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ANDROID-BASED CARRIAGE CALCULATION MOBILE APPLICATION DESIGN USING THE ANDROID STUDIO IDE (INTEGRATED DEVELOPMENT ENVIRONMENT)

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ABSTRACT

The growth of vehicles in Indonesia can lead to an increased risk of traffic accidents due to road user traffic violations, one of which is the Over Dimension Overloading (ODOL) vehicle violation. The unavailability of an application to calculate the specific payload capacity for Motor Vehicle Examiners to automatically test the calculation of the load capacity of a motorized vehicle, trailer and attached carriage is an important problem. This application is designed using the Android Studio IDE and Java programming with PHP as an intermediary xml and MySQL database. The analytical method used to formulate an application program design and system design is carried out to facilitate users. From the results of testing this application is said to be accurate and fast in carrying out the process of calculating the carrying capacity. The advantages of this application can provide consideration of whether or not a vehicle is able to withstand the strength of the carrying capacity in accordance with the carrying capacity of the vehicle and provide the results of adjusting the carrying capacity according to standards so as to reduce violations of Over Dimension Overloading (ODOL) vehicles on the highway.

Keywords**:** application; ide; transport capacity

INTRODUCTION

Transportation is a means of a service as an activity of moving goods and passengers from one place to another. Transportation is an important point of growth and development of a country, especially in all social and economic activities of society. The development of the number of motorized vehicles broken down by type in 2019-2021, the highest total increase occurred in 2020 of 143,797,227. The higher the number of vehicle growth in Indonesia can lead to an increased risk of traffic accidents that will occur. Traffic accidents can be caused by road user traffic violations, one of which is the Over Dimension Overloading (ODOL) vehicle violation.

Responding to the large number of ODOL accidents in Indonesia, vehicles that are required to be tested must ensure that they have passed the road-worthiness and technical requirements of Motor Vehicle Testing. The process of weighing motor vehicles through the Motor Vehicle Weighing Unit is carried out by calculating the overall weight of motorized vehicles on a runway. Motorized Vehicles are said to be in an overloaded condition or not, namely by measuring each axle according to the Heaviest Axle Load (MST) reference given by the Ministry of Transportation through a circular letter by the Director General of Land Transportation Number SE.02/AJ.208/DRJD/2008. So, it is necessary to calculate the distribution of loads on motor vehicles carrying goods based on the axle configuration. Checking the carrying capacity is carried out to determine the carrying capacity of a vehicle so as not to carry excess loads that exceed the carrying capacity of the vehicle. The unavailability of an application that can be used to calculate the carrying capacity automatically is an important problem. these constraints can come from officers from the Department of Transportation, in this case, motor vehicle testers who have difficulty doing calculations. Based on the problems above, the authors designed a more effective and efficient Haulage Calculation

Mobile Application using the help of the "Android Studio" application for use by Motorized Vehicle Testers. This application also makes it possible for the public to view news and information and share the latest information with users. This application will be designed using Android Studio and Java programming with PHP as an intermediary xml and MySQL database. The analytical method used to formulate an application program design, system design to make it easier for users, making system designs using source code and testing systems that have been used before. The end of the results of the implementation process in the form of Java and PHP programming and the results of trials by prospective users. With this application it is hoped that it can assist testers in producing accurate calculation results so as to reduce violations of vehicle carrying capacity.

LITERATURE REVIEW

Overloading

Overloading is a condition in which the vehicle is loaded with a weight that exceeds the standard permitted by the manufacturer. Total permitted weight (JBI) is the maximum weight of a motorized vehicle and its permissible load according to the class of road being passed. The weight of the JBI will increase if the total axle of the motorized vehicle increases. Or it can be formulated as follows:

JBI = BK + G + L (1)

Where,

BK = Vehicle Empty Weight (kg)
G = Person's Weight (allowed) (kg)
L = Payload Weight (allowed) (kg)

The government determines JBI by taking into account the carrying capacity of the lowest class of road passed, the strength of the tires, the strength of the axle design as an effort to minimize damage to roads and motorized vehicles. Meanwhile the Vehicle Manufacturer sets the Total Gross Weight (JBB) standard for axle strength, so that in supporting safety the JBI may not exceed the JBB.

