DEVELOPMENT OF 3D BIKE SIMULATION ASSEMBLING USING FREBEWORK WEBGL AND LIBRARY THREE.JS WEB-BASED

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ABSTRACT

BikeSystem was founded in the end of the year 2011 by some young people are creative in Bandung with the vision:*make the system Networking the cyclists in Bandung*. Equipped with facilities such as a lounge and gathering TV area, coffee shop, garage, bike parking, as well as of course the store with exclusive merchandise, Bikesystem has a mission:*Manifesting Dreams into a bike shop Concept, complete and convenient* . Designed not only to function as a store and bike repair shop but also a gathering place for the community, share the latest information, as well as the location of the meeting point cyclists. Store BikeSystem is a conventional store that just post a public bicycle components. his has proved difficult for prospective buyers to know the detailed model description or bicycle components that will dicustom or designed. Based on the exposure to the problem above, then the solutions offered are membangun a multimedia interactive 3D simulations that support the process of product sales bike with bicycle Assembly simulation of *custom* in-store *BikeSystem*, where sithe stem can help prospective buyers or users of the site to do a simulation of Assembly nor the bicycle customization on the page internet site so that site users or prospective buyers can see the description in detail of the model and the components of the bike for the visual design of the results of the selected components to build a bicycle according to the tastes of the potential buyers or users of its internet site. Based on the testing then obtained that the user is on a very positive attitude towards the goal of the research is to make it easier for prospective buyers to customize your bike and bikes specifications provide information that is assembled.
Key words: Simulation, 3D, bike, Unity, Assembly

1. INTRODUCTION

1.1. Background

Store BikeSystem is a store that sells bicycles in conjunction with components or accessories-Accessories. The shop is located at JL. IR. h. Djuanda No. 342, An Dago, Bandung is selling some brands such as Giant, United, Shimano, RockShock, and other brands. Store BikeSystem is a line of business that caters to bike sales Fullbike and Bikesystem have the bicycle manufacturing services that provide components – components of bicycle Assembly. Bicycle Assembly has several components that need to be assembled to make the bike can be used [1]. Bikes basically consist of a Frameset bicycle, bicycle Wheelset , drivetrain bike bicycle seat, or also called the saddle, then bicycle called the cockpit also handlebar [1]. Bikes are generally sold in stores are already assembled into one with components – components that have been provided by the manufacturer of the brand of bike, but there are also stores selling bicycle separately or is composed of several components so that the prospective the buyer can assemble a bike with the components desired by prospective buyers and the ability [1].

As for the process of assembling a bike at bikesystem by the way potential buyers came to the store to choose the products you wish tocustom. If there are prospective buyers who want to buy a bike for fullbike so prospective buyers will choose a bicycle fullbike products from the manufacturer to the specifications that have been determined from the plant, pay, and instantly disposable. Bicycle product aside from the process fullbike is the prospective buyer buy with model components and options that are provided by BikeSystem. Prospective buyers who want tocustom bike can choose how to determine the components in accordance with his wishes. Factors that must be considered in assembling bicycles are prospective buyers should understand in matches from each component. Prospective buyers who want to do the Assembly of bicycles are advised to directly go to the store and asked directly to the store owner invite cyclists or more senior. This becomes an obstacle because information description model of the components and the components along with the price of components custom bikes in store BikeSystem described is less obvious and less specific. This has proved difficult for prospective buyers to know the detailed model description or

bicycle components which complicate the prospective buyers or confusion lay in designing custom bike.

Based on the exposure to the problem above, then the solutions offered are mambangun a multimedia interactive 3D simulations that support the process of product sales bike with bicycle Assembly simulation of custom in-store BikeSystem, where the system can help prospective buyers or users of the site to do a simulation of Assembly nor the bicycle customization on the page internet site so that users of the site or the prospective buyer can see visual overview of the results of the design of the selected components to build a bicycle according to the tastes of the potential buyers or users of its internet site. 3D multimedia simulation built using technology where this technology using WebGL Javascript API and three.js Libraries that offer accelerated 3D graphics into halama internet sites without installing software an additional, and expected by the existence of multimedia simulation in the form of a 3D prospective buyers can do the bicycle Assembly through the pages of internet sites.

1.2. Goal and Purpose

1.2.1 The Intent of the

The purpose of this research is for build a Simulation of Assembly the bike using the 3D webgl library and framework three.js web based.

