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FIRESIDE: CREATING AN IMMERSIVE HISTORICAL NARRATIVE THROUGH VIDEO GAMES

APPLIED PROJECT

B.Sc. Computer Science

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2019

ASHESI UNIVERSITY COLLEGE

FIRESIDE: CREATING AN IMMERSIVE HISTORICAL NARRATIVE THROUGH VIDEO GAMES

APPLIED PROJECT

Applied Project submitted to the Department of Computer Science, Ashesi University College in partial fulfilment of the requirements for the award of Bachelor of Science degree in Computer Science

Seyram Tsatsu Kartey

2019

DECLARATION

I hereby declare that this applied project is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:

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Candidate's Name:

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Date:

……..

I hereby declare that preparation and presentation of this applied project were supervised in accordance with the guidelines on supervision of applied project laid down by Ashesi University.

Supervisor's Signature:

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Supervisor's Name:

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Date:

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I would like to express my gratitude to God, first of all, for providing me with the strength this to complete this applied project.

To my supervisor, David Hutchful, whose encouragement and advice helped me undertake this project, I am grateful. I also thank my family for their unfailing support and prayers and also my friend Oluwatobi Adelaja for his support.

Finally I thank Brackeys, Sebastian Lague and Luronry whose youtube tutorials aided me in completing my project.

Abstract

The emergence of educational video games have changed the perspective of many on video games as only an entertainment tool. Video games have been beneficial in improving language skills, reading skills and cognitive abilities of children. The traditional method of teaching and learning history in the classroom has made history boring and unlikeable for students. Although, methods like films and museums attempt to engage the student, they do not fully immerse them. To create an immersive learning experience for students, video games can be used as a technological tool.

This project describes a video game: Fireside, which attempts to create an immersive learning experience for students in junior high schools for learning history.

Key Terms

Action-adventure games, Role-playing games (RPG), Non-Playable Characters (NPC), Nav Mesh Agent, Rigging

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CHAPTER 1: INTRODUCTION

1.1. Introduction

"History is defined as the study of past events, particularly in human affairs" [1]. In Ghana, the most familiar medium of teaching history is in through the formal educational system usually in junior high schools. Unfortunately, this mode of teaching history in the classroom to students is purely theoretical making it very boring for the recipients. According to Thomas Ketchell, "History teaching is still stuck in the dark ages because its outdated context and delivery have children bored with it, especially as they continuously deal with static figures and numbers. History, therefore, is needed to be brought to life and one of the best ways to do that is through technology" [2].

It is, however, important to note that, for history to be brought to life, it must be told as a story that has a flow and deeply impacts the recipient. This is important because "storytelling is used to mimic life and make us feel emotions" [3]. That being said, traditional storytelling media like films, theme parks, historical monuments, and museums attempt teaching history as stories/narratives. Although effective, these methods are limited in that learners are primarily passive observers (meaning, the audience is confined to the reception of information), and therefore they cannot fully immerse themselves in the historical narrative [4].

As such, video games are some of the new technological ways of teaching history to students that will not only spark interest in learning but will also aid in building an immersive historical narrative that can be preserved with future generations.

The Fireside project is, therefore, a third-person action-adventure game that attempts to create an immersive historical narrative tailored mainly for students and teachers and also other historical enthusiasts trying to explore the Ghanaian history and culture.

1.2 Background

History is treated as an in-class educational experience where students are required to sit and be presented with knowledge. They later recall the retained information in examinations. What educationist do not realize about this traditional approach is that it makes the experience boring and does not pique the student's interest in the subject [5]. “Because, history contains many facts, figures, and names that are usually not motivating to memorize for most people"[6].

Greg Milo argues that content is undoubtedly important when learning history, however, teaching this subject has placed so much emphasis on content that it has placed too much importance on memorizing the content and the facts than the story[6]. Due to this, students are unable to engage fully in this subject because they are unable to identify the value of the lessons taught in the classroom to their lives. Therefore, the aim of African History studies should not be just to test the cognitive skill of the student but to tell the African story.

Also, according to John Fielding, the effective way to evoke the student's interest in history is by immersing them in the lessons. Through this, they can learn history through involvement [7]. Many Strategies exist that provide an immersive learning experience, although very useful, they are limited in various ways. The overarching limitation of these strategies is that the audience are treated as passive observers.

Films and Documentaries – Films and documentaries are a great way to stimulate the learning experience of students in the classroom, and especially in the history class, they are one of the most commonly used methods. Documentaries, however, are also like teaching because the audience is introduced to a narrator although there are cinematic scenes that represent historical accuracies. Also, “if students are not engaged in some questioning of the experience, films become an uncertain way of determining the effectiveness of learning” [7].

History Museums – History museums are also another good method of teaching although some of the information is scaled down; thus not every piece of history is captured in a museum.

Renaissance Fairs – Renaissance fairs are weekend festivals that are publicly available and attempts to recreate historical settings for the pleasure of the guests. This method is a more engaging experience for a learner but is unfortunately once/twice a year.

Learning history therefore requires a fresher perspective methods to engage students on the history learning experience. Educational video games can provide a more immersive, enjoyable and efficient way of significantly improving learning and retention [8]. The immersive approach should aim to emotionally involve the player through the interactions, the storytelling, the characters, the motivation to play, the decisions and flow that are included in the game [9].

1.3. Related Work

Introduction

Although many may consider video games as an entertainment tool, many researchers have analyzed the importance of games in teaching and learning. The emergence of educational video games to the commercial market has begun to receive positive reception by parents and educational experts because of the confirmed the positive impact that video games have had on adolescent social and cognitive growth as well as the positive effect on academics [10].

Statistical research performed by Dr. Richard Blunt on the effectiveness of game-based learning proved that video games increase the cognitive ability of students. The result showed that a significantly higher number of students (about 80%) that used simulation video games to learn a course received letter “A” grades as compared to students (about 40%) who did not use this approach [11]. (Does game based learning work).

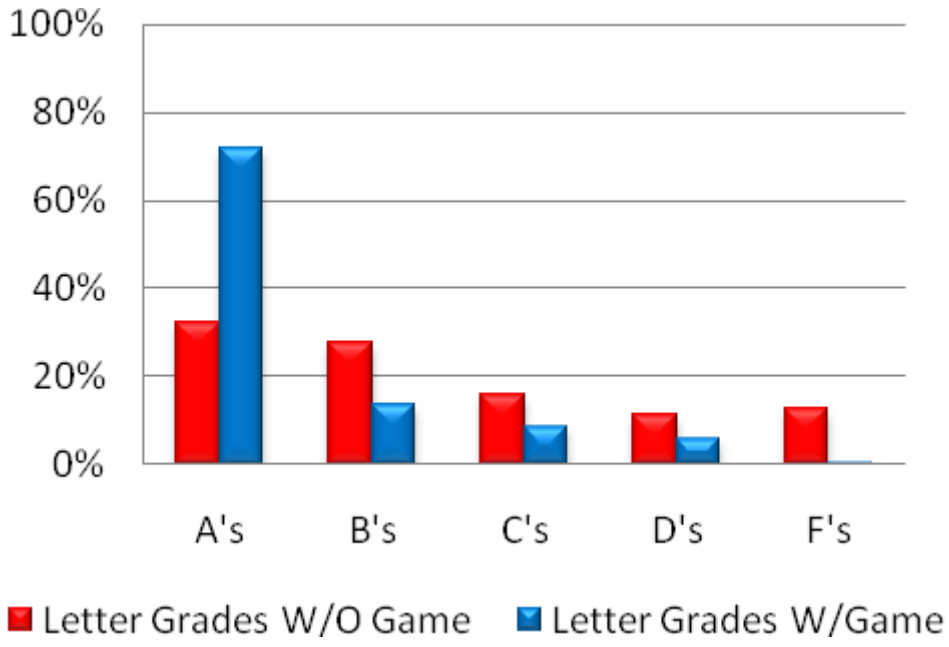


Fig 1.1: Study 1 Distribution of Letter Grades [11]

The benefits of educational games goes beyond academia as it extends to improving other areas like language, social and reading skills in adolescents. Video games are the more preferable approach of learning for children especially as it engages the children more in learning experiences [12].

An interview with a French tutor in Ashesi University who uses games in the classroom to aid language learning described how using games in class improved student learning and excitement for learning French. She compared it to her previous school which used the traditional method of teaching, indicating that she observed an improvement in the student's ability to speak French in Ashesi because they were more engaged and excited to learn because of the games. Video games are definitely a more engaging way to teach history and many games have attempted to make this possible

The fireside project takes its inspiration from other video games that apply certain historical narratives and accuracy in their gameplay as an educational tool or a reference to real-world history. Some of these games are:

1.3.1. The Assassin's Creed Franchise

The assassin's creed games are third-person action-adventure video games usually set in different historical timelines and locations ranging from the Rome to the France [13]. The player navigates this world as an assassin belonging to the Assassin Brotherhood and must protect the world and its freedom from a group of villains called the Templars who seek to control and manipulate the world using special artifacts called the pieces of Eden. As the game progresses, the player has the opportunity to meet and interact with real historical figures like George Washington, Leonardo DaVinci, Niccolo Machiavelli, Benjamin Franklin and more.

This third person view provides the player with a free range of view and also easy interaction and learning from the playable world. However the main focus of the game is not historical; the characters have their objectives which do not necessarily affect how history unfolds. Therefore the role of the character is not backed by historical evidence

1.3.2. Call of Duty (World War 2)

Call of Duty World War 2 is a first-person shooter game set in the second European theatre of the Second World War [14]. The player controls an American soldier who leads a squad that can supply health, ammunition and extra firepower at will or by instruction in the battle against German Nazi soldiers. The first person perspective prevents the player from seeing his character but can see what the character sees. The player's range of view is limited to a rotation of the player's camera/field of vision and can only interact with the character sees. The historical setting is set in the real-world European theatre, which includes the clothing, weapons, and buildings that existed during that period. The game also includes finding health packs or the aid of teammates to heal or replenish ammo unlike the previous call of duty games where health and automatically replenished.

The first person perspective combined with the historical realism of the game immerses the player in the game with a sense of game inclusion where although the player knows he is playing a fictional character, the player also feels he exists as part of the game since his view only rotates as the controlled character rotates. Unlike Assassin's Creed, this games' focus is essentially historical such that, the character controlled partakes and has his objective is affected by real-world events extracted from a historical timeline.

1.3.3. Mission U.S

Mission U.S is a free online interactive adventure role-playing game design with the sole purpose of teaching the history of America [15]. There are five separate missions where the player takes the role of individual characters. Similar to the call of duty games, the characters are fictional representations of historical individuals. The sole aim of this game is to educate. As a result, the player can only interact with diverse historical figures and also make decisions that change the characters outcomes however these decisions do not affect real-world history. The character's actions and abilities are grounded in reality, and the player learns what the game presents as it progresses.

