

Article

Implementation Of Forward Chaining Expert System To Identify Facial Skin Types In Determining Facial Beauty Treatments

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Abstract: Skin is part of the outer layer of the human body which is flexible, soft and sensitive and is the first line of defense from various germs, viruses, bacteria and what is very important and the main part is facial skin, therefore we must keep it healthy, fresh and clean by determining proper beauty facial treatment. This research was conducted to design and create an expert system capable of identifying facial skin types to determine facial beauty treatments. Making this expert system using forward chaining method. The result of this research is an application that can help make it easier for users to determine facial facial treatments without having to queue and wait for consultations with a beauty doctor, so that they can immediately determine the appropriate type of skin facial treatment through the Android application.

Keywords: Expert System, Forward Chaining, Beauty Facial Treatment, Android

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1. Introduction

The skin is part of the outer layer of the human body which is flexible, soft and sensitive and is the first line of defense from various germs, viruses, bacteria and what is very important and the main part is facial skin, therefore we must keep it healthy, fresh and clean[1]. For that we have to do regular care of the skin with various kinds of beauty facials, before doing the treatment we must first know the type of our facial skin because everyone has different skin types[2]. Many people find it difficult to identify their own skin type, on the other hand there is an expert or a beauty doctor whose hours of practice are limited, so most patients have to wait in line and the distance or location of the expert and the patient and the consultation fee is quite expensive. In accordance with the above problems, an application is needed that can replace the absence of a beautician or expert to provide easy information in determining the type of facial treatment that suits the patient's facial skin type[3][4]. This expert system is one of the novelties in the field of Artificial Intelligence which makes it easy to quickly identify facial skin types based on the characteristics that have been obtained from an expert or beauty doctor, after the skin type is known, the system will provide a type of treatment solution. the right facial according to our skin type.

Technological developments now really help and lighten human work, as well as in diagnosing in the field of beauty[5]. With the rapid development of technology for many people it is very helpful in solving problems or identifying things quickly and accurately. For this reason, a system is needed that can assist in diagnosing in the field of beauty, for example in human facial skin[6]. One suitable system is an expert system.

Expert System itself is one of the fields of Artificial Intelligence which studies communication between humans and computers through suggestions to store expert knowledge. This kind of computational model facilitates communication between humans and computers in terms of information retrieval, so that an interaction occurs between the two using previously confirmed knowledge from experts[7]. This expert system will later make it easier to quickly identify the type of facial skin based on the characteristics that have been obtained from an expert or beauty doctor, after the skin type is known, the system will provide a solution for the right type of facial treatment according to our skin type according to the database obtained from experts[8][9]. Database is an arrangement of complete operational data records from an organization or company, which organized and stored in an integrated manner using certain methods so as to be able to fulfill optimal information needed by users[10][11].

2. Materials and Methods

The research method used in this study is the waterfall method. In this method the development of a software is linear from the beginning to the end[12]. This method has been widely used for developing software applications and is a classic model of software engineering that is widely used in research projects for government and large companies[13].

2.1. Forward Chaining Method

The picture below (figure 1) is the expert system method used in this study:

