Dynamic Difficulty Adjustment

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Overview

- **Why should we care**
- Background
- Hunicke Experiment
- Emotion Based Dynamic Difficulty Adjustment
- MDDA

Why Do We Care

- Developers want to sell copies
- Players want to have a good experience
- 65% of American adults play video games

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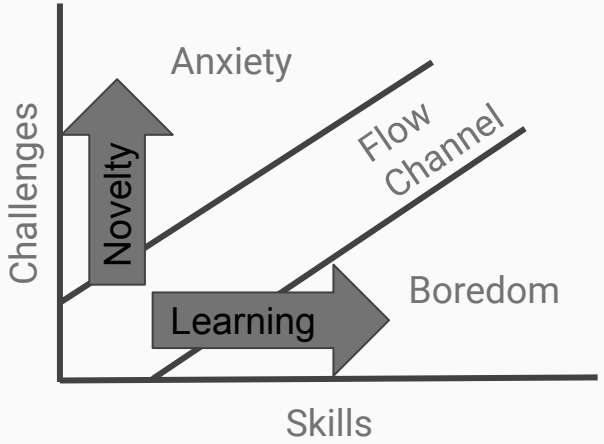
- Hunicke Experiment
- EDDA
- MDDA

Flow and Difficulty

- Want to put players in a state of flow
- Difficulty helps put players in flow

What is Flow

- Mihaly Csikszentmihalyi (Me-high Cheek-sent-me-high)
  - Hungarian-American Psychologist
- Highly focused mental state
  - In the zone
  - Time



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Why is it hard to get correct

- Difference in perceived vs actual difficulty
- New player vs. professional

Static Difficulty

- Most have at least 3
  - Can be more
- Difficult to find correct setting
  - Takes time

What does DDA Mean

- Changing difficulty
- When is a change determined

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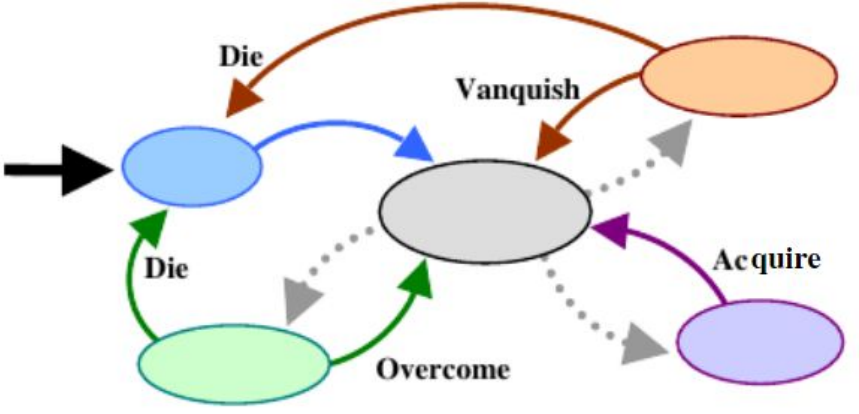
Hunicke Experiment

- Hunicke and The Case for Dynamic Difficulty Adjustment in Games
- Game used
- FPS loop
- Gave players health
  - Formula to determine the probability of death
- 20 participants
  - Rated their own gaming ability



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What Was Found

- 2.4 Less deaths
  - Self rating didn't affect the amount of deaths
- More enjoyment from higher skilled players

	Mean	Standard Deviation
Unadjusted	6.4	2.108185
Adjusted	4	2.951459

[3]

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Emotion-Based DDA (EDDA)

What is it?

Emotion-Based DDA (EDDA)

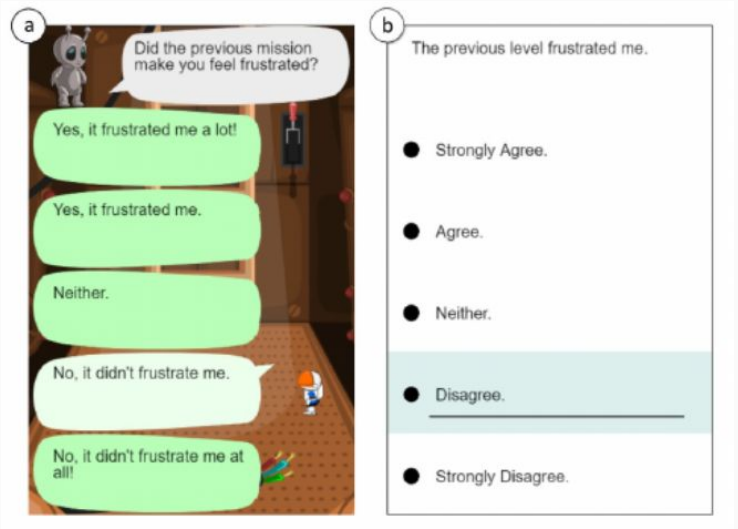
- Frommel et al. wrote Emotion-based Dynamic Difficulty Adjustment Using Parameterized Difficulty and Self-Reports of Emotion
- Wanted to see if DBSR was an effective way to track player emotion
- Wanted to see if EDDA was an effective way to determine when to change the game

What they did

- Used the game Space Jump
- Players played on 3 different difficulties
  - EDDA
  - Increasing difficulty
  - Constant difficulty
- 66 participants

