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Business Simulation Game Design Based on Real Time Strategy Using SpringRTS Engine

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***Abstract*—Competition in today's business world is getting tougher and raises the number of changes, in which the changes occur more rapidly. Because of that the ability and skills of human resources should also be able to learn quickly to adapt the changes in business world. Therefore, entrepreneur needs a tool that can give the effect of teaching and improve the ability of decision-making and reduce the financial risk for businesses. This research aims to develop a game which can do business simulation. In the process of developing this game, SpringRTS framework is used to maintain the development. There are some steps being taken, which originated from the literature study followed by analysis and design requirements and proceed with expressing ideas that have been done on the analysis and design steps into a tangible form, which includes 3d modeling, uv texture mapping, 3d assembling and coding with the Lua programming language. This research successfully produces business simulation game that can give the effect of teaching in a game without compromising the beauty of the graphics aspect according to research output which made a simulation game with 3 dimensional graphics which make the user whom played it did not easy to became bored.**

Keywords--Game; real time strategy; simulation; business; education; engine; game engine.

I. INTRODUCTION

Today, change is a key feature of doing business. These changes require the presence of human resources who are ready to face change provided by sufficient knowledge and expertise. As a result, the world of education is required to further improve its teaching methods. One teaching method that can answer these problems is with simulation games. Simulation games as a teaching method offer advantages that ordinary teaching methods cannot afford. Simulation games are able to provide participants with dynamism in the learning process and be able to provide a quick feedback, both of which are important in an effective learning method. In addition, business simulation games can provide an interactive, motivational and risk-free environment in learning the dynamics of the system in the industry, while also being able to test decisions based on theories that have been obtained in lectures. Research shows that the use of business simulation games has been going on since the 1960s [1].

Competition in the industrial world today is increasingly stringent and competitive, where changes occur faster. So that the ability and skills of human resources must also be able to learn quickly to adapt to changes in the business and industrial world [2]. Business simulation games can be used as a learning method that applies learning experiences. The advantage of this business simulation game is to invite participants to experience what they are playing or experiencing. Where the effects of this business simulation game can provide lessons and experience in the business and industry world and can test participants' abilities in decision making and reduce financial risk.

Thus, that learning media with simulation models can be used as a tool to hone business skills of business people. Simulation gaming as one of the forms of experiential learning is able to provide a motivating, interactive, and risk-free environment [3].

II. PURPOSE

The purpose of this research is "Designing and building a business simulation game that can provide learning effects and improve the ability of users in doing business".

III. METHODOLOGY

Method used in developing the system is the Software Development Life Cycle (SDLC) method. This method is commonly used in developing or building a system because in this method using the stages that support the development of the system to run systematically.

In this method the stages carried out in the study include the analysis phase, design phase, implementation phase and testing phase. All steps are adjusted to the conditions of the research being carried out.

A. Analysis

In this stage the researcher analyzes the data needed and conducts reference studies from several studies, especially from research entitled "Designing Agribusiness Supplier Simulation Game Design with Dynamic System Approach" [4]. The study discusses the making of business simulation games that adopted

the fish supplier business using the tool namely Powersim studio. Which simulates the purchase of goods to sub-suppliers, sales of goods to supermarkets (consumers), and finance. From the research there are several market actors whose rules we use as a rule that is used to fill the rules for objects and also existing units in the game.

B. Design

At this stage the researcher designs the game itself which is tailored to the needs of the game to be built. In this stage the researcher prepares the material or content that will be included in the game.

In this stage there are steps taken, namely:

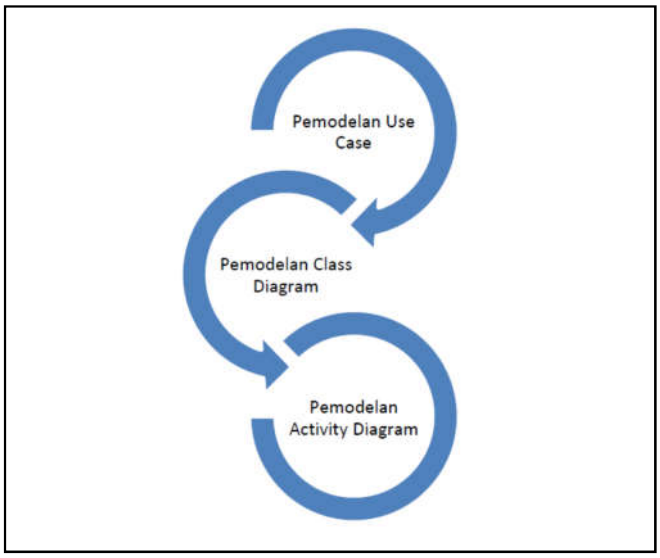

Figure 1. steps in the Design Stage

Figure 1 shows the design process in several stages, we explain in full as follows:

1. Use Case Modeling: A system modeling process that shows the Use case set and actors. This diagram is used to model business processes based on the perspective of system users.