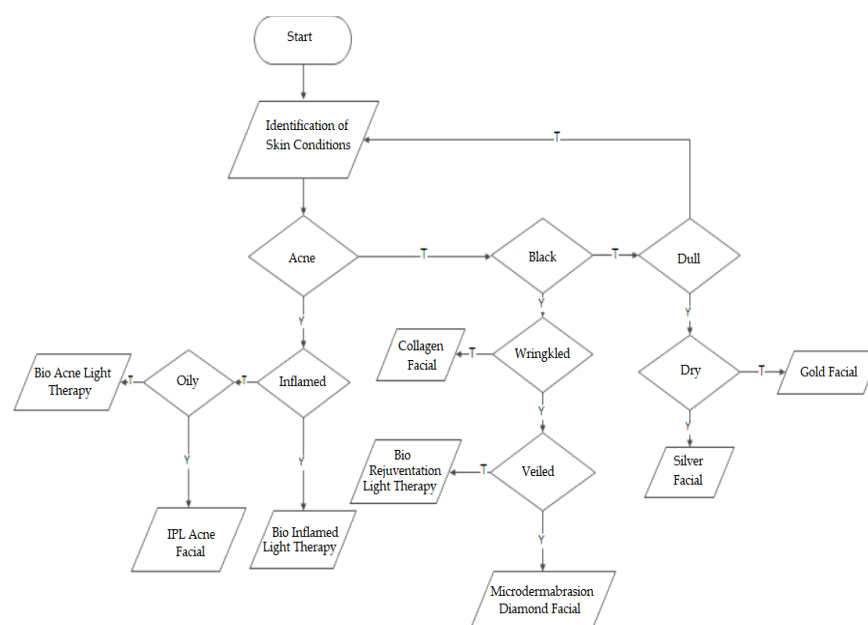


Figure 1. Forward Chaining Method

Description :

1. Input Identification of Facial Skin Conditions, in the form of questions for diagnosing facial skin conditions, such as: facial skin with acne, oily facial skin, wrinkled facial skin, blackheads, dull facial skin, wrinkled facial skin, black spots facial skin, facial skin dry[14].

2. Treatment Output, results from the process of diagnosing facial skin conditions using the forward chaining method to produce Bio Acne Light Therapy Treatment, IPL Acne Facial Treatment, Inflamed Light Therapy Treatment, Rejuvenation Light Therapy Treatment, Microdermabrasion Diamond Facial, Collagen Facial, Gold Facial, and Silver Facial.

2.2. Linguistic Variable Data

Table 1 is the data that will be used in every possible condition of facial skin symptoms experienced after grouping:

Table .1 Linguistic Data of Facial Skin Conditions

No	Linguistic Variabel	Value
1	Blackheads Facial Skin	Yes / No
2	Facial Skin Black Spots	Yes / No
3	Inflamed Facial Skin	Yes / No
4	Acne Facial Skin	Yes / No
5	Oily Facial Skin	Yes / No
6	Dull Facial Skin	Yes / No
7	Dry Facial Skin	Yes / No
8	Facial Skin Wrinkles	Yes / No

Linguistic Data on Facial Skin Conditions, in the form of diagnostic questions for facial skin conditions, such as: Blackheads Facial Skin, Facial Skin Black Spots, Inflamed Facial Skin, Acne Facial Skin, Oily Facial Skin, Dull Facial Skin, Dry Facial Skin, and Facial Skin Wrinkles. Forward Chaining method diagnosis, the system will determine the type of facial treatment based on input from the user.

3. Results and Discussion

The initial stage of the waterfall method is analyzing software requirements. this stage is to gather the necessary requirements of the software to be built thus producing a form of software requirements specification [15]. The results of the analysis from interviews and observations conducted by researchers at the research location are expert systems to identify facial skin types in determining facial beauty treatments [16], [17]. In this study, a rule-based system is used to store and modify expert system information so that it can be clearly informed, which is explained through the following design.

3.1. System And Software Design

The design that will be explained in this study includes model design in the form of UML (Unified Modeling Language) consisting of Use Case Diagrams and Activity Diagrams.

3.1.1. Use Case Diagram

Use case diagrams describe the interaction between the user and the system, and can also describe the type of user interaction with the system. Several things that can be done by the user to the system can be seen in the Use Case Diagram in Figure 2

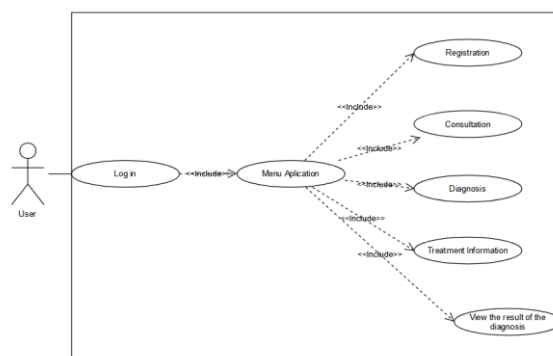


Figure 2. Use Case Diagram

3.1.2. Activity Diagram

In Figure 3 and Figure 4, the Activity Diagram explains the work flow of the sequence of each activity in a process in this study.

