Pushbutton Engine Based : Interactive Game on Cultural Heritage

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***Abstract*— Culture is an important element in representing the personality of a nation. Indonesia has a very rich culture due to various ethnics that spread into thousands of archipelago. There is a tendency, Indonesian young generation do not recognize their cultures. "Desa Maya Budaya Indonesia" (DayaBaya) : Virtual Village with Indonesian Culture - is a game developed to introduce Indonesian culture to young generation. This game simulates a virtual village located in a region in Indonesia that can be developed according to the player's desires and wishes. The simulation will help young generation to know various cultures of Indonesia at the early stage.**

Keywords - culture; game; simulation;

I. INTRODUCTION

Cultural heritage and natural history of a nation is a very valuable element; it can describe the identity of a nation. To preserve it, the introduction of culturally-diverse Indonesian culture must be inculcated early on. The young generation is expected to discover the culture of the nation by themselves.

In today's technological era, the teens tend to abandon their culture that is not interesting anymore. Therefore, an appropriate method to resolve the issue is needed. In this case, the authors chose the game that can interactively introduce Indonesian culture.

This game will be designed for younger users aged 6-15 years. It is a simulation game which features a village in one of the regions in Indonesia that can be developed as the users wishes. It provides a unique object livelihoods in the area, for example: paddies, plants, etc. This object will generate wealth in a specific time. Property can be used to buy other objects. Any existing cultural objects in the game will display the information. The information will be displayed in the form of names, images, and a brief description of the object.

Through the development of this game, we expect that the teens can recognize Indonesian culture and preserve it for future generations. This game is a web-based games that can be accessed via the internet and in a form of flash. In this case, the authors use the Push Button Engine as a platform engine in developing the game.

II. PUSHBUTTON ENGINE

The development of this game is expected to be completed in a minimum time. Therefore, we need election strategy that is appropriate in designing this game. There are several game engines that can be used. Here is a table that compares two tools, Push Button Engine (PBE) and Flixel in building a flash game [1].

Based on the Table 1, the author decided to use PBE as DayaBaya game development tools. PBE was chosen because it is easy to use and more powerful to develop flash-based game.

PushButton Engine (PBE) is an open source flash game engine intended for the quick design, creation and deployment of games to a worldwide audience. PBE is the back-end behind many popular online games, like Zoo World, FishVille, Grunts, and Social City [2].

A. Pushbutton Engine Design

The PBE is built on two pillars - its component system and its serialization library. The first is what makes it possible to build and share pieces of functionality. The second is what makes it easy to combine them [3]. The PBE starts by creating components, then using the engine's simple XML level format to combine them into game objects and the objects into a whole world.

Table 1. Comparison of PBE and Flixel

	PBE	**Flixel**
Design Principal	*Component-Based*	*Class Inheritance Paradigm*
Extension	*Available in Component Store*	*No Centralised Location*
Physics	*More Powerful*	*Basic*
API Clarity	*Un-Consistent Class Name and Property*	*Consistent Class Name and Property*
API Stability	*Unstable between Old and Newer Version*	*Unstable between Old and Newer Version*
External Level Definitions	*Easy to construct*	*Hard to construct*

PBE uses components concept because they avoid the major problems that come from inheritance-based implementations. As Ben Garney of PBE Creation says in his quick talk, the main reason why the components are used in PBE because class inheritance design is broken [4]. Games that are made with components are naturally more modular, maintainable, and extensible [5]. The example of PBE component in this game can be described in Figure 1.

An object is represented as IEntity Game that contains a list of one or more IEntityComponents. For example, a player entity is built from components that are visible. Each component is called as an entity. It is easy to imagine how the data might flow in this example – mover to maintain the position of the object and update the physical state as time passes. When the sprite needs to render, he will take the data from the mover. Input valid to force to mover that moves the player character based on user actions [5].

Inheritance concepts are different with components in PBE. In the design of inheritance classes, each class can inherit some functionality from its parent. The design of the class can become more complicated if we want to add new features, and parent can be very large because they contain the same functionality that is owned by his child. However, this function can be broken down into sections and combined to create the full functionality of an entity. That's how component concepts have PBE. The same component can be used in building some object.

B. Pushbutton Engine Design Isometric Component

DayaBaya is an isometric game. Isometric games are games that use isometric projection to display the objects of the game. Since by default PBE is not equipped with isometric component yet, DayaBaya use free external isometric component of PBE that can be found at HybridMindset's Blog. DayaBaya is developed based on PBE components architecture in Figure. 2.

