

# **DEVELOPMENT OF FOOD RECOMMENDATION APPLICATION BASED ON CALORIE NEEDS USING AN ANDROID-BASED SMARTBAND**

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## **ABSTRACT**

The daily diet is very influential with one's health. The purpose of this study is to create a system that can facilitate the community in regulating daily eating patterns by providing food recommendations along with information on the nutritional content contained in food and can recommend restaurants and cooking tutorial videos to make it easier for people to consume recommended foods. This research uses descriptive research method — software development using SDLC waterfall model. The modeling analysis used in object-oriented modeling using UML (Unified Modeling Language) tools, while the technology used is GPS, Google Maps API, Google Directions API, Youtube Data API, Youtube Android Player API, Bluetooth, and Smartband. Based on the implementation and testing with the BlackBox method, the application used can run well. While based on the results of beta testing conducted by distributing questionnaires to 30 respondents, the results obtained are as much as 88.7 percent of answering applications that can solve the problems that have been identified.

**Keyword:** calorie calculation, food recommendations, Youtube Data API, smartband, Android.

## **1. INTRODUCTION**

### **1.1 Background**

Information and communication technology is currently experiencing very rapid development. One example of technological progress is the internet. The internet is a basic need of Indonesian people. This is evidenced by the results of the Indonesian Internet Service Providers Association report (APJII) in 2017, which stated 143 million out of 262 million people were connected to the internet.

An eating pattern is a food consumption habit that is carried out by someone in their daily eating activities and aims to meet the needs of food including attitudes, heredity, beliefs, and eating

habits [1]. Poor eating patterns are a trigger of obesity. Obesity is related to diet, especially when eating foods that are high in calories and low in fiber [2]. West Java Health Office in 2016 conducted an examination of 1,644,079 people and obtained data that identified obesity as many as 138,965 people (8.45%). According to data from the Ministry of Health of the Republic of Indonesia in 2018, it is known that people who are obese in adults more than 15 years experience an increase. It is known that in 2007, 2013, and 2018 there were 18.8%, 26.6% and 31% of people were obese.

Some phenomena currently experienced by the community are they do not know the number of calories in a food, the number of people who have difficulty finding food with the number of calories according to their needs and the many people who have difficulty controlling diet and controlling several calories consumed each day. Based on the results of a survey that was carried out to 63 respondents, many respondents had difficulty the night of the problem.

Several studies have been done before that relate to this research. Based on research by El-Amrawy et al. [3] found that wearable device technology can be used as a detector for heart rate, sleep patterns, fitness activities, and calories burned. Based on research by Ismani et al. [4] found that the main cause of a person suffering from diabetes is due to unhealthy eating patterns. Based on the research of Toepak et al. [5] it was found that the Youtube Data API can be used by users as YouTube video players directly. Based on Taryadi's research [6] it was found that Location-Based Services (LBS) technology can be used to assist tourists in finding a specific restaurant and culinary menu locations. Based on the research of Setiawan and Herdianto [7] it was found that Android is very suitable to use because it is an operating system with an open-source license so that it can be freely developed by everyone to support their daily activities and work. Based on Sihombing's research [8], it was found that the Google Maps API can be used to display locations, routes, and road directions that can help users to get appropriate direction information. Based on research by Fitri et al. [9] it was found

that the Harris-Benedict formula can be used as a formula to calculate people's daily calorie needs.

Based on the problems that have been described above, it can be concluded the need to build a food recommendation application based on calorie needs using an Android-based Smartband.

## 1.2 Android

Android is the most widely used mobile operating system used today. Android is a Linux-based mobile device operating system that includes an operating system, middleware, and applications [10].

## 1.3 Youtube Data API

Youtube Data API is a service from Youtube for application developers that allows users to be able to send and receive data from Youtube. By using the Youtube Data API, users can upload videos and can receive video data through applications developed [5].

## 1.4 Youtube Android Player API

Youtube Android Player API is a service from Youtube for application developers that allows users to play videos contained on Youtube directly through applications developed [5].

## 1.5 Zomato API

Zomato API is a service from Zomato for app developers that gives users the latest and most complete restaurant information for more than 1.5 million restaurants in more than 10,000 cities in the world. By using the Zomato API, users can search for restaurants by name, type of cuisine, or restaurant location. The Zomato API can also show detailed information, including value, location, and type of cooking, and use the Zomato Foodie Index to find areas with the best restaurants [11].

