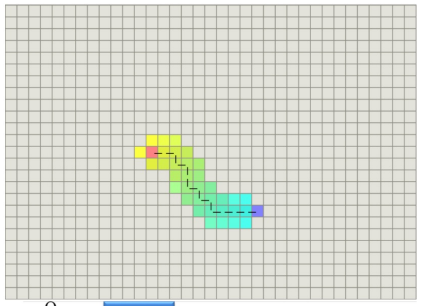
# Player Modelling: Introduction

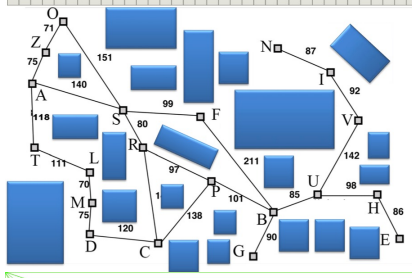
Matthew Guzdial

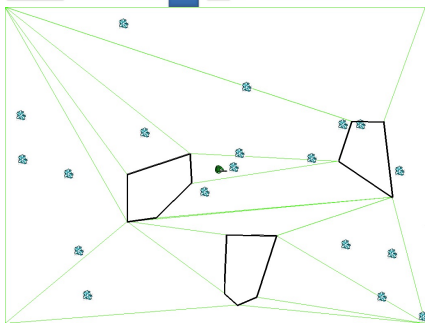
# Announcements

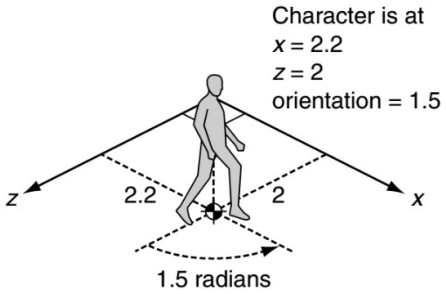
- Quiz 3 on Friday! (released 11am, 48 hours to complete)
  - I will not be in the lecture hall, but I'll sit on the Google Meet
- Help Session Thursday (tomorrow) 5-7:50pm (ETLC E2-002)
- Make-up option added for assignments (details on eClass)
- Assignment 3 due Monday (normal 23h grace period)
- Midterm course survey!

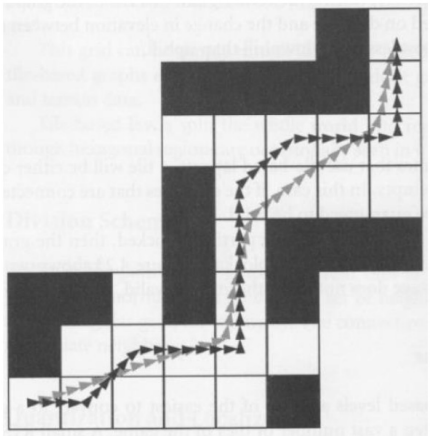
# Review: Spatial Representations and Movement Strategies