2. Modeling Class diagrams: describe the structure of the system in terms of defining the classes that will be made to build the system. Each class has attributes and methods. Attributes are variables owned by a class. Operations or methods are functions that belong to a class.

3. Modeling activity diagrams: describe the flow of events. A description that represents the workflow or process work flow in a system. This diagram is almost similar to flowchart modeling, because the workflow of an activity to other activities can be modeled.

C. Implementiton

In this stage the implementation is carried out by pouring ideas that have been carried out in the steps of analysis and design into a real form, these steps can be seen in Figure 2 below:

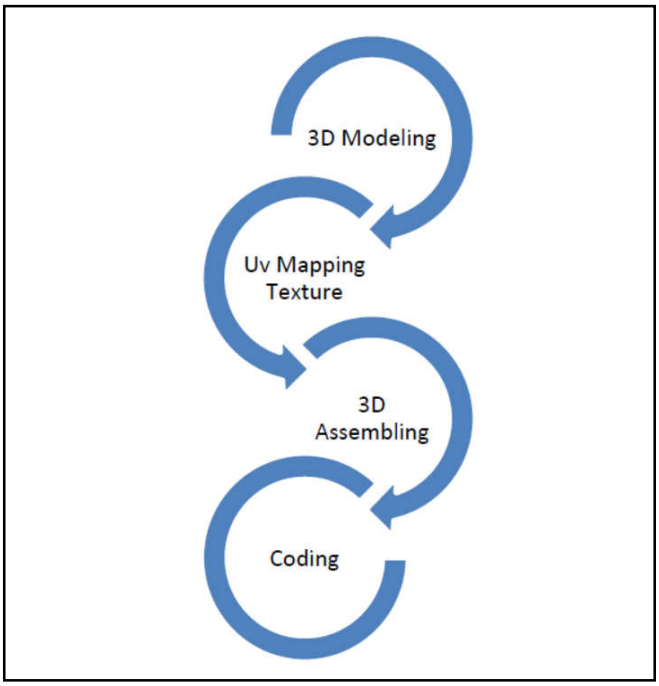

Figure 2. Implementation Phase

In Figure 2, there are several stages in the implementation of this game:

3D Modeling: The process of making a three-dimensional model using Wings3d software.

Uv Mapping Texture: The process of making three-dimensional textures in two dimensions and in this study the alpha channel feature is added which detects the dominant black and white texture area.

3D assembling: The process of solving a three-dimensional model into several parts so that the model can be animated by the engine using Upspring software.

Coding: The process of coding games using Lua[5] programming, in this case the implementation is done with the help of a notepad++ tool.

D. Testing

In this stage testing is done by running a game and giving a questionnaire to all users who play this game to get an assessment.

IV. SYSTEM DEVELOPMENT

A. System Requirements Analysis

1) Tools

The tools used in this research include hardware and software, including:

a. Hardware

1) AMD E450 APU ™ Dual Core 1.65 Ghz Processor

2) Memory of 2048MB

3) Monitor 1360 x 768 pixels, 32 bits

4) VGA ATI Technologies Inc.

b. Software

1) Windows 8 RTM Operating System

2) GIMP 2.8 which functions to do texture mapping

3) Wings 3D 1.4.1 which functions to make 3-dimensional model units

4) Upspring used to do 3d assembling

5) Notepad ++ v5.64 is used for coding

2) Material

The material used in the research is the result of several studies, application development from the springRTS.com forum[6], and several references available on the internet about matters relating to this research.

B. Data Analysis

1) Role Analysis

From the results of the analysis produced, the author makes the development of role prototypes and unit units to be created as:

- Unit Owner: Can create a Supplier unit, Karefur, Warehouse and also function as a main unit
- Warehouse Unit: Can add financial capacity limits in the game and can make Truck units
- Supplier Unit: Can make unit items
- Truck Unit: Can transport unit items to be delivered to the Karefur unit
- Item Unit: Can be sold to the Karefur unit to add finance.
- Employee Unit: Serves to reclaim goods and make money
- Karefur Unit: Serves to create employee units and increase financial flows.