## 1.6 Purpose and objectives

The purpose of this thesis research is to build a restaurant recommendation application, and cooking tutorial based on calorie needs using Android-based Smartband technology. The objectives of this thesis research are:

1. Facilitate the public in knowing the calorie content in food.
2. Facilitate the community in searching for food with the number of calories that suits their needs.
3. Facilitate the public in controlling diet and controlling several calories consumed every day.

## 1.7 Software Development Method

The software development method used in this study is the waterfall method. The stages of the

process in the waterfall method can be seen in Figure 2.

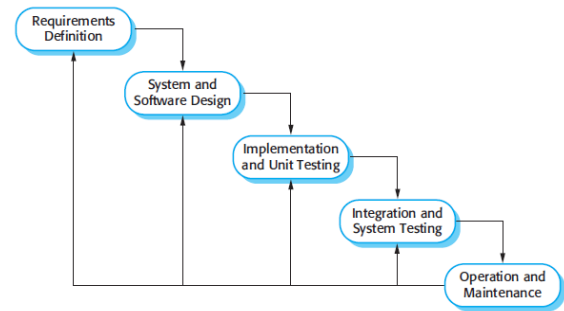


Image Source: Software Engineering (2011) [12]

Figure 1 Waterfall Model

## 2. RESEARCH CONTENTS

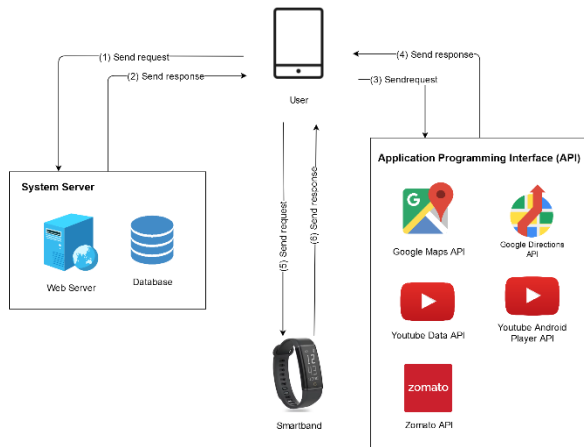
### 2.1 Problem analysis

People, especially those who are on a diet program or want to have an ideal body, have some problems in knowing what foods are suitable for their calorie needs, as well as not knowing where to go for restaurants and food making tutorials. Therefore, we need a system that can solve problems that are being experienced by people who want to have a healthy and ideal body. Problems encountered include:

1. Many people who do not know the calorie content in food.
2. A large number of people who have difficulty finding food with the number of calories that suits their needs.
3. The number of people who are challenging to control diet and control several calories consumed every day.

### 2.2 Systems Architecture Analysis

Analysis of system architecture is used to describe how a system sends data requests and how the system sends responses to the requested data to the user. The system architecture to be built can be seen in Figure 2.



**Figure 2 System Architecture**

### 2.3 Technology Analysis

Analysis of the technology used aims to find out what technology will be used to build the application by what is desired. The technology that will be used in applications that will be made later as follows:

#### 1. GPS

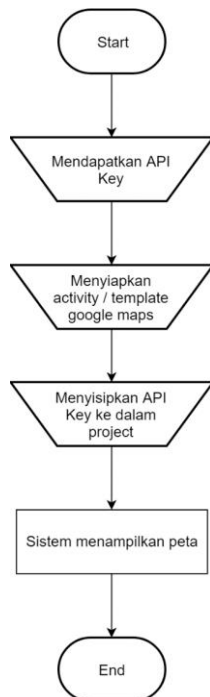
GPS is used to get the user's location which will later be used as the location of the route between the user and the restaurant.

#### 2. MySQL Database

MySQL Database is used as a storage medium that will later be stored on the server so that it can be used by the system anytime and anywhere.

#### 3. Google Maps API

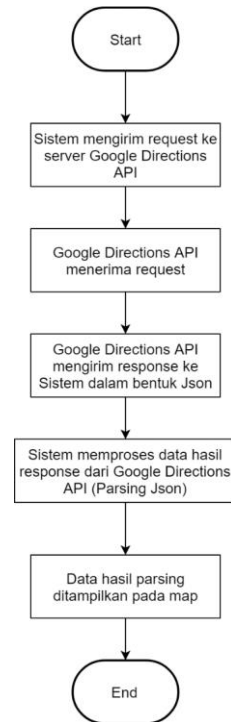
The Google Maps API is used as a means of displaying routes between users and restaurants in the form of a map. As for how to use the Google Maps API can be seen in Figure 3.