1.2.2 The Purpose of

The purpose of this research is Mambangun a 3D multimedia simulation that can perform custom bike and gives a clear infromasi concerning the description of each component and the price of each component of that bike. That will support the process of product sales and custom bikes in store BikeSystem on the page internet site so that users of the site or the prospective buyer can see the visual depiction of the results custom bikes are selected without having to go to the store.

2. THE CONTENT OF RESEARCH

2.1.1 The Cornerstone Of The Theory bikesystem

BikeSystem was founded in the end of the year 2011 by some young people are creative in Bandung with the vision: make the system Networking the cyclists in Bandung. Equipped with facilities such as a lounge and gathering TV area, coffee shop, garage, bike parking, as well as of course the store with exclusive merchandise, Bikesystem has a mission: Manifesting Dreams into a bike shop Concept, complete and convenient . Designed not only to function as a store and bike repair shop but also a gathering place for the community, share the latest information, as well as the location of the meeting point cyclists.

2.1.2 technology website

World Wide Web (WWW) is a provider of information systems with large scales that manage information is distributed in the internet using hypermedia technologies. The WWW has the following characteristics:

a. Support interfaces that integrate WWW provides an integrated interface against the protocols, data formats, addressing systems, and others. This led to a wide range of services and data bases on the internet can be accessed directly.

b. The ease of the user WWW transparently supports most applications-applications that reside on the internet such as telnet,gopher, anonymous file transfer protocol , finger, and other applications.

c. Ease in the development of the Capabilities of server WWW can be developed easily using the standard PHP server between WWW with alplikasi else. The program also allows information changes dynamically which can be retrieved in real time.

d. Does not depend on particular flatform WWW allows one can build server WWW in a variety of different systems and provide information in the form of hypermedi. WWW tdak designed to support specific system.

2.1.3 Multimedia

According to Vaughan (2004, p1) multimedia is some combination of text, images, sounds, animations and videos sent to you through your computer or other electronic device or by digital manipulation. But in general the multimedia can be defined as the use of computers to process several media for a media or an interactive system that allows its users to interact with the system and obtain the quality more than the acceptance of information [2].

2.1.4 WebGL

An abbreviation for WebGL (Web-based Graphics Library) is a Platform Application Programming Interfaces (APIs) library of 3D graphics that allow internet browsers to create a 3D scene with a simple and efficient way [1] . Webgl was first introduced by Vladimir Vukicevic a software engineer in 2007, and in 2009 the Foundation of web standards WebGL started developed by Khronos Group along with Opera, and began followed by Google (Chrome), Mozilla (Firefox), Apple (Safari), and other developers of 3D[3]. Webgl has an approach to client-based

rendering where the elements that make part of the 3D scene (scene) is usually downloaded from the server, but all of the process required to get pictures done in local using graphics hardware client. Webgl is a new standard for 3D graphics on the Web [3]..

2.1.5 JavaScript Object Notation (JSON)

JSON (JavaScript Object Notation) is a lightweight data interchange format, easy to read and written by humans, as well as easily translated and made (generate) by computer. This format is based on the JavaScript Programming language, Standard ECMA-262 3rd Edition-December 1999. JSON is a text format that is not dependent on any programming Language because it uses the style language that is commonly used by programmers family C include C, C++, C #, Java, JavaScript, Perl, Python etc. Because of these properties, making it ideal as a language pertukarandata JSON [4].

2.1.6 BPMN

BPMN stands for Business Process Modeling Notation, a new methodology was developed by Business Process Modeling Initiative as a new standard on business process modeling, and also as a system design tool complex systems such as e-Business-based message (message-based). The main objective of BPMN is a notation that provides easy to use and understandable by everyone involved in the business, including business analysts to model a business process, the developer of the technique that builds systems that implement business, and many levels of management should be able to read and understand the process diagrams quickly so that it can help in decision making. The new BPMN notation are also designed for the nature of web services-based system..

2.1.7 UML

The Unified Modelling Language (UML) is a notation family graphics are powered by a single model, the meta help describing the system design and software, especially those built using object-oriented programs. Graphical modeling languages already exists in the software industry for a long time, the main trigger behind it all is that programming languages are at a level of abstraction that is not too high to facilitate discussion about design. UML was born from the merger of many object oriented graphic modeling language that is thriving in the late 1980 's and early 1990 's. Ever since its existence in 1997. (Fowler, 2007)

2.1.8 Blender

Blender is a free application and open source 3D creation suite. Overall support of 3D pipe-modeling, rigging, animation, simulation, rendering, compositing and motion tracking, video editing and even make the game.

