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Agus Suryanto, Octavianti Paramita, and Feddy Setio Pribadi



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The Development of Android – Based Children’s Nutritional Status Monitoring System

Agus Suryanto¹, Octavianti Paramita², Feddy Setio Pribadi^{1,a)}

¹ Informatics and Computer Engineering Education
Electrical Engineering Department
Universitas Negeri Semarang
Semarang, Indonesia.

²Home Economics Department
Universitas Negeri Semarang
Semarang, Indonesia

^{a)}Corresponding author: feddy.setio@gmail.com

Abstract. The calculation of BMI (Body Mass Index) is one of the methods to calculate the nutritional status of a person. The BMI calculation has not yet widely understood and known by the public. In addition, people should know the importance of progress in the development of child nutrition each month. Therefore, an application to determine the nutritional status of children based on Android was developed in this study. This study restricted the calculation for children with the age of 0-60 months. The application can run on a smartphone or tablet PC with android operating system due to the rapid development of a smartphone or tablet PC with android operating system and many people own and use it. The aim of this study was to produce a android app to calculate of nutritional status of children. This study was Research and Development (R & D), with a design approach using experimental studies. The steps in this study included analyzing the formula of the Body Mass Index (BMI) and developing the initial application with the help of a computer that includes the design and manufacture of display using Eclipse software. This study resulted in android application that can be used to calculate the nutritional status of children with the age 0-60 months. The results of MES or the error calculation analysis using body mass index formula was 0. In addition, the results of MAPE percentage was 0%. It shows that there is no error in the calculation of the application based on the BMI formula. The smaller value of MSE and MAPE leads to higher level of accuracy.

INTRODUCTION

The characteristics of the developed nations are high levels of health, intelligence, and high labor productivity. Those characteristics are influenced by the nutritional state. Nutrition plays an important role in the human life cycle. In children, malnutrition causes growth disorder and it can continue into adulthood when it is not addressed. In order to know the nutritional deficiencies, assessment of nutritional status can be conducted as a measure of growth in children. According to the Centers for Disease Control (CDC), the nutritional status of children consists of good nutrition, mild malnutrition, moderate malnutrition, severe malnutrition, overweight, and obesity.

Malnutrition often escapes from sight or regular observation. However, it slowly contributes to the high maternal mortality rate, infant mortality, child mortality and low life expectancy (Simarmata, 2009). Based on data from the National Socioeconomic Survey (Susenas) 2005, the figure of malnutrition and malnutrition is 28% of the number of Indonesian children. Susenas data suggests that the prevalence of malnutrition decreased from 37.5% (1989) to 24.6% (2000).

Indicators used to measure the nutritional status of children is called anthropometry, while the parameter which is widely used is Weight by Age (W / A), Height by Age (H / A), and weight according to height (weight / height). This study was aimed at developing a system to determine the nutritional status of children with the advantage of technological developments, especially on a smartphone or tablet PC android operating system.

The calculation of the nutritional status of children in the world of health is still conventional by only checking the weight and the height of children in Children Health Center (Posyandu). It is not uncommon for

busy parents do not have time to bring their children to the Children Health Center. Therefore, an android – based application was created in this study to determine the nutritional status of children based on the formula weight (W) by height (H).

This application was only limited to the nutritional status of children aged 1-5 years using the standard of WHO-NCHS by weight to height ratio as a basic formula for making Android – based children nutritional status calculation application.

The creation Android – based children nutritional status calculation application used Smartphone or tablet PC was expected to help resolve issues related to health, especially the problem of child nutrition. The description above was the reason why this study was conducted to create Android – based Children Nutritional Status as an application that assists users to monitor children nutrition.

LITERATURE REVIEW

Nutrition is an organism process which uses food consumed normally through the digestive process, adsorption, transportation, storage, metabolism and secretion of substances that are not used to sustain life, growth and normal functioning of organs, as well as to generate energy. (Supariasa, et al, 2002).

Nutritional status is a condition caused by the status of the balance between the number of nutrients intake and the amount which required by the body for a variety of biological functions: (physical growth, development, activity, health care, and others). (Suyanto, 2009)

Nutritional status is a state of health of an individual’s body or group of people caused by the digestive process, absorption, and the utilization of food nutrients. The nutritional status of a person can be measured and assessed. Based on the assessment of nutritional status of a person or group of people, it can be seen that whether a person or group of people the nutritional status is classified as normal. Nutritional Status is a state of physical health of a person or group of people caused by the ingestion, absorption (absorption), and the use (utilization) nutrients food. The nutritional status of a person can be measured and assessed. Based on the assessment of nutritional status of a person or group of people, it can be seen whether a person or group of people the nutritional status is classified as normal or abnormal.

