Applied Artificial Intelligence in 3D-game (HYSTERIA) using UNREAL ENGINE4

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Abstract—**Game development industry spreading it roots at wider level. With the advancements in technologies gaming industries adopted latest trends for developing modern games. Artificial intelligence (AI) with programming provided countless support for latest technology adoption in game industry. This paper aims to highlight some major points of our research "Creation of third person shooter game in unreal engine 4". We discussed how we can use one of the most powerful current generation game engines in an attempt to create our own game "Hysteria". Endeavoring used to replicate the process of the major game production cycle .It is used by modern gaming industries. We attempted it to create an action adventure shooting game by creating its own original storyline. The game Hysteria is played from a third person perspective in which the player must go through multiple environments fighting hordes of enemies and try to reach the end of level. Depending on the difficulty level that the player sets, there will be the number of enemies and their fighting intensity. The game has been developed but running at initial stages; further enhancement will be required to give it a much professional impression so that in near future it could be successfully commercialized.**

Keywords—applied AI; UNREAL ENGIN 4; Game creation; third-person shooter,3D gaming; technology adoption

I. INTRODUCTION (*Heading 1*)

The project under creation is to provide a gaming revolution in Pakistan. Video game industry is one of the highest grossing sectors in the technological field [1]. With the development of a game project, the aim is to motivate the aspiring game developers working on minor Indie game projects, to take a major step and work on a major game title and this may lead to introduction of several game development teams and development studios [2]. We use one of the most powerful game engines Unreal Engine 4, which is the current version of the Unreal Game Engine series by Epic Games. With Unreal engine we use employ several powerful soft ware's such Autodesk Maya, Zbrush and Gimp .

and facing major changes and being continuously updated, upon release, it is certain to create the identity of Pakistan Game Industry in the international entertainment market and compete with other current generation advance game titles.

Fig 1: The main title screen of hysteria displaying all the typical basic options of a title screen

II. HYSTERIA STORYLINE

There is now almost a tradition for a game of any genre to have an interesting and catchy storyline in order to captivate the attention of consumers. We also took the liberty of designing our original storyline.

Considering various factors such as survival, action, drama, adventure and heavy science fiction, our story is set in a fictional universe in which human beings have reached out and conquer other planets and their reach have extended to outer space. The main character of our story Commander Anderson is a Galactic Patrol Federation commando whose space ship crashed in an unfamiliar planet of which the environment heavily resembles that of earth but much more exotic. This planet is HYST-51891 an unidentified planet is occupied by hostile and savage human beings whose origins are unknown. They arrived suddenly and drove the previous occupants to extinction.

Fig 2. Commander Anderson, The main character donning the Galactic Patrol Federation armor and wielding a laser assault rifle.

On the planet Commander Anderson is attempting to fix his space ship or get any sort of help when he is ambushed by the hostile native of the planet. These human beings are ruthless to intruders and wield the same advance armors and weaponry used by the Galactic Patrol Federation and are known as the Demons. He must know battle these creatures and escape the planet as the planets climatic changes are eventually drawing its catastrophic destruction. As he traverses through many environments from exotic green ruins to the deep jungle, from the frozen frost wastelands to the fire lands of HYST-51891 also known as Hysteria's Hell , he must defeat all the enemies that cross his path and find a way to escape the impending doomsday on the planet.

The story is science fiction themed and manages to bestow upon the player a sense of survival as the number and fighting intensity of adversaries will grow as the player passes through each level.

Fig 3.The game play screenshot.

III. SOFTWARES USED IN DEVELOPING HYSTERIA

Hysteria is a science fiction action adventure game played from a third person perspective in which the player must shoot the enemies and avoid enemy fire by using the cover objects. We used industry standard tools that are used by the modern game development studios to create professional commercial games. Some of them are listed below:

1) UNREAL ENGINE 4:

Fig 4: Hysteria is powered by Unreal Engine 4.

There are a number of professional tools that we used to bring our vision to life, the most notable and the trump being the unreal engine 4 game engine which acts as a compiler which arranges each of the individual objects created sequentially and in proper order. It is also used to give the color, textures and contrast of the environments and characters. While the assets of the game may be developed in other software unreal engine 4 is used to modify these assets in order to make them look realistic and beautiful [6] . It also provides the basic graphic options of scaling, translation and rotation which are heavily used for modifying and arranging the environment together. Scaling and translation is used to extend the platforms created using blenders while rotation is used to rotate and arrange the scaled environment in perfect order.

It is also used for giving the player and the enemies' characters skeletons. This is accomplished through the in game rendering. Unreal engine 4 has blueprint technology implement into it which can be used as a sort of visual coding. It is important as it has been used to create the main artificial intelligence between the player characters [3].