**Figure 3 Flowchart usage of Google Maps API**

#### 4. Google Directions API

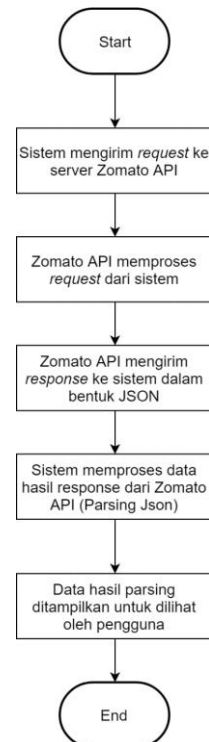
Google Directions API is used to get route data between user location and restaurant location. The way to use the Google Directions API can be seen in Figure 4.



**Figure 4 Flowchart usage of Google Directions API**

#### 5. Zomato API

The Zomato API is used to get restaurant data. The way to use the Zomato API can be seen in Figure 5.



**Figure 5 Flowchart use of the Zomato API**

### 6. Youtube Data API

The Youtube Data API is used to get cooking video tutorials. The method for using Youtube Data API can be seen in Figure 6.

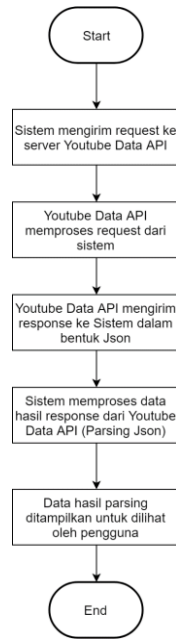


Figure 6 Flowchart usage of Youtube Data API

### 7. Youtube Android Player API

Youtube Android Player API is used to play cooking tutorial videos. Youtube Android Player API can be seen in Figure 7.

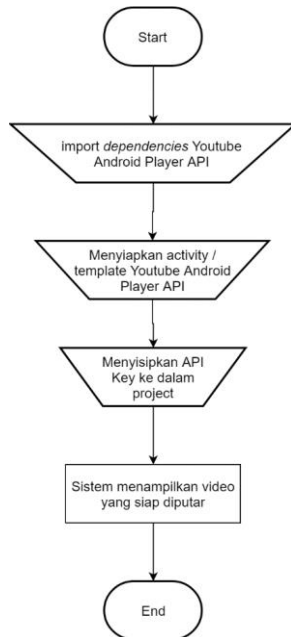


Figure 7 Flowchart usage of Youtube Android Player API

### 8. Bluetooth

Bluetooth is used as a means to be able to connect applications with a Smartband. The method for using Bluetooth can be seen in Figure 8.

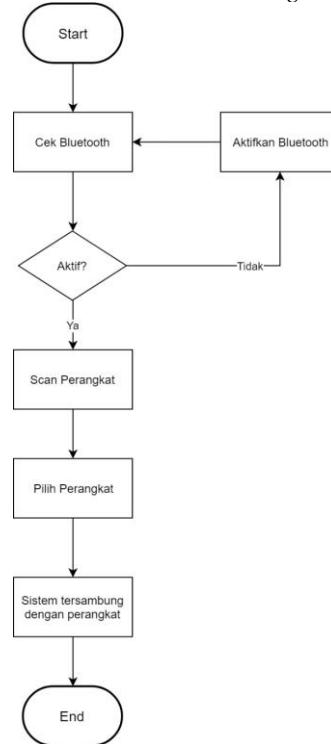


Figure 8 Bluetooth usage flowchart

### 9. Smartband

Smartband is used to get the user's footsteps data which is then processed into burned calorie data. The way to use a Smartband can be seen in Figure 9.



Figure 9 Smartband usage flowchart

## 2.4 Method Analysis

Method analysis aims to find out what methods will be used to build applications that suit your needs. The methods used in application development will be as follows:

### 1. Harris-Benedict

The Harris-Benedict method is used to calculate the user's daily calorie needs. Data needed to calculate energy requirements are data on age, weight, height, gender and user's physical activity level.

The process of calorie calculation uses the Harris-Benedict method, namely:

#### a. Count AMB

AMB (Basal Metabolism Rate) is the minimum energy requirement needed by the body.

AMB male formula :

$$66 + (13 \times BB) + (5 \times TB) - (6,8 \times U) \quad (1)$$

AMB female formula :

$$655 + (9,6 \times BB) + (1,8 \times TB) - (64,7 \times U) \quad (2)$$

Formula description :

BB : Weight

TB : Height

U : Age

#### b. Calculate the value of a physical activity

Physical activity values can be seen in table 1.