The game gives the player control of the characters choices only, unlike Call of Duty and Assassin's Creed which give the player control of the characters movement, combat, and choices

1.4. The Proposed Solution - The Fireside

The fireside is a third-person action-adventure video game based on the historical events of the 1900/1901 (Yaa Asantewaa) war against the British that occurred in Ghana formerly known as Gold Coast. This game aims to provide users with an immersive and educative historical narrative through gaming experience on this iconic moment in Ghanaian history. Although the game focuses on the Yaa Asantewaa story, the user, however, does not

play as Yaa Asantewaa but rather as an unknown character that acts as a close aide to Yaa Asantewaa. The players play as this character who instead of directly influence historical events, observes these events taking place since he is a close figure to Yaa Asantewaa, also, this character has his abilities and roles that help the narrative progress.

1.5. The 1900/1901 War in Gold Coast

Research performed by Margaret Achiama outlines the Yaa Asantewaa storyline [16].

In the year 1896, the Asantehene, Nana Prempeh I was arrested and exiled to Seychelles by the British as an attempt to obtain control over the proud Asante warrior nation. But the Asantes were resilient and had been at war with the British for many decades preluding to Prempeh's exile. Following, this event, Nana Yaa Asantewaa, the mother of Nana Prempeh I and the queen mother of Ejisu became ruler of the Asante nation.

The Asantes believed that their discipline would allow the British return their King but steadily grew impatient when the British delayed his return and the war levies (50,000 ounces of gold per year) imposed on them dented their financial stability. However in 1900, Sir Frederick Hodgson, the current governer, arrogantly demanded to sit on the Golden Stool twice to exert his authority.

The Golden Stool was a divine symbol of ancestral worship for the Asantes and was greatly revered even above the Asantehene. Angered by this, Yaa Asantewaa who rallied the Asante men to defend the honor of the state and protect the Golden Stool. The Asantes laid siege to the Kumasi Fort (The British stronghold), but the British managed to rally reinforcements and ambushed and defeat the Asante forces, Yaa Asantewaa was captured and exiled to Seychelles, and the war ended in 1901. But this event created a series of chain events that eventually led to Ghana's independence in 1957.

1.6. Objectives

The main aim of the fireside project is to develop a user-friendly computer game accessible to students and teachers learning history. The objectives of the project are:

- To provide an immersive experience while learning the history
- To provide an accurate historical narrative and representation of the Yaa Asantewaa war
- To increase interest in Ghanaian history and learning

1.7. Outline of the Paper

There are six chapters in this paper. The first chapter introduces and sheds details on the project. It covers the related work, objective and the proposed solution. The second chapter covers the requirements of the application; the third chapter details the architecture and design used in this project. The fourth chapter talks about the implementation. Chapter five explains how the system was tested and the results obtained, and the paper concludes in chapter six.

CHAPTER 2: Requirements

This chapter provides a detailed outline of the Fireside Game, its features, system requirements, and applications. It explains who the users of the application are and how the requirements suit their needs.

2.1. Requirements Gathering

According to MacCallum-Stewart and Parsler, a historical game is one that references a historical landmark accurately. It "has to begin at a clear point in real-world history and that history has to have a manifest effect on the nature of the game experience" [17]. The player's experience should be shaped by the historical accuracy of the game. Also stories are important to people and good stories inspire them. A good story increases the interest of a player and is a necessity in keeping a user engaged. The stories must be interwoven with gameplay experience else the player will become bored. For historical games, key events in that history should influence the stories [18]. The fireside game therefore has to adhere to this gameplay requirements to be considered a good historical video game.

2.2 Users

The application is intended for a two group of users:

1. Students in junior high schools who have difficulty grasping historical content taught in classrooms and are looking for a way to understand and easily remember classroom lessons through gameplay interaction.
2. African history enthusiast looking to explore deeper content on African history but have limited access to African historical resources

2.3 Requirements

2.3.1 Functional requirements

i. Immersion: The player should be able to engage with the game through movement, and interacting with the game world and important non-playable characters (like Yaa Asantewaa). This interaction with the game world and game system, coupled with the historical storytelling should create an experience that impacts the emotions and learning of the player.

ii. Historical Accuracy: The game should depict a level of historical accuracy in the game design in areas such as the terrains (Elmina, Ashanti Region, and Kumasi Fort) and the characters (Yaa Asantewaa, British soldiers, Ashanti generals)

iii. Historical Stories/Narrative: The game should represent the historical narrative of the Ashanti 1900/01 war accurately. Indicating the causes and effects and the roles and motivations of each character in the story

iv. Quests: Aside from the main story, separate quests should exist within the game that enhances the game's story or reveals certain relevant information about the game's history. The quests are separated into two categories; these are the story quests and the side quests.

    a. Story Quests: The story quests contain missions that enhance the gameplay of the main story. These are compulsory quests that form part of the main story but are only assigned to the main character by certain relevant characters in the game.

    b. Side Quests: The side quests, although similar to the story quest, are differentiated through the implementation of the feedback learning. The side quests simply provide historical information to the player.

v. Feedback Learning: The game should provide the player with simple objective quizzes to help them remember some of the historical information acquired through the side quests. However, if the user gets an answer wrong, the gameplay should continue to a

certain point in the game where it fails the user because of the wrong answer from the previous quests.

For example, a side mission to find out the name of the new British governor should have a correct answer of Sir Frederick Hodgson chosen but if the user chooses a wrong answer, like Sir Garnet Wolsely, the game should fail because of that wrong answer. But when the right answer is chosen, the game should continue. This will ensure that the player pays attention to information passed out during the game. However, not all side quests will enforce the feedback learning module. So as not to make the game repetitive and annoying to the user. The quizzes for side quests should, therefore, be historically accurate to introduce some level of difficulty for the player.

2.3.2 Non-Functional requirements

i. Playability: The player should find the controls easy to learn and remember even after long periods away from the game.

ii. Deployment: The final build of the game should be available for free download for Microsoft Windows platforms.

iii. Stability: The final build of the game should run smoothly on all laptops and should not crash consistently. If it crashes, it should be as a result of the game's bad designs but as a result of the devices specifications.

2.4 Use Case Model

After a user installs the game on their game and runs it. They can start a new game or load a previously saved game progress from the main menu. Starting a new game will begin a new game story where the user has access to the main story and other quests, like the side quests and the story quests. Since the side quest implements the feedback learning, the answers chosen by the user will determine the continuation of the game. The story quests however help

the user continue the story and do not require short and simple quizzes from the feedback learning. The user should also have the ability to save the game and exit at will.

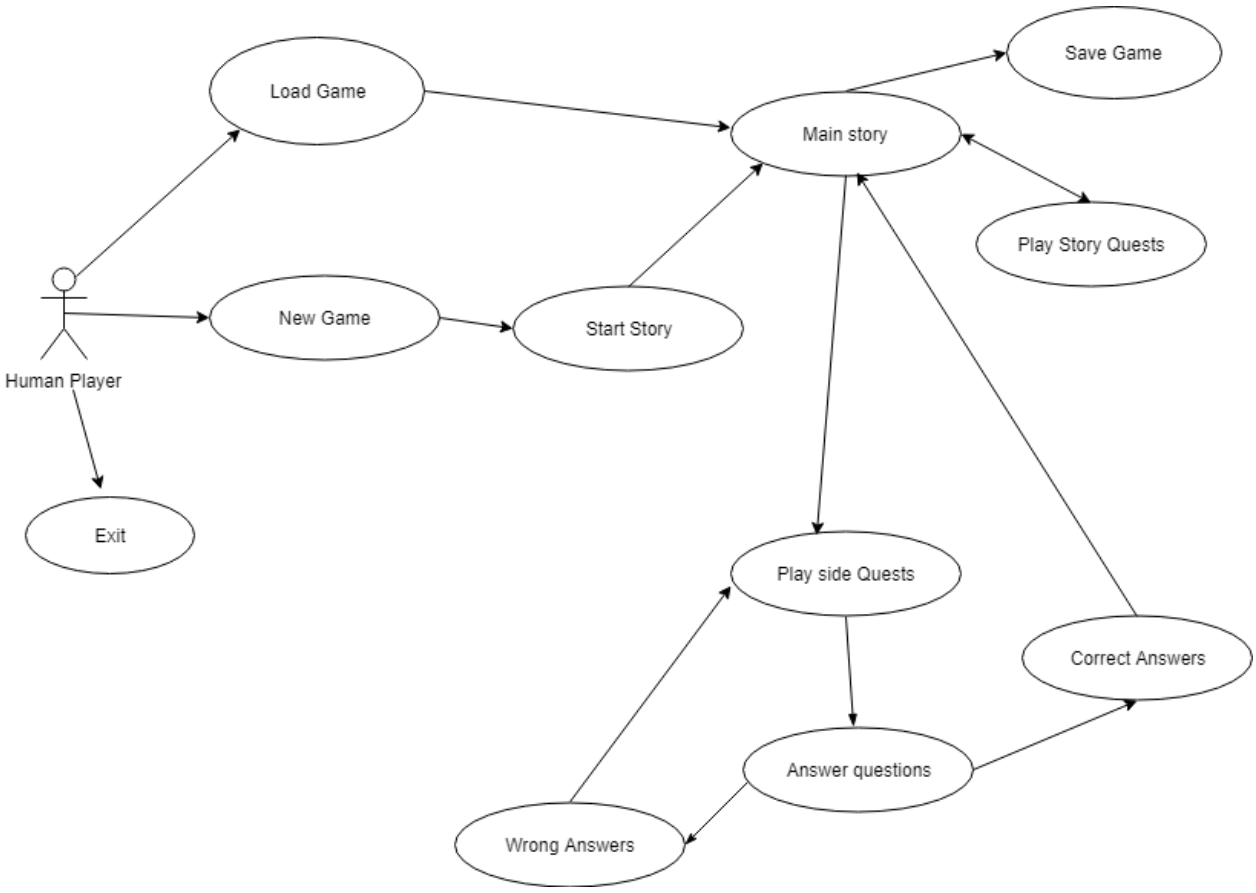


Fig 2.1 Use case diagram indicating how the user plays the game

CHAPTER 3: Architecture and Design

This chapter provides a detailed outline of the different architecture going to be used in the game and a breakdown of how these architectures apply to the making of the game.

3.1. Model View Controller (MVC) Architecture

The Model View Controller (MVC) architecture is used to represent the game structure because it adjusts for independent modifications to the project that does not affect the other components and overall structure of the game.

The View component handles the visual representation of the game on the screen; this includes all the characters, world renderer and other historically accurate locations in the game. The Model component manages the game objects that hold and sets the necessary game variables such as enemy life, user life, attack systems, location details, game data, and progress, etc. Finally the controller component acts as a bridge between the view and model component with the function of sending messages back and forth between the two components. It consists of the player input processing, like mouse clicks, player movement, attacks and interactions with the game.

