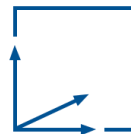


Adaptive Difficulty in Massively Multiplayer Online Role-Playing Games to Create Optimal Experience

Lukas Liu

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Supervisor(s): Daniel Dyrda

Introduction

- Covid-19 pandemic increased popularity in online games
- more and more new players pick up video games
 - wide variety of players with different skill and experience levels
- traditional difficulty cannot accommodate any kind of player

Problem Description

- static difficulty progression is not optimal for every player
- difficulty has to suit as best as possible for a group of players at once
- acquiring the necessary information to determine the need of difficulty changes
- identifying elements in an MMORPG to execute difficulty adjustments

Approach

- Defining and describing key terms
- Analyze an existing MMORPG to determine possible variables for implementation
 - focus on boss fights
- Create a prototype adaptive difficulty system
- Discuss its effectiveness and issues

MMORPG

- Role-playing game
 - The Character
 - acts as the players gateway into the world
 - progression systems
 - interactions with the world or other players
 - The World
 - accompanied with a theme
 - persistent world containing the game's content
 - sets rules and boundaries of a fictional reality

MMORPG

- Massively Multiplayer Online
 - The Community
 - world is inhabited with a lot of other players at once
 - competition, cooperation, social interactions
 - experience a fictional world together

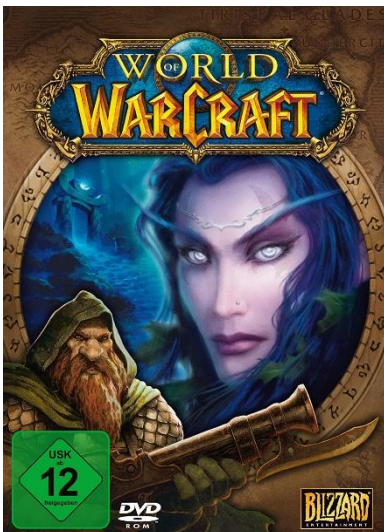


Fig. 1 World of WarCraft Cover Art

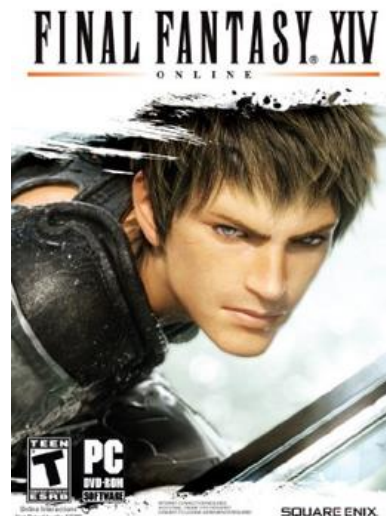


Fig 2. Final Fantasy XIV Cover Art



Fig. 3 Guild Wars 2 Promotional Art



Fig. 4 Old School RuneScape Logo

Game experience

- games are a tool to create an experience
 - games themselves are not an experience
- highly subjective
 - player psychology, motivations, perception, playstyle
- a good game experience difficult to quantify and measure
 - studies and opinions vary due to subjective nature