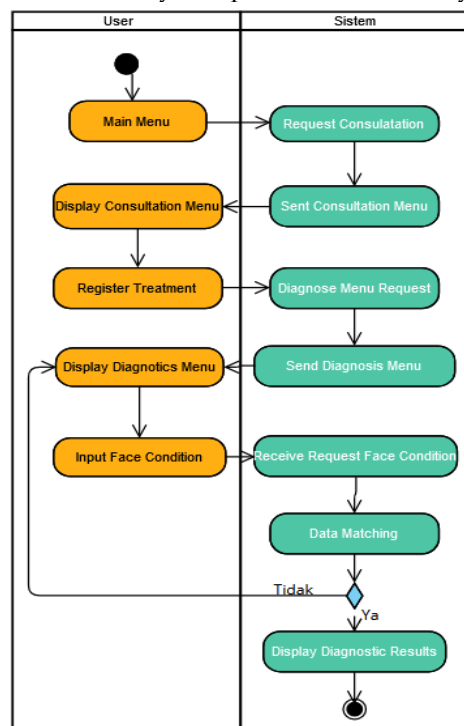


Figure 3. Consultation Menu Activity Diagram

The user opens the main menu then enters the request menu for the consultation page, then on the consultation page display the user registers for treatment to request a diagnosis menu, then the user inputs facial conditions and the system performs data matching, if appropriate the system will display the diagnostic results.

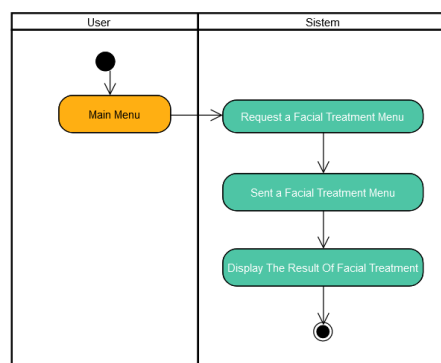


Figure 4. Activity Diagram Facial Treatment Information Menu

In the Activity diagram above, we can see that the displayed system is a request a Facial Treatment Menu, Sent a Facial Treatment Menu and Display The Result of Facial.

3.2. Implementation and Testing

3.2.1. User Interface

The user interface (User Interface) is a display design connecting the user (User) with the application system so as to facilitate the operation of the application. The interface on Android has many vendors and devices that use the Android operating system with a different display or user interface (UI)[18].

The User Interface is not only to facilitate interaction between humans and devices (machines) but also to beautify the appearance of the device. The user interface for Android apps is built using layout hierarchies (ViewGroup objects) and widgets (View objects). Layouts are containers that control how views are positioned on the screen. UI component widgets such as buttons and text boxes[19]–[21].

3.2.2. Facial Care and Condition Data

Table 2 contains data on facial skin care and conditions that are used as input and output data in the application "Expert System for Identifying Human Facial Skin Types to Determine Facial Beauty Treatments". The type of facial treatment has a code (F) while facial skin conditions have a code (K). Each type of facial treatment has set the condition of the facial skin that is suitable for the facial treatment. Treatment Data and Conditions have consulted with a Skin Specialist Doctor. For facial conditions there are 8 facial conditions and for facial facial treatment types there are 8 types which can be seen in Table 2:

Table 2. Treatment Data and Face Conditions

Facial Code	Facial Treatment Name	Condition Code	Face Conditions
F1	Bio Acne Light Therapy	K1	Acne Facial Skin
F2	IPL Acne facial	K1	Acne Facial Skin
		K7	Inflamed Facial Skin
F3	Bio Inflamed Light Therapy	K1	Acne Facial Skin
		K2	Oily Facial Skin
F4	Bio Rejuvenation Light Therapy	K3	Black Spots Facial Skin
		K5	Wrinkled Facial Skin
F5	Microdermabrasion	K3	Black Spots Facial Skin
	Diamond Facial	K5	Wrinkled Facial Skin
		K6	Blackheads Facial Skin
F6	Gold Facial	K8	Dull Facial Skin
F7	Silver Facial	K8	Dull Facial Skin
		K4	Dry Facial Skin
F8	Collagen Facial	K3	Black Spots Facial Skin