2.1.9 Unity

Unity is a tool which is integrated to create games, architecture and building simulation. Unity games can for PC and Online games. For Online games needed a plugin, namely the Unity Web Player, as with Flash Player in the Browser.Unity is not designed to process design or modelling, because unity is not a tool for designing. If you want to design, use another editor such as 3dsmax 3D or Blender. Many things can be done with unity, there is audio features reverb zone, particle effects, and Sky Box to add the sky. Features of the scripting provided, supports 3 languages programming, JavaScript, C #, and Boo. Flexible and EasyMoving, rotating, and scaling objects only need to inline code. So too with Duplicating, removing, and changing properties. Visual Properties in the define Variables with scripts shown in the Editor. Can be shifted, in drag and drop, get to choose a color with the color picker. .NET-Based. This means that the penjalanan program was done with Open Source .NET platform, Mono.

2.1.10 Photoshop

Adobe Photoshop, or commonly called Photoshop, is an artificial image editor software Adobe Systems devoted to editing photos/pictures and effects. This software is widely used by digital photographers and advertising company so it is regarded as the leader of the market (market leader) for image processing software/photo, and with Adobe Acrobat, considered the best product ever produced by Adobe Systems. The eighth version of the application is called by the name of photoshop CS (Creative Suite), nine Version called Adobe Photoshop CS2, versions of ten called Adobe Photoshop version CS3, Adobe Photoshop CS4 is the eleventh, and the twelfth version is Adobe Photoshop CS5, Thirteenth version is Adobe Photoshop CS6, and Adobe Photoshop are fourteen versions of the CC (Creative Cloud).

2.1.11 C Sharp

The language of the C # is a programming language that is both modern *general purpose*, object oriented, which can be used to create on top of the architecture of the Microsoft .NET Framework. The C # language has similarities with languages Java, C and C++ (more information can be seen in the history of the language C #). The programming language was developed by a team of developers at Microsoft , led by Anders Hejlsberg, a long-hapless transverse in the world the development of programming languages because it is that makes Borland Turbo Pascal, Borland Delphi, and also Microsoft J++. Now, C # has been standardized by the European Computer Manufacturers Association (ECMA) and also International Organization for Standardization (ISO) and has stepped on the 3.0

version supports some new features some kind of Language Integrated Query (LINQ) and others.

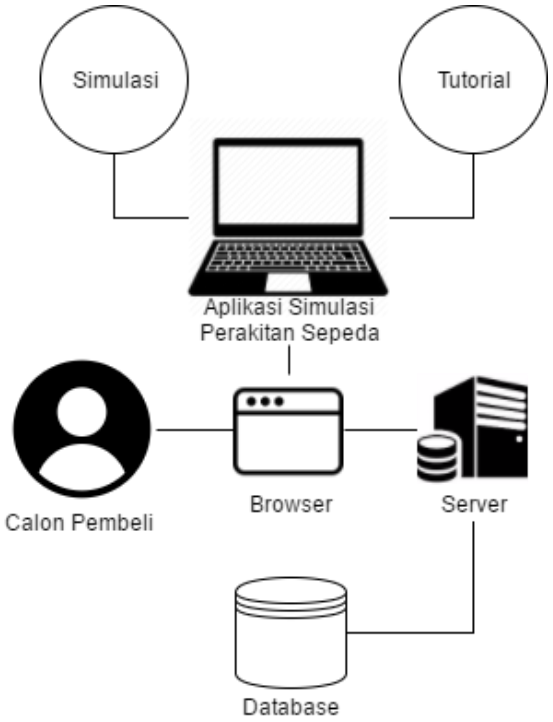
2.2. The analysis of the

2.2.1 the introduction of Applications Built

Bicycle Assembly simulation application development 3d has a purpose and that is to create a simulation of 3D interactive Assembly multimedai bike that can help prospective buyers or users of the site to do the simulation Assembly with bicycle customization on the page internet site so that users of the site or the prospective buyer can see the description in detail the components and models with visual design results from the selected component to build a bicycle according to the tastes of the potential buyers or users of the internet site.

