Inspired Reality Games

Project: GRAVITY

Game Design Document

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**Loose Incremental Dynamic Difficulty Adjustment (LIDDA)**

LIDDA is a Difficulty Scaling mechanic that seeks to define a level of challenge suited for the player. This is based on both player selection and overall game progression and performance. This DDA is a variant of typical DDA’s in that the challenge offered to the player does not scale downwards on average. Hence, why the system is incremental. Instead, challenge deviation and levels of scaling are used instead. Hence, why the system is a loose DDA.

The player selects a difficulty level to determine the predefined starting difficulty. Each difficulty level features a different rate of challenge scaling over game progression. The current iterations for challenge scaling are logarithmic, linear, and exponential for each difficulty level respectively. While challenge scaling is exclusively incremental, there are several modifiers to fine-tune the challenge level for each player, and may decrease the growth rate of challenge and pressure applied.

The first challenge modifier is the “Peaks and Valleys” trigonometric graph, such as a sine curve. The purpose of this system is to inject a wave-like behavior where pressure is applied to the player in fixed intervals, each peak applying more pressure than the previous. Every peak is followed by a valley where challenge diminishes and the player is offered a moment of respite. This is discussed further in the Wave Mechanic. For the sake of mathematics, this trigonometric curve is multiplied by the ever-growing challenge factor discussed in the previous paragraph.

The second challenge modifier is the “Skill Range”. This range is a measure of the player’s skill, which may be calculated by hits, misses, shots fired, damage taken, and stability crystals collected, all over elapsed game duration to establish weighted ratios that provide a rough estimate of how the player is doing. The largest magnitude effectiveness is a logarithmic boost or decline to the challenge growth factor over the course of the game. Player Skill has a more profound effect on easier difficulties, as its purpose is to form fit difficulty for low-level and novice players. Players who select a higher difficulty will see much less of a change by Skill Range.

The third challenge modifier is the “Aggression Index” and this is used to provide extra challenge when there is a special event, such as the destruction of many ships in a short period of time. The purpose of this challenge modifier is to act in response to player aggression or kill-streaks by momentarily pushing back. Unlike other scales, the Aggression Index is designed for short bursts and the overall effect wears off quickly. However, the highest levels of aggression can produce up to three times the amount of the current scaled challenge level in a short period of time. Aggression Index will not punish a player for scoring kills, but will punish a player for scoring too many kills too quickly.

There are a variety of ways that difficulty may be increased. Simple ways that exist in many games today, known as “False Difficulty,” include the following:

1. Increasing enemy statistics (Health, Damage, Speed)
2. Increasing enemy accessibility to power-ups
3. Reducing stability crystal drops (Health drops)
4. Increasing number of enemies on the map.

Other means of increasing difficulty include improvements to the logic behind the game. These “Real Difficulty” modifications include:

1. Improving enemy awareness and response timing.
2. Improving enemy evasiveness to attacks.
3. Improving enemy accuracy and leading shots.

**Gravity Well**

The Gravity Well is a large structure located at the center of the map. The appearance of the well is like a floating, cylindrical spire with floating rings that rotate

**Player Goals**

1. Prevent the Gravity Well from becoming too strong.
   1. Destroy debris before they collide with the well.
2. Collect Stability Crystals to stay alive.
   1. Destroy debris and asteroids.
   2. Destroy enemy ships.