2) Analysis of Blueprint Business simulation games

a) Unit (Unit)

The unit is an entity in this game which can be controlled by the user and has different attributes and properties which will affect the course of the game, namely (as shown on Figures 3-9):

1) Owner (business owner)

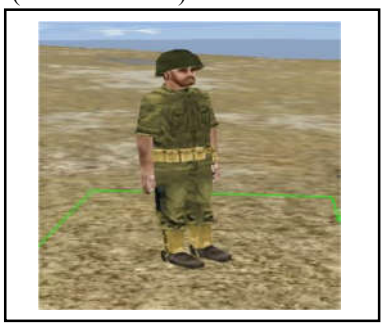

Figure 3. Unit Owner

2) Warehouse

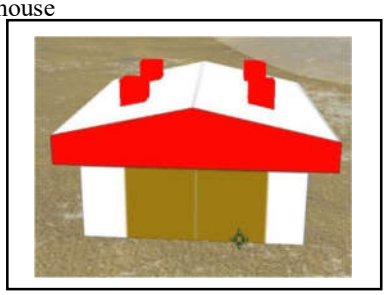

Figure 4. Unit Warehouse

3) Supplier

Figure 5. Unit Supplier

4) Karefur

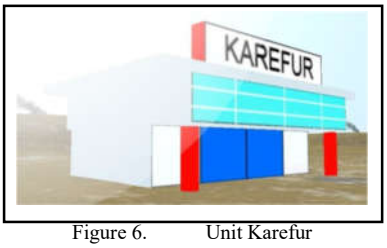

Figure 6. Unit Karefur

5) Trucks

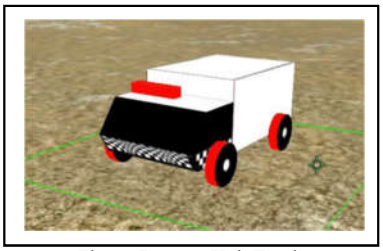

Figure 7. Unit Trucks

6) Goods

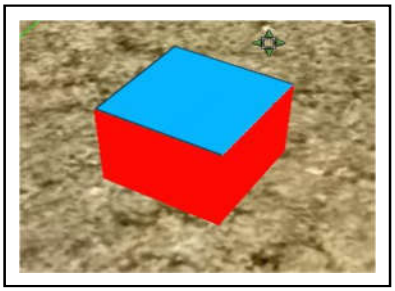

Figure 8. Unit Goods

7) Truck Employees

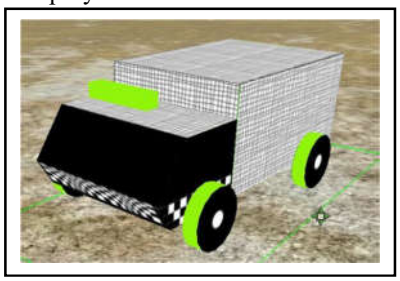

Figure 9. Unit Truck Employees

b) Interface Design

The material used in the research is the result of several studies, application development from the springRTS.com forum, and several references available on the internet about matters relating to this research.

C. Design

This contains the process and stages of the program design phase carried out in the process of making this research.

1) Use Case Diagram

Use Case Diagrams are used to create system modeling that shows the Use case set and actors. This diagram is used to model business processes based on the perspective of system users.

a) Use Case Spring

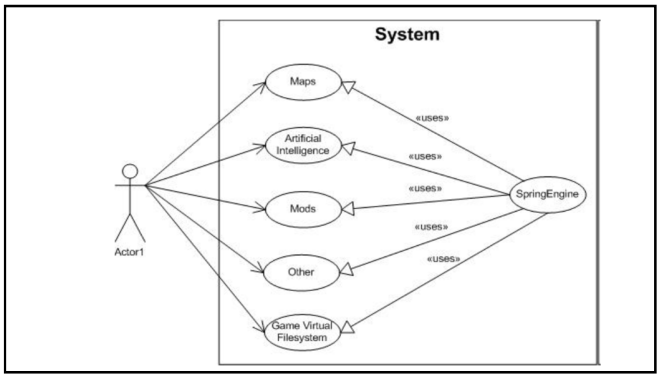

Figure 10. Use Case Spring Engine

Figure 10 is a use case diagram of the spring engine in which there are several entities used by games and engines, in this research the authors limit the assessment of virtual filesystem game entities

b) Use Case Game Virtual File System

The following Figure 11 describes the use case virtual filesystem used by the spring engine.

