

Quick Counting Educational Game for Vocational School Students Based on Scratch

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Abstract

Abstract. Mathematics is a subject that requires thinking to calculate quickly so as not to waste the remaining time studying in class. Educational games are a solution that is offered as a very innovative learning media and can be a learning medium that is fun, fun and addictive. This educational game aims to improve the ability of Vocational High School students to explore and find alternative answers, improve students' ability to make the right decisions and improve students' ability to count. The goal of implementing this program is that high school students still have trouble counting quickly.

1. INTRODUCTION

Education is an important factor that can support the life of a country. The provision that every citizen has the right to pursue education has been stated in the 1945 Constitution. Therefore, the government established a 12-year compulsory education program. Good learning media is learning media that is in accordance with the existing learning environment. Currently learning media has experienced many variations along with technological developments. Educational Games are something that is very fun and useful for improving thinking skills. (Andang Ismail 2019).

Mathematics is a subject that requires thinking to calculate quickly so as not to waste the remaining time studying in class. Educational games are a solution that is offered as a very innovative learning medium and can be a learning medium that is fun, fun and addictive. According to the research results of Pramuditya, Noto, & Syaefullah (2017)

The benefits of educational games make it easier for us to do the counting process. Our speed at calculating numbers increases rapidly and the answers we get become more accurate. Several studies related to the application of the fast counting method have been carried out (Caffriyati & Lisa, 2015; Ekasanti; 2017; Sari, 2011; Surat, 2017).

2. Theoretical Framework

Education is an important factor that can support the life of a country. The provision that every citizen has the right to pursue education has been stated in the 1945 Constitution. Therefore, the government established a 12-year compulsory education program. Good learning media is learning media that is in accordance with the existing learning environment. Currently learning media has experienced many variations along with technological developments. Educational Games are something that is very fun and useful for improving thinking skills. (Andang Ismail 2019).

2.1 . Multimedia Development Life Cycle (MDLC)

1. Concept (Concept) The concept stage is to determine the purpose and who are the program users (audience identification)
2. Design Design is making detailed specifications regarding application architecture, style, appearance and material requirements for making applications.
3. Collection of Materials (Material collecting) Material collecting is the stage of collecting materials according to the needs being worked on.
4. Assembly (Assembly) The assembly stage is the stage of making all objects or multimedia materials
5. Testing (Testing) After the application is made, it's time to test the capabilities and performance of the application, whether it is as expected
6. Distribution At this stage the application will be stored in a storage medium, this stage can also be called the evaluation stage for the development of finished products to make them better.

2.2. SCRATCH

Scratch is a programming language designed to introduce computer programming concepts in a simple way that anyone from any background can understand. Scratch features a very simple and easy to use interface. In contrast to programming languages which are usually text-based , Scratch uses "graphics" to teach programming logic

2.3 Paint 3D

Paint 3D is a simple 3D object drawing application developed by Microsoft. Paint 3D offers many features and sophistication in it, even though it's not better than 3D Max , AutoDesk , Blender , and others, but Paint 3D provides unique and cool results for beginners.

2.4 Black Box Testing

Black Box Testing is a method used to test software without having to pay attention to the details of the software , this test will only check the output value based on the input value of each feature. There is no attempt to find out what program code was used to generate the output . Black box testing is done by trying to enter the data that has been provided into the software , which must be in accordance with the wishes of the software developer . This test is important to do to ensure that the software that has been developed is as desired (Ningrum et al, 2020)

2.5 Storyboards

Storyboard is the general design of an application that is arranged sequentially and is equipped with explanations and specifications for each image, button and text. Storyboards are scripts that are written in the form of pictures or sketches to visually show how the action of a story takes place (Nurhasanah & Destyany, 2011) . The elements used to describe the Storyboard consist of the project name, page number modules on the screen, and screen sketch images along with object details such as text, images, animations and others (Diaartono, 2008)

2.6 Activity diagrams

Activity diagrams are a way to describe a work flow or activity of a system or business process. The node of an Activity diagram is called an action, so an Activity diagram can be called a diagram consisting of a collection of actions (Fowler, 2005).