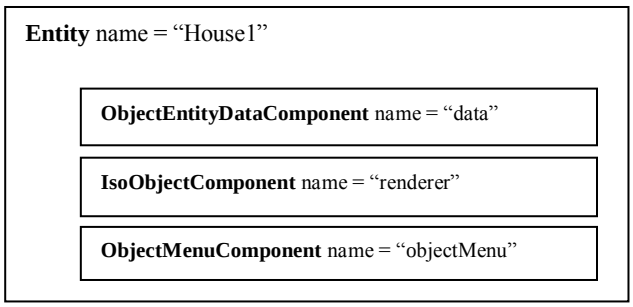

Figure 1. View of PBE Entity Component

The IsoSceneView is an actual IsoView Object that implements the IUITarget interface for use with a PBEComponent. This allows us to take advantage of the native panning and zooming that the AS3IsoLib view already provides. The IsoSceneView does not sit in the PushButton Engine but all other isometric components take advantage of the engine in some fashion [6]. The integration view of isometric component in PBE can be seen in Figure 3.

III. DAYABAYA GAME DESIGN

A. Game Scenario

DayaBaya is a game simulating the development of a village in Indonesia. At the beginning of the game, it displays the lobby. In the lobby, players will see a map of Indonesia and its regions to be chosen by the player. When an area has been chosen, then the game will displays a field that describes the characteristics of the area. An illustration of the game is shown in Figure 4. There are 3 states in this game : initial state, development state and final state.

Initial State

- Players register / login in order to play the game.
- Game will feature land and objects typical of the villages that have been selected in the lobby.
- Players will be given an initial capital of one house and one item of business objects that will be used in developing the village.
- Players are at the first level.
- Wisdom point is a reward which value increases when players answered the quiz questions correctly, and it can be used to construct objects of cultural preservation. The initial value is 10.
- Level of knowledge is a reward which value increases when players answered the quiz correctly, and as an indicator for the turnover level. The intial value is 0.
- Coin is the reward which value increases if the object is ready to harvest livelihood. It can be used to build all objects except for cultural preservation.

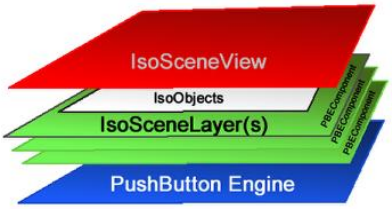

Figure 2. Isometric Component Visual Architecture [6]

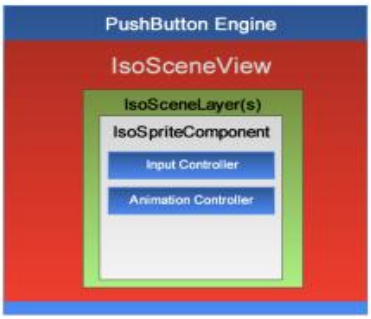

Figure 3. Isometric Component Integration Visual Diagram [6]

Development State

- Players can earn coins of the object which has been owned livelihoods.
- The object of livelihood will produce a coin in a certain time period.
- Every purchase of new objects requires a coin, except for objects of cultural heritage.
- When building a new object, the game will feature a quiz that will give you a few questions relating to the local village.
- Each correct answer from the quiz will increase the level of knowledge.

Final state of the game

- Games will consist of 3 levels of the game, namely level 1, level 2 and level 3.
- Level 1 is the stage when the new game is played.
- Level 2 is the level where the level of knowledge of the user has reached the limit of a certain number of 5.
- Level 3 is the final level where the user reaches the maximum level of knowledge in a game that is 10.
- Any change of level will unlock new objects that were previously locked.

B. Game Architecture

An architectural game can be seen in Figure 5. This architecture consists of five major parts :

1) Game Control

It is the manager of a game in the form of interface that can be used by players in playing the games.

2) Game View

Game View is part of the game architecture, which describes the elements and processes involved in showing the outer layer of a game. Game view consists of:

- **Option Menu** is a menu manager that will access the Audio and Display.
- **Audio** is the element which controls back sound in the game. Audio will take the assets of Game Assets of Music and SFX.
- **Display** is showing the display element in this game. Display consists of the Info Screen, Isometric Object Field, Language, Object Picker, Screen Quiz and Quiz.

3) Game Logic

Game Logic is part of the DayaBaya game architecture that handles the logic in the game. It consists of several elements, namely:

- Game State and Data Structure
  DayaBaya has two states, namely Play and Build state. Play state will arrange games so that users can play this game. Build state will set the game so that players can build new objects that are available.
- Physics is the part which controls the animation and movement of objects.
- Process Manager is the part that regulates the flow of processes in the game to fit scenario.
- Events that are used in DayaBaya is Quiz. Players will gain value for every correct answers to questions.
- Command interpreter is the part that interprets the command that is in the game.
- Score Scheme is part of a set marking scheme in DayaBaya. The counting process that assessed aspects of the game occurred in this section.

4) Game Assets.

Existing assets in this game include object info, database list of questions, music, Isometric Objects, Object icon and SFX.

