Computer Graphics (CG)

[EN455]

Project Proposal: Unreal Engine 3D Game Development

Due on Monday, 11 April 2022

Dr. Prerana Mukherjee

Submitted by:

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[Team Representative, Team Name: Carpe diem]

on behalf of

[Team: Carpe diem]

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2. Team Details

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3. Project Details

Project Title (Same as title of *Term Paper*):	Multiplayer FPS: 3D Game Development using Unreal Engine
Software Used:	Unreal Engine

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In this project, we build a **3D multiplayer FPS game** using the popular **Unreal Engine**. The game features different game modes (like *Deathmatch, Capture the Flag, Conquest*, etc.) for multiplayer matches. We also implement *AI players (bots)* for playing alone. Different weapons like *SMG and shotgun* are implemented *along-with their respective fire modes.*

We make use of the *Blueprint Visual Scripting* system in Unreal Engine to build the complex gameplay elements and environment. Blueprints are visually scripted additions to the game. They work by using graphs of Nodes for various purposes - object construction, individual functions, and general gameplay events - that are specific to each instance of the Blueprint in order to implement behavior and other functionality.

Depending on the complexity of the component, it is either completely designed using blueprints or is extended with code on base blueprint.

As such most of the work in our project narrows down to the following three parts:

1. **Part 1 (p1):** Designing blueprints for elements (like guns, characters, world elements, etc.) and for world rendering and levels (we use Level Blueprints to implement different game modes)
2. **Part 2 (p2):** Interconnecting each component according to a predefined game logic
3. **Part 3 (p3):** Drafting project proposal and final term paper.

4. Work Distribution

Work will be distributed amongst team members in such a manner that everyone has to role in both parts. Detailed work distribution will be:

Name Wise		
S. No.	**Name**	**Tasks**

1.	Abhishek Jain	• Making blueprints **(p1)**
		  ○ Levels (Conquest, CTF, Deathmatch)
		  ○ Sound (Explosions, Movement sounds, Weapon sounds)
		  ○ Textures
		• Drafting project proposal **(p3)**
		• Researching free assets for Unreal Engine which can be used directly or for learning purpose for making the game **(p1)**

2.	Tanuj Raghav	• Making blueprints **(p1)**
		  ○ Animations (Walking, Crouching, Crouching with gun, Knife attack, Hit Reactions, Throwing, etc.)
		  ○ Vehicles
		• Drafting final term paper **(p3)**
		• Debugging and final packaging of game **(p2)**

3.	Karitk Ohri	• Making blueprints **(p1)**
		  ○ Animations (Walking, Crouching, Crouching with gun, Knife attack, Hit Reactions, Throwing, etc.)
		  ○ Interfaces (Weapon interface, movement control interface, etc.)
		• Drafting final term paper **(p3)**
		• Debugging and final packaging of game **(p2)**

4.	Vishal Chaudhary	• Making blueprints **(p1)**
		  ○ Levels (Rush, Team Deathmatch)
		  ○ Textures (Surface textures for all possible gameplay elements)
		• Interconnecting already created blueprints while creating game logic **(p2)**
		• Drafting project proposal **(p3)**

5.	Sidharth Kumar	• Making blueprints **(p1)**
		  ○ Weapons (Assault Rifle, Sniper Rifle, Shotgun, Machinegun, Knife, Grenade, etc.)
		  ○ Special Effects (Spark, flare, water, lens flare, smoke, etc.)

		○ Textures (Surface textures for all possible gameplay elements) ● Drafting final term paper **(p3)**
6.	Shubham Singh	● Making blueprints **(p1)** ○ Game characters and AI Bots (AI Players for each game mode, FPS character, TPS Character) ○ Widgets (Game menu, lobby, HUD, Score, etc.) ● Interconnecting already created blueprints while creating game logic **(p2)** ● Reviewing and editing term paper before final submission **(p3)** ● Reviewing and editing project proposal before final submission **(p3)**
Taskwise		
1.	Making blueprints **(p1)** ● Levels (Conquest, CTF, Deathmatch) ● Levels (Rush, Team Deathmatch) ● Sound (Explosions, Movement sounds, Weapon sounds) ● Textures (Surface textures for all possible gameplay elements) ● Animations (Walking, Crouching, Crouching with gun, Knife attack, Hit Reactions, Throwing, etc.) ● Vehicles ● Interfaces (Weapon interface, movement control interface, etc.)	● Abhishek Jain ● Vishal Chaudhary ● Abhishek Jain ● Abhishek Jain, Vishal Chaudhary, Sidharth Kumar ● Tanuj Raghav, Kartik Ohri ● Tanuj Raghav ● Kartik Ohri

