the results output information acne problems suffered selected based on symptoms and the value simalirity acne patients who experienced with the use of the methods Reasoning Base Case will provide solutions to the new case. [1] According to Ketut Arlin Aryani, Dewa Gede Hendra Divayana, I Made Agus Wirawa, (2017), a skin disease caused by the influence of tropical climate, among others phlegm (attacking the folds of the skin), scabies (generally strike the covered area, for example the back and body), ringworm (attacking areas that rough and scaly eg hands and feet) and acne (raided the face and body) The cause of acne is the blockage of the drain oil glands, closing the outlet of the sebaceous glands if mass externally, both of cosmetics, chemicals, dust and pollution as well as the outlet of the sebaceous glands narrower (hyperkeratosis) from ultraviolet radiation, sunlight, or radiotraffic active, The study was done by researchers, found the results of some types of acne, among which acne blackhead, whiteheads, papules, pustules, nodules cysts, conglobata and fulminans. Of some types of acne have a level of each group, ranging from mild (mild), moderate (moderate) and severe (severe), most patients with acne disorders psikologis and development of personality that can reduce the level of confidence or be embarrassed because of illness acne.

2. Theory

2.1 Sietem Expert

An expert system is a system whose performance adopting the expertise of an expert in a particular field into the system or a computer program is presented with a display that can be used by a user who is not an expert so as to sestem the user can make a decision or set policy like an expert, According to [3] Anik Andriani (2017: 9).

2.2 Case Base Reasoning (CBR)

Menurut Zulfian Azmi and Verdi Yasin (2017: 115) there are several stages in the process of Case Base Reasoning method which is as follows:

a. *Retrieve*

Doing a search input degree of similarity in symptoms given case patients with existing cases in the knowledge base to look for cases that are similar (similarity) is the highest. Only cases that have similarities with the base case to be processed.

b. *reuse*

At this stage of calculating the value of similarity every case that had previously been done matching of new cases in the case of the old one, so that the results of calculation of the value equation similarity each case obtained from: (total value of symptom similarity elected x weight / total weight symptoms in old case data).

c. *Revision*

Revision stages is a stage review of the proposed solution cases, this process will revise the information system proposed solutions will be evaluated and corrected back to address the errors that occurred on the issue of new cases.

d. *retain*

In the indexing process will retain, integrate, and extract the new solutions into the database as patient medical records, if experts said the new case as the case is valid then the case can be updated to this new case basis to resolve the problems to come.

The formula used as follows:

Weighting parameter (W):

The characteristics of the selected symptoms of old cases (same) = 1

The characteristics of the selected symptoms of old cases (not equal) = 0

$$\text{similarity}(\text{problem}, \text{case}) = \frac{S_1 * W_1 + S_2 * W_2 + \dots + S_n * W_n}{W_1 + W_2 + \dots + W_n}$$

In the above formula using the technique of similarity (problem, case) to the Nearest Neighbor algorithm Retrieval, while keternagan of the following formula:

S = similarity (Similarity value) is 1 (equal) and 0 (diff)

W = weight (Weight given).

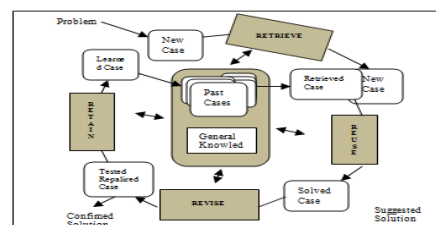


Fig 1. Method Struktur CBR

Source: <https://www.researchgate.net/publication/293328997>

3 Analysis

The following will explain any parts that are in part analysis and design:

3.1 Data analysis

Table 1.
Data Table symptoms

No.	code symptom	symptom
1	G01	Opening pores clogged by sebum
2	G02	pus
3	G03	Black lumps
4	G04	Located on the surface of the skin
5	G05	prickly
6	G06	Formed under the skin
7	G07	Oily skin
8	G08	Small white lumps
9	G09	Appeared in groups
10	G10	painful
11	G11	Acne prominent
12	G12	Looks redness of the skin
13	G13	small bump

No.	code symptom	symptom
14	G14	hard lumps
15	G15	inflammation
16	G16	big bump
17	G17	Coloured Red

Table 2
Table Disease Acne on Face

No.	Diseases code	name of disease
1	P01	Blackheads Black (Blackhead / Open comedo)
2	P02	White comedones (Whitehead / Closed comedo)
3	P03	Acne papules (papules acne)
4	P04	Acne pustules (Pustules ance)
5	P05	Acne nodules (nodule ance)
6	P06	Cystic acne (cystic acne)