2.2.2 Analysis Of System Architecture

The system architecture is built consisting of application Simulation and Tutorial Bike Assembly and server to load the 3D object Components of bicycles. System architecture in construction simulation of Bicycle Assembly can be seen in Figure 2.1



Pictures 2.1 The Image Analysis System Architecture

2.2.3 Needs Analysis Hardware

Analysis device Hard is the most important thing in a supporting performance of a system. The hardware needed to build applications using the 3d bike Assembly simulation framework webgl and three.js library web-based there on table 2.1

The hardware that is in bikesystem

The following are the specifications of the hardware that is in the place of research.

Table 2.1 spesifikasi perangkat keras yang ada di bikesystem

Perangkat Keras	Spesifikasi
CPU	2 *core*
RAM	2 GB
Display	Resolusi 1366 x 768
Mouse	1 Unit Standar
Keyboard	1 Unit Standar
Internet Connection	10 Mbps

The following are the minimum hardware requirements sepesifikasi required by the user to run the application. Found in the table 2.2

Table 2.2 Analisis Kebutuhan Perangkat Keras implementasi system

No	Perangkat Keras	Spesifikasi
1	Monitor	Monitor 14” inches
2	Precessor	Processor AMD A8-5550M APU withRadeon HD Graphics 4CPU 2.1GHz
3	Memory	6GB RAM
4	Hardisk	500GB
5	VGA	VGA AMD Radeon HD 8550G + HD 8570M Dual
6	Mouse	Standar

2.2.4 Needs Analysis Software

Needs analysis software geared to find out the needs of the software to be used in the construction of the system as well as the implementation of the system. Needs minimal software used systems are:

Software for construction of the system

The following are the specifications in the development of systems that can be seen in table 2.3

Table 2.3 Perangkat lunak pembangunan system

No	Perangkat Lunak	Spesifikasi
1	Sistem Operasi	Windows 10
2	Tools Utama	Unity 5.3.5f1
3	Tools Pendukung	Blender 2.78c
4	Tools Pendukung	Photoshop cs6
5	Tools Pendukung	Wamp server

2.2.5 User Analysis

As for users who are involved in the construction of bicycle Assembly simulation

application for BikeSystem on the user's *Browser*, basically users should have some criteria that is needed with regard to the criteria user needs in the use of learning applications is as follows

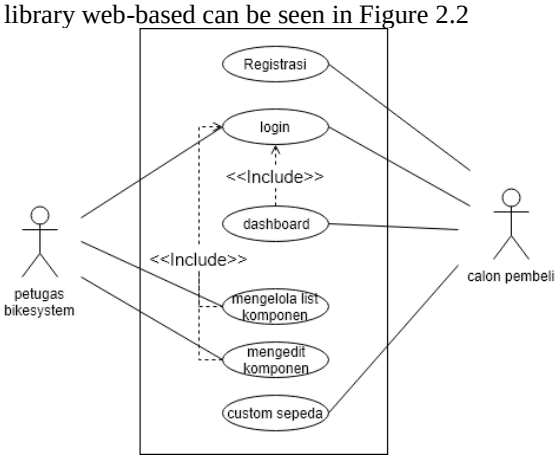
User characteristics
Here are the characteristics of the expected users of the user for the application to be constructed which can be seen in table 2.4

Table 2.4 Tabel Analisis Pengguna

Pengguna	Calon pembeli dan petugas bikesystem
Umur	Diatas 12 tahun
Jenis Kelamin	Laki-laki dan perempuan
Keadaan Fisik Pengguna	Normal (memiliki jari tangan lengkap, dapat melihat), Motorik tidak terlalu kaku.
Bahasa yang dikuasai	Bahasa Indonesia

2.2.6 Use Case

Usecase diagram is a diagram that shows the functionality of the system, provide a picture of how something that is outside of the system like for example users, interact with the system. Usecase Diagrams development of bicycle Assembly 3d simulation using framework webgl and three.js library web-based can be seen in Figure 2.2



Pictures 2.2 Pictures Use Case Diagram

2.2.7 Scenario Diagram

Use case scenario shows the process that occurs in any part of the use case, where users give commands in each section so that the response of what is given by the system to the user after the user giving the command on each of the sections of the use case.