Android is the first platform that is both open and comprehensive aimed for mobile device. Android is a combination of these following three components, (Meier, 2010, p4)

1. The operating system is open source for mobile devices.
2. An open source platform for creating mobile applications.
3. The devices, especially mobile phones, which run the Android operating system and applications.

Android architecture can be described and illustrated in Figure 1 below:

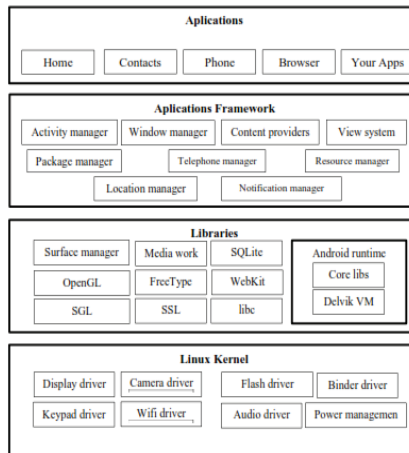


FIGURE 1. Chart android architecture

Frameworks which have been made on the issue of determining the nutritional status of the children. Those issues are many people in the society who do not know the information about how to calculate or determine the nutritional status of children and the rapid development of smartphone technology or tablet PC with android system that is widely owned by society. An android app was designed in this study to determine the nutritional status of children. This application displays only the nutritional status of children based on the calculation of the input data required in the application for instance Weight, Height, and age.

RESEARCH METHODS

This study was aimed at creating an Android – based application. Therefore, the appropriate research method was Research and Development. According to Sugiyono (2009: 297) Research and Development is a research method that is used to produce a particular product, and test the effectiveness of a particular product. Certain products can be produced by using needs analysis and testing the product is required to test the effectiveness of these products in order to function in society.

Research and Development (R & D) is widely used in the engineering field where almost all technology products such as electronic devices, hardware (hardware), vehicles, aircraft, weapons and tools household modern are developed through this research method. This research method is also used in engineering are also used in the field of natural science, administration, and social science. The products in this study was software that is application Children Nutritional Status calculation running on an android – based smartphone or tablet PC.

The study took place on January-April 2015 in the Central and Children Health Center in RW 05, RW 10 and RW 13 Kembangarum village, West Semarang Sub District.

The flow chart of the android application to determine the nutritional status of children can be seen in Figure 2.

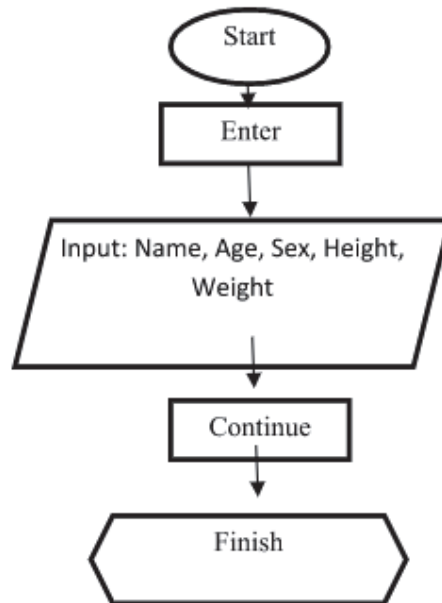


FIGURE 2. Flowchart Application Status Determinants of Child Nutrition.

Design validation was an activity to assess whether the application is valid or not, the validation was conducted by measuring the level of accuracy (the percentage of error count) from the calculation of the application. The test was conducted by comparing the calculation results of android application and sample data from calculation results by using the formula BMI in various Children Health Center based on the child's condition. This validation process was conducted using a tablet PC in order to facilitate testing.

The accuracy indicates proximity value with the actual calculation results. In determining the level of accuracy, the true value of the measured parameter was required. In addition to calculating using the MSE method, MAPE (Mean Absolute Percentage Error) was also used. MAPE is the method of obtaining the level of accuracy by finding absolute mistakes and dividing by the number of experiments that produced an average in percentage resulting in error calculation between the calculation results based on the android – based application with a calculated BMI formula.