	• Weapons (Assault Rifle, Sniper Rifle, Shotgun, Machinegun, Knife, Grenade, etc.) • Special Effects (Spark, flare, water, lens flare, smoke, etc.) • Game Characters and AI Bots (AI Players for each game mode, FPS character, TPS Character) • Widgets (Game menu, lobby, HUD, Score, etc.)	• Sidharth Kumar • Sidharth Kumar • Shubham Singh • Shubham Singh
2.	Drafting project proposal **(p3)**	Abhishek Jain, Vishal Chaudhary
3.	Drafting final term paper **(p3)**	Sidharth Kumar, Kartik Ohri, Tanuj Raghav
4.	Debugging and final packaging of game **(p2)**	Kartik Ohri, Tanuj Raghav
5.	Interconnecting already created blueprints while creating game logic **(p2)**	Vishal Chaudhary, Shubham Singh
6.	Reviewing and editing term paper before final submission **(p3)**	Shubham Singh
7.	Reviewing and editing project proposal before final submission **(p3)**	Shubham Singh
8.	Researching free assets for Unreal Engine which can be used directly or for learning purpose for making the game **(p1)**	Abhishek Jain

5. Motivation and Challenges

3D Multiplayer FPS games like *PlayerUnknown's Battlegrounds (PUBG), Call of Duty and Halo* are hugely popular these days. At the same time, making FPS games is popular among beginners in the game making industry (this can be observed from the fact that the Unreal Marketplace is mostly filled with assets related to FPS games). Owing to this and our own familiarity with such games, we decided to make a 3D FPS game initially.

We have chosen Unreal Engine *because it works with C++* (unlike Unity which works with C#). And since Unreal Engine is *originally meant to make multiplayer games, we also decided to make a multiplayer game.*

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Challenges in this project:

- **Doubtful Project Success:** We have never made a game using a game engine before. Moreover we are unfamiliar with the kind of planning and work that goes into making a game. We do anticipate great results at the end of this project, but we are also worried whether this will be a successful project or not.
- **Designing Game Logic:** Unreal has its own visual scripting system called Blueprints which reduces a lot of complexity in making the game. We have plans to design and make blueprints for gameplay elements. However we don't entirely know how to bring all those elements together with a running game logic.
- **Game Physics:** Being familiar with games like PUBG and CoD, we know how game physics affect the gaming experience (For e.g. being hit with a bullet on different parts of the body should cause different reactions and different amounts of loss in health). It is a difficult task to implement minute but significant reactions in the game characters and environments.

Most of the above challenges correspond to our lack of knowledge and skills in the game development field.

6. Methodology

The game will be made entirely using Blueprints. Blueprints for game components will be extended using code as and when required. The game will feature:

- Multiplayer functionality and AI bots (for playing alone)
- Different game modes (for e.g. Deathmatch, Capture the Flag, etc.)
- Different weapons (for e.g. Assault Rifle, Shotgun, etc.)
- TPS and FPS modes

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6.1 Software Used

- Unreal Engine v4.22.3
- GitHub
- Git
- Cmake
- G++ compiler
- Visual Studio Community (with C++ game development and nuget workload)

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6.2 Project Stages

- Drafting proposal
- Reviewing and editing project proposal before final submission
- Making blueprints of gameplay elements (characters, AI players, weapons, vehicles, special effects, textures, animations, game modes)
- Interconnecting blueprints made in previous stage while simultaneously creating game logic
- Debugging and packaging the game
- Drafting final term paper
- Reviewing and editing term paper before final submission

7. Results

Final outcomes of this project will include:

Multiplayer FPS Game	A playable multiplayer FPS game.
Term Paper	A term paper drafted in IEEE conference format containing details of designing and making the game.

[END]