1. Scenario Use Case Login

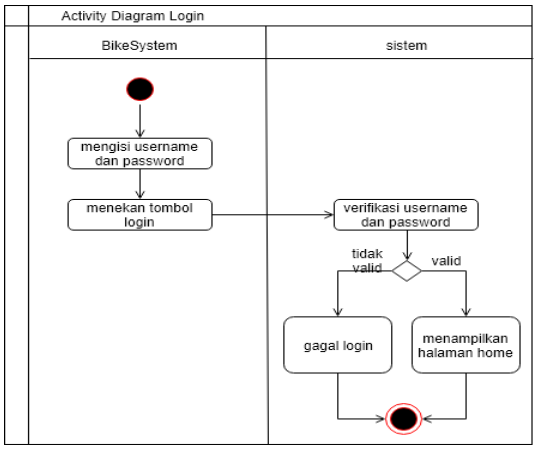
Table 2.5 Scenario Use Case Login

Use Case Name	Login
Actor	Petugas Bikesystem dan calon pembeli
Description	Pengguna yang merupakan bagian Petugas bikesystem dan calon pembeli melakukan login untuk dapat mengakses sistem sesuai dengan hak aksesnya
Triggering Event	Pengguna menekan tombol enter atau login
Preconditions	Pengguna berada pada halaman login, form login dalam keadaan kosong
Postconditions	Pengguna berhasil login, menampilkan halaman menu utama sesuai dengan hak aksesnya
Step Performed (Main Path)	1. Pengguna mengisi *username* dan *password* 2. Pengguna menekan tombol login 3. Sistem memverifikasi *username* dan *password* 4. Sistem menampilkan halaman utama sesuai dengan hak aksesnya
Extensions	3.1 Verifikasi *username* dan *password* salah 3.2 Sistem menampilkan pesan "*username* dan *password* salah"

2.2.8 Activity Diagram

Activity diagram menggambarkan berbagai alir aktivitas dalam sistem yang sedang dirancang seperti bagaiamana aktivitas itu berawal dan berakhir. Sebuah aktivitas bisa direalisasikan oleh satu *use case* atau lebih. Aktivitas menggambarkan proses yang sedang berjalan sedangkan *use case* menggambarkan bagaimana aktor menggunakan sistem untuk melakukan suatu aktivitas.

1. Activity Diagram Login

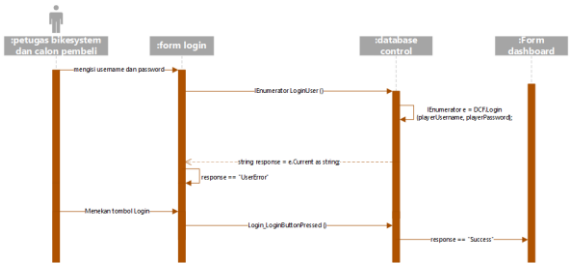


Gambar 2.3 Activity Diagram Login

2.2.9 Sequence Diagram

Activity diagram describe the various flow activity in a system that is being designed such that activity however began and ended. An activity can be realized by one use case or more. Activity describes the process that is running while the use case describing how an actor uses a system to perform an activity:

1. Sequence Diagram Login

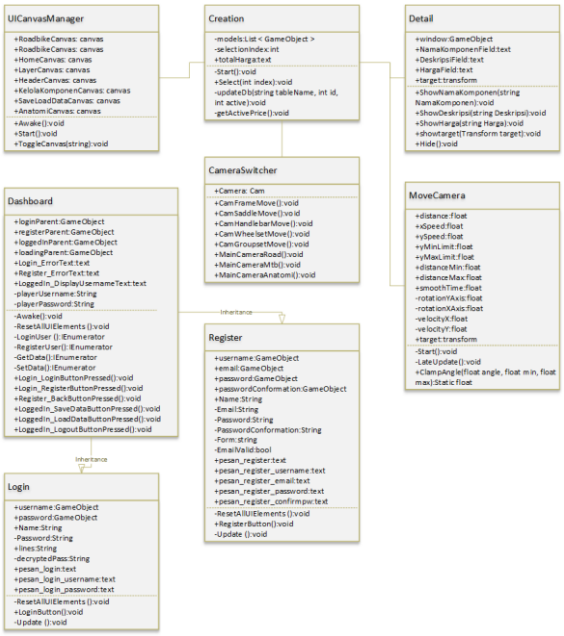


Pictures 2.4 Sequence Diagram Login

2.2.10 Class Diagram

Class diagrams (*Class Diagrams*) is the most common chart used in all object-oriented modeling. Class modeling shows the classes that exist in the system and the relationships between the classes that, the attributes and operations of classes in operation.