Dialogue-Based Self-Reports

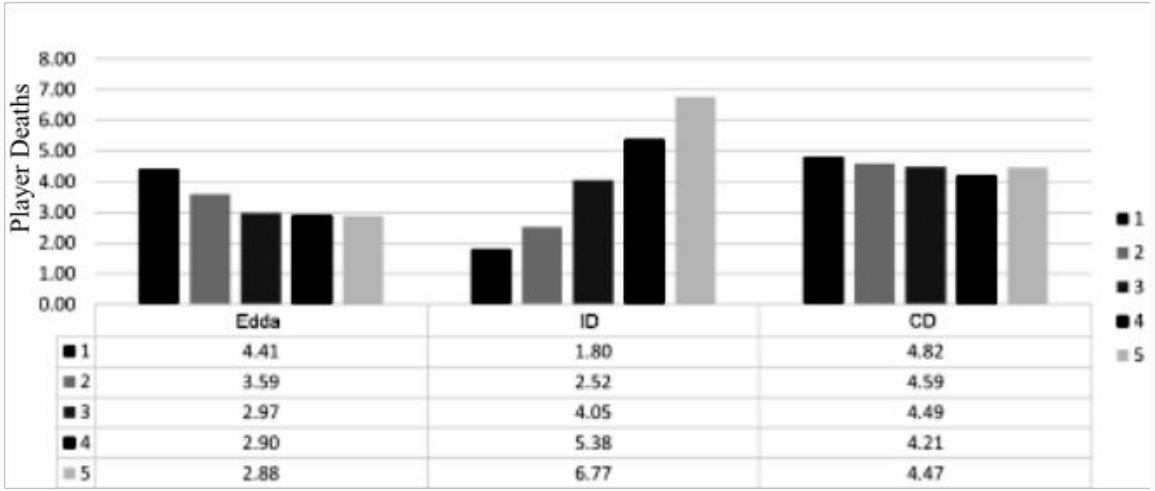
- Questions from Non-Player Character (NPC)



[2]

What Was Found

- Less player death in EDDA
- DBSR measured player frustration/boredom as accurately as standard survey



	Edda	ID	CD
1	4.41	1.80	4.82
2	3.59	2.52	4.59
3	2.97	4.05	4.49
4	2.90	5.38	4.21
5	2.88	6.77	4.47

[2]

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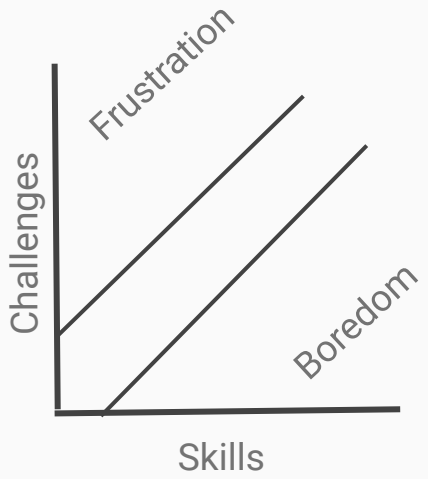
Multiplayer Dynamic Difficulty Adjustment

- Baldwin et al. wrote Crowd-Pleaser: Player Perspectives of Multiplayer Dynamic Difficulty Adjustment in Video Games
- What is it?
  - DDA, but in a multiplayer setting
- Why is MDDA more difficult



The setup

- 154 participants total
  - 125 completed the full survey
- 2 different perspectives from each person
  - Why?
- In the context of Call of Duty
  - Not in the study

Determination

When will it be decided a player needs a boost

- Before the match starts (In the lobby)
- During the match

Component	Attribute	LPP	HPP
Determination	Pre-gameplay	4.2	3.8667
	During Gameplay	4.7067	3.78

[1]

Automation

Who will determine when a player needs help

- System
- The LPP or teammates

Component	Attribute	LPP	HPP
Automation	Applied by System	4.6454	3.922
	Applied by Player(s)	4.1418	3.766

[1]

Recipient

Who will get the boost

- The LPP
- Everyone on the LPP's team

Component	Attribute	LPP	HPP
Recipient	Individual	4.5664	4.021
	Team	4.1189	3.1818

[1]

Skill Dependency

What kind of boost is given

- Movement speed boost
- Health boost

Component	Attribute	LPP	HPP
Skill Dependency	Skill Dependent	4.4478	4.6045
	Skill Independent	4.5672	3.5896

[1]

User Action

How does the LPP apply the boost

- Interaction
- Automatic application

Component	Attribute	LPP	HPP
User Action	Action Required	4.5231	4.3923
	Action Not Required	4.4077	3.6615

[1]

Duration

How Long will the boost be applied

- 1 time
- 2 or more times
- Amount of time

Component	Attribute	LPP	HPP
Duration	Single-use	4.5827	4.5267
	Multi-use	4.9921	3.7795
	Time-based	4.685	4.189

[1]

Visibility

Who knows that a player gets the boost

- The player that receives the boost knows
- Teammates and/or enemies (can include recipient)
- No one knows a boost was applied

Component	Attribute	LPP	HPP
Visibility	Recipient	5.0794	3.8492
	Non-recipient	3.9206	4.3571
	No one	3.881	3.6111

[1]

Conclusion

- Flow and difficulty
- Different ways to determine when to intervene
  - Look at numbers
  - Look at emotions
- More difficult in MDDA

Questions?

References

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