Table 3.
Table Case Old Disease

Diseases code	The characteristics of the disease symptoms	Solutions disease
P01	Opening pores clogged by sebum pus Black lumps Located on the surface of the skin prickly	The most effective way that can be done at home is to use a face wash, pore strips, exfoliator, and a face mask to absorb all excessive dirt from the pores. If not improved please consult your doctor, who will give a particular drug.
P02	Formed under the skin Oily skin prickly Small white lumps Appeared in groups	To treat acne whiteheads using a facial soap containing benzoyl peroxide is the main option to mengontrolkadar excessive oil in the pores. Acne can not be cured by treatment overnight it takes at least two months with this soap. If not yet healed you should see a physician for other treatment, the doctor will meresep medicines containing retinoids and antibiotics when there is inflammation.
P03	Acne prominent Under the skin feels nyaeri Looks redness of the skin	To treat acne whiteheads using a facial soap containing benzoyl peroxide is the main option to control the levels of excess oil in the pore-pori. Jika not improved please consult your doctor, who will give a particular drug.
P04	painful Oily skin small bump prickly pus	Acne is not known whether the disease pustules (Pustules ance) can be treated. However, if not improved please consult your doctor, who will give a particular drug.
P05	painful Formed under the skin prickly hard lumps inflammation	The most effective way that can be done at home is to use a face wash, pore strips, exfoliator, and a face mask to absorb all excessive dirt from the pores. To be sure there is no cure for mengobatannya please consult your doctor, who will give a particular drug.
P06	painful inflammation big bump Coloured Red pus Formed under the skin	Please consult a doctor, who will give a particular drug. , Due to tackle the disease Cystic acne (cystic acne) has no cure. Drugs that it can only make the patient does not feel pain.

a. Acne Disease Case For Disease Similarity Value New Case

The process of determining similarity similarity value of new cases by adapting the old cases in 4 CBR process as follows:

1) Retrieve

At this stage of the process of determining the symptoms of each disease based on the records pengetahuan acne experts in the form of disease data, the characteristics of the symptoms of the disease, and disease prevention solutions acne cases of old patients. After that the system will perform weighting by matching one by one between the characteristics of the symptoms of a new disease cases selected patients against disease cases old cases that exist in the knowledge base and the user will input the symptoms that have been selected. Weighting process performed by the system shown in the calculation of a patient chooses symptoms if the characteristic symptoms are selected (equal) among new cases with old

cases will be worth 1, and if the characteristic symptoms are selected (not the same) between the new case to case old will be worth 0. Or it can be written as follows:

Weighting parameter (W):

The characteristics of the selected symptoms of old cases (same) = 1

The characteristics of the selected symptoms of old cases (not equal) = 0

S = similarity (similarity value) is 1 (equal) and 0 (diff)

W = weight (weight given)

a) P1 Case Calculation

The characteristics of the new cases symptoms (X)		The characteristics of the symptoms of old cases (P1)
pus	1	Opening pores clogged by sebum
Black lumps	1	pus
Located on the surface of the skin	1	Black lumps
prickly	1	Located on the surface of the skin
Oily skin (not the same)	0	prickly

Fig 2. Calculation of Case I

$$similarity(problem, case) = \frac{S_1 * w_1 + S_2 * w_2 + \dots + S_n * w_n}{W_1 + w_2 + \dots + w_n}$$

$$similarity(X, 1) = \frac{(1 * 1) + (1 * 1) + (1 * 1) + (1 * 1) + (0 * 0)}{Jumlah\ kasus\ gejala\ lama}$$

$$= \frac{1+1+1+1+0}{5} = \frac{4}{5} = 0.8$$

b) Calculation II case

The characteristics of the new cases symptoms (X)		The characteristics of the symptoms of old cases (P2)
Pus (not the same)	0	Formed under the skin
Black lumps (not the same)	0	prickly
Located on the surface of the skin (not the same)	0	Oily skin
prickly	1	Small white lumps
Oily skin	1	Appeared in groups

Fig 3. Calculation Case II

$$similarity(problem, case) = \frac{S_1 * w_1 + S_2 * w_2 + \dots + S_n * w_n}{W_1 + w_2 + \dots + w_n}$$

$$similarity(X, 2) = \frac{(0 * 0) + (0 * 0) + (0 * 0) + (1 * 1) + (1 * 1)}{\text{Number of cases of old symptoms}}$$

$$= \frac{0+0+0+1+1}{5} = \frac{2}{5} = 0.4$$

c) Calculation of the case III

The characteristics of the new cases symptoms (X)		The characteristics of the symptoms of old cases (P3)
Pus (not the same)	0	Acne prominent
Black lumps (not the same)	0	Under the skin
Located on the surface of the skin (not the same)	0	painful
Itch (not the same)	0	Looks redness of the skin
Oily skin (not the same)	0	