Heaviest Axle Load

The axle load is the magnitude of the driving wheel pressure from one vehicle axis to the road. Therefore, the heaviest axle load (MST) is used as a reason to control and regulate vehicle loads in and around as stipulated in legal guidelines. The heaviest axle load is determined by considering the lowest class of road passed, the strength of the tires, the strength of the axles and the Gross Vehicle Weight (GVW) or the appropriate amount determined by the vehicle manufacturer. The principle of force moment balance is a principle in the calculation of the heaviest axle load on a vehicle with the 1.1 configuration. The heaviest axle loads for each road class are shown in Table 1 below:

Table 1. Classes of Roads based on function and use

Road Class	Road Function	Motor Vehicle Size	Heaviest Axle Load
Kelas I	Arterial Road Collector Street	Width ≤ 2500 mm Length ≤ 18,000 mm Height ≤ 4200 mm	10 Ton
Kelas II	Arterial Road Collector Street Local Road Neighborhood Road	Width ≤ 2500 mm Length ≤ 12000 mm	

Height ≤ 4200 mm 8 Ton
Kelas III Arterial Road
Collector Street
Local Road
Neighborhood Road Width ≤ 2500 mm
Length ≤ 9000 mm
Height ≤ 3500 mm 8 Ton
Kelas Khusus Arterial Road Width ≤ 2500 mm
Length ≤ 18,000 mm
Height ≤ 4200 mm > 10 Ton
(Sumber: Undang Undang Republik Indonesia No. 22 Tahun 2009 tentang LLAJ)

Hauling Capacity Calculation Flow
Aspects of the calculation of the carrying capacity are the supporting variables for the testing/calculation of the carrying capacity in accordance with the results of identifying the type of vehicle and measuring the dimensions of the vehicle. The variables that are taken into account are Total Permitted Weight, Total Allowed Combined Weight (JBKI), Total Allowed Weight (JBB), empty weight, dimensions of the motorized vehicle, attached carriages and trailers.

Figure 1. Description of the Variable Force for calculating the carrying capacity
The elaboration of the variable carrying capacity calculation, as shown in the picture above, namely:
1. S1: Weight on axis 1, R1: Resultant force on axis 1
2. S2: Weight on axis 2, R1: Resultant force on axis 2
3. P: Distance between the front axle to the center of gravity of the driver's seat space
4. a: Wheelbase, front axle distance to rear axle (single axle vehicle)
5. q: the distance between the first axis and the center of gravity of the load
Heaviest Axle Load: maximum pressure weight on the vehicle's axle on the road.
After obtaining the measurement results on the carrying capacity calculation variable, the next step is to carry out the calculation process, as for some of the calculation processes, namely:
1. Determine the Weight of the Vehicle by adding up the total weight of each axle
2. Determine the weight of cargo or goods through the variables JBB, BK, and the weight of the person.
3. Determine the carrying capacity by adding up the weight of the cargo or goods and people.
4. Determine the heaviest axle load by identifying the heaviest weight on each axle
5. Determine the tire strength based on the total weight of each axle
The results of the calculation will provide a decision whether the heaviest axle load exceeds the tire strength capacity of the motorized vehicle, attached and trailer or the class of road traversed so that the pressure strength of the vehicle's carrying capacity can be known and adjusted if the calculation results show that the results are not capable.

Android Studio Idea (Integrated Development Environment)
Android Studio is an Integrated Development Environment (IDE) which is an integrated programming software for Android-based application development which was first introduced by Google in 2013. Android studio was developed from the Eclipse IDE using the IDE Java IntelliJ IDEA with novelty on the features and usability side. as with Eclipse using Ant, Android Studio uses Gradle as a Java-based build tool with the following advantages: More flexible and interactive use, Multi-build APK, Access to Google Services, more efficient user interface,

Build in support of Google Cloud Platform , Library directly from Maven Repository, Flexible Layout.