2.7 Flowcharts

Flowchart or flowchart which was originally used to describe a sequence of problem solving processes in the computer industry. By using a flowchart, the writer can easily explain a process sequence that is relatively complicated when explained using words (Dewobroto, 2005). Flowcharts are made to help understand complex and also long logical sequences so that they are more easily communicated to other people and especially programmers who are in charge of implementing programs.

2.8 Use case diagrams

Use case diagrams according to (Fowler, 2005) are one of the Unified Modeling Language (UML) diagram models used to describe the functional requirements of a system. Use cases can describe interactions between users and the system being developed, by providing a narrative about how the system is used. In other words it describes who can use the system and in what way users interact with the system.

3. Methodology

3.1 Research Design

Research flowcharts are needed to carry out process planning, process analysis, and process documentation as guidelines for conducting research. The following is the research flowchart shown in Figure 3.1.

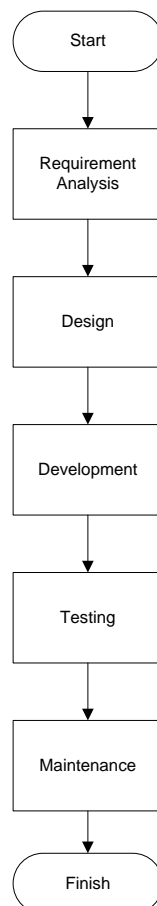


Figure 3.1 Research Design

3.1.1 Data Collection Method

In study This use method collection data covers:

a. Study of literature

This literature study was conducted by the author to gather sources written sources, by reading, studying and recording things important related to that problem being researched.

b. Observation

Observations made by researchers are by observing direct to object study. Observation done For obtain information in a manner direct to problem Which currently researched to determine true system in accordance.

3.2 Designing Use case diagrams

3.2.1 Game player use case diagram

Use case diagram is a functional description of a system by describing the players and their relationship with the system. The use case diagram will describe how the player interacts with the role that the player will play with the system that has been built. From the analysis results obtained system processes as shown in Figure 3.2

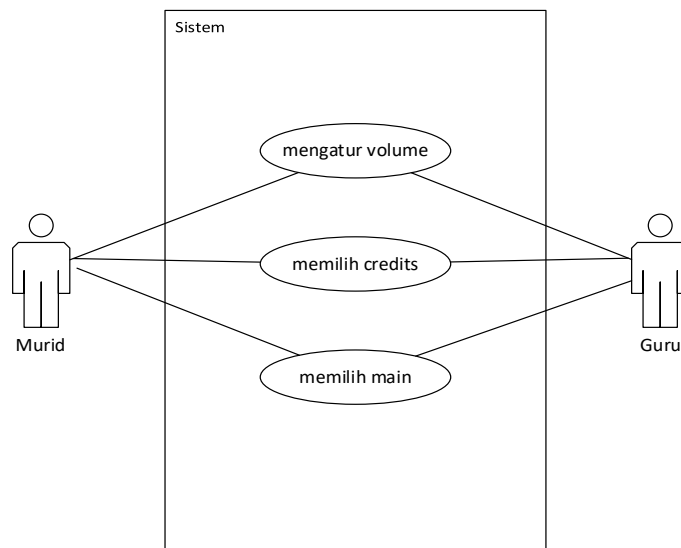
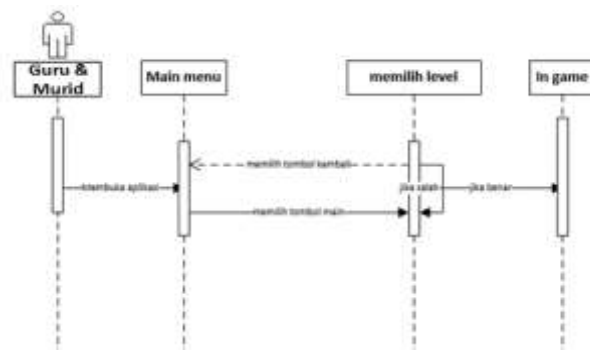