Fig 4. Calculation Case III

$$similarity(problem, case) = \frac{S_1 * w_1 + S_2 * w_2 + \dots + S_n * w_n}{W_1 + w_2 + \dots + w_n}$$

$$similarity(X, 3) = \frac{(0 * 0) + (0 * 0) + (0 * 0) + (0 * 0) + (0 * 0)}{\text{Number of cases of old symptoms}}$$

$$= \frac{0+0+0+0+0}{4} = \frac{0}{4} = 0$$

d) Calculation case IV

The characteristics of the new cases symptoms (X)		The characteristics of the symptoms of old cases (P4)
pus	1	pus
Black lumps (not the same)	1	prickly
Located on the surface of the skin (not the same)	1	small bump
prickly	1	painful
Oily skin	1	Oily skin

Fig 5. Calculation of Case IV

$$\text{similarity}(\text{problem}, \text{case}) = \frac{S_1 * w_1 + S_2 * w_2 + \dots + S_n * w_n}{W_1 + w_2 + \dots + w_n}$$

$$\text{similarity}(X, 4) = \frac{(1 * 1) + (0 * 0) + (0 * 0) + (1 * 1) + (1 * 1)}{\text{Number of cases of old symptoms}}$$

$$= \frac{1+0+0+1+1}{5} = \frac{3}{5} = 0.6$$

e) Calculation case V

The characteristics of the new cases symptoms (X)		The characteristics of the symptoms of old cases (P5)
Pus (not the same)		painful
Black lumps (not the same)		Formed under the skin
Located on the surface of the skin (not the same)	1	prickly
prickly		hard lumps
Oily skin (not the same)		inflammation

Fig 6. Calculation Case V

$$\text{similarity}(\text{problem}, \text{case}) = \frac{S_1 * w_1 + S_2 * w_2 + \dots + S_n * w_n}{W_1 + w_2 + \dots + w_n}$$

$$\text{similarity}(X, 5) = \frac{(0 * 0) + (0 * 0) + (1 * 1) + (0 * 0) + (0 * 0)}{\text{Number of cases of old symptoms}}$$

$$= \frac{0+0+1+0+0}{5} = \frac{1}{5} = 0.2$$

f) Calculation of the case VI

The characteristics of the new cases symptoms (X)		The characteristics of the symptoms of old cases (P6)
pus	1	pus
Black lumps (not the same)		painful
Located on the surface of the skin (not the same)		Formed under the skin
Itch (not the same)		inflammation
Oily skin (not the same)		big bump
		Coloured Red

Fig 7. Calculation Case VI

$$\text{similarity}(\text{problem}, \text{case}) = \frac{S_1 * w_1 + S_2 * w_2 + \dots + S_n * w_n}{W_1 + w_2 + \dots + w_n}$$

$$\text{similarity}(X, 6) = \frac{(0 * 0) + (0 * 0) + (1 * 1) + (0 * 0) + (0 * 0)}{\text{Number of cases of old symptoms}}$$

$$= \frac{0+0+1+0+0}{6} = \frac{1}{6} = 0.166666$$

2) reuse

The characteristics of the new cases symptoms (X)	1	The characteristics of the symptoms of old cases (P1)
pus	1	Opening pores clogged by sebum
Black lumps	1	pus
Located on the surface of the skin	1	Black lumps
prickly	1	Located on the surface of the skin
Oily skin (not the same)	1	prickly

Fig 8. Similar Cases

$$similarity(problem, case) = \frac{S_1 * w_1 + S_2 * w_2 + \dots + S_n * w_n}{W_1 + w_2 + \dots + w_n}$$

$$similarity(X, 1) = \frac{(1 * 1) + (1 * 1) + (1 * 1) + (1 * 1) + (0 * 0)}{\text{Jumlah kasus gejala lama}}$$

$$= \frac{1+1+1+1+0}{5} = \frac{4}{5} = 0.8$$

From the above calculation of the cases had the lowest similarity value P3 which is the case at 0 further cases of 0.166666 further P6 P5 case further by 0.2 by 0.4 hereafter P2 cases P4 cases of 0.6 and as high as is the case of P1 by 0.8. In this reuse process, the solution provided is the solution to the long case similarity value with the highest new cases. The results of calculations with the results showing the level of confidence value of 0.8 so the solution P01 case is recommended to the user that the solution P1 acne disease prevention or disease Blackheads Black (Blackhead / open comedo). The result of manual calculation with a suitable program, which produces an output that is the solution P01 disease.

