# DEVELOPMENT OF SMART PERSONAL STYLIST APPLICATION FOR CLOTHING SETTINGS RECOMMENDATIONS ON ANDROID

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## ABSTRACT

Clothing is one of the basic needs that can protect the human body. Humans can show themselves to others through the clothes they wear. Basically everyone has different skin characteristics and colors. Someone can look more attractive if you wear the right clothes. But not everyone can choose clothes that match the characteristics and color of the skin they have. The limitations of knowledge in determining the right clothes make people who like stylists are willing to pay for the services of fashion stylists to make themselves more attractive to the public. Based on this, to deal with the problems that occur is to build an application that can provide clothing recommendations quickly and easily. By utilizing technology on android devices that is, the camera for shooting skin colors then utilizes the Clarifai API as a determination of the user's skin color. Clarifai API is a service that can process image data into results in the form of predictions from the image data entered by the user. In determining the recommendation, the method used is CBR (Case-Based Reasoning) by comparing input data with knowledge data to find the highest similarity value in knowledge data. The results of the highest similarity value will be used as clothing recommendations for users.

**Keywords**: Understanding Clothing, Android, Clarifai API, Case-Based Reasoning.

## 1. INTRODUCTION

Clothing is one of the basic human needs to protect the body from the sun or in cold weather. Along with the evolving function of the use of clothing, which is to provide comfort in accordance with the types of needs such as work clothes, sports clothes, home clothes and sleepwear [3]. Humans can show themselves to others through the clothes they wear. For people who have high prestige, of course they will try to wear clothes that are trending or popular even though the price is expensive.

Basically everyone has a different character. A person can look more attractive if you wear the right clothes. But the reality is not everyone can choose clothes that are suitable for themselves [2], for example, people who look thin and tall when wearing thin clothes will affect their appearance, preferably wear thick clothes and pants that are rather wide. The limitation of knowledge in choosing clothes is what causes a person to be unable to determine the clothes that are suitable for him. So for people who like stylists are willing to pay for the services of fashion stylists to make themselves more attractive in public.

From a sample of 60 people there were 77% of people who stated difficulties in integrating and matching clothes to be used according to their character, 77% of people expressed difficulties in adjusting their clothes to skin color, 75.4% of people found it difficult to find new clothes match the clothes they have, 77% of people find it difficult to find clothes that match their skin color, and 98% of people agree there is an android application that can recommend clothes that match the clothes they already have.

Based on the problems that have been explained, the solution to overcome the problem is to build a smart personal stylist application for recommendations on Android-based clothing. Currently Android devices are widely used by every community. By utilizing the technology available on android devices, cameras for skin color shooting and then using Clarifai API as a determination of skin color, sersor GPS to detect user locations and utilize the openweather API for weather data retrieval, users only choose clothing images that are almost similar to clothes owned by the user and store it in a database then

the user takes a picture of the skin color and the activities to be carried out which will later be recommended for clothing that matches the skin color and activities to be carried out. Appropriate clothing means that the clothing is owned and additional accessories such as clothing, belts, shoes, and others. For additional accessories that are not owned yet, the application will be searched by online stores.

## 2. CONTENT OF RESEARCH

### 2.1 Method

Data analysis methods in software development use the software paradigm in RAD (Rapid Application Development). RAD is a system development that emphasizes speed in its development through involvement of users [1]. The flow of the RAD method can be seen in Figure 1.

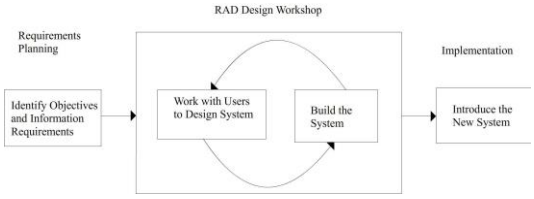



**Figure 1. RAD method**

For an explanation of the RAD method is as follows.

a. Requirements Planning

At the planning stage the requirements identify user needs and system specifications through data collection using questionnaires and literature studies. So that the application will be built according to the needs of the user.

b. RAD Design Workshop

In the RAD Design Workshop stage, it changes all needs analysis that has been collected from the requirements planning stage into the software architecture design and data structure. The results of the RAD Design Workshop stage are document software requirements.

c. Implementation

At the implementation stage, changing the design stage in the RAD Design Workshop stage into software that is understood by the computer using the Android studio application. After that, the software will be tested to find the error message. the application is ready to use if it runs according to the user's expectations.

