

Game Design Document (GDD)

Operation Clean Sweep

Team:

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Planner

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Visual Designer

Engine: Unreal Engine 5 (C++ project)

Platform: PC

Development Period: July–August 2025

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1 Overview

Operation Clean Sweep is a 3D tactical shooter built in Unreal Engine 5, featuring a hybrid third-person and first-person camera system. The game pits a squad of four (player + 3 AI or multiplayer) against a fortified enemy base with aggressive AI bots. Designed as part of a Data Structures and Algorithms (DSA) project, the game not only provides fast-paced action but also implements real-time strategy and backend DSA logic.

2 Objective

- Infiltrate and clear an enemy HQ defended by armed AI bots
- Survive with limited health resources
- Showcase DSA concepts through core mechanics like AI, inventory, team stats, and enemy waves

3 Target Audience

- Game developers and students learning Unreal Engine, AI, or DSA
- Players who enjoy tactical third-person shooters
- Academic reviewers evaluating practical application of DSA in game logic

4 Core Gameplay Mechanics

4.1 Player Mechanics

- Third-Person view by default
- Scope aiming switches to First-Person temporarily
- Smooth transitions between TPS and FPS
- Sprinting, crouch, and sliding movements
- Health system with a very limited healing mechanic
- Gunplay with animations, muzzle flash, and bullet impact effects

4.2 Shooting

- Hit detection with AI damage
- Recoil and visual feedback
- Impact particles and animations on hit

4.3 AI Enemy Bots

- Patrol, Alert, Attack, Chase behavior
- Each bot has its own health and damage system
- Guns with firing logic
- Patrol and battle logic driven by Behavior Trees

4.4 Squad Mechanics

- 4-player squad (1 Player + 3 AI bots OR multiplayer)
- Real-time status via TAB menu (kills, damage, name, alive/dead)

4.5 Victory Condition

- Eliminate all enemies in the base
- Reach the HQ to complete the level

5 Environment & Map Design

- **Spawn Area:** Open ground with forest elements and trees
- **Boundaries:** Waterfall at the back (death trigger), mountains on three sides
- **Objective HQ:** Enemy base at the front, heavily guarded
- **Assets:** Downloaded and customized map, characters, weapons, and UI elements

6 DSA Concepts Integration

DSA Concept	Integration Area
Arrays	Squad members, enemy/bullet pooling
Queues	Cooldown timers, spawn system
Stacks	Undo actions (optional)
Graphs	Navigation Mesh for AI pathfinding
Trees	Behavior Trees for enemy AI
Hash Maps	Kill tracking, damage stats
State Machines	Player state (idle, shooting, sprinting)

7 UI Elements

- Health & Ammo HUD

- Team Tab Menu (Kills, Status, Damage)
- Objective Notifications
- Scope Zoom UI for FPS mode

8 Assets & Tools

- **Engine:** Unreal Engine 5 (C++ project)
- **Assets:** Downloaded from Unreal Marketplace / Mixamo
- **Animation:** Animation Blueprints for recoil, running, sliding
- **UI:** UMG for health bar, stats, team info

9 Development Phases (Sprint Overview)

Sprint	Duration	Focus
Sprint 1	Week 1	Unreal Engine setup, character movement
Sprint 2	Week 2	Combat mechanics, weapon firing, FPS/TPS toggle
Sprint 3	Week 3	AI bots, behavior trees, enemy shooting
Sprint 4	Week 4	DSA integration, UI, health system, team tab
Sprint 5	Week 5	Final polish, demo video, testing & documentation

10 Team

Name	Role	Contributions
Muhammad Affan bin Aamir	Project Lead, C++ Developer, Planner	Core logic, DSA integration, planning
Umar	Map & Models Research, Blueprint Assistant, Visual Designer	Map design, asset integration, visual polish

11 External Documentation

- **Project Proposal:** [ProjectProposal.pdf](#)

- **Notion Workspace:** [Operation Clean Sweep - Project Hub](#)
- **Cloud Storage for Final Files:** (Insert link after project completion)