The following is the class diagram shown Figure



Pictures 2.5 Pictures Class Diagram

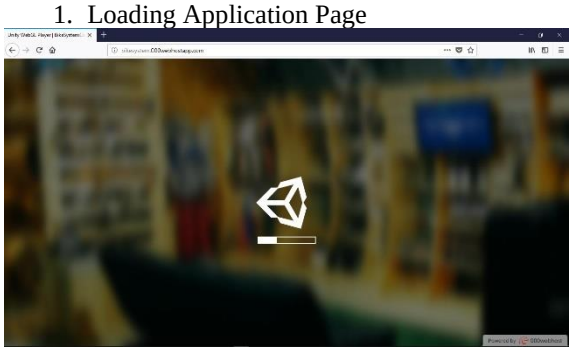
Definisi Use Case

Table 2.6 Definisi Use Case Diagram

No.	Usecase	Description
1	Login	Process data management by matching *username* and *password*.
2	Registration	The process of adding data by filling out the email, *username*and *password*.
3	dasboard	Activity of the data user to keep custom bike
4	Manage The List Component	Activity bicycle components list
5	Managing Edit Component	Data change activity komonen
6	*Custom* bike	Activity merangcang *custom* bike by choosing the bicycle components available as well as featuring in the form of 3D visualization