Figure 3.2 Use Case Diagram

3.3 Sequence diagram design

3.3.1 Sequence diagram Start the Game

Explanation of sequence diagrams Starting the game can be seen in Figure 3.2.1 The player as the owner of the entire application must operate to start the game



3.3.1 Sequence diagram Start the Game

3.3.2 Designing Activity diagrams

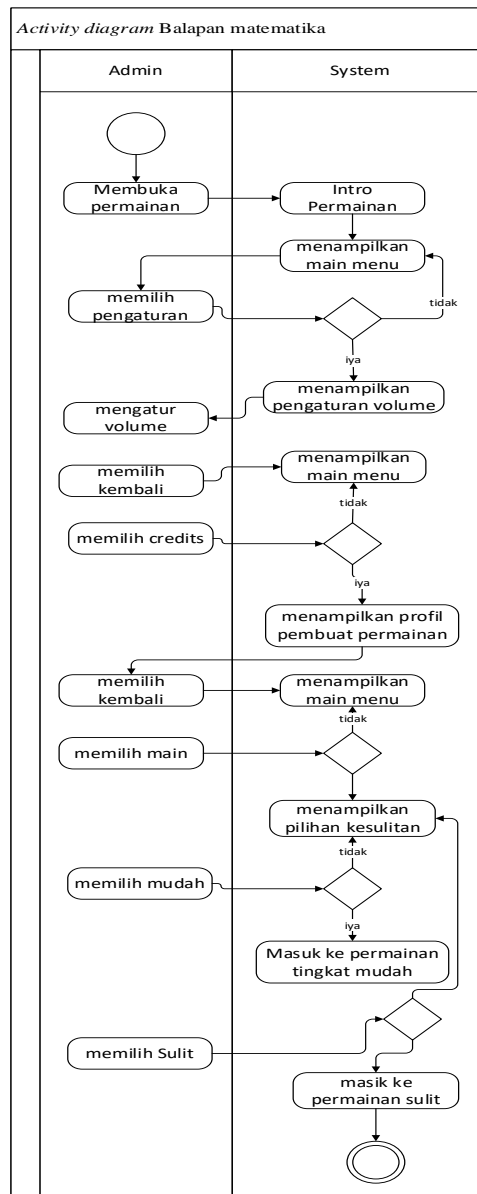


Figure 3.2.2 Designing activity diagrams

Activity diagram is a design of work activities in a running system. Activity diagrams are used by defining or grouping the display flow of a system

4. Result and Discussion

4.1 Implementation of interfaces

Interface implementation is a display of programming results based on the system design that has been designed. The following is the implementation of the interface that has been built.

4.1.1 Home Page

On this page the main menu will be displayed which users can use to operate the application. The appearance of the main menu page can be seen in Figure 4.1



Figure 4.1 Appearance of the start page

4.1.2 Game Display

On the Hard difficulty page, players can play games on hard difficulty that contain quick multiplication questions. The display of the difficulty level page can be seen in Figure 4.2.



Figure 4.2 Display Game

4.2.1 Blackbox Testing

System testing will be carried out using the black box technique . This technique is a testing method that focuses on the functionality of the system that has been built and pays attention to the suitability of the expected results from the actions given by the user. The functionality process that will be tested from the system is testing playing easy levels , testing difficult levels, testing adjusting volume, testing viewing credits.

	Menu Test Table		
Input Data		Which are expected	Trial results
Click the Start Button		Enter the menu select the game level	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful
Click the Credits button		Displays game creator information	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful
Click the Settings button		Displays the settings menu	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful
Adjust volume button in settings		Set the size or music in the game	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful

Kick the back button in the credits menu		Return to the main menu	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful
Click the back button in the settings menu		Return to the main menu	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful
Click button to play easy level		Get into the game on easy difficulty	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful
Click the hard level button		Enter the game with a difficult level	<input checked="" type="checkbox"/> Success <input type="checkbox"/> Not successful

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