The structure of Android Studio is formed from several elements including Manifest which contains components of the application (activities, services, user permissions and content providers), Java App which is a program command instruction in the form of Java syntax, Res as a graphical directory and application layout, Gradle is a build tool. which is used to detect the version of the operating system, software development kit (SDK) and libraries for developing, customizing and running Android Studio applications.

METHODS

The type of research to be carried out is Research and Development (R&D). Research and Development is defined as a process or stages in the development of a new product or product improvement both in the form of hardware and software. As with other types of R&D research in general, this research will produce outputs in the form of products in the form of software on the Android platform that can be used by motor vehicle testers to assist in the process of measuring/testing carrying capacity.

System planning

System design is carried out using the Unified Modeling Language (UML) to describe the flow and principles of the system as a whole. UML can describe the form of user interaction activity in the Use Case Diagram that is needed to describe the entire system. Unified Modeling Language (UML) is applied to describe activities and interactions that can be carried out by users (users) and is described in the form of Use Case Diagrams as shown in Figure 4.

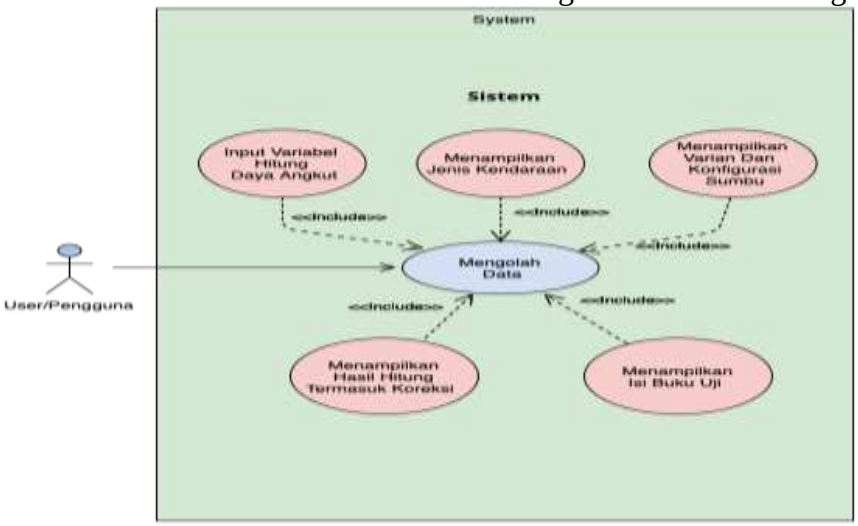


Figure 4. Use Case System Diagram

Through Figure 4 it can be obtained that the operations that can be carried out by the user are the input variable, calculate the carrying capacity and view the calculated data. The Use Case view is divided into 4 (four) operations, namely displaying the type of vehicle, displaying variants and vehicle axle configurations, displaying calculation results including corrections and displaying the contents of the test book. The activity diagram is used to show the process flow in the program as shown in Figure 5. The activity diagram or program process flow is active when the application is open and the main menu page that displays the type of vehicle will open and the user is asked to select the type of vehicle to be tested based on the type of configuration The selected. After the identification of the type of vehicle is complete, the

program will display a variable page for calculating the carrying capacity and the user is asked to fill in the data according to the measurement results of the vehicle dimensions in the field.