Game experience

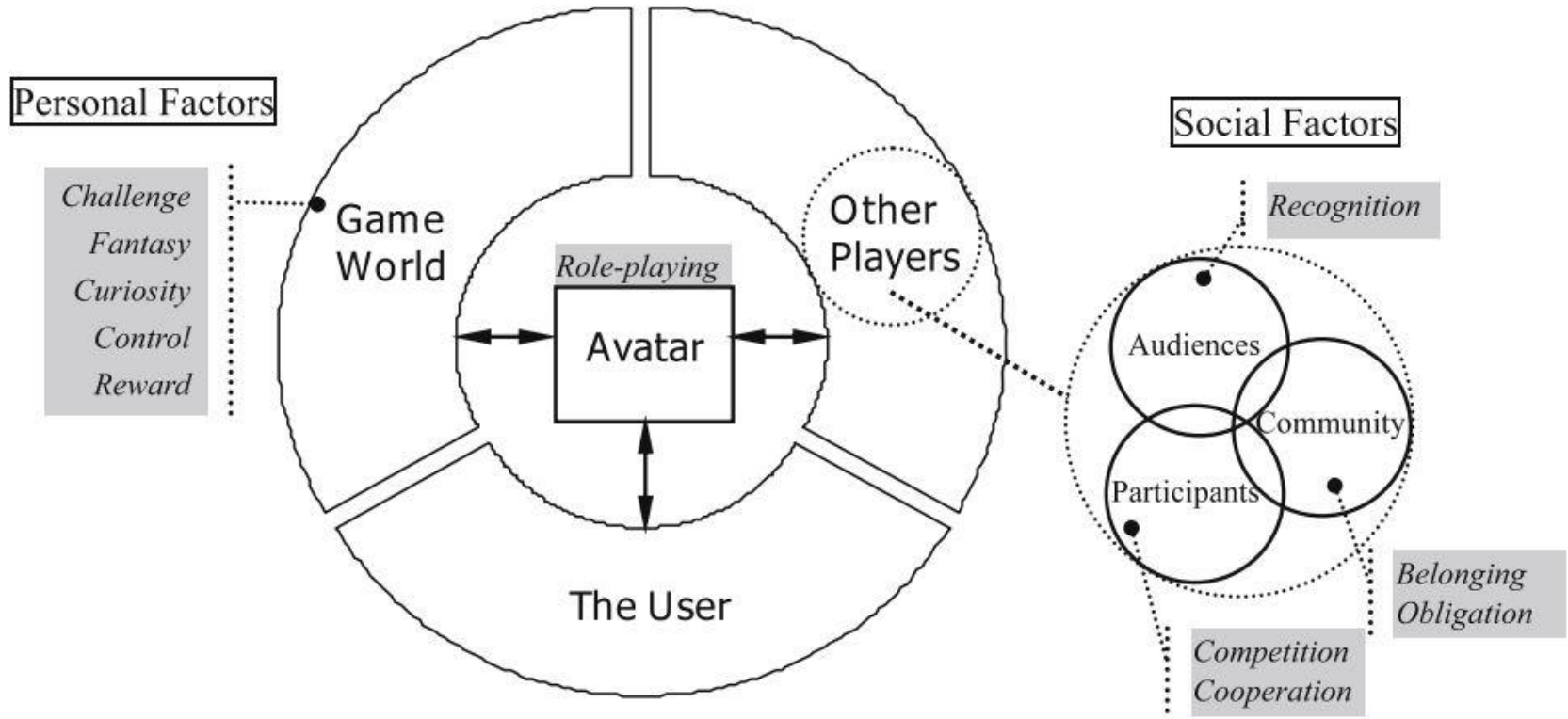


Fig 5. User Experience Model for MMORPGs

Flow

- mental state of full immersion and concentration
 - loss of awareness and time, in control, high concentration, intrinsically rewarding
 - perceived challenges adequately challenging relatively to the player's skills
 - player needs to feel challenged
 - clear goal
 - immediate feedback for progression