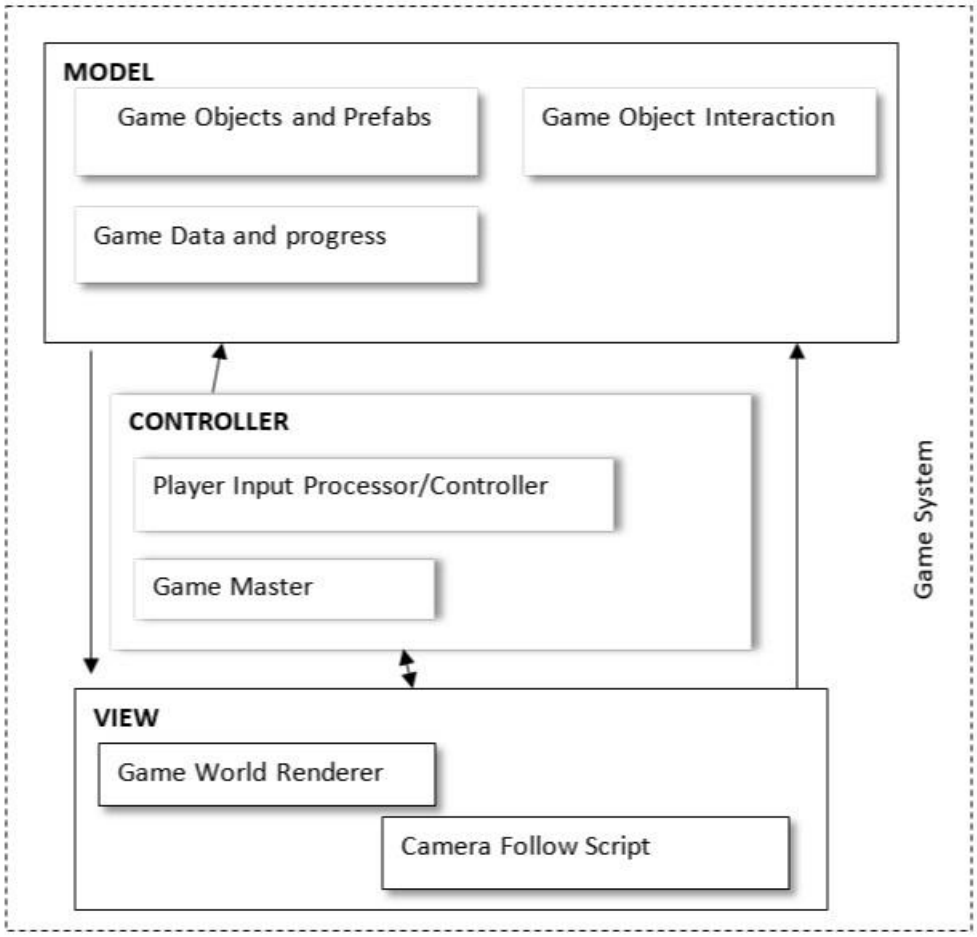


Figure 3.1 Model view controller architecture showing how each independent game components interact with each other

3.2 Entity Component System Architecture

The entity component system (ECS) is an architecture mostly used in game development. Simply put, it is a way of organizing data normally used in games [19]. The core of the system are the entities and each entity has features called components. The components may be common across different entities. Unity uses the ECS architecture to define games developed in the engine. The entities are the game objects that are created and used in the game (e.g. player characters, enemies, weapons, etc.) and are usually tagged with unique IDs. The components are the mono behaviour (In Unity) classes attached to the game objects and contain the data of each game object, indicating how it interacts with the world.

The mono behaviour components are object oriented programming (OOP) classes that carry data and functionality of the class so the system is a box of components and each time a component is created, it is stored in the heap memory of the system where the game objects can access this data from. For this game, the game objects are the player, enemies, weapons, terrain objects (like trees, water, etc.). The components are the movement, attack systems, health bar, textures, key input, position etc.

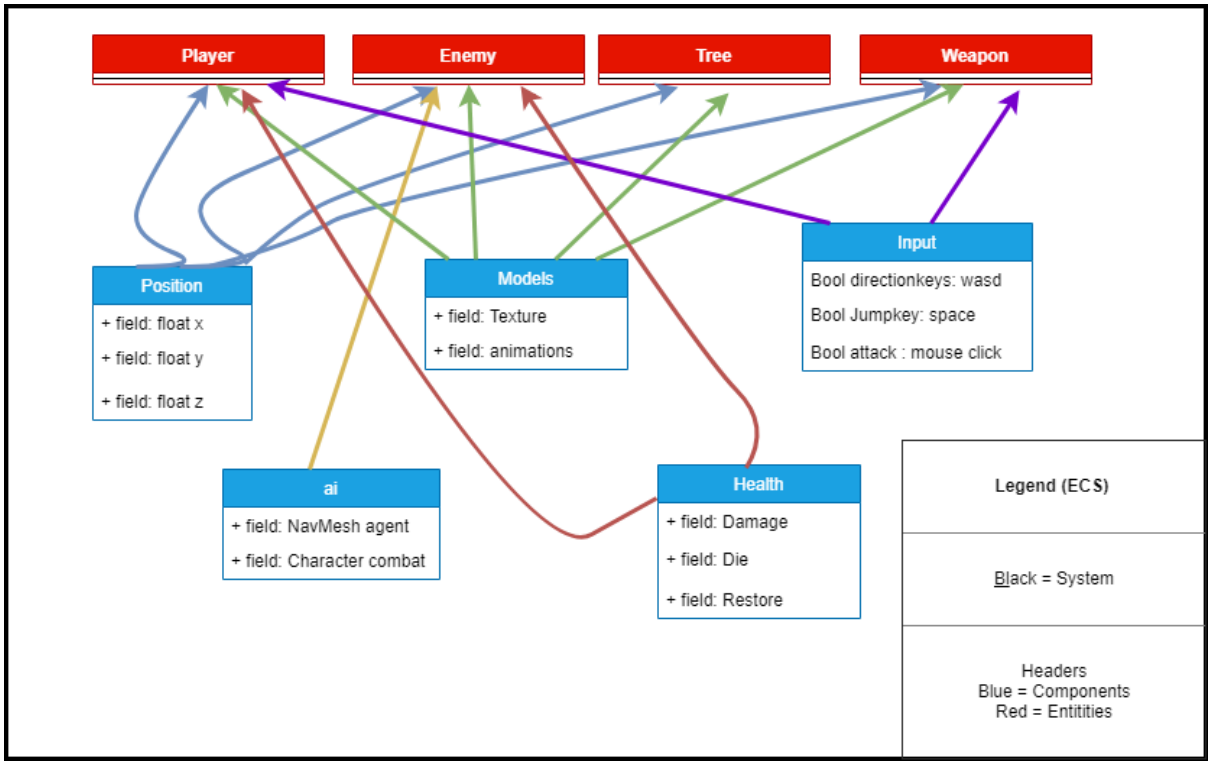


Figure 3.2 Entity Component System architecture showing how each game object can use general purpose components stored in the system

Chapter 4: Implementation

This chapter details the system, frameworks and tools used in the development of the fireside game. The chapter explains the importance of each tool to the completion and functionality of the game.

4.1 Platform

The game was developed for Microsoft Windows supporting personal computers. This is because computers have better processing for the graphics and historical detail of the game and also because it is the most widely available platform in schools.

4.2 The Game Development Process

The game development process is a systematic approach that usually requires teams of experts and years to complete. Indie games are games that are created by individual or small teams of developers that rely on alternative distribution centres as compared to bigger game developments companies that have a secure publishing channel. The fireside game can therefore be considered as an indie game.

4.2.1 The Idea

The idea stage is the intended design and benefits of the game. Originality is a key factor in ideating as it helps set the game apart from other games. The idea of a game considers the plot and world in which the game can exist (fantasy or real). The genre of the game is also determined through the development of the story, like a Single-player action-adventure third-person game, or a sports game.

4.2.2 Storyboarding

A storyboard is “a sequence of drawings, typically with some directions and dialogue, representing the shots planned for a film or television production” [1]. In video games, the

storyboards are usually used for brainstorming but, they can also be used to depict a game's story as shown below in fig 4.1. These images were downloaded from google.com and joined together to create the story of the 1900 war

Fig 4.1. Storyboard part 1 describing the 1900 war

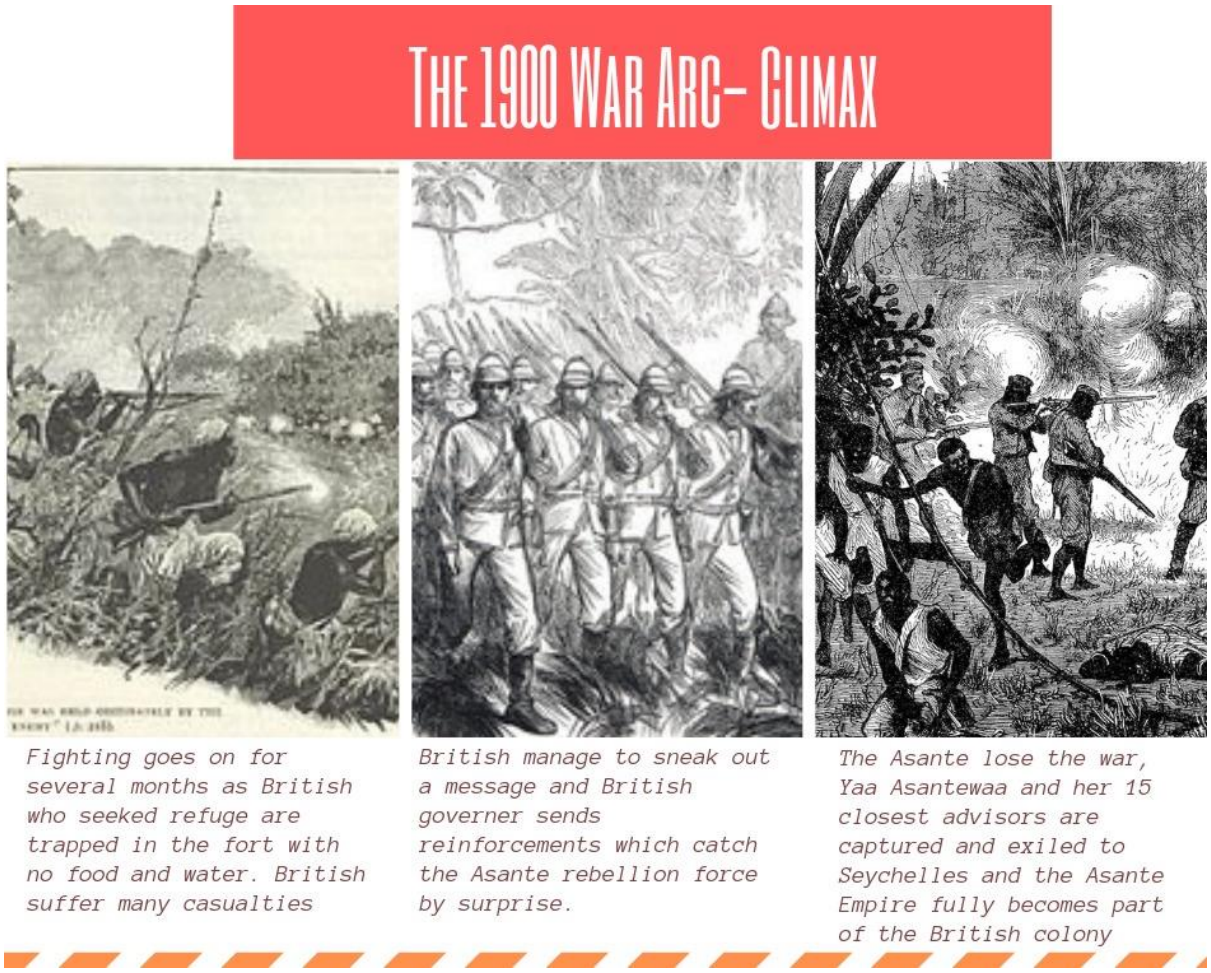
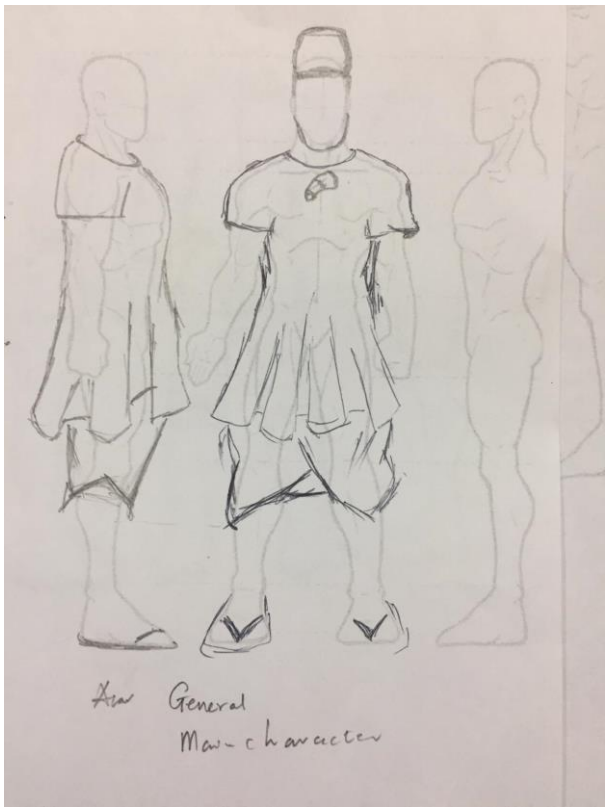