2.3. Research Results

1. Loading Application Page



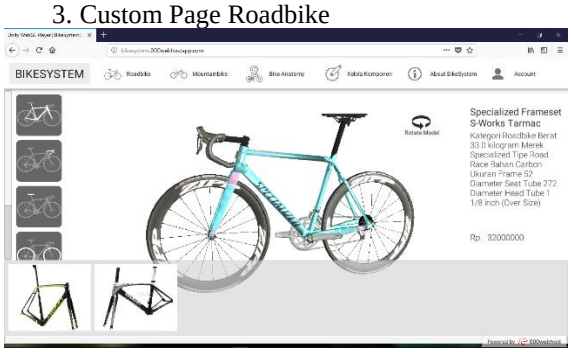
Pictures 2.6 Loading Application Page

2. Main Page



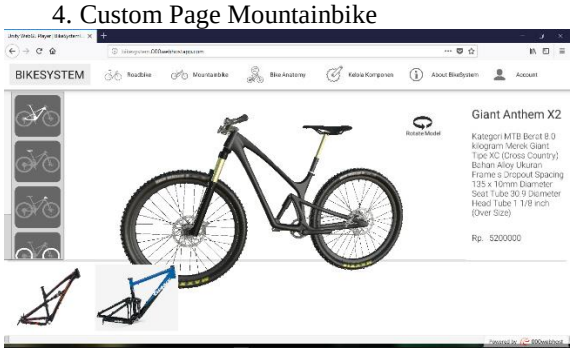
Pictures 2.7 Main Page

3. Custom Page Roadbike



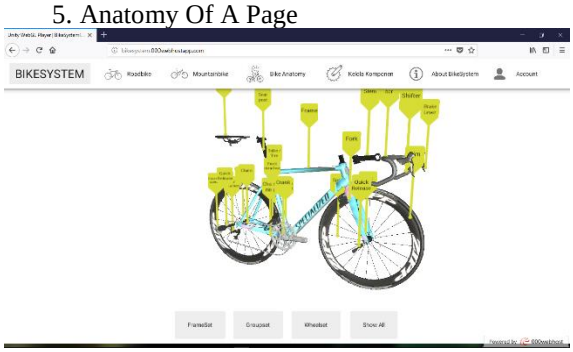
Pictures 2.8 Custom Page Roadbike

4. Custom Page Mountainbike



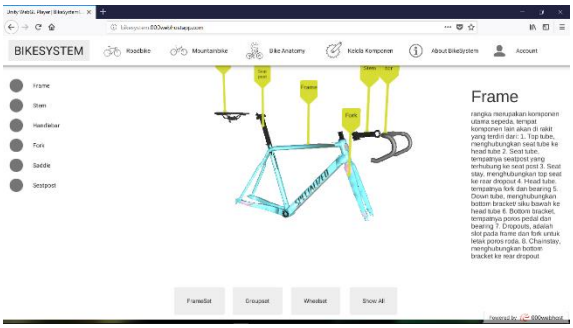
Pictures 2.9 Custom Page Mountainbike

5. Anatomy Of A Page



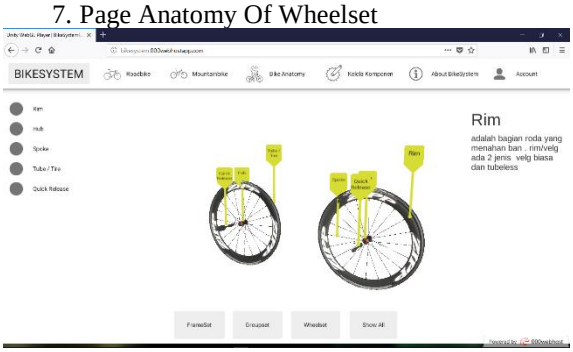
Pictures 2.10 Anatomy Of A Page

6. Anatomy Of A Frameset Page



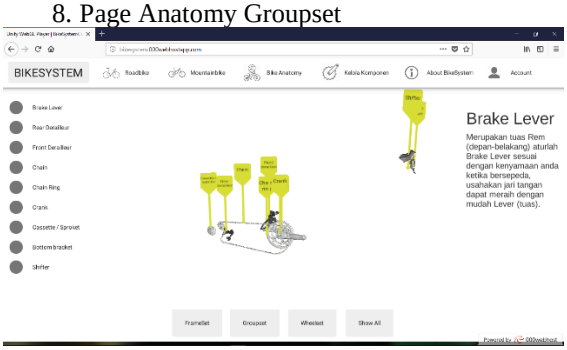
Pictures 2.11 Anatomy Of A Frameset Page