RESULTS AND DISCUSSION

The android – based application to determinant of children nutritional status was designed specifically to run on a smartphone or tablet PC with android operating system which is open source software to make it easier to create the application. This application was made through a simulation to be similar as a calculator calculating body mass index so that people who use it only input the necessary input. The application was user – friendly

even for a novice user. First, click the Start button, the user could immediately fill in the data of children, and then press the count then the results were displayed along with the child's status in detail. Once completed, users were given the choice to count back, Calculation History, Progress Charts, and exit.

The calculation of this application was based on several components to be selected and entered. Those components included the name, age, weight and height, inputting date. Calculation began with the child's name, the age, weight, height, and the calculation date.

Filling in the components must be in sequence because the component determined the result of the calculation and the data in Tables and Graphs. Android application as the calculation of Children Nutritional Status can be categorized as a measure of body mass index Therefore, it is necessary to test the results obtained from its usage.

The initial display on the application of the children nutritional status calculation can be seen in Figure 3, there are two selection buttons are in and out



FIGURE 3. Initial Display Test of Application

Figure 4 is the display for Children Nutritional Status Calculation Program:



FIGURE 4. The Display Test of Filling in the Children Data

Figure 5 is the BMI Calculation Result Display of the Child Nutritional Status Calculation Program:



FIGURE 5. Display Test of BMI Calculation Results

Figure 6 is the BMI Calculation Result Display of the Child Nutritional Status Calculation Program that has been saved:

Nama	Tgl Ukur	BB	TB	Status Giz
11 nov		55	180	NORMAL
		25	55	BERLEBIH
azora	4 januari	11	85	NORMAL
azora	6 febuari	11	85	NORMAL
azora	7 maret	11	86	NORMAL
Azora	6 juni	12	89	NORMAL

FIGURE 6. Table Display Test

Figure 7 is the Graphic display of the BMI Calculation Result Display of the Child Nutritional Status Calculation Program that has been saved:

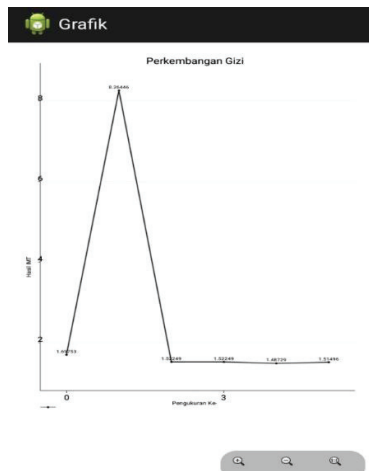


Figure 7. Graph Display Test

From the test results of children nutritional status calculation application, it can be concluded that the function of each component on the display of the calculation ran well. When the calculation results were compared with the provisions of the WHO, the percentage errors and miscalculation of the android app was very small. From these tests, it can be considered whether the application is ready to be used or not. The overall results of the testing each child for children nutritional status calculation application of different ages can be seen in Table 1 below

TABLE 1. Data Analysis of Children with Various Age

NO	USIA	MSE	MAPE
1	0 - 5	0	0 %
2	6 - 11	0	0 %
3	12 - 23	0	0 %
4	24 - 60	0	0 %

The data above illustrates that the error rate of the application results were calculated by comparing the calculation results between applications and body mass index formula. The score of the mistake expressed in MSE is 0. The average error in the form of a percentage was 0%.

From the results above, it can be seen that the mean error calculation was very small and it can be concluded that the calculation of BMI formula and computation applications did not show significant differences. Therefore, the test results became calculation that have been standardized by WHO (World Health Organization) and the application can be used as a tool to determine the nutritional status of children which can be used by doctors, nurses, and parents because the application is not complicated.

CONCLUSION

Based on the study, it can be concluded that:

1. Android App Creation was developed through several stages such as 1) analyzing the BMI formula based Weight and Height of children, planning and manufacturing which was conducted using computer and some software supports including process design display program, creating a prototype design which at last it was ready to be tested on a Tablet PC with android operating system. The results of the test showed that the application could function well.

2. The results of MES or the error calculation analysis using body mass index formula was 0. In addition, the result of MAPE percentage was 0%. It shows that there is no error in the calculation of the application based on the BMI formula. The smaller value of MSE and MAPE leads to higher level of accuracy.

3. The Android - Based Calculation of Children Nutritional Status Application Child was feasible and could be used by medical personnel or the public because its accuracy level was in accordance with WHO standards

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