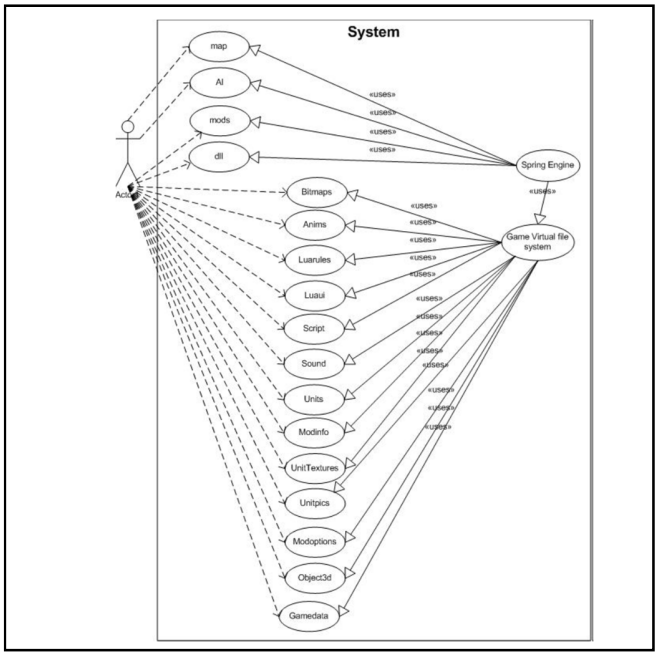

Figure 11. Use Case Diagram Virtual File System game

2) Class Diagram

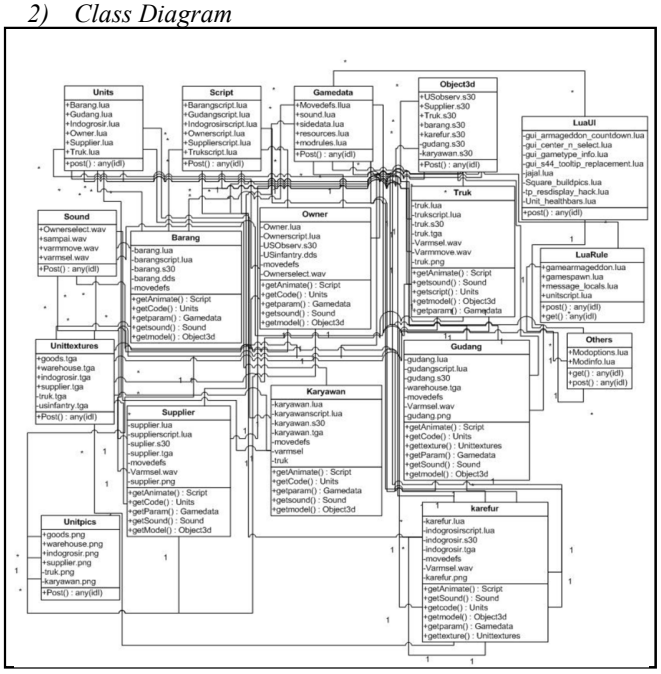

Figure 12. Class Diagram

Class diagrams are shown on Figure 12. This system implements many classes as can be seen on Figure 12.

3) Activity Diagram

Figures 13 and 14 show activity diagrams on this system.

a) Activity Diagram Start game

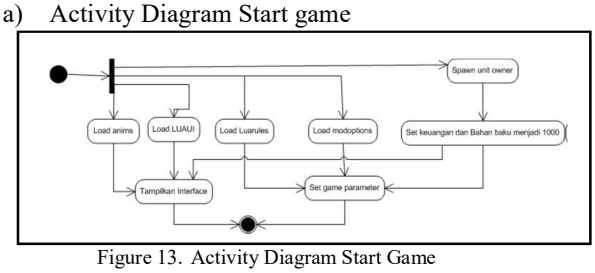

Figure 13. Activity Diagram Start Game

b) Activity Diagram Spawn unit.

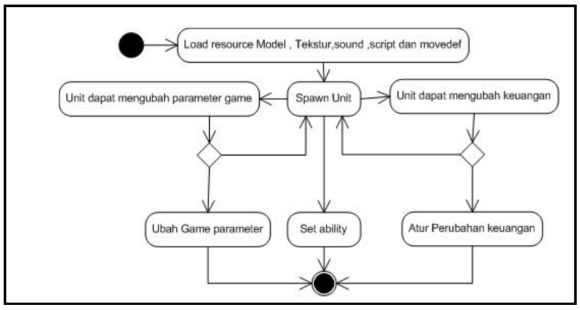

Figure 14. Activity Diagram Spawn Unit

D. Implementation

The implementation phase is the development of the design phase that has been done before.

1) Interface Implementation

The implementation of the interface of the game built is designed so that the appearance of the game can be attractive to users who use it. In this game the default interface modified on several elements (Figure 15).