Description of Facial Skin Condition (K):

- K1 : Acne Facial Skin
- K2 : Oily Facial Skin
- K3 : Black Spots Facial Skin
- K4 : Dry Facial Skin
- K5 : Wrinkled Facial Skin
- K6 : Blackheads Facial Skin
- K7 : Inflamed Facial Skin
- K8 : Dull Facial Skin

3.2.3. Diagnostics Table Database

This Diagnosis table is stored in the Firebase database used to store data on human facial skin conditions, namely there are 8 human facial conditions[22], [23]. In this database you can also set forward chaining rules, edit data and can delete or add data, as can be seen in Figure 5:

ID	Question	Yes	No	Action
K1	Does your facial skin have acne?	K7	K3	Edit Delete
K2	Does your facial skin oily?	F3	F1	Edit Delete
K3	Do you have black spots on your facial skin?	K5	K8	Edit Delete
K4	Does your facial skin dry?	F7	F6	Edit Delete
K5	What is your facial skin wrinkles?	K6	F8	Edit Delete
K6	Does your facial skin have a mask?	F5	F4	Edit Delete
K7	Is your facial skin inflamed?	F2	K2	Edit Delete
K8	Is your facial skin dull?	K4	F0	Edit Delete

Figure 5. Database Tabel Diagnosa

This Table of Facial Treatment Types is stored in the Firebase database used to store facial treatment data, namely there are 8 facial data that can be added, edited or deleted, can be seen in figure 6:

ID	Facial	Action
F0	Facial Light Therapy	Edit Delete
F1	Bio Acne Light Therapy	Edit Delete
F2	IPL Acne Facial	Edit Delete
F3	Bio Inflamed Light Therapy	Edit Delete
F4	Bio Rejuvenation Light Therapy	Edit Delete
F5	Microdermabrasion Diamond Facial	Edit Delete
F6	Gold Facial	Edit Delete
F7	Silver Facial	Edit Delete
F8	Collagen Facial	Edit Delete

Figure 6. Database of Facial Treatment Tables

3.2.4. Program Trial Results

The results of the accuracy test are program trials carried out by users on UMAHA Sidoarjo students. Trials were carried out on 20 students to try treatment consultations using expert system applications according to their facial conditions. From the results of the trials carried out, it produced an accuracy of 85%, namely as many as 17 students according to the condition of their faces, and as many as 3 students who were irrelevant to their facial conditions. The following are the results of the diagnostic trial of the Expert System application program for identifying human facial skin types to determine facial beauty treatments, which can be seen in Figure7.

NAME	AGE	GENDER	FACIAL TREATMENT	Action
Fauzi	25	Pria	Silver Facial	Delete
Intan	27	Wanita	Gold Facial	Delete
Putri	24	Wanita	Collagen Facial	Delete
Jay	25	Pria	IPL Acne Facial	Delete
Aisla	30	Wanita	Bio Inflamed Light Therapy	Delete
Riska	28	Wanita	Sorry facial not detection	Delete
Intan	26	Pria	Microdermabrasion Diamond Facial	Delete
Hungli	20	Wanita	Silver Facial	Delete
Laila	23	Wanita	Bio Rejuvenation Light Therapy	Delete
Puri	17	Wanita	Bio Inflamed Light Therapy	Delete

Figure 7. Database of Facial Treatment Tables

4. Conclusions

Based on the problems that have been discussed and resolved through this report, it can be concluded that this expert system application program can determine the type of human facial treatment according to the condition of the skin type. From the results of this research experiment resulted in an accuracy of 85%. With the existence of this expert system application program, it is very easy to solve one's facial skin problems if you want to do facial beauty treatments. The design of this Android-based expert system is certainly more practical and will make it easier for users to diagnose facial skin types without having to queue and wait for a doctor's consultation or suddenly the doctor cannot work because this application is like an expert/doctor, so you can immediately determine the skin type for treatment. the appropriate face and without the need to open a computer or laptop to access it because it is based on Android.

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