Fig 4.2. Storyboard part 2 describing the 1900 war's climax

4.2.3 Concept Art

"A concept art is an appearance of illustration used to express the visual demonstration of a temper for use in films, video games, animations etc. to visualize the conceptual through before the final product." [20]. The concept art for these characters were researched and drawn by hand to be imported in the 3D modelling application.



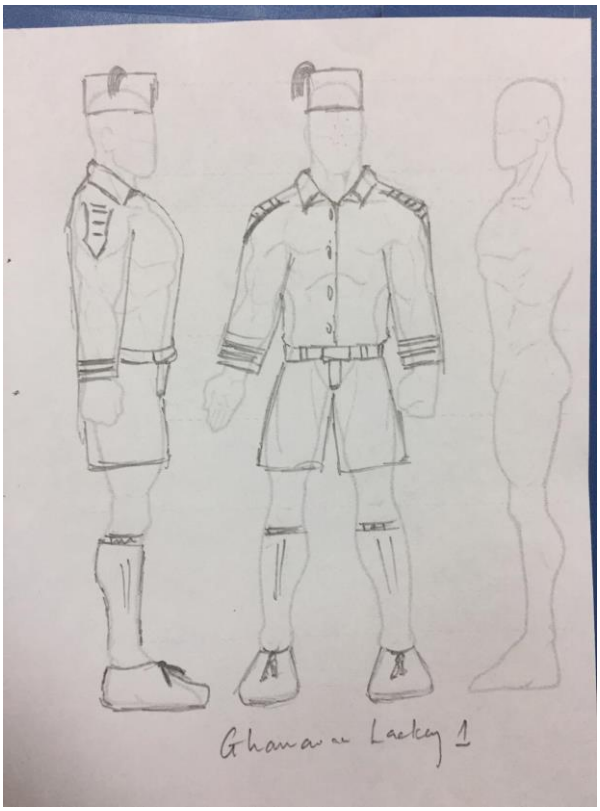


Fig 4.3. Main Character: Asante General *Fig 4.4. NPC: Enemy lackeys*

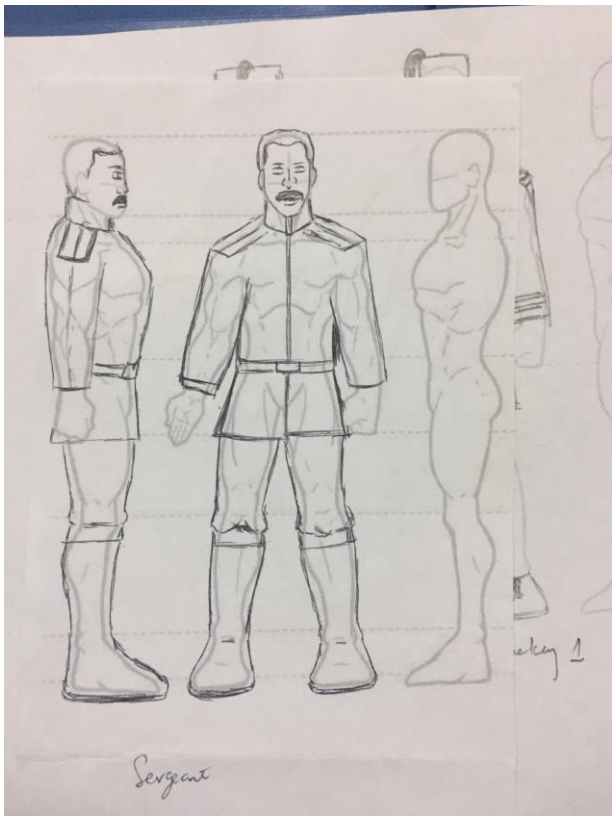


Fig 4.5. British Governor (Frederick Hodgson)

Fig 4.6: Ghanaian soldiers under the British protection in 1900 via Pinterest (https://www.pinterest.com/pin/550916966893903624/?lp=true)

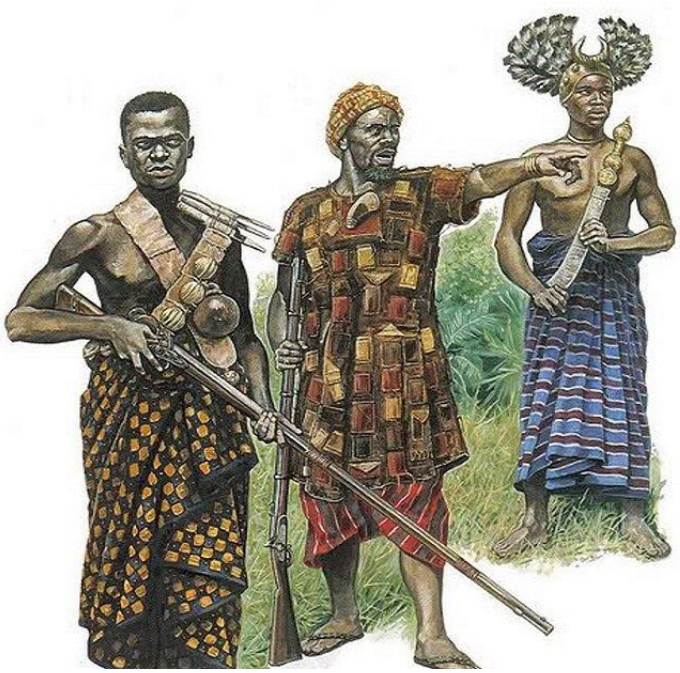


Fig 4.7: Asante warriors, from left to right: The gunman, the general and the sword bearer via Pinterest (https://www.pinterest.com/pin/547046685961833627/?lp=true)

Fig 4.8: British soldiers

Fig 4.9: Coomasie Fort in 1900 via hippostcard (https://www.hippostcard.com/listing/coomassie-ashanti-region-kumasi-the-fort-ghana-real-photo-postcard/19554977)

4.2.4 3D Modelling

3D Modelling involves designing and transforming the concept art into game objects that can be played or interacted with inside the game. Model designs can range from the terrain design, building designs to the character designs. 3D models are created using applications like Autodesk, Sketchup, Blender and Cinema4D. Most Game Companies use 3d applications for realistic face capture. This project uses blender as its primary 3D modelling application. This process takes the longest in the game development process because it first involves importing the concept art into the applications, followed by downloading a human template and aligning it with the concept art in the background. The next stage involves modelling the clothes on the human template, this is done by taking parts of the template, duplicating it and then separating it from the actual body. The design of the cloth is shaped using the concept art in the background. The separated cloth is now sculptured to look like a cloth. The model is then rigged to make it humanoid and allow animations to play in the human template. The rig is

then bonded to the body and then weight painting is used to correct the rig influence on the model that are not desirable.

4.2.5 Scripting

Scripting is using code to create functionality and allow the player have control of the game. Programming languages often differ based on the game engine used. For example, Unreal uses C++ as its primary language while Unity game engine uses C# or JavaScript.

4.2.6 Animating

Animating is giving the game objects lifelike qualities, like walking, running, jumping etc. Also animating is creating cut scenes that describes the game story.

4.2.7 Testing

Testing is experimenting on the game to determine bugs and access if it is ready for exporting. Testing in game development is usually test driven to ensure that bugs are identified in the individual modules at earlier stages.

4.2.8 Exporting

This is the process of compiling all the modules of the system and converting it into an executable file that can be downloaded by the intended user

4.3 Game Design/Rendering

The game's world design is reminiscent of the 1900 Gold Coast Ashanti and British Empire and as such all the buildings, landscapes and other game objects needed to be as historically accurate as possible. All game design and game development actions were performed in unity 5.5

4.3.1 Unity and unity engine library

Unity is a cross-platform game development engine that provides users with the ability to develop high-quality 2-Dimensional (2D) or 3-Dimensional (3D) games using free game design tools like terrain builders and free game assets that make game designing easier for the developer. The unity game engine library contains components and classes that help the developer create game objects that are controllable using scripts. Choosing unity was because it was a free development game engine and the learning curve was less steep when compared to other game engines like unreal. Also unity allows imports from Blender and Mixamo which will be discussed further below. For this game, unity was used to create three separate terrains, which are: The Ashanti Empire, The British Empire and the Coomasie (Kumasi) fort. Unity was also used to import general assets like real sky, trees, terrain textures and models that made the world design look realistic. Unity was also used for the game scenes and the playable aspects of the game.