**Table 1 Value Of Physical Activity**

Aktiviti	Gender	
	Male	Female
Very light (<25% move)	1,30	1,30
Light (75% sit or stand, 25% move)	1,65	1,55
Is on (40% sit or stand, 60% work activities)	1,76	1,70
Weight (25% sit or stand, 75% work activities)	2,10	2,00

#### c. Calculate the energy needs

Energy requirement can be calculated using Formula 3.

$$\text{energy requirements} = \text{NAF} \times \text{AMB} \quad (3)$$

Formula description :

NAF : The Value Of Physical Activity

AMB : Body Metabolic Rate

#### d. Count IMT

To calculate the BMI (Body Mass Index) can be seen in Formula 4.

$$\text{IMT} = \text{BB} \left( \frac{\text{kg}}{\text{m}^2} \right) \quad (4)$$

The BMI values can be seen in Table 2.

**Table 2 IMT Value**

Body condition	Category	Threshold
Thin	Weight loss weight level	< 17,0
	Mild weight loss	17,0 – 18,5
Normal		18,5 – 25,0
Fat	Lightweight overweight	25,0 – 27,0
	Overweight weight level	>= 27,0

If the BMI value is included in the fat category, then the calorie needs are reduced by 500 Kcal, whereas if the BMI value falls into the thin type, the calorie needs are added by 500 Kcal.

## 2.5 Functional Requirements Analysis

The analytical method used to build the system that will be created later is the OOAD (Object Oriented Analysis And Design) method. In analyzing functional requirements using the OOAD method, UML diagrams are used. UML diagrams are used to describe technical requirements, namely using Usecase Diagrams, Activity Diagrams, Class Diagrams, and Sequence Diagrams.

### 2.5.1 Functional Requirements Specifications

Functional requirements specification is a system specification that aims to solve user problems. Technical requirements specifications can be seen in Table 3.

**Table 3 Functional Requirements Specifications**

Kode SKPL	Software Requirements Specifications
SKPL-F-001	Android system provides facilities for users to register.
SKPL-F-002	Android system provides facilities for users to login.
SKPL-F-003	Android system provides facilities for users to fill user profiles.
SKPL-F-004	
SKPL-F-005	Android system provides facilities for users to connect applications with a smart band to get the calorie data that users burn every day.
SKPL-F-006	Android system provides facilities for users to view the calorie data that users burn every day.
SKPL-	The android system provides facilities for

F-007	users to view food recommendations based on their calorie needs using and data from DKBM Indonesia.
SKPL-F-008	The android system provides facilities for users to search for food using data from DKBM Indonesia.
SKPL-F-009	The android system provides facilities for users to view dining recommendations using the Zomato API and Location-Based Service.
SKPL-F-010	The android system provides facilities for users to view details of places to eat using the Zomato website.
SKPL-F-011	Android system provides facilities for users to see the route between the user's location and the location of eating in a map using Location Based Service, Google Maps API, and Google Directions API.
SKPL-F-012	The Android system provides facilities for users to watch cooking tutorial videos using the Youtube Android Player API and Youtube Data API.
SKPL-F-013	The Android system provides facilities for users to watch cooking tutorial videos using the Youtube Android Player API and Youtube Data API.
SKPL-F-014	Android system provides facilities for users to save food in history.
SKPL-F-015	Android system provides facilities for users to view user profile data.
SKPL-F-016	Android system provides facilities for users to change user profile data.
SKPL-F-017	Android system provides facilities for users to view the history of calories consumed and calories needed every day.
SKPL-F-018	Android system provides facilities for users to view food history that has been stored
SKPL-F-019	Android system provides facilities for users to delete food history that has been stored for that day only.
SKPL-F-020	Android system provides facilities for users to log out.

diagram on the system to be made can be seen in Figure 10.

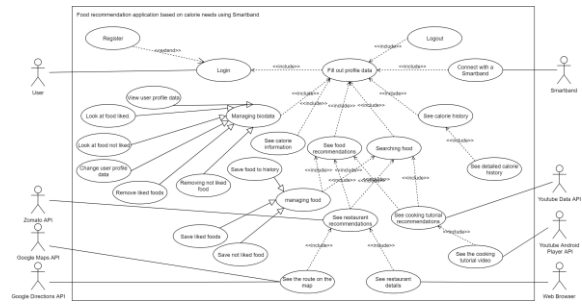


Figure 1 Use Case Diagram

## 2. Sequence Diagram

A Sequence diagram is a diagram that illustrates an interaction between one object with other objects contained in a system to be made. An example of a sequence diagram on the system to be built can be seen in Figure 11.