5) Player Stats Repository

This repository will store user data. The data stored is the username and the final score which will be displayed on the user history.

C. Objects Rich Picture

The objects of the game DayaBaya are grouped into five categories, including landscape, livelihoods, housing, traditional songs, and cultural reserves. The grouping can be seen in Figure 6.

Each object is selected using the object picker and placed on the isometric field, except for the object of traditional songs. The objects of folk songs are used to change the background music. Players can choose a traditional song from a list; however the list of the songs is vary depend on the level and the state of the game.

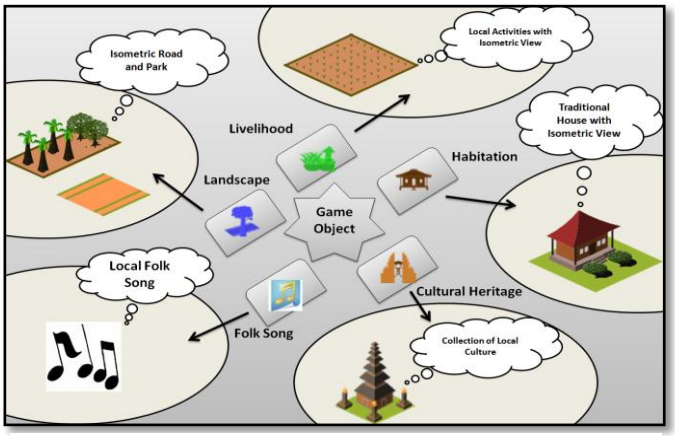

Figure 6. Object Rich Picture

IV. IMPLEMENTATION

Indonesia is one country that has cultural diversity, each region has its own culture that characterizes the region. In developing this game, the selected area is Bali which was chosen because of its rich cultural heritage, natural history, and places of interests most visited by domestic and foreign tourists.

The following are the stages in the development of the game DayaBaya, including:

A. Data Collection

- *Data Classification*
  The data collected is the data of cultural heritage and natural history of Bali. According to the UNESCO, cultural heritage is divided into several groups (these groupings can be seen in Figure 7), while the natural history is divided into several groups (these groupings can be seen in Figure 8).
- *Format Data*
  The data needed in the DayaBaya game is documented in the form of electronic data. The format of these data can be seen in Table 2.
- *Method*
  The data are collected by means of literature studies, interviews with historians and culture, and making observations to several agencies, such as: museums, and tourism services.

Table 2. Format Data

Data Type	Format Data
Audio	.mp3, .midi, .wav
Visual	.png, .jpg, .gif, .pdf, .doc
Audio-Visual	.mpeg, .avi, .mp4

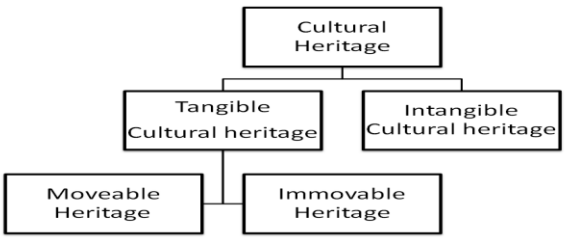

Figure 7. Cultural Heritage Classification [8]

B. The Game Object creation

The object of the game are made by using an editor called Inkscape which is a Open Source vector graphics editor that uses the W3C standard Scalable Vector Graphics (SVG) file format [9]. Inkscape supports many advanced SVG features (markers, clones, alpha blending, etc.). Great care is taken in designing a streamlined interface, and very easy to edit nodes, perform complex path operations [9].

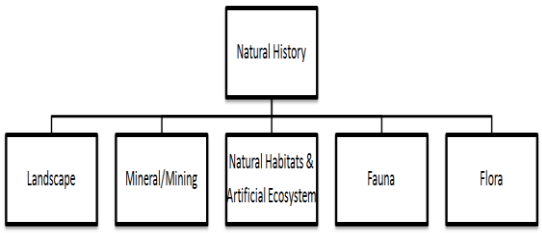

Figure 8. Natural History Classification [8]

C. Component

This game uses components that have been provided by PBE and components independently developed by the author. The components developed by the authors are stored into several directories according to the function of each component. The directories are comprised of:

- Config
- Constructor
- Field
- Object
- Quiz
- Menu
- Utils
- Net

D. Setup

This game is an Internet-based game. For easy access, this game will be installed on the server e-Indonesiana.[1]

V. CONCLUSION

Since Indonesia is one country that has cultural diversity where each region has a culture that characterizes the region, then in developing this game, we selected Bali area as a starting point. Bali was chosen because of its rich cultural heritage, natural history, and the areas that are mostly visited by domestic and foreign tourists. The DayaBaya game is developed in several stages which include:

- Defining the game genre.
- Creating a game design, including the game scenario, and the object of the game determine the engine to make game.
- Collecting data of cultural heritage and natural history of a region, in this case the local data of Bali.
- Creating game objects, objects created consisting of 4 groups, namely landscape, livelihoods, housing, and cultural preservation.
- Creating a new component in the PBE.
- Installing the game on the server.