4.3.2 Blender

Blender is a free, open-source 3D graphics software that can be used for creating 3D models and animations for the 3D models. Blender was used to model the historical characters and buildings placed in the game. The characters are, Yaa Asantewaa, Sir Frederick Hodgson (Gold Coast Governor), British Lackeys (Gameplay enemies) and the main Character (an Ashanti general). The main character was also animated using blender in order to make his gameplay animations like walking and attacking unique to the other characters. However other characters were animated using mixamo. The castle and fort building models were downloaded online due to time constraints.

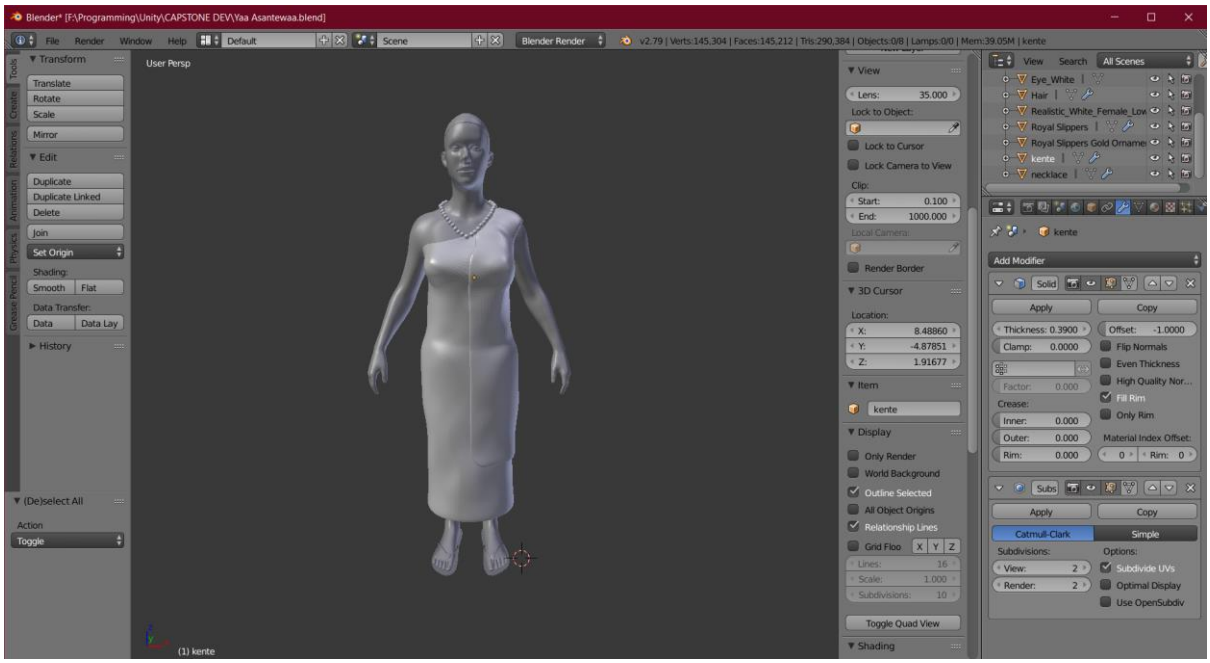


Fig 4.6 : Yaa Asantewaa model in Blender

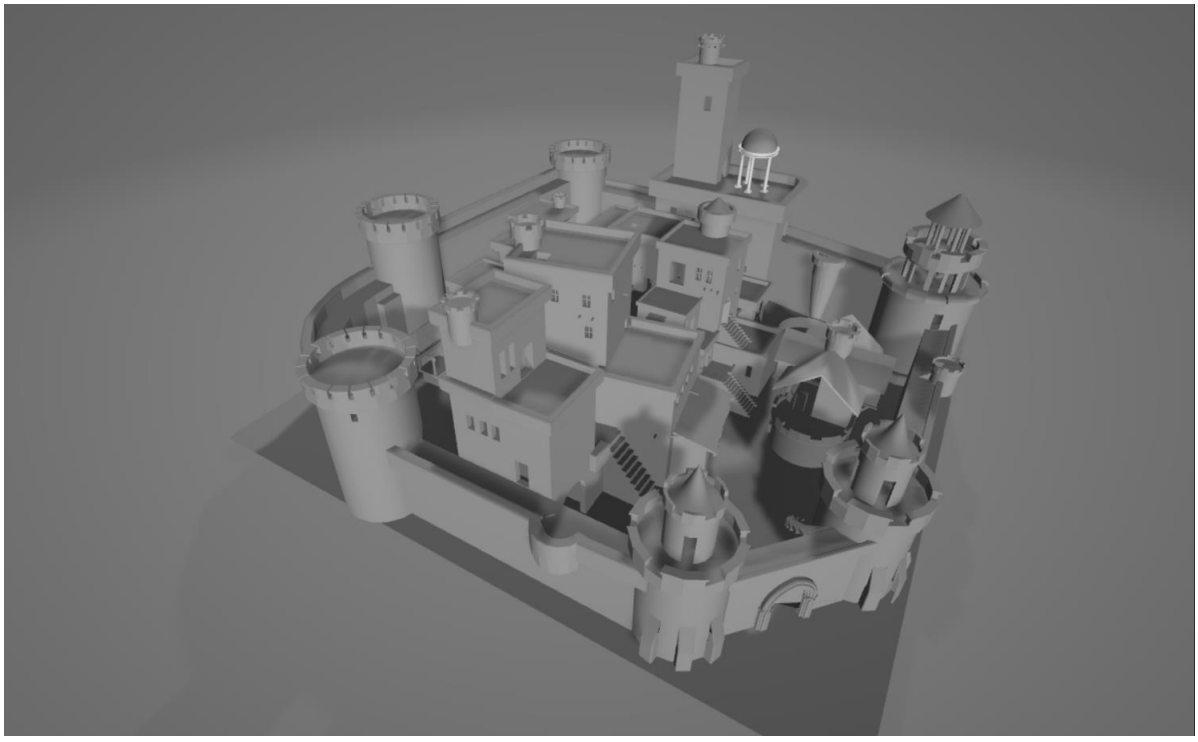


Fig 4.7 : Elmina caste model, downloaded from https://www.cgtrader.com/free-3d-models/castle