Flow

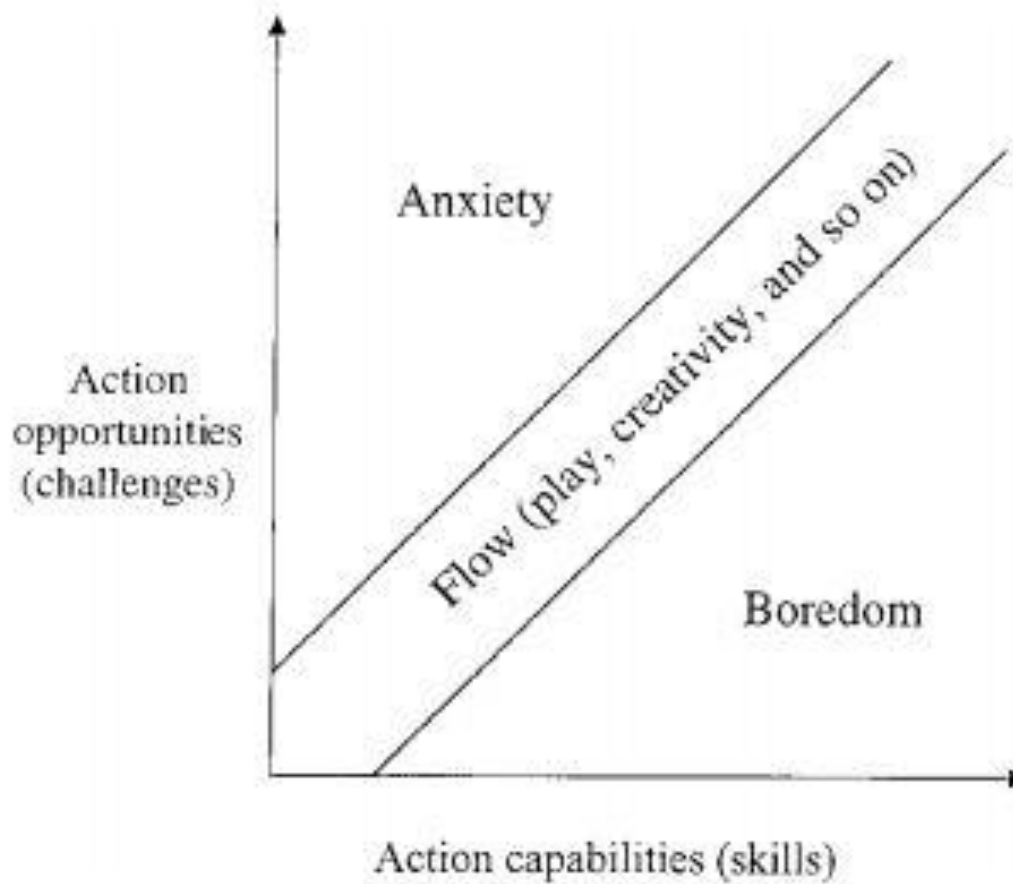


Fig 6. Original Flow model

Flow

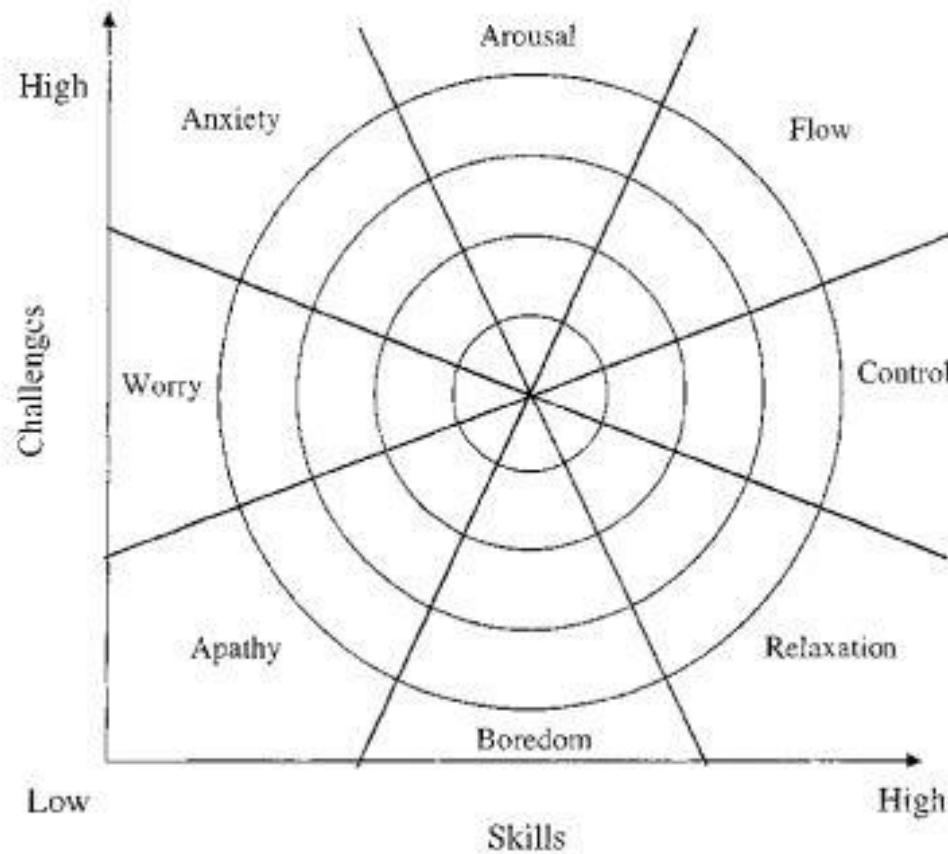


Fig 7. Revised Flow model

Difficulty

- **Predetermined difficulty**
 - most commonly used and easy to implement
 - one or multiple set difficulties
 - modern games offer more customization
- > appropriate difficulty only attainable through trial and error
- > possible frustration or boredom

Difficulty

- **Adaptive difficulty**

- difficulty adjusted during gameplay
- information obtained before or during gameplay
 - player performance, player preference
- adjustments made directly to in-game challenges

-> risk of making inappropriate changes

-> can result in an improved game experience if done correctly

Analysis



- Time
 - anything pertaining time and chronological order in the encounter
- Attempts
 - information of current and previous attempts of specific encounter of player(s)
- Enemy
 - enemy features, behaviour and data that involves the enemy

Analysis



- Players
 - features, progression status and skill level of a player/players
- Mechanics
 - attack patterns or game mechanics in the encounter for the players to overcome/figure out
- Environment
 - encounter environment and surroundings that affect the fight directly/indirectly

Implementation







- Unity open-source project Boss Room
- cooperative multiplayer RPG up to 8 players
- 4 different roles with different abilities
- dungeon with smaller enemies and a boss



Fig 8. In-game screenshot from *Boss Room*

Implementation

Implemented changes:

- scoring system
- scaling strength of the boss enemy
- internal difficulty system
 - tracks player count 
 - tracks win/losses 
 - tracks hit frequency of boss mechanic 
- variable intervals of the boss' strength scaling 
- variable damage and health of enemies 
- variable environmental changes 

Discussion

- small changes made difficulty more dynamic
- in MMORPGs more difficult because of multiple players at once
- challenge lies in correct adjustment accuracy
- baseline provided with analyzed parameters
- more testing , more intricate methods

Conclusion

- adaptive difficulty proves useful in improving game experience
- challenge in attaining useful information for adjustments
- MMORPG context (rewards, player count)
- risk of system making faulty decisions
 - testing, more information, option to turn off

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