

Computer Games Development SE607

Technical Design Document

Year IV

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Contents

[Technical Design 2](#_Toc54713656)

[References 2](#_Toc54713657)

# Project Overview

The proposed project is a VR survival game that immerses players in a post-apocalyptic wasteland filled with dangers and challenges. The game features an intelligent AI system that makes the gameplay experience more challenging and unpredictable. The main objective of the game is to defeat enemies in strongholds while navigating the wasteland trying to find items to help the player along the way. The game's AI system makes this task more challenging by adapting to the player's actions and making strategic decisions. Players must use their wits and skills to outmanoeuvre and defeat the AI enemies while exploring the game's world and completing quests.

* 1. **Programming Languages**
* C#
  1. **Technology**
* Oculus Quest 2 – A virtual reality (VR) headset with inbuilt movement tracking which allows the user to fully immerse yourself in games. The Quest 2 comes with two hand-held controllers which allow the user to interact with the virtual world.
* Unity Engine – The game engine is compatible with multiple platforms and provides an array of features, including audio, animation, physics, and more. It allows input from various sources, such as a mouse, keyboard, game controllers, and touch for mobile development.

# Feature List

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| --- | --- |
| Day/Night Cycle | Wrist Pocket Inventory System |
| AI – Behaviour Tree | Random Map Generation |
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| Boss Strongholds | Vehicle Repairs |
| Sandbox level | An array of weaponry |
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* 1. **Scripts List**

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| --- | --- |
| **Script Name** | **Functionality** |
| Inverter | Used in the Behaviour Tree, used in order for the BT to work. |
| Node | Used in the Behaviour Tree, used in order for the BT to work. |
| Selector | Used in the Behaviour Tree, used in order for the BT to work. |
| Sequence | Used in the Behaviour Tree, used in order for the BT to work. |
| ChaseNode | This a behaviour used in the behaviour tree, this creates a chase behaviour for the BT |
| GoToCoverNode | This is another behaviour node, used in the BT in order to create a new behaviour |
| HealthNode | This is used in the behaviour Tree, this is used to distribute health to the AI |
| isCoverAvailable | This is used in the BT, this is another behaviour |
| isCoveredNode | This is used in the BT, this is combined with the isCoverAvailable script |
| RangeNode | This is another behaviour node, used in the BT in order to create a new behaviour |
| ShootNode | This is another behaviour node, used in the BT in order to create a new behaviour |
| ObectSpawning | This script is used to handle objects spawning down onto the terrain |
| BoundsTest | This script is used in the handling of the wrist socket inventory system |
| ColliderMeasurer | This script is used in the handling of the wrist socket inventory system |
| LookRotator | This script is used in the handling of the wrist socket inventory system |
| MeshDrawer | This script is used in the handling of the wrist socket inventory system |
| WristSocket | This script is used in the handling of the wrist socket inventory system |
| ActivateGrabRay | This is used in order to activate rays from the players hands to grab items in game |
| ActivateTeleportRays | This is used in order to spawn teleportation rays from the players hands to move around |
| AIManager | This is used for the AI, used alongside the BT |
| AIUnit | This is used alongside the BT, used in some AI enemies to give another behaviour. |
| AnimateHandOnInput | This is used to add animations to the players hand when interacting with the controllers |
| Cover | This is used with the BT to add another behaviour |
| FaceCamera | This is used to have an object face towards the player. |
| FireBulletOnActivate | This is used to spawn projectiles when using weapons |
| FollowTarget | This is used to have an object follow another in the game area |
| GameMenuManager | This is used to handle the game menu that appears in the game. |
| MainMenuManager | This is used to handle the main menu of the game |
| MapCreator | This is used in the when generating the terrain |
| ProgressBar | This is used with the enemy healthbar in game |
| SetTurnType | This is used in order to change the movement in game |
| Waypoint | This is used in BT, another behaviour |
| XRGrabInteractabeTwoAttach | This is used to enable a two-hand grab on certain objects. |
| PlayerScript | This is used to handle all things player in the game |
| MapGeneration | Used in creating the terrain |
| MainMenu | This is used in handling the main menu of the game |
| BulletCollisions | This script handles collisions inside of the game |
| Breakables | This is used in order to handle different items in game and to break them down into smaller objects. |
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* 1. **CRC Cards**