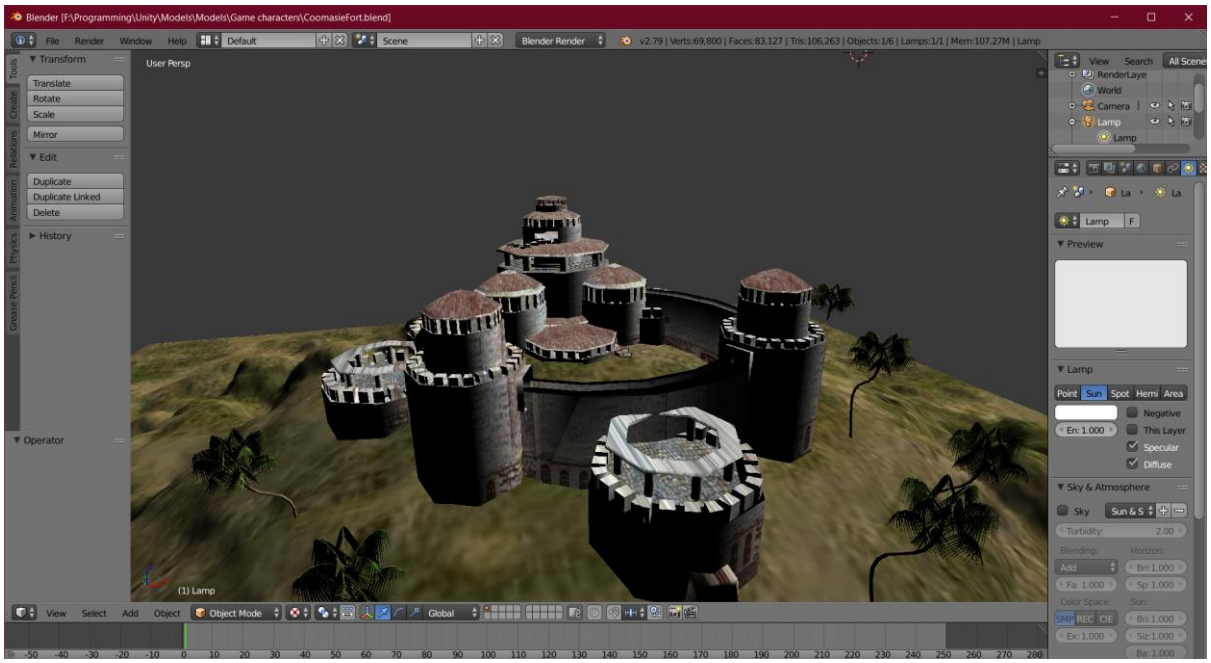


Fig 4.6 : Kumasi Fort model, downloaded from https://free3d.com/3d-models/castle

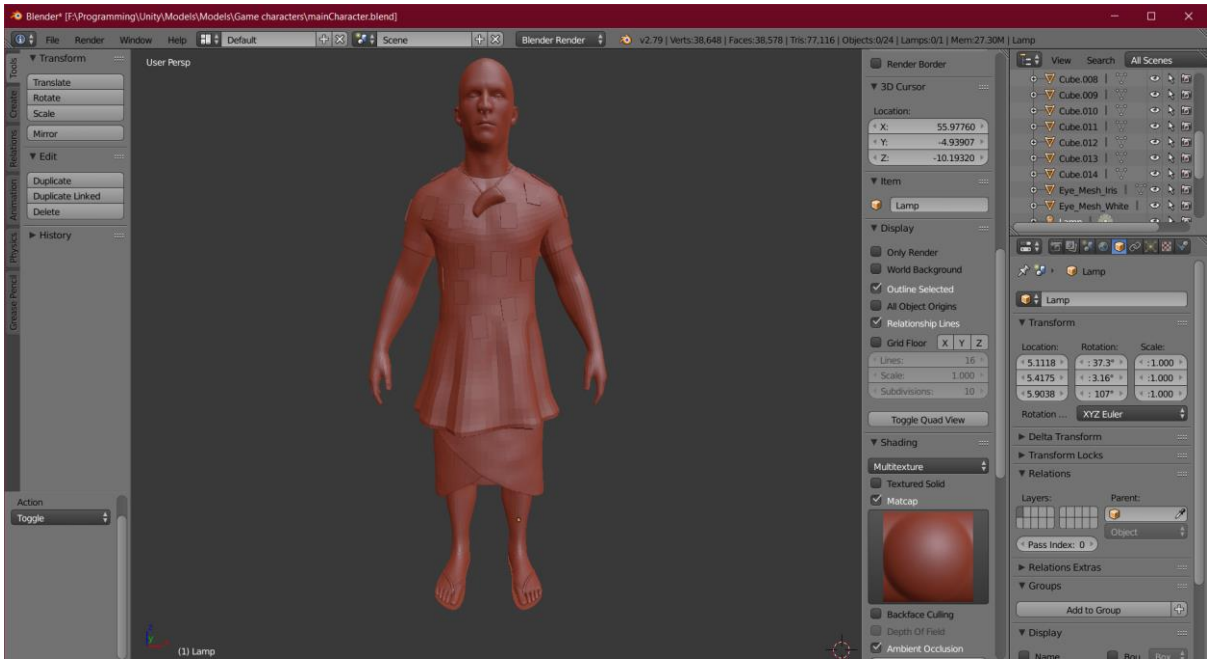


Fig 4.7: Main Character

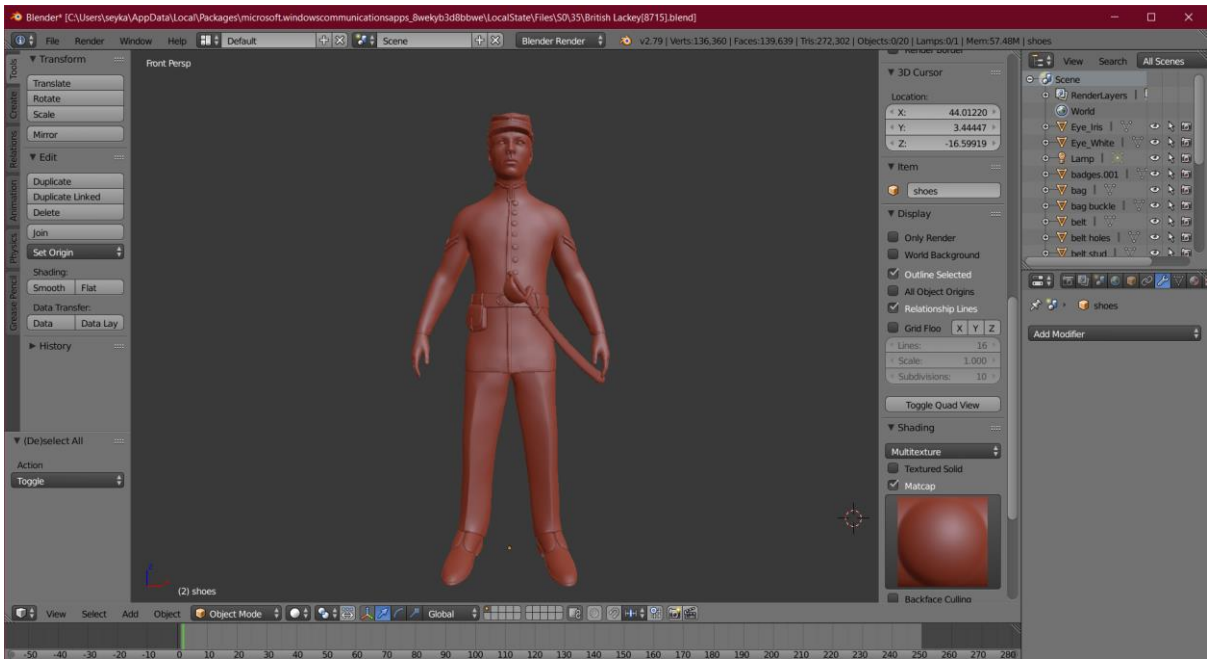


Fig 4.8: British Enemy

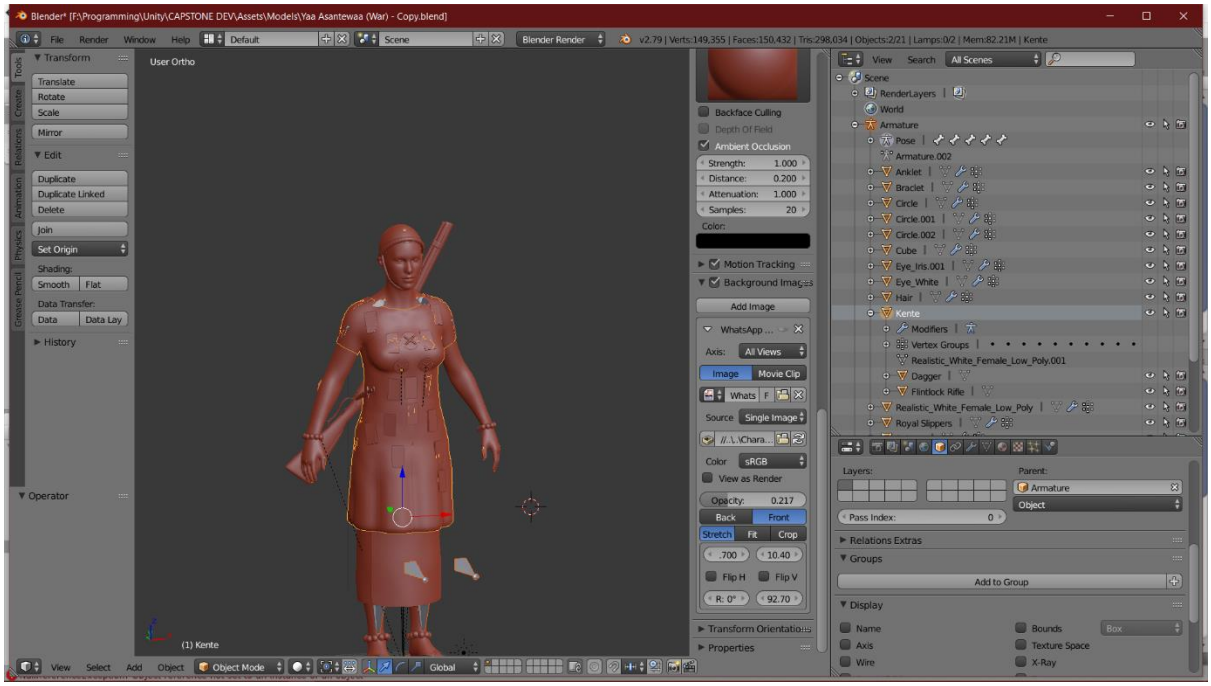


Fig 4.9: War version Yaa Asamtewaa

4.3.3 Mixamo

Mixamo is a 3D web-based service that provides 3D character animations. Some of these animations are free or can be paid for. These animations were downloaded and used for general characters like the enemy movements.

4.3.4 Procedural Texturing and UV unwrapping/mapping – Unity

Procedural texturing is using mathematical description and algorithms to create a texture. UV unwrapping is projecting a 2D image to a 3D model's surface for texture mapping. These were necessary in the game to make the characters look realistic and importing certain African textures that could not be generated in blender or from the basic material components in unity. For example, Textures like the kente and the skin tones of the models were generated in unity.

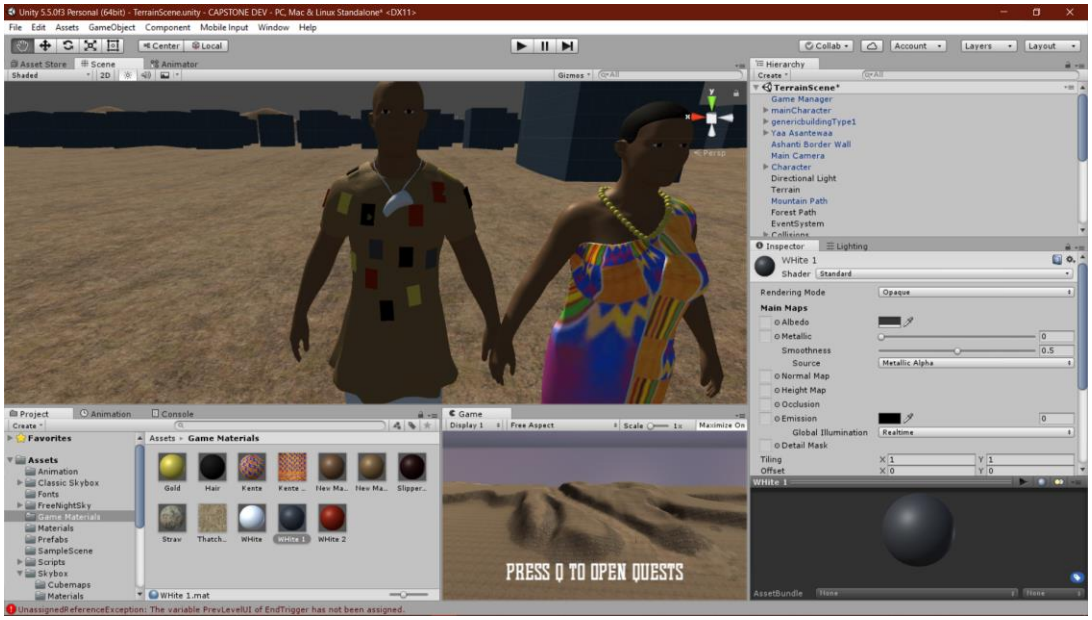


Fig 4.10: Procedural texturing technique applied in unity engine

4.4 Language Used – C#

C# is an object-oriented and component-oriented programming language. The decision to use C# was because it was the pogramming language that was compatible for the Unity game engine.

Chapter 5: Testing and Results

This section shows the way the entire system will be tested to access if it passes its requirements and fulfils its objectives.

5.1 Testing Overview

As indicated in the entity component diagram in figure 3.2, the fireside game consists of different components that affect the game entities therefore, each component needed to be tested appropriately. The game was therefore be component tested, system tested and finally user tested to confirm that the game meets it set requirements

The effect of the system on the user was tested in 3 separate ways, with 3 different user groups. This was a comparison testing consisting of students that learnt the history of Yaa Asantewaa using the academic resources (textbooks and teaching content) provided in class, students that learnt this history using storyboards that detailed the events of the Yaa Asantewaa War and also students that will learnt the historical narrative by playing the video game. The aim of the test was not to necessarily gauge their cognitive skills but their narrative capabilities.

5.2 Component Testing

The main components of the game were tested and any bugs identified were fixed. These main components were the game objects position, the enemy NPC's AI, Input, Health and Models. However, these components could only observed properly when applied to entities, as such some of the errors developed in the components were because compatibility issues with the other components.

5.2.1 Enemy NPC's AI

The role of the NPC was to approach and begin to attack the main character when his position was in their field of vision, however due to the integration of the model animations

and Nav Mesh Agent in the AI, some of the animations produced gameplay errors which could not be fixed due to time constraints. During the walk animation, the NPC returned to a specific position on the terrain after the walk animation had played even though it was supposed to follow the player. In some cases, the walk animation did not play at all, giving the NPC a sliding effect. Since this could not be fixed, the walk animation was temporarily removed from the game

5.2.2 Health

To test this component, an initial simple test was conducted to determine if the player could die if their health statistics reduced from 100, by pressing T, the player's health reduced by 10 until 0 and then a death animation played to indicate that the player had died. Further test were conducted to determine if the player could die from enemy attacks. Once the player was within the enemy's attack area, the enemy attacked the player and as the player received damage, their health stats gradually reduced till they died. The only way to stop receiving damage was to exit the enemy's attack area and field of view.