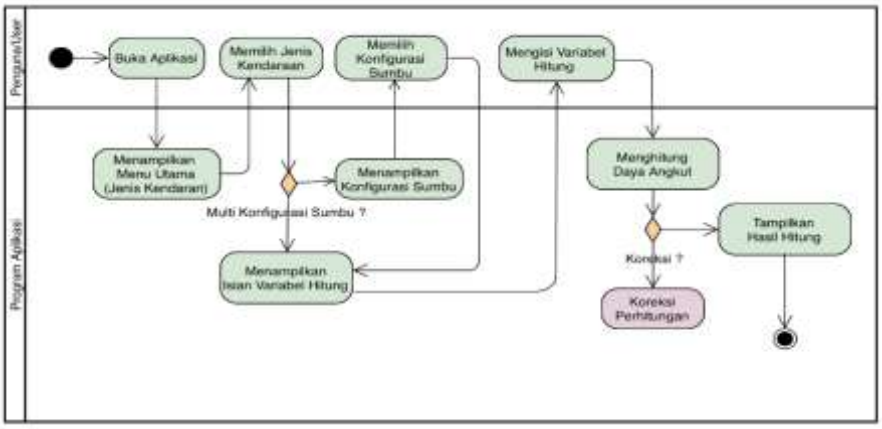


Figure 5. System Activity Diagram

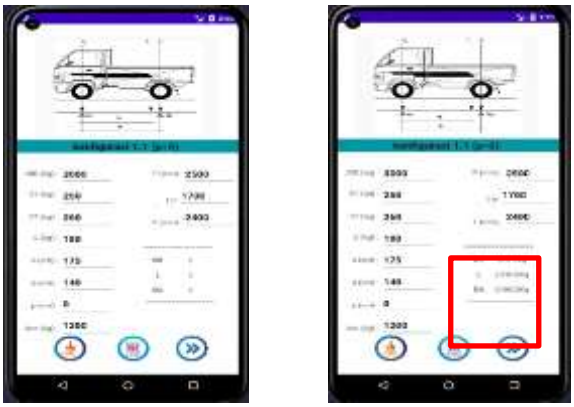
After the numeric data has been successfully inputted, the user can instruct the program to carry out the calculation process, so that the calculation results and calculation corrections are displayed.

RESULTS

Realization of Making a Mobile Application for Calculation of Carrying Capacity (SiHidaya)

(a) (b) (c)

Figure 5: a. Splash Screen page
b. Main Menu Page
c. Axis Configuration Menu



(a) (b)

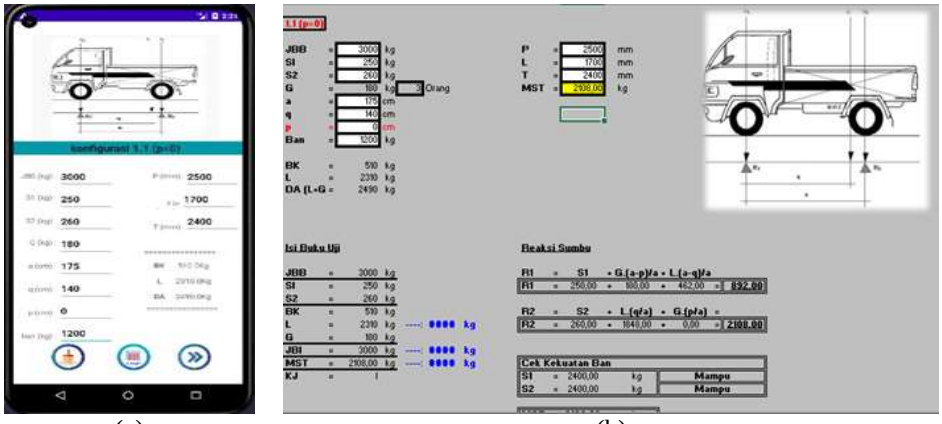
Figure 6. : a. Haulage Calculation Page
b. Loading Capacity Variable Calculation Result Page

(a) (b) (c)

Figure 7: a. Axle Reaction Calculations and Tire Capability Pages
b. Loading Correction Result Page
c. Pouring Results in the Test Book

SiHidaya Application Testing

To find out the feasibility results of the application, a comparison of the results of the SiHidaya application trial was carried out with calculations in excel to determine the accuracy of the SiHidaya application calculation results.