2) BLENDER

Blender is an open-source 3D computer graphic software that is used for creating 3d printed models used in our game [4][11]. Many of our assets are that are used in game are created using blender. For e.g. the guns that are wielded by Commander Anderson and the enemies was modelled in blender and then exported to unreal engine 4 in which it was given proper texture and finally implemented in on the joint point of the player and enemies skeleton to make an appearance that they are actually wielding the gun.
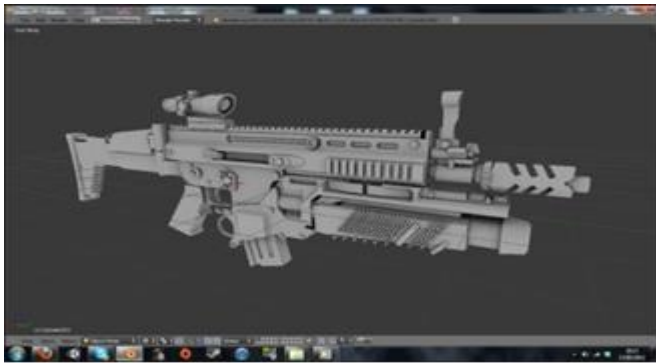
Fig 5: The assault rifle is modelled using blender and then exported to unreal engine 4.

The blender is only used for modelling an object as its color; contrast and texture are given in any graphic software that it is imported to, such as Autodesk Maya, 3DsMax or in our case, the unreal engine 4.

3) ZBRUSH

Zbrush is used in the animation and gaming industry to create high resolution modes (able to reach 40+ million polygons) [5] . In our project, although it is used for a small role, it plays a critical small role as some of the contrast for enemies and player character and the environments (mountains, rocky terrai8n and statues) were modified using Zbrush. It is an advanced tool that could have been used to create even more detailed characters for out games but the idea was omitted we lack the necessary time to model the characters in such a complicated tool.

4) AUTODESK MAYA

Unreal engine 4 consists of an A.R.Ts (Animation and Rigging Tools) which is used for animating and rigging in game characters using Autodesk Maya. This plug in of Autodesk Maya posses a default character rig model which is used to create animation (character moving and running). These animations can be exported to unreal engine 4 to test in game play and can be replaced by our default model [7].

Fig 6: The Unreal Engine 4 A.R.Ts plug in running on Autodesk Maya.

This is optional as the Unreal Engine 4 also has the in game rendering system but the downside is that it is of inferior quality than the A.R.Ts. That why A.R.Ts is used by most animators as it not only eases up the animation process but have far more versatile options while animating characters.

IV. DEVELOPMENT OF HYSTERIA

1) ARTIFICIAL INTELLIGENCE:

The artificial intelligence is the most crucial part of our game. It is how the player and enemy react to each other [8]. The enemies have been programmed with AI to react in certain situations such as:

- ➢ To attack the player when in their line of sight.
- ➢ To petrol an area under which they are stationed.
- ➢ To become aware of the player character when hit by player fire and the player is not in their line of sight.
- ➢ To keep firing at the player until the player character runs out of health/ life bar.
- ➢ To cease fire once the player dies.
- ➢ To take cover when under player fire.
- ➢ To use assault rifle when fighting player.
- ➢ To use shotgun when fighting player.
- ➢ To use sniper rifle while taking cover using cover object when fighting player.
- ➢ To lay down dead when their health / life bar runs out (Death animation).

The following AI situations have been programmed using the blueprint technology of the unreal engine 4. It is its visual scripting system.
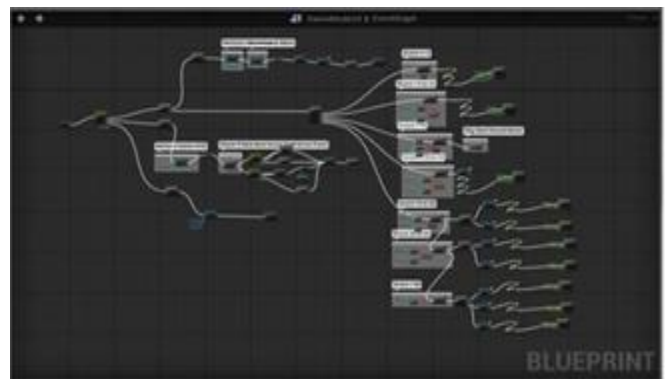

Fig 7. The Blueprint technology is used to orchestrate the in game Artificial Intelligence.