5.2.3 Input

This component was mainly tested on the main character since. Player input like movement, attack and interactions were tested using the default assigned key maps. The input maps tested were; W and S for moving forward and backward, A and D for moving sideways, Q and E for opening quests and feedback quizzes respectively and Mouse button clicks and control for attacks and camera rotation.

5.2.4 Models and Position

The models and position of game objects were tested together because each object in the game needed to have a position on the terrain. Some unfixable errors were observed from this test. The vertical y-position of some enemy models either went below 0 or above 10 during

gameplay. This means that, they either sunk into the terrain or were floating in the air. Because the error did not occur with other models, they are suspected to be a modelling issue. To fix this, some of the models were position inside the terrain or slightly above the terrain to ensure that their y-positions on the terrain were 0. However this is bad design but cannot be fixed due to time constraints.

5.3. System Testing

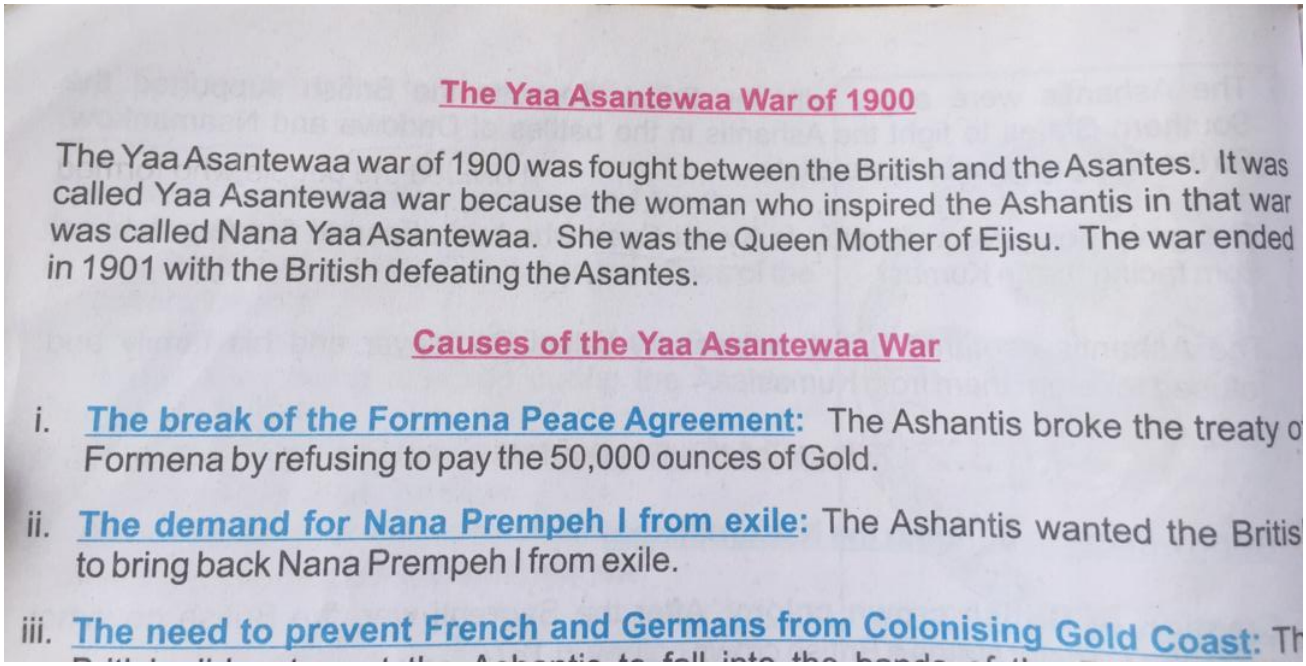
In the system testing, all the separate components were integrated and tested on their interaction with the game world. The game run smoothly at runtime. The character was able to interact with other characters like Yaa Asantewaa and the enemies in the game and was also able to select answers from the feedback learning module. The character was also able to transition between terrains and was able to start a new game from the main menu.

5.4. User Testing

This process involved testing the game with the intended users to access if the game was able to meet its immersion requirement as well as the ability of the user to narrate the historical narrative. Comparison tests were also performed using the traditional method of learning using the junior high school social studies text book and the storyboard (Fig 4.1 and Fig 4.2). Each user group tested was tested independently of the other in order to not truncate the results or receive bias answers. Also to ensure that students did not rote memorize, the students were not told that they would be tested on their narrative capability.

5.4.1 Traditional Method of Testing

A group of 10 students from Ashesi University were tested using the Flamingo Social Studies Textbook used in Junior High schools and asked to describe the story of the Yaa Asantewaa War [21]. The resources used for this tests are shown below.



The Yaa Asantewaa War of 1900

The Yaa Asantewaa war of 1900 was fought between the British and the Asantes. It was called Yaa Asantewaa war because the woman who inspired the Ashantis in that war was called Nana Yaa Asantewaa. She was the Queen Mother of Ejisu. The war ended in 1901 with the British defeating the Asantes.

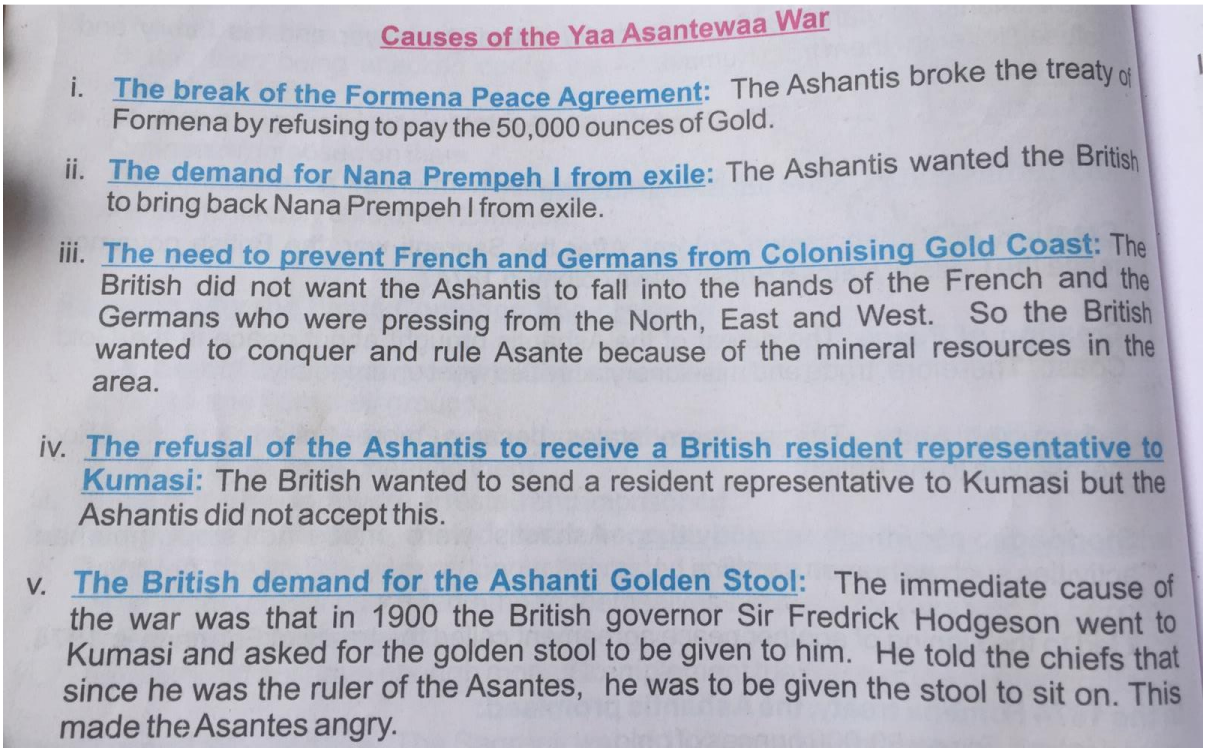
Causes of the Yaa Asantewaa War

i. **The break of the Formena Peace Agreement:** The Ashantis broke the treaty o Formena by refusing to pay the 50,000 ounces of Gold.

ii. **The demand for Nana Prempeh I from exile:** The Ashantis wanted the Britis to bring back Nana Prempeh I from exile.

iii. **The need to prevent French and Germans from Colonising Gold Coast:** Th

Fig 5.1: screenshots of the Yaa Asantewaa war taken from the textbook [21]



Causes of the Yaa Asantewaa War

i. **The break of the Formena Peace Agreement:** The Ashantis broke the treaty of Formena by refusing to pay the 50,000 ounces of Gold.

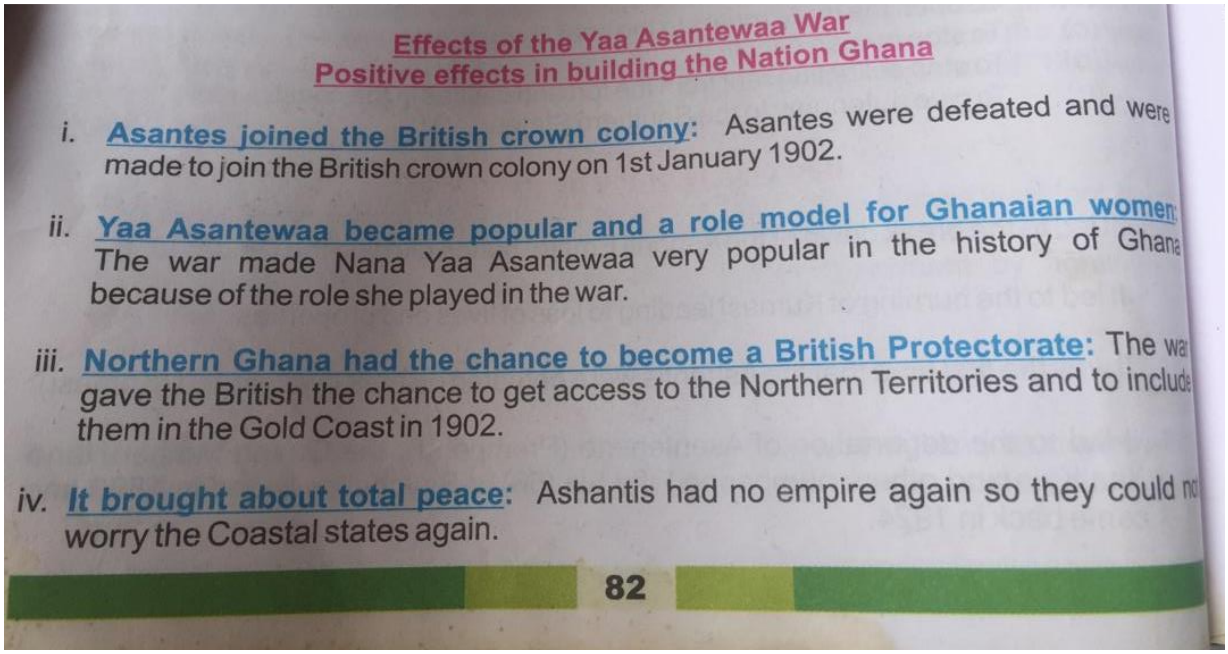
ii. **The demand for Nana Prempeh I from exile:** The Ashantis wanted the British to bring back Nana Prempeh I from exile.

iii. **The need to prevent French and Germans from Colonising Gold Coast:** The British did not want the Ashantis to fall into the hands of the French and the Germans who were pressing from the North, East and West. So the British wanted to conquer and rule Asante because of the mineral resources in the area.

iv. **The refusal of the Ashantis to receive a British resident representative to Kumasi:** The British wanted to send a resident representative to Kumasi but the Ashantis did not accept this.

v. **The British demand for the Ashanti Golden Stool:** The immediate cause of the war was that in 1900 the British governor Sir Fredrick Hodgeson went to Kumasi and asked for the golden stool to be given to him. He told the chiefs that since he was the ruler of the Asantes, he was to be given the stool to sit on. This made the Asantes angry.