(a) (b)

Figure 8: a. SiHidaya Application Loading Capacity Cal
b. Loading Correction Result Page

Table 2.
SiHidaya Application Testing Results

Function	Condition	Expected output	Generated output	Tester Status
Loading Capacity Variable Data Input	Fields are filled in correctly	Successfully Count data	Successfully Count data	Valid
	Column filled with some or	Unsuccessfully Calculate the data	Unsuccessfully Calculate the data	
The calculation results	empty	Appears the results of the calculation of the carrying capacity data	Appears the results of the calculation of the carrying capacity data	Valid
	Fields are filled in correctly	Showing no results	Showing no results	
Correction of Transport Data		The results of the adjustment of the payload adjustment appear	The results of the adjustment of the payload adjustment appear	Valid
	Column filled with some or	No adjustment results appear	No adjustment results appear	
Reset Data	empty	Empty data on all forms	Clear data	Valid
	Fields are filled in correctly	The form remains blank	on all forms	

Table 2 is a table of the results of testing the SiHidaya application on an android mobile. Based on the test results, it can be concluded that the status of each function tested is valid so that the application function runs well according to the expectations of the researcher.

In the Beta testing method, this application will be tried to be tested with several opinion questions to application users or sample users to find out the benefits of the Haulage Calculation application in the field (Masripah et.al. 2020). The user sample consists of 10 people, namely 2 the general public, 3 Motorized Vehicle Testing Officer, 3 Logistics Company Employees, and 2 Weighbridge Officers.

Table 3.
Results of Respondents' Answers to the SiHidayah Application

No	Question	Strongly Disagree	Not enough Agree	Netral	Agree	Very Agree
1	The application for calculating the carrying capacity with the Android-based Unified Modeling Language (UML) is needed in the process of testing and calculating the carrying capacity in the field.	-	-	-	2	8
2	This application for calculating the carrying capacity with the Android-based Unified Modeling Language (UML) is easy to use	-	-	-	3	7
3	The application for calculating the carrying capacity with the Android-based Unified Modeling Language (UML) is useful and makes it easy to calculate the carrying capacity	-	-	-	3	7
4	The application for calculating the carrying capacity with the Android-based Unified Modeling Language (UML) is effective and efficient in helping officials and the public to become more familiar with the importance of carrying capacity testing	-	-	-	4	6
5	This application for calculating the carrying capacity with the Android-based Unified Modeling Language (UML) is accurate in producing the results of calculating and correcting the carrying capacity	-	-	-	3	7

DISCUSSION

This research resulted in an Android-based power calculation application called SiHidaya. Application development is carried out using the Android Studio IDE (Integrated Development Environment) and Java with PHP as the xml intermediary and MySQL database. The application is specifically intended for Motor Vehicle Examiners who will test the calculation of the carrying capacity of a motorized vehicle, trailer and attached carriage. This application has designed a user interface that is easy to use for the general public. In this application, the user only needs to enter the numbers from the measurement of the dimensions of the vehicle and some data obtained from the vehicle administration.

Figure 5a. below shows the application splash screen page or the first page when opening the application as a loading progress marker, then the main menu display will appear as shown in figure 5b in the form of a main menu screen displaying several types of vehicles. in the form of a type of vehicle, the user is asked to select one of the menu list buttons on the main menu, so that on the next page, more specifically the user can choose the type of vehicle to be tested according to conditions in the field. Then it will show a sub menu page of the type of vehicle that is based on the vehicle axle configuration, the user is asked to choose according to the axle configuration of the vehicle to be tested as can be seen in Figure 5c.

Figure 6.a shows the payload calculation page according to the vehicle identification that has been selected in the previous vehicle type menu option. On the calculation page the user is asked to enter numbers in the payload calculation variable. On this page there are the first 3 calculations, namely the calculation of empty weight (BK), weight of cargo or goods (L), and carrying capacity (DA) by pressing the "calculator" icon and the results will appear as shown in Figure 6.b The user can continue calculation by pressing the icon "next".

Figure 7.a is a display of the next calculation, namely the calculation of the axle reaction and the ability of the tire, the main results of this application are on this page, where the application can provide a decision whether the heaviest axle load exceeds the strength capability of the tires of motorized vehicles, trailers and trailers or class the road traveled. By giving two types of decisions, namely "able" or "unable". If "able" then the calculation is considered complete, but if the decision results in "unable" then the application will provide recommendations for adjusting the calculation variables which cause exceeding the carrying capacity. Furthermore, the user can pour the calculation results on the display of the test book as shown in Figure 7c. and the results of the calculation process can be downloaded in the form of a soft file report in pdf format.

