**Vapor Drift**

Project Proposal Document

**Project Title:** Vapor Drift

**Course code:** CSE299

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**Group Id:** 5

**Section:** 4

**1. Introduction**

This project aims to design and develop a high-fidelity **3D endless runner game** called *Vapor Drift*. The core challenge is to create a fast-paced, reflex-driven arcade experience within a **retro-futuristic, synthwave environment** known as The Grid. The game will combine the standard lane-switching mechanic with resource management systems (Boost and Phase-Shift) to foster strategic play. The objective is to apply modern web-based 3D rendering and real-time logic to create a technically rigorous and visually striking digital product that maximizes player engagement and replay value.

**2. Project Objectives**

* To develop a functional **3D procedural generation engine** capable of creating an infinitely unique and immersive highway environment.
* To implement the core **three-lane movement** and precise collision detection system using a 3D rendering library.
* To design and integrate a resource-based **Drift/Boost** system that rewards skillful movement and tactical acceleration.
* To develop a **Phase-Shift** ability with associated cooldown and collectible management for temporary invincibility.
* To establish a dynamic difficulty scaling mechanism that increases obstacle frequency and player speed based on real-time distance score.

**3. Project Description**

The player controls a renegade **AI hovercraft** attempting to outrun the relentless **System Corruption** (the ever-closing edge of the screen). Starting with limited speed, the player must explore the three-lane highway of The Grid, utilizing swipe controls to avoid static blockades, laser gates, and mobile security drones. Core survival hinges on the player’s ability to manage two crucial resources:

* **Boost:** Activated by accumulating charge through near-misses and sharp turns, granting a burst of speed and temporary invincibility.
* **Phase-Shift:** A rare, high-value defensive ability (charged by collecting Energy Cores) that allows the hovercraft to briefly become intangible and pass harmlessly through obstacles.

**4. Methodology**

1. **Planning & Design:** Define the 3D asset pipeline, finalize the movement physics parameters, and map control responsiveness for mobile touch and desktop keyboard inputs.
2. **Implementation:** Construct the core application using the chosen JavaScript framework and initiate the 3D scene. Develop the procedural logic for track and obstacle spawning based on distance.
3. **Feature Integration:** Implement the state machines for the Boost and Phase-Shift abilities, including UI meters and associated audio/visual feedback. Integrate the scoring and high-score persistence system.
4. **Testing:** Conduct alpha and beta testing, focusing specifically on control latency, frame rate performance, and ensuring the procedural generation does not create unavoidable obstacles.

**5. Tools & Technologies**

* **Game Engine/Library:**  Unity
* **Programming Language:** C#
* **Design Tools:** Figma / Blender
* **Version Control:** GitHub
* **Platform:** Mobile Compatibility

**6. Expected Outcome**

The group expects to deliver a fully functional **single-file web application prototype** of the *Vapor Drift* game. This prototype will demonstrate all core gameplay mechanics, including dynamic procedural track generation, working Boost and Phase-Shift systems, and a persistent high-score tracker. The project will serve as a strong portfolio piece, demonstrating proficiency in real-time 3D rendering, complex state management, and performance-driven design within a modern web environment.

**7. Future Enhancements**

* **Dynamic Audio Integration:** Integrating a music library (e.g., Tone.js) to dynamically adjust the synthwave track’s tempo and intensity in direct correlation with the player’s speed.
* **Expanded Environment:** Introducing new biome variations within The Grid (e.g., "Data Tunnels," "City Overlook") with unique obstacles and visual effects.
* **Multiplayer Competition:** Implementing a real-time, competitive leader board or a "ghost racing" feature using persistent cloud storage.

**8. Conclusion**

The *Vapor Drift* project represents a comprehensive and engaging application of computer science principles, integrating 3D graphics, procedural algorithms, and intricate game logic into a cohesive experience. The successful completion of this project will showcase the team's ability to transform theoretical knowledge into a polished, high-performance software solution, offering valuable experience in a cutting-edge field of web game development.