### 2.2 Analysis of the Built System

System analysis is a general description of the system to be built. a description of the system analysis built on the smart personal stylist application for recommendations on clothing settings can be seen in Figure 2

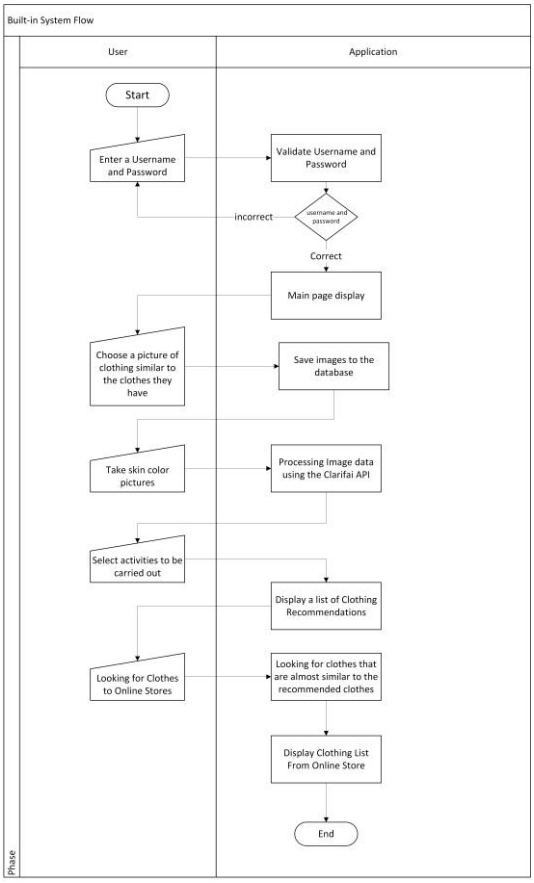



**Figure 2. System Overview**

The explanation of the picture of the system that will be built is as follows

1. The user enters a username and password on the login page.
2. The system verifies the username and password that the user entered. if appropriate it will go to the main page, but if it doesn't match it will return to the login page
3. On the main page, the user selects an image of clothing that is similar to the clothes owned by the user.
4. Then the system stores the clothing data that has been selected by the user into the database.
5. After choosing a picture of clothing, the user takes a skin color picture using the camera on an Android smartphone.
6. Then the image taken by the user will be sent to the Clarifai API to get skin color.
7. After selecting the clothing image and taking a skin color picture, the user chooses the activity to be carried out.
8. The system displays the clothing recommendation information that is

appropriate based on skin color and activities that will be carried out by the user.

9. Then for some clothes the recommendations that have not been owned by the user will be searched by the application to the online store.

### 2.3 Analysis of Clothing Recommendations

The method applied for clothing recommendations uses the Case-Based Reasoning (CBR) Method by using a solution of previous problems [5]. The recommendation method in the application is the prediction result from the Clarifai API will be the input data for finding solutions on the knowledge base. The following is the process of Case-Based Reasoning (CBR) method.

**1. *Retrieve***

*Retrieve* is taking an old case from the case base for a case similar to a new case. in the retrieval process uses the Nearest Neighbor algorithm. As for the calculation formula, look for the following:

$$Similarity = \frac{(S1\ x\ W1) + (S2\ x\ W2)}{W1 + W2}$$

Ket S1 = *Similarity* skin color is 1 (same) and 0 (different)
S2 = *Similarity* activities are 1 (same) and 0 (different)
W1 = skin color weight
W2 = activity weight

For the similarity the value of the attribute is at value 0, it means that the case is not similar, until the value 1 means a similar case. Attribute and value table as follows:

**Table 1. Attribute and Value**

| No | Attribute | Value |
|---|---|---|
| 1 | skin color | a. White<br>b. Tan<br>c. Black |
| 2 | activities | a. Work<br>b. Sports<br>c. Holiday |

similarity of values in attributes:

**a) Similarity in skin color values**

the similarity of skin color values can be seen in table 2

**Table 2. Similarity of skin color values**

| Similarity | White | Tan | Black |
|---|---|---|---|
| White | 1 | 0,6 | 0 |
| Tan | 0,6 | 1 | 0,4 |
| Black | 0 | 0,4 | 1 |

Similarity value is defined between the similarity of one skin color with another skin color, where for the greatest similarity based on the most similar skin color.