Based on the comparison results with the calculation process using the same type of vehicle and numerical data, the results are the same between the two. It was concluded that the SiHidaya application is accurate in the process of calculating vehicle carrying capacity. Furthermore, the functions in the SiHidaya application are tested to find program system failures. Testing establishes two testing techniques Alpha and Beta methods. Alpha testing is a type of application testing to ensure program execution goes according to the output expected by the application maker with the help of the blackbox method, namely testing the application without regard to the program execution flow (Wantoro et.al).

After all the answers have been collected, the next step is to calculate the percentage of respondents who have filled out the list of questions. Calculations are carried out using a Likert scale which is used to measure user opinions and perceptions of the SiHidaya Pranatawija et.al. application. Data analysis yielded a percentage of 94%, stating that the Android-based Si Hidayah application is accurate to help speed up the calculation process and is easy for the public and Motor Vehicle Examiners to use.

CONCLUSION

Based on the research results, it can be concluded that the Android-based hauling capacity calculation application uses the Android IDE (Integrated Development Environment). This application is specifically designed for Motor Vehicle Examiners who will test the calculation of the carrying capacity of motorized vehicles, trailers and attached carriages. This application is designed with a user interface that is easy to use for the general public. From the results of testing this application is said to be accurate and fast in carrying out the process of calculating the carrying capacity, so that it can be used directly by the government or the general public who need the results of calculating the carrying capacity of motorized vehicles, trailers and attached trains. The advantages of this application can provide consideration of whether or not a vehicle is able to withstand the strength of the carrying capacity in accordance with the carrying capacity of the vehicle and provide the results of adjusting the carrying capacity according to standards so as to reduce violations of Over Dimension Overloading (ODOL) vehicles on the highway.

REFERENCES

Iskandar, H. (2008). Klasifikasi jalan sesuai regulasi. *Kolokium Puslitbang Jalan dan Jembatan TA.*

Kementerian Perhubungan, "Surat Edaran Dirjen Perhubungan Darat No. SE.02/AJ.108/DRJD/2008 tentang Panduan Batasan Maksimum Perhitungan JBI, JBKI untuk Mobil Barang, Kendaraan Khusus, Kendaraan Penarik Berikut Kereta Tempelan/Kereta Gandengan," Dirjen Perhubungan Darat, Jakarta, 2004.

Kementerian Perhubungan, "Undang-Undang No 22 Tahun 2009 Tentang Lalu Lintas dan Angkutan Jalan,Direktur Jenderal Perhubungan Darat, Jakarta, 2009.

Masripah, S., & Ramayanti, L. (2020). Penerapan Pengujian *Alpha* Dan *Beta* Pada Aplikasi Penerimaan Siswa Baru. *Jurnal Swabumi*, *8*(1), 100-105.

Pangaribuan, J., Sastrodiyoto, A., Purnama, S., Boer, N. A., & Anggada, S. (2016). Pengaruh Dimensi, Muatan Terhadap Jumlah Berat Yang Diijinkan Mobil Bak Muatan Terbuka. *Jurnal Penelitian Sekolah Tinggi Transportasi Darat*, *7*(2), 230–244.

Pranatawijaya, V. H., Widiatry, W., Priskila, R., & Putra, P. B. A. A. (2019). Penerapan skala Likert dan skala dikotomi pada kuesioner online. *Jurnal Sains Dan Informatika*, *5*(2), 128-137.

Presiden RI, D. R. (2012). *Peraturan Pemerintah Nomor 55 Tentang Kendaraan*.

Wantoro, A., & Nurmansyah, A. (2020). Penerapan Augmented Reality (AR) Dengan Kombinasi Teknik Marker Untuk Visualisasi Model Rumah Pada Perum Pramuka Garden Residence. *Jurnal Teknoinfo*, *14*(2), 95-98.