A Project Description On

Developing a videogame using unreal engine based on a four stages methodology

Submitted in partial fulfilment of the requirements for the award

of the degree of

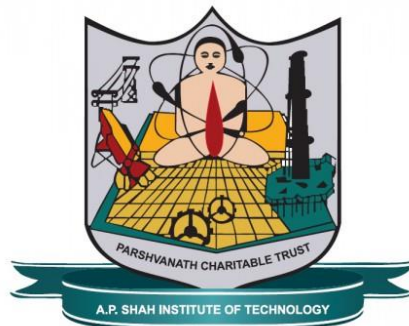## Bachelor of Engineering

in

Computer Engineering

by

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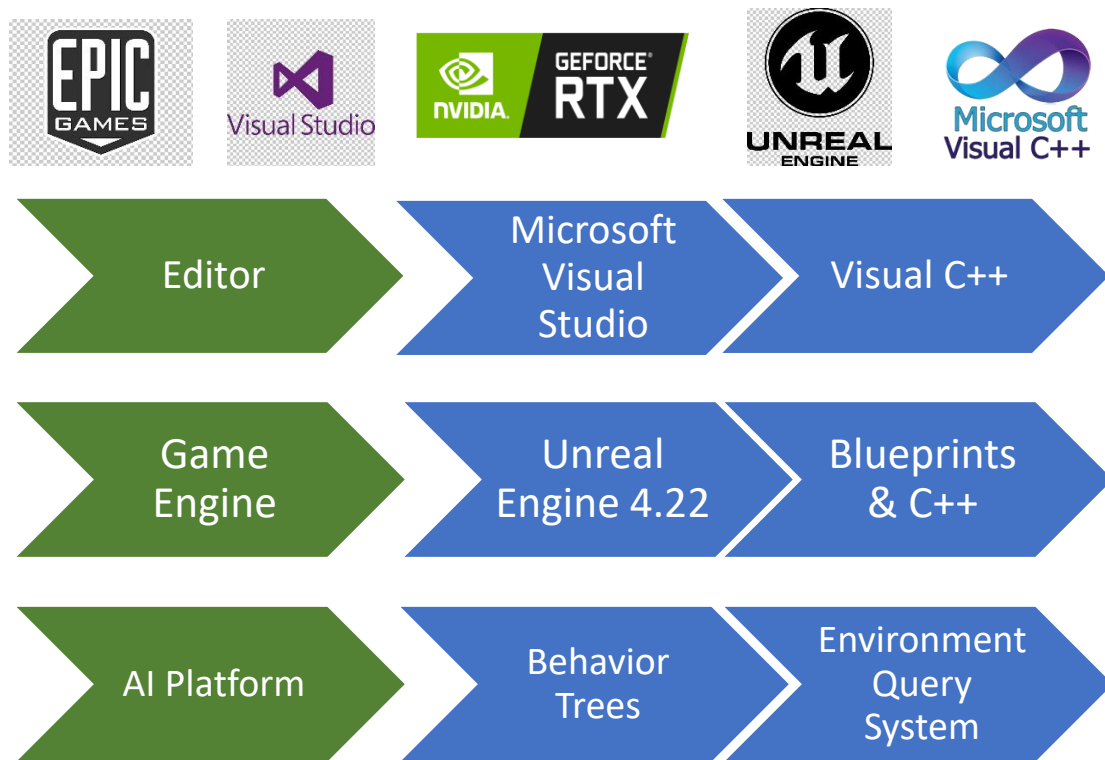UNIVERSITY OF MUMBAI

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1 Scope

The Unreal game engine makes use of C++ and Blueprints to efficiently render skeletal meshes, materials, assets and integrate them into a simulated environment. The infractions caused by human beings have been visually demonstrated by Artificial Intelligence (BOTS). The AI has been rationalized using behaviour trees, environmental query system to replicate the behaviour of humans and animals.

The AI plays the role of the antagonists which deteriorate the environment around an industrial ecosystem. The player has a set of objectives to accomplish to restore balance in the habitat and perform some side quests parallel to go with the mission objective. The AI have a clearly defined range of interaction logically designed using the BTs. The interactive cases get execute one at a time. Certain nodes in the BTs have an embedded Environmental Query System which acts as a separate flow of execution. Once the ecosystem gets restored to its initial state, the flora and fauna return to initial status.

The Unreal Engine version used for this project is 4.22; it's the first IDE that supports ray tracing and offers advanced AI scripts. The particle effects rendered in the engine emphasize the present and foreseeable effects on the environment. Updated lighting effects act as visual boost.

2   Technology Stack

Editor → Microsoft Visual Studio → Visual C++

Game Engine → Unreal Engine 4.22 → Blueprints & C++

AI Platform → Behavior Trees → Environment Query System

Unreal Engine is a part of Epic games and every finished game is deployed on the Epic Games Store. The game uses assets that are created within the material editor or those available from the Epic Games Store. The logic for the game is designed using the Microsoft Visual Studio IDE in the Visual C++ programming language. The major difference between C++ and Visual C++ is that in the later, for an unreal project, the compiler ignores UFUNCTIONS() and UPROPERTIES() declared in the header files and makes use of engine functions in the editor. An important aspect of creating video games is rendering. Stronger the GPU, smoother and faster is the rendering. The GPU used in this project is the EVGA Nvidia GeForce RTX 2070.

3 Environmental Aspects

This project aims to bring into notice the importance of environmental aspects in our everyday life and the deterioration caused by humanity to our surroundings including the atmosphere, flora and fauna, as well as aquatic bodies and make the users of this application aware of their role to the environment and the society.

4 Benefits to the society

Video games have long been a part of entertainment well early since the 1970s. But they were very expensive, to say the least. Even the resources for developing such games were very limited, and mostly closed source. With the advent of recent computers (mostly due to their computing power, hardware, memory usage, resource allocation, and being open source), it is now possible to develop simple games using minimum expense and efforts.

Recent developments in computer graphics have concentrated on advancements in hardware and software equally. Greater computing power equals greater yield. Since UE4 is now free, videogames can be created by individual users and generate an easy source of income whilst house-sitting. Epic Games offers programmers to put up not just games but also individual assets on the marketplace, thus flourishing the videogame industry.

5 Applications

One of the latest research areas in computer science and computer graphics is augmented reality and virtual reality. Virtual reality is an interactive computer-generated experience taking place within a simulated environment. It incorporates mainly auditory and visual feedback but may also allow other types of sensory feedback. On the other hand, augmented reality is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. Recent developments in computer graphics have concentrated on advancements in hardware and software equally. The latest advancements in videogame industry have been made in the healthcare sector.

The in-focus videogame highlights creation and usage of artificial intelligence using behaviour trees, based on Environmental Query System that runs in a separate blueprint in the form of a stack. The Behaviour Trees follow a flow of logic that executes sequentially in pre-order traversal, such that the first node has the highest priority and last one has the lowest, showing us how the AI thinks. AI can also be hardcoded to perform a specific task.

A heavily rendered environment is aesthetically pleasing to all the viewers and attracts a whole generation quite easily. Sending a message to a wider audience through the means of a game is relatively easier as its objectives subconsciously tend to affect the mindset of a youth better than the currently available means.