3) revise

At this stage of the process revise, the information will be restored to mengnanggulangi errors that occurred on the problem of new cases. The confidence level of 0.8 to the solution to a long illness P1 cases resulting recommendations can be immediately given.

4) retain

At the stage of this process will index, integrate, and extract the new solution will be deposited into database. Selanjutnya, a new solution that is already stored in the knowledge base will be used to solve new cases will come.

b. Data Selection

The selection is kriteria case by case which has the highest similarity to the new case will be suggested as a solution to the problems of new cases. As shown in the table below:

Table 4.

Selection Table Data

Base Case of Disease	value similarity
P01	0.8
P04	0.6
P02	0.4
P05	0.2
P06	0.166666
P03	0

Based on the above table data selection case for solutions to problems of new cases will be taken based on the highest criteria.

4.2 System planning

The system design provides the design of the proposed system, such as database design, input design, output design and interface design.

a. The design of the proposed system

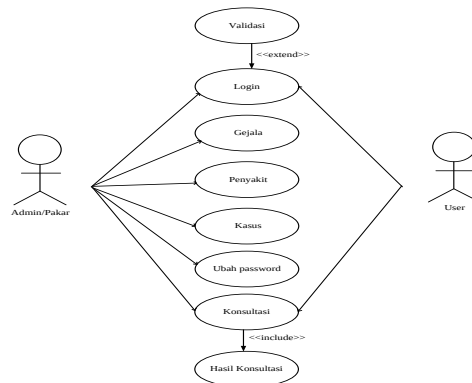


Fig 9.Use Case Diagram System

5. Conclusion

The conclusions from the results of the research is as follows:

- Expert systems are built to provide identification conclusions based on the symptoms that have to infer or predict disease that affects what type of acne and the right solution to overcome the problem of acne suffered.
- The system can also help the hospital when the hospital using this application system to help patients who are waiting in line for a consultation so that if there is understaffed in the consultation can terbantunya Hospital side.
- Base Case Reasoning method using the formula Retrieval Nearest Neighbor algorithm to infer or consider the most similar case from the case database lookups when processing a case on the steps of the method stages Reasoning Base Case.

6. Reference

- [1] Asmin Amonius Herdi Saputra Gulo, Muhammad Syahrizal "Design Expert Systems Applications Haemophilia Diagnose Disease In Humans Applying Reasoning Base Case Method", Journal of Pelita Information Technology, 2018, 17 (1), 24-29.
- [2] Maharani Ayu. 2015. "Skin Disease Treatment, Prevention, and Treatment". Yogyakarta: New Library Press.
- [3] Erick Kurniawan. 2018. "Fast Advanced Visual Basic 2010". Yogyakarta: CV ANDI OFFSET
- [4] Ketut Arlin Aryani, Dewa Gede Hendra Divayana, I Made Agus Wirawan, "Disease Diagnosis Expert System Acne On Face With Certainty Factor Method," Journal of Information Engineering of National Education, 2017, 6 (2).
- [5] Nina Oktarina and Supreme Kuswanto, "IT-Based Learning Program Application Ms.Acces To Improve Student Comprehension Highlights On Inventory", Journal of Educational Research, 2011, 29 (2).
- [6] Rosa A. S & M. Saladin. 2018. "Software Engineering and Object-Oriented Structured Revised Edition". Bandung: Informatics Bandung.
- [7] T.Sutojo, Edy Mulyanto, Vincent Suhartono. 2017. "Artificial Intelligence". Yogyakarta: CV ANDI OFFSET.
- [8] Referee Ginting, "Expert System Diagnose Kidney Disease Reasoning Method Using the Base Case", 2018, 3 (2).
- [9] Yulianti pm, "Aptitude Testing Based Case-Base Reasoning In Expert System To Determine Interest and Talent Elementary school students", Journal of Technology and Information systems UNIVRAB, 2016, 1 (2).
- [10] Windi Sentanu, "System, Expert For Diagnosing Disorders Lan Network", in 2014.
- [11] Zulfian Azmi and Verdi Yasin. 2017. "Pengantar Expert System And Method". Jakarta: Partners Media Discourse.