As shown in Fig 7, the blueprint programming consists of various nodes that are arranged and scripted to make the characters react to certain situations. The nodes as shown in the above diagram are connected together to make an enemy do certain things. It is basically programming their

reaction and their default behavior, for e.g. in An Enemy blueprint, there will be a node for enemy to be in stationary position and that exact node extends to patrolling a certain area and that node will extend to move to one waypoint and then move to the other waypoints and then back, by going back and forward to the waypoints, a patrol of the area is being completed, and if the player character is enemy pre-programmed sight, there is a node that will engage the enemy character with the player in gun fight and as their health bar runs out, there will be a node of death animation for the enemy.

The player character will have similar nodes but most of their actions will be consisted in the node which gives player the overall control of the player character.

The nodes have to be pre-programmed by the developer and when certain actions and reactions are programmed in to the node, there is virtual artificial intelligence within game [10] .

Fig 8. Nodes of camera, character and key toggle.

The Fig 8 also gives a clearer example as there is node arrangement in the player character session as there is a node arrangement for updating the camera view of the game as the player progress forward using the L key. Notice how the nodes are all connected together so that when the player makes the player character move, the camera will be programmed to automatically follows.

Hence blueprint technology is one of the most important features of the unreal engine 4 as it is directly responsible for planning down and developing the in game functionalities and sequencing [9] .

2) ENVIRONMENT CREATION

The environment in game was developed using unreal engine 4 and blender. Blender was first of use to create platforms on which the player and enemy character move. It was used to create objects that were later on programmed to avoid enemy fire and hence became covers.

Fig 9: Environment manipulation of scaling to create extended floor from platforms.

The platforms are exported into the unreal engine 4 and manipulated by using the in game functionalities of scaling (the platforms were extended in order to create the floor and ground), translation (use to transit the scale floor and grounds to proper place) for creating mountains and rotation was used to rotate the objects into proper order. Besides the usual movement of these manipulated objects into proper place, unreal engine was also used to give those contras, textures and overall realistic feelings.

Blender is also used heavily in creating the hallway levels of the game as the platform were heavily modified and arranged together (using scaling, translation and rotation) with blender to give it an appearance of the hallway, only after arranging the hallway together was it exported into the unreal engine to give it contrast and textures.

Fig 10: The hallway arranged through many scaled, translated and rotated platforms in unreal engine 4 with contrast.

The unreal engine 4 is the most recent version of the unreal game engine by Epic Games. Due to it developed for making games on next generation consoles (8th generation games) its superior graphics is credited for the realistic look of the environment as it is used to develop game using high end graphic cards. Only graphic cards with a direct x 11 is appropriate for developing a game in unreal engine 4 or playing a game title developed in unreal engine 4.

cover when under enemy fire (either player with player character or enemy with enemy AI).

Fig 11: The hallway after giving the frozen wastelands contrast, notice the superior graphics.

Some of the environments consist objects such as trees and statues that are too difficult and complicated for contrasting and texturing in unreal engine 4, this is why software like Zbrush can be appropriate for such job.
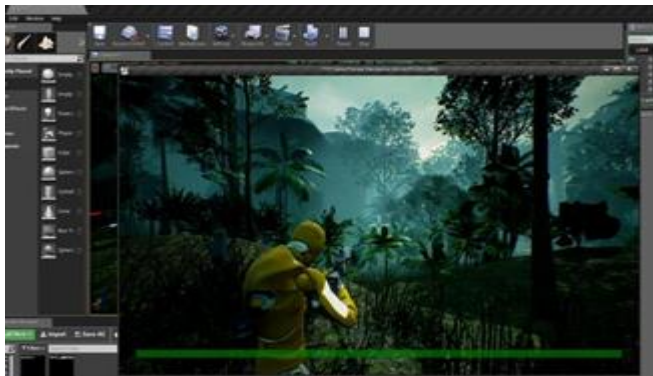

Fig 12: The in development screenshot, the trees are textured in Zbrush.

3) CHARACTER CREATION

The characters and enemies all follow same character skeleton render and are contrasted and textured using unreal engine 4 and Zbrush.
They are programmed to wield both one assault rifle and one shotgun or one sniper rifle.
Their artificial intelligence programmed with unreal engine 4 blueprints allows them to move, attack each other, and take

Fig 13: Some of the enemy characters in development view window of the game.

V.   CONCLUSION

With the release of one of the first major studio console game title HYSTERIA from Pakistan, an era of gaming revolution is to be inspired. Many of the indie-game developers will be inspired to create creative major game titles in advanced game engines such as Unreal Engine and Cry Engine and the development of Pakistani game studios own game engine will become in-evitable and this may lead to major gaming revenue to be generated within Pakistan.

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