Fig 5.2: screenshots of the Yaa Asantewaa war taken from the textbook [21]



Effects of the Yaa Asantewaa War
Positive effects in building the Nation Ghana

i. **Asantes joined the British crown colony:** Asantes were defeated and were made to join the British crown colony on 1st January 1902.

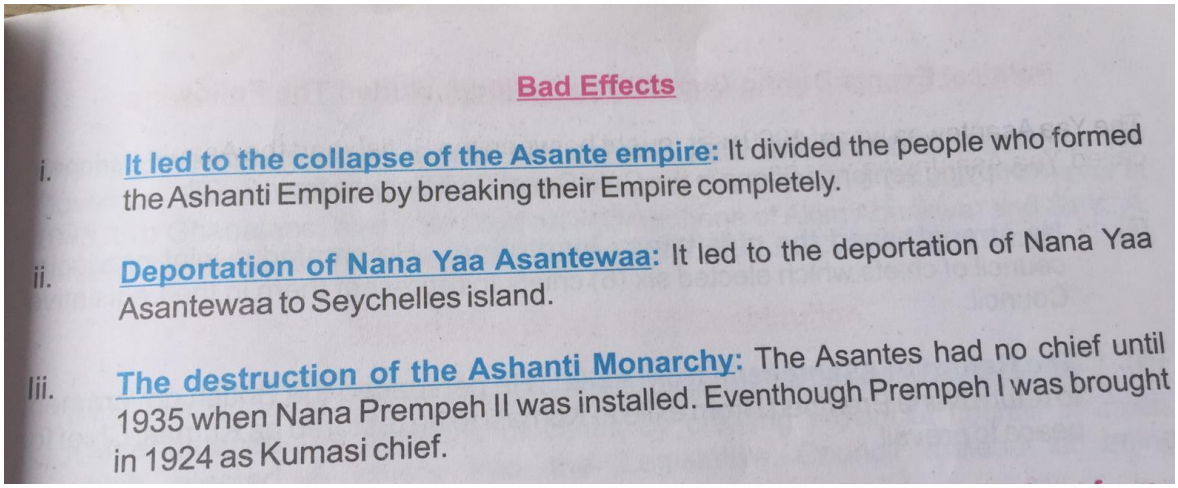
ii. **Yaa Asantewaa became popular and a role model for Ghanaian women:** The war made Nana Yaa Asantewaa very popular in the history of Ghana because of the role she played in the war.

iii. **Northern Ghana had the chance to become a British Protectorate:** The war gave the British the chance to get access to the Northern Territories and to include them in the Gold Coast in 1902.

iv. **It brought about total peace:** Ashantis had no empire again so they could no worry the Coastal states again.

82

Fig 5.3: screenshots of the Yaa Asantewaa war taken from the textbook [21]



Bad Effects

i. **It led to the collapse of the Asante empire:** It divided the people who formed the Ashanti Empire by breaking their Empire completely.

ii. **Deportation of Nana Yaa Asantewaa:** It led to the deportation of Nana Yaa Asantewaa to Seychelles island.

Iii. **The destruction of the Ashanti Monarchy:** The Asantes had no chief until 1935 when Nana Prempeh II was installed. Eventhough Prempeh I was brought in 1924 as Kumasi chief.

Fig 5.4: screenshots of the Yaa Asantewaa war taken from the textbook [21]

5.4.2 Storyboard Testing

A different test was run with another group of 10 students from Ashesi that used the storyboards in fig 4.1 and fig 4.2 to learn the history of Yaa Asantewaa

5.4.3 Fireside Game Testing

Although the game was still in its Beta testing, a release of the software was made available to only 7 students for use. These students were observed and feedback was generated to improve on the game. Table 5.1 below shows the user testing process which checks for whether the game meets its stated requirements and if the user was satisfied with the total experience.

Fig 5.5 Game Menu selection process

Fig 5.6 Quests in the game system

Fig 5.7 Player ability to interact with other characters

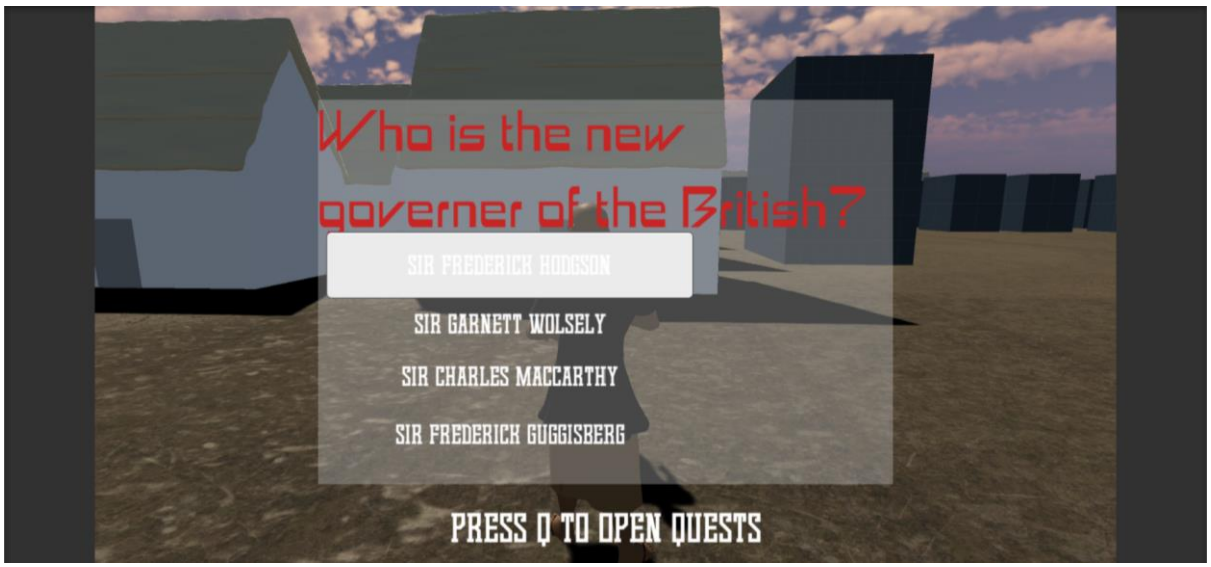


Fig 5.8 Feedback Learning model

Fig 5.9 Elmina Castle as shown in the game

Fig 5.10 Player interaction with war version Yaa Asantewaa

Fig 5.11. Enemy attempting to attack Player, enemy dialogue at the bottom screen

Table 5.1: Requirement and User Testing

REQUIREMENT	QUESTIONS	IMPLEMENTATION STAGE	TESTS
Immersion	Is the user able to interact with characters, the game world and the historical stories?	Complete	Passed
Historical Narrative	Has the user been introduced to the causes and effects of the historical story?	Complete	Passed
Historical Accuracy	Can the user identify some important landmarks or characters within the game	Complete	Passed

Questing	Can the user interact with quests and play them	Complete	Passed
Feedback Learning	Can the user answer mini quizzes that are generated from playing the short quests?	Complete	Passed

5.5 Results

The students that used the textbook were able to narrate the story but lacked the full description of the story. They also complained about the lack of detail of the story in the textbooks, however they were able to describe the causes and effects of the story.

The storyboards were an upgrade on the traditional method. Students described that seeing more pictures helped them understand the story more and it was fun seeing the pictures.

Students enjoyed the game, with minor complaints. The major complaints were on the gameplay as students hoped the game could be more interactive, however, they narrated the story better than both the storyboard and the textbook as the cut scenes showed more detail than the two previous methods could.

Chapter 6: Conclusion and Recommendations

6.1 Introduction

The fireside project was developed as a free-to-play Microsoft Windows Platform game that created an immersive experience when learning history. The game is a third-person action-adventure game focused on the historical events of the Yaa Asantewaa War that occurred in the Gold Coast in the year 1900. The user played the story and learnt history through the story quests and side quests which applied some feedback learning to ensure the students studied history.

6.2 Limitations

6.2.1 Gameplay Limitations

Some of the animations had errors thus affected the overall gameplay experience. Some users did not like the fact that some of the enemies glided instead of walking. Some understood that the game was still in development and was susceptible to such issues.

Another limitation was that some of the terrains were lacking in detail, students expected to see more historically accurate building models and more characters than the current demo provided. Finally, the loading and saving mechanics could not be implemented.

6.3 Future work

From the limitations explained in section 6.2. The game needs to be further improved before it can. From the gameplay, the animations of the models need to be fixed to give the game a lifelike feel. The story needs to be extended longer and more story and side quests should be created to make the game more engaging. The character models and the building models will become more historically accurate, Buildings like the Asantehene's palace, the Elmina Castle and the Kumasi fort will be accurately represented in the game. The story's cut

scenes will be revamped to improve the game immersion. The load and save mechanics will be included so the player does not lose all their data when the game is exited.

This should increase the reception of the game and increase student's interest in learning history.

6.4 Conclusion

The problem of how student receive history through traditional teaching methods is one that plagues many academic institutions all over the world. Traditional teaching's promotion of rote learning and recall has ensured that many students find history boring and unlikeable. Although many solutions exist to create an immersive historical learning experience, they are limited in how the student is not involved in the shaping of this experiences.

Video games however creates this opportunity for students to shape their learning experience while immersed in it. Fireside is an action-adventure video game that focuses on the Yaa Asantewaa war of 1900 in Gold Coast to create this immersive historical narrative for students in the African region.

The fireside game serves as an indication of how historical games can positively impact student learning especially in Africa.

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Appendix

Research Questions

1. How long have you been teacher in Ashesi University?
2. As a tutor, you often games and activities in your classroom teaching experience, why do you think this is a good way of helping your students learn French?
3. How effective do you think using games in the classroom helps students study French?
4. Do you think using games and activities is a better way of improving student learning? Why?
5. Can you provide me with statistical comparison (if possible) on which one proved better?
6. Do you often apply digital games in your lessons? (If yes, how. If No, why)?
7. Do you see this as a distraction or otherwise?