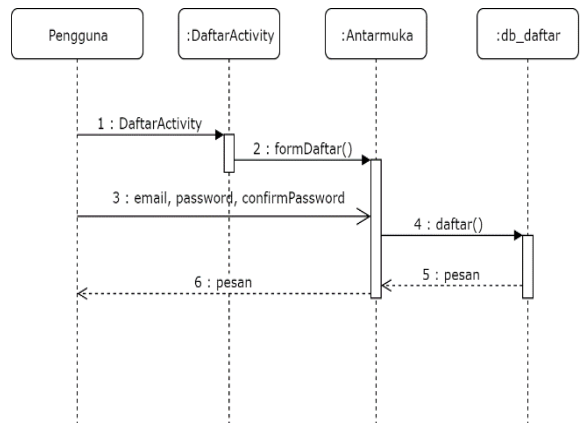


Figure 2 Sequence Diagram

## 2.7 Menu Structure Design

The menu structure design is used to facilitate users in using the system that will be made later. The menu structure of the system to be made can be seen in Figure 12.

## 2.6 Functional Requirements Analysis

The analytical method used to build the system that will be created later is the OOAD (Object Oriented Analysis And Design) method. In analyzing functional requirements using the OOAD method, UML diagrams are used. UML diagrams are used to describe technical requirements, namely using Use Case Diagrams, Activity Diagrams, Class Diagrams, and Sequence Diagrams.

### 1. Use Case Diagram

Use case diagrams are used to illustrate the interface between actors and activities on the system that will be made later. There is also a use case

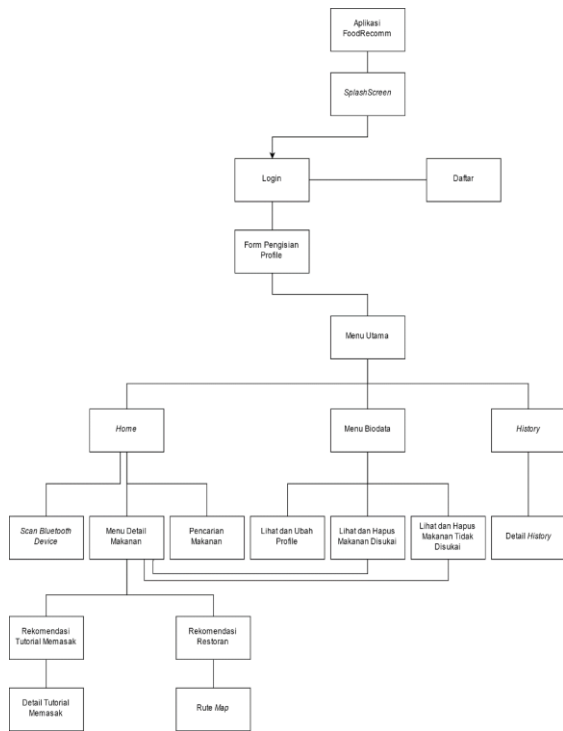


figure 3 Menu Structure Design

### 2.8 Interface Design

Interface design is used to facilitate the development of applications later. The example of interface design for the application to be built can be seen in Figure 13.

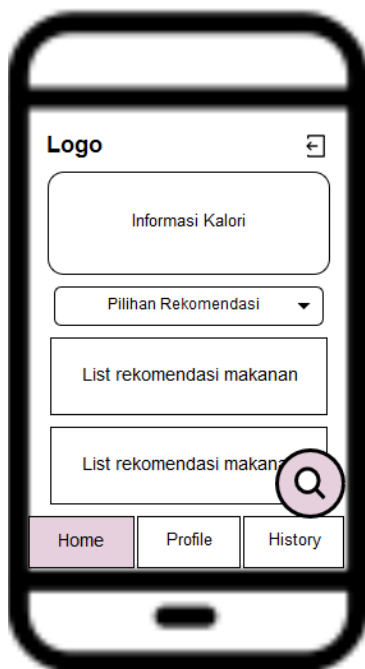


figure 4 Interface Design

## 3. CLOSING

### 3.1 Conclusion

Based on the results of the design made, then the design of the application recommendations for eating and cooking tutorials using an Android-based smart band is by what is expected for further testing.

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