**b) Similarity value of activity**

For the similarity of activity values can be seen in table 3

**Table 3. Similarity value of activity**

| Similarity | Work | Sports | Holiday |
|---|---|---|---|
| Work | 1 | 0,4 | 0,6 |
| Sports | 0,4 | 1 | 0,5 |
| Holiday | 0,6 | 0,5 | 1 |

Similarity value is defined between the similarity of activities with other activities, where for the greatest similarity based on the most similar activities.

Attribute weight is defined with the following values:
SP= 1; P= 0.75; CP= 0.5; KP= 0.25; dan TP= 0;
Exp SP = Very important ; P = Important
C = Enough ; KP = not too important
TP = Not important

**Table 4. Attribute weight**

| Attribute | weight |
|---|---|
| skin color | 0,75 |
| activities | 0,75 |

the knowledge can be seen in table 5

**Table 5. knowledge**

| id | top | under ling | foot wear | acc esso ries | Skin colo r | activ ities |
|---|---|---|---|---|---|---|
| 1 | Whi te shir t | Chi nos | Shoe s | Bla ck tie | Tan | Wor k |
| 2 | Bla ck shir t | Jea ns | Shoe s | Nav y swe ater | Whit e | Holi day |
| 3 | Whi te shir t | Jea ns | Shoe s | | Blac k | Holi day |
| 4 | Bla ck shir t | Dr aw stri ng | slipp ers | Bro wn belt | Tan | Spor ts |

For the process of recommending new cases as follows

**Table 6. New cases**

| Case ID | skin color | activities |
|---|---|---|
| 1 | White | Sports |

Recommendation Weight

Skin color : 0,75

Activities : 0,75

**Case calculation 1**

**Table 7. Case similarity value 1**

| value of knowledge | *Similarity* | case value |
|---|---|---|
| Tan | 0,6 | White |
| Kerja | 0,4 | Sports |

$$Similarity = \frac{(S1\ x\ W1) + (S2\ x\ W2)}{W1 + W2}$$
$$= \frac{(0{,}6\ x\ 0{,}75)+(0{,}4\ x\ 0{,}75)}{0{,}75+0{,}75}$$
$$= \frac{(0{,}45)+(0{,}3)}{0{,}75+0{,}75}$$
$$= \frac{0{,}75}{2}$$
$$= 0{,}375$$

**Case calculation 2**

**Table 8. Case similarity value 2**

| value of knowledge | *Similarity* | case value |
|---|---|---|
| White | 0,1 | White |
| Holiday | 0,5 | Sports |

$$Similarity = \frac{(S1\ x\ W1) + (S2\ x\ W2)}{W1 + W2}$$
$$= \frac{(1\ x\ 0{,}75)+(0{,}5\ x\ 0{,}75)}{0{,}75+0{,}75}$$
$$= \frac{(0{,}75)+(0{,}375)}{0{,}75+0{,}75}$$
$$= \frac{1.125}{2}$$
$$= 0{,}563$$

**Case calculation 3**

**Table 9. Case similarity value 3**

| value of knowledge | *Similarity* | case value |
|---|---|---|
| Black | 0 | White |
| Holiday | 0,5 | Sports |

$$Similarity = \frac{(S1\ x\ W1) + (S2\ x\ W2)}{W1 + W2}$$
$$= \frac{(0x\ 0{,}75)+(0{,}5\ x\ 0{,}75)}{0{,}75+0{,}75}$$
$$= \frac{(0)+(0{,}375)}{0{,}75+0{,}75}$$
$$= \frac{0{,}325}{2}$$
$$= 0{,}163$$

**Case calculation 4**

**Table 10. Case similarity value 4**

| value of knowledge | *Similarity* | case value |
|---|---|---|
| Tan | 0,6 | White |
| Sports | 1 | Sports |

$$Similarity = \frac{(S1\ x\ W1) + (S2\ x\ W2)}{W1 + W2}$$
$$= \frac{(0{,}6\ x\ 0{,}75)+(1\ x\ 0{,}75)}{0{,}75+0{,}75}$$
$$= \frac{(0{,}45)+(0{,}75)}{0{,}75+0{,}75}$$
$$= \frac{1{,}2}{2}$$
$$= 0{,}6$$

**2. *Reuse***

From the calculation of the Retrieve process, the similarity values of each case can be obtained as follows

**Table 11. Similarity of cases**

| Case ID | Value of New Case Similarities |
|---|---|
| 1 | 0,375 |

| | |
|---|---|
| 2 | 0,563 |
| 3 | 0,163 |
| 4 | 0,6 |

**3. *Revise***

From the case that has been done, obtained the highest similarity value of 0.6 which will be made into a clothing recommendation

**4. *Retain***

Then add the rules by entering new case data that has been found the solution in a knowledge base that can be used for the next case with the same problem.