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| EnemyAI | |
| Responsibilities | Collaborators |
| Select behaviours depending current conditions.  Check for damage between AI and other objects | HealthNode  GoToCover  ChaseNode  isCoverAvailable |

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| Map Generation | |
| Responsibilities | Collaborators |
| Generate a terrain with random properties in order to create a unique map on each playthrough | MapGenerator  ObjectSpawning |

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| Inventory | |
| Responsibilities | Collaborators |
| Keep track of an item inside of the inventory slot on each wrist | LookAt |

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| GameMenu | |
| Responsibilities | Collaborators |
| Spawn a game menu in front of the player that will change the movement type of the player |  |

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| Player | |
| Responsibilities | Collaborators |
| Handle everything related to the player, all the way from movement, health, and collisions between objects. | XR Toolkit |

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| Map Creator | |
| Responsibilities | Collaborators |
| Generate a terrain that will be able to spawn objects down onto itself. | ObjectSpawning |

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| Set Turn Type | |
| Responsibilities | Collaborators |
| This class is used to change the main movement properties of the player, changing it from teleportation or continuous | Player |

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| Wrist Socket | |
| Responsibilities | Collaborators |
| Hold an item in place, change the scale of the object before an item is placed and after an item is taken back out | Inventory |

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| Look Rotator | |
| Responsibilities | Collaborators |
| Always have the main wrist sockets on each hand face towards the player | Wrist Socket |

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| Progress Bar | |
| Responsibilities | Collaborators |
| Handle a UI bar that will be above the AI and display their health. Also handles facing towards the player at all times. | AI |

* 1. **UML**

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| Progress Bar | |
| Public | Private |
| * SetProgress(float Progress) * setProgress(float progress, float speed) | * Image progressImage * Float defaultSpeed * Gradient colorGradient * Coroutine AnimationCoroutine |

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| --- | --- |
| Look Rotator | |
| Public | Private |
| * Transform target | * Awake() * onEnable() * onDisable() * ResetRotation(XRBaseInteractable interactable) * Update() * LookAtTarget() * OnValidate() |

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| --- | --- |
| Wrist Socket | |
| Public | Private |
| * Float targetSize * Float sizingDuration | * Vector3 originalScale * Vector3 objectSize * Bool canSelect * Void OnHoverEntering * Void OnHoverExiting * Void storeObjectSizeScale * Vector3 FindObjectSize |

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| --- | --- |
| Set Turn Type | |
| Public | Private |
| * ActionBasedSnapTurnProvider snapTurn * ActionBasedContinuousTurnProvider continuousTurn * ActionBasedContinuousMoveProvider move * TeleportationProvider teleportation * setTypeFromIndex() * setMovementFromIndex |  |

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| --- | --- |
| Look Rotator | |
| Public | Private |
| * Transform target | * Awake() * onEnable() * onDisable() * ResetRotation(XRBaseInteractable interactable) * Update() * LookAtTarget() * OnValidate() |

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| --- | --- |
| Map Creator | |
| Public | Private |
| * gameObject object * int mapWidth * int mapHeight * int minTrees * int maxTrees | * Start() |

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| playerScript | |
| Public | Private |
| * Vector3 AverageVelocity() * Update() * Awake() | * CharacterController controller * Float historicalPositionDuration * float historicalPositionInterval * Queue<Vector3> historicalVels * Float lastPositionTime * MaxQueueSize |

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| Inventory | |
| Public | Private |
| * Static ColliderMeasurer Instance * Vector3 Measure(Mesh mesh) | * MeshFilter meshfilter * Awake() * Start() * onValidate() |

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| Game Menu | |
| Public | Private |
| * GameObject menu * InputActionProperty showButton * Transform head * Float spawnDistance | * Update() |

# References