In our future works, this game will be developed into templates, which can be used by using data of cultural heritage and natural history from other regions. This allows the authors to make culture gaming of other areas in Indonesian.

VI. FUTURE WORK

In future work, the authors will perform an experiment with school's teenagers as targeted users. The experiment will measure effects of the game to user's cultural understanding.

[1] http://e-indonesiana.cs.ui.ac.id

VII. ACKNOWLEDGMENT

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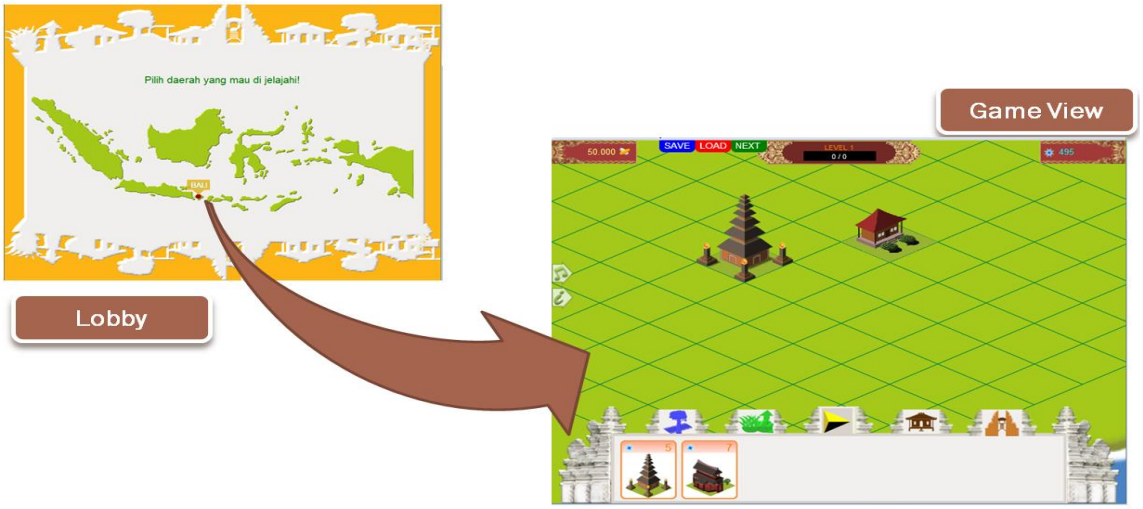

Figure 4. Screenshot of Game Scenario

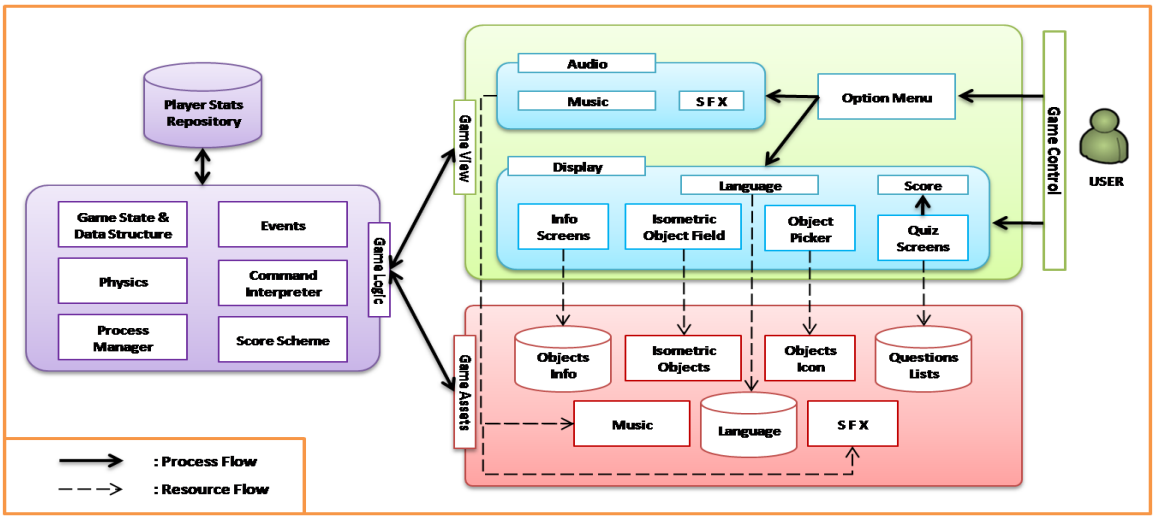

Figure 5. DayaBaya Game Architecture [7]