### 2.4 Functionality Testing Results

All features of the smart personal stylist application for clothing setting recommendations are tested using the Black box method. Black box testing is done by functional testing of the applications built and to find program errors [4]. the results of the test are as follows:

1. Test result Login

**Table 12. Test result Login**

| Cases and Test Results (Data True) | | | |
|---|---|---|---|
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Email:<br>*Password*: | System Displays the main menu | Show Main Menu | Accepted |
| **Cases and Test Results (Incorrect Data)** | | | |
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Email:{empty}<br>*Password*: {empty} | The system displays the message "Email or password cannot be empty". | The message "Email or password cannot be empty" appears | Accepted |

2. Test result Register Account

**Table 13. Test result Register Account**

| Cases and Test Results (Data True) | | | |
|---|---|---|---|
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Username:<br>Email:<br>*Password*: | The system displays the message "Data account successfully saved" | Display message "Data account successfully saved" | Accepted |
| **Cases and Test Results (Incorrect Data)** | | | |
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Username: {empty}<br>Email: {empty}<br>*Password*: {empty} | The system displays the message "Complete account data" | Display message "Complete account data" | Accepted |

3. Test result Choose clothes

**Table 14. Test result Choose clothes**

| Cases and Test Results (Data True) | | | |
|---|---|---|---|
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| clothing items: | The system displays the message "Data successfully saved" | The message "Data has been saved successfully" | Accepted |
| **Cases and Test Results (Incorrect Data)** | | | |
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| clothing items; {empty} | The system displays the message "Clothing items have not been selected" | The message "Clothing item has not been selected" appears | Accepted |

4. Test result Remove Cabinet

**Table 15. Test result Remove Cabinet**

| Cases and Test Results (Data True) | | | |
|---|---|---|---|
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Cupboard ID: | The system displays the message "Data successfully deleted" | The message "Data successfully | Accepted |

| | | | |
|---|---|---|---|
| | | deleted " appears | |
| **Cases and Test Results (Incorrect Data)** | | | |
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Cupboard ID:{empty} | The system displays the message "Complete closet data" | The message "Complete closet data" appears | Accepted |

5. Test result Take photos Skin color

**Table 16. Test result Take photos Skin color**

| **Cases and Test Results (Data True)** | | | |
|---|---|---|---|
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Photo file: | The system displays the results of photo analysis | Display the results of photo analysis | Accepted |
| **Cases and Test Results (Incorrect Data)** | | | |
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Photo file:{empty} | The system displays the message "Complete photo data" | Display message "Complete photo data" | Accepted |

6. Test result Select Activities

**Table 17. Test result Select Activities**

| **Cases and Test Results (Data True)** | | | |
|---|---|---|---|
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Event type: | The system displays the message "Type of event has been selected" | The message "Type of event has been selected" appears | Accepted |
| **Cases and Test Results (Incorrect Data)** | | | |
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Event type:{empty} | System displays message "Complete event data" | Display message "Complete event data" | Accepted |

7. Test result Call the Online Store API

**Table 18. Test result Call the Online Store API**

| **Cases and Test Results (Data True)** | | | |
|---|---|---|---|
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Keywords: | The system displays online store goods data | Show online store goods data | Accepted |
| **Cases and Test Results (Incorrect Data)** | | | |
| **Input Data** | **Expected results** | **Observation** | **Conclusion** |
| Keywords:{empty} | The system displays the message "Keyword data cannot be empty" | A message appears "Keyword data cannot be empty" | Accepted |

# 3. CLOSING

## 3.1 Conclusion

The following is a Conclusion that can be taken on the final results of this study from the test result questionnaire with 30 respondents, then obtained Conclusion as follows.

1. Can provide clothing recommendations based on characteristics.
2. Can provide recommendations in choosing new clothes that match the clothes that you already have.
3. Can provide clothing recommendations from activities that will be carried out
4. Can provide clothing recommendations based on skin color.

## 3.2 Suggestion

the smart personal stylist application for recommendations for clothing settings that have been built has been able to solve the problems

faced. The suggestions for developing a smart personal stylist application for clothing suit recommendations are:

1. The algorithm used to provide recommendations needs to be developed again so that the recommendations are more accurate.
2. Add choices of activities so that the recommendations given are better.

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