7. Page Anatomy Of Wheelset



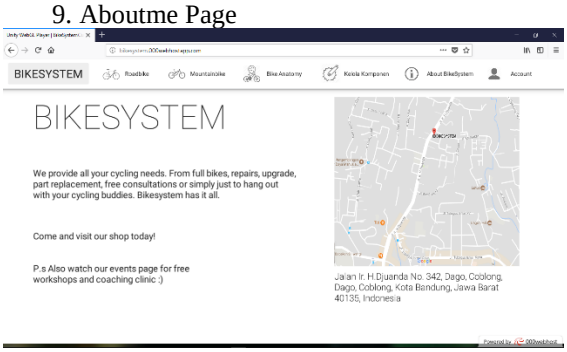
Pictures 2.12 Page Anatomy Of Wheelset

8. Page Anatomy Groupset



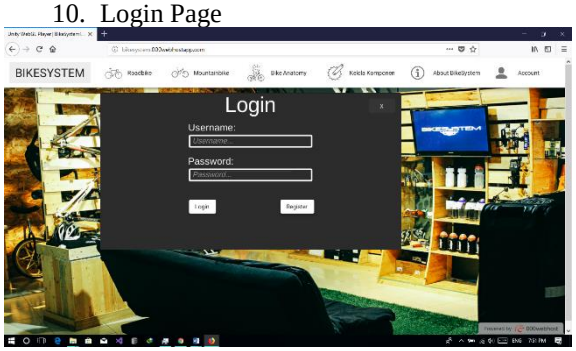
Pictures 2.13 Page Anatomy Groupset

9. Aboutme Page



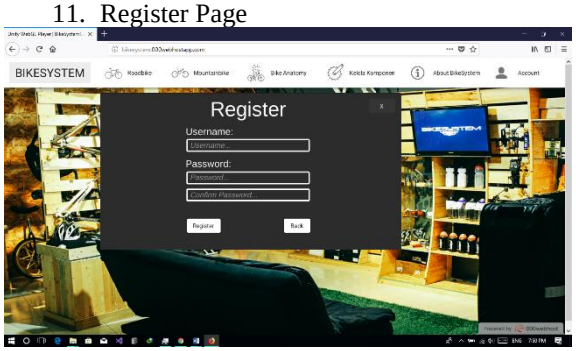
Pictures 2.14 Aboutme Page

10. Login Page



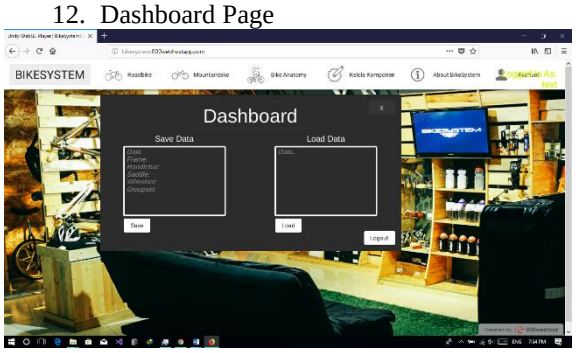
Pictures 2.15 Login Page

11. Register Page



Pictures 2.16 Register Page

12. Dashboard Page



Pictures 2.17 Dashboard Page

2.4. Software Testing

2.4.1 Testing User Acceptance Test (UAT)

Testing User Acceptance Test is the formal testing conducted with respect to user needs, requirements, and business processes that aim to determine whether the software was built already meets the criteria or not acceptance and to enable a user, customer or other authorized entity to determine whether the software is already qualified are accepted or not [20].

2.4.2 Testing A Test Case Design

Metode testing in the testing test cases design it is using black box testing methods, because the black box testing focuses on the functional requirements of the software and try to find the functions that are not true or lost, found errors in the interface, find errors in data structures or external database access, as well as errors in performance applications tested.

2.4.3 Alpha Testing

Based on the results of application testing that has been done then it can be inferred that the application The construction of Bicycle Assembly Using 3D Simulation Framework WebGL and three.js Library Web-based built already running as expected and accepted by users of the application, from it to keep and take care of the application in order to face accepted and used by the user, it will do further development and maintenance of applications against the construction of Bicycle Assembly Using 3D Simulation Framework WebGL and three.js Library Web-based.

2.4.4 Beta Testing

Beta testing done this test user, the surroundings are the actual user's direct surroundings. The user doing the assessment of the application, the method used is the method of interview and questionnaire method interview is done only with the Owner's BikeSystem, while the method of questionnaire conducted by the user. From the results of the interview and the questionnaire then pulled the conclusion whether the application has been built in accordance with tujuaan or not.

Based on the results of the questionnaire data obtained from research that has been done before, then the percentage of answers can be searched by using the following formula:

Y = P/Q x 100%

Description:

P = the number of answers respondents each Question

Q = the number of responde questionnaire

Y = percentage Value

Based Beta testing that has been done before by using the method interviews and questionnaires, then a conclusion can be drawn are as follows:

1. Bicycle Assembly 3D Application Framework Using WebGL and three.js Web based on BikeSystem is easy to use
2. the simulation presented in 3D Using Bicycle Assembly Application Framework WebGL and three.js Web based in BikeSystem makes it easy to assemble a bicycle
3. images and bicycle components in the application using the 3D Bike Assembly Framework WebGL

and three.js Web based in BikeSystem nearly resembles its original form

4. the grant component description and price of bicycle components in applications using the 3D Bike Assembly Framework WebGL and three.js Web based in BikeSystem this makes it easy to determine the components of the bike and bike price want

5. Display interface presented in the application of Bicycle Assembly Using 3D Framework WebGL and three.js Web based at BikeSystem is good

3. COVER

3.1. Conclusion

Based on the results obtained in the research and preparation of theses Basic Abacus Learning Application Development Android-based and tailored to its purpose, then the conclusion is as follows:

1. after you are done testing with the dissemination of the questionnaire, then obtained that prospective buyers are on a very positive attitude towards the first objective of the study is to Mambangun a multimedia simulation 3D who can do custom bike and gives a clear infromasi concerning the description of each component and the price of each component of that bike.

2. Bicycle Assembly Simulation Application Development Framework using the 3D WebGL Library and three.js Web-based, built most of the features represented in the meet the needs of the Assembly of custom bikes in bikesystem.

3.2. Advice

Based on all the results that have been achieved in the preparation of this final project, has a number that should be recommended that future development of Bicycle Assembly Using 3d Simulation Framework Webgl And three.js Library Web-based it can be more well again, including:

1. Add features such as: Sales Order that is integrated with the Backend
2. Add the Sort by Feature
3. Making the application is dynamic
4. Develop 3D applications becomes lighter

4. A BIG THANK YOU

Alhamdulillahi robbilal ' Amen,

All praise and thanks the author panjatkan the presence of the Almighty God who has given faith, strength, intelligence, health, high spirits, as well as all the sustenance that assigned to the author, because it is blessed with permission and this research can resolved properly in accordance with the planned time.

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