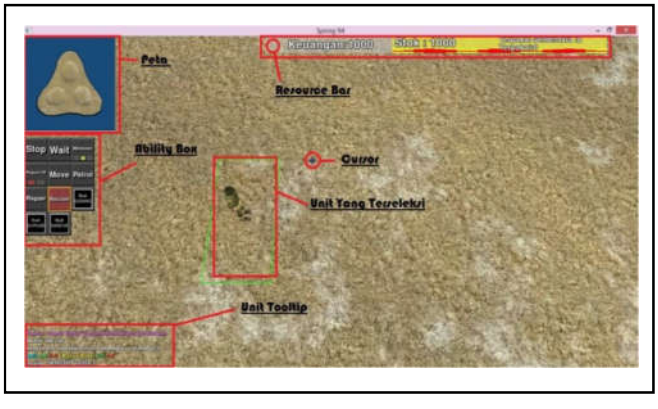

Figure 15. Modified Spring interface

2) Unit Implementation

The implementation of the unit contains three-dimensional modeling, texture with alpha channel, animation script and unit script. The unit here consists of unit owners, warehouse units, suppliers, facilities, trucks, goods, employees.

E. Testing

The last stage of making the system is testing, this test intends to determine the extent of the overall capability of this system. At this stage, the tests performed will use the black box method. This technique is very commonly used when someone wants to test a system that focuses on functional systems that have been built and pay attention to the system whether it has been running as expected.

1) Alpha Testing

Alpha testing is focused on system functionality requirements by testing data by system developers.

Based on the results of Alpha testing that has been done, it can be concluded that the system built has been successful and acceptable because functionally the system is in accordance with the initial requirements and produces the output or output expected by the system developer.

2) Beta Testing One

Beta testing one focused on finding bugs that were accidentally formed in the creation of the system, Table 1 will explain the details of the bug found by the author and some testers.

TABLE I. LIST OF TABLE

No.	Entity	Bug
1	Finance	-The money does not decrease and increase -Regeneration of money too fast
2	Unit Owner	-Can be reclaimed by employee units
3	Truck Unit	-Can be reclaimed by employee units
4	Karefur Unit, Supplier, Warehouse	-No can affect game finance
5	Widget	-The implementation of the limit time game still has bugs
6	Gadget	-The limit time function still cannot be called

3) Beta Testing Two

In the beta test two focused on game testing in the end user perspective. The functional test beta test results can be seen on Table 2.

TABLE II. LIST OF TABLE

No.	Statement	Assessment				
		SS	S	N	KS	TS
1	Is the look of the game interesting?	8	2			
2	With three-dimensional graphics, can users easily capture lesson?	4	4	2		
3	Can the interface design be easily understood?		3	5	2	
4	Can the game simulate a business process?		7	3		
5	Can this game be used as a tool to improve the business insight of an entrepreneur?	5	5			
Total		17	21	10	2	
Percentage		34%	42%	20%	4%	

Thus, based on the three results of the tests that have been carried out, it can be concluded that the entire system built is in accordance with the expected, because the system functionality has been able to run properly, the system has a good three-dimensional appearance even though there are some defects in the financial system.

V. RESULT AND DISCUSSION

1) Benefits of Research Results

a) For users

1) Get insight into business in a game.
2) With three-dimensional graphics the user gets a game that can spoil the eye and not easily get bored.

b) For Researchers

1) Researchers can understand the process of making a three-dimensional model
2) Researchers can understand the process of making textures of three-dimensional objects
3) Researchers can understand the process of making animation with three-dimensional modeling

4) Researchers can understand the process of programming the SpringRTS framework based on Lua programming

5) Researchers can understand the concept of making a real time strategy game

c) *For Readers*

For Readers who want to learn about the concept of making a research real time strategy game this research can provideed on system functionality requirements by testing data by system developers.

2) *Advantages of Research Results*

By implementing the SpringRTS framework with Virtual filesystems, it can improve the effectiveness of the developers' work due to the facility of a virtual file system that allows structuring files are neater and easier for developers to understand.

The system produced by this study has standard rules in the program development process so even though there is a change in developer or programmer, it will not be a problem while the new programmer or developer understands the concepts and standard rules of the programming model.

VI. CONCLUSION

After the research is successfully carried out, the conclusions that can be taken are as follows:

1) This research produces a business simulation game that can provide learning effects and improve the ability of users in doing business

2) This study can provide learning effects in a game without reducing the aspect of graphic beauty.

3) This research produces a game that has a good three-dimensional graphical display so that users are not easily bored in using it.

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