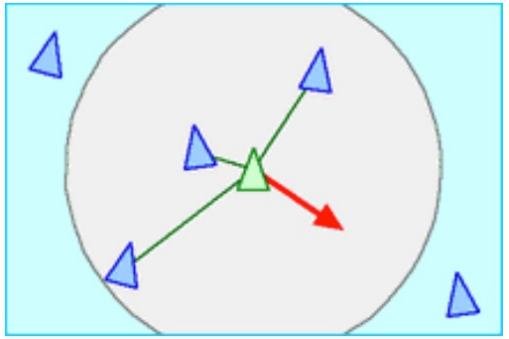




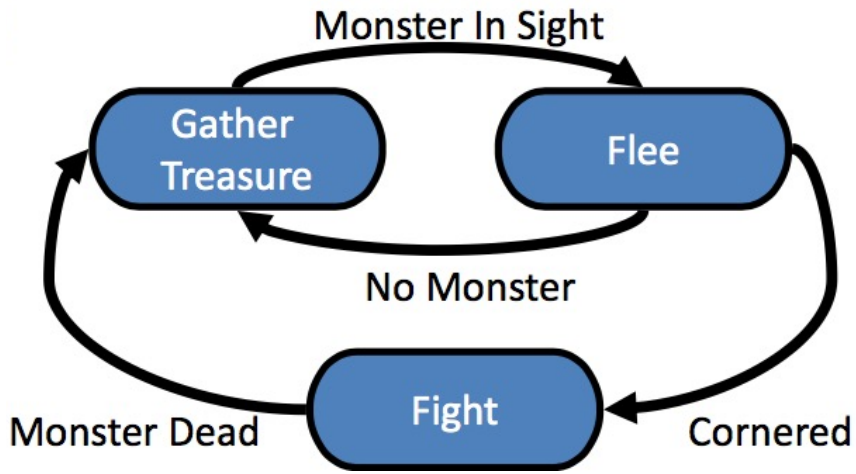







# Review: Decision Making Strategies

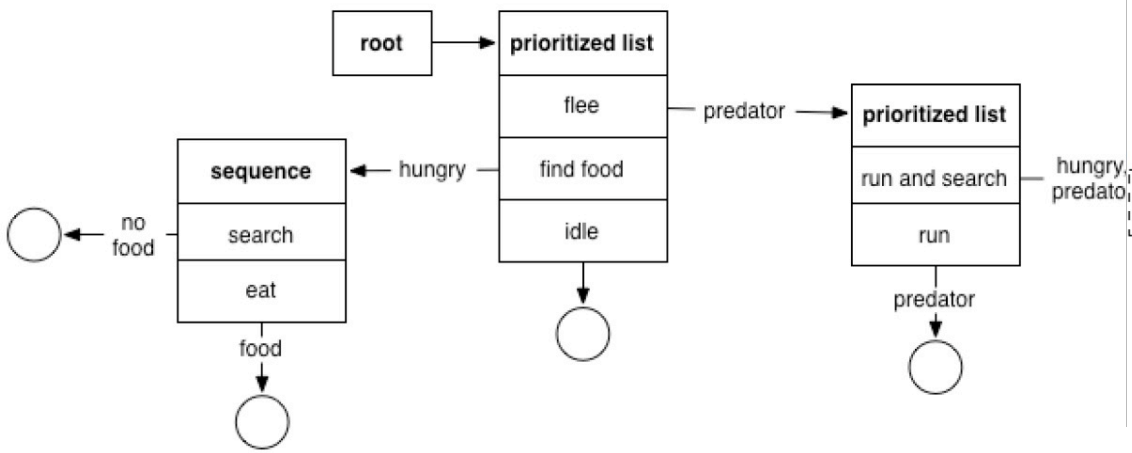


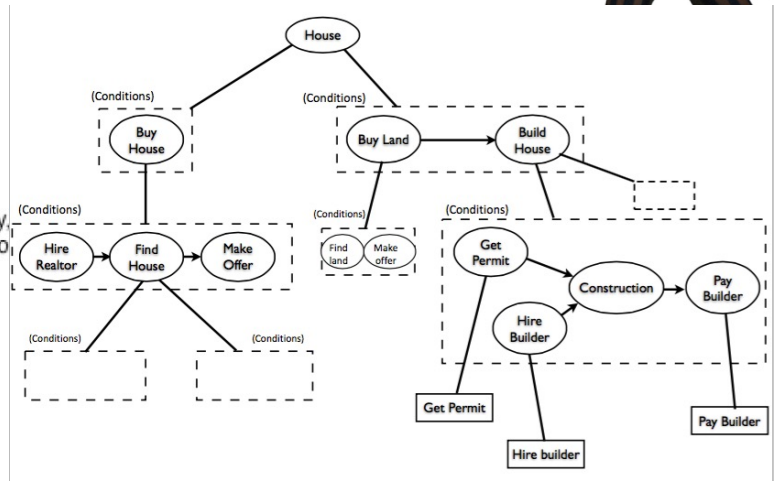

## Rule Matching

Query

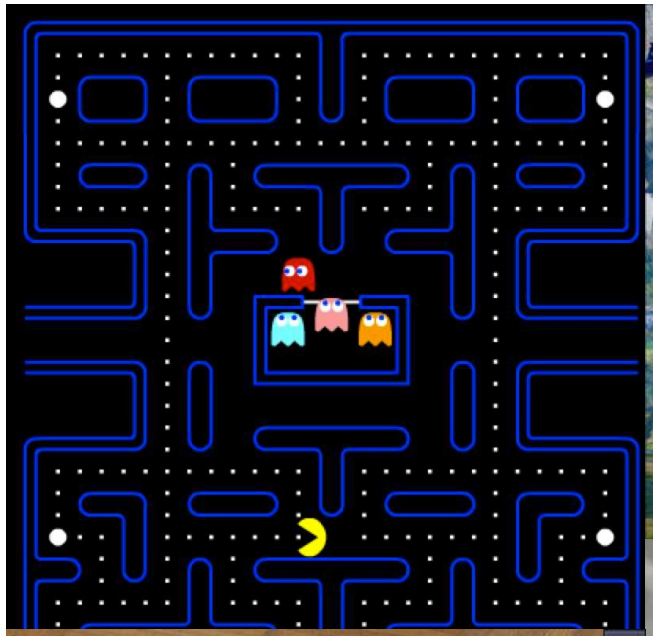
```
{ who: nick, concept: onHit, curMap:circus, health: 0.66, nearAllies: 2, hitBy: zombieclown }
```

PASS { who = nick, concept = onHit } → *"ouch!"*
FAIL { who = nick, concept = onReload } → *"changing clips!"*
FAIL { who = nick, concept = onHit, health < 0.3 } → *"aaargh I'm dying!"*
PASS { who = nick, concept = onHit, nearAllies > 1 } → *"ow help!"*
PASS { who = nick, concept = onHit, curMap = circus } → *"This circus sucks!"*
PASS { who = nick, concept = onHit, hitBy = zombieclown } → *"Stupid clown!"*
PASS { who = nick, concept = onHit, hitBy = zombieclown, curMap = circus}
→ *"I hate circus clowns!"*



# At this point we have all the AI one might typically consider “AI” in a game





# What element of most modern AAA games are we missing?


# Left4Dead AI Director

# Player Modeling

A set of approaches that represent/quantify the player's experience with the goal of improving that experience.

Improving the experience either:

1. Within the game (picking which Mario Kart item)
2. Outside the game (analytics, more on this Monday)

**Can you think of a way Player Modeling impacts you if you play games?**

# My Answer


OVERWATCH
RANKED DIVISIONS
ICON
NAME
SKILL RATING
SEASON 1
BRONZE
1-1499
1-29
SILVER
1500-1999
30-39
GOLD
2000-2499
40-49
PLATINUM
2500-2999
50-59
DIAMOND
3000-3499
60-69
MASTER
3500-3999
70-79
GRANDMASTER
4000-5000
80-100
TOP 500
TOP 500 IN REGION

# Model-based versus Model free

We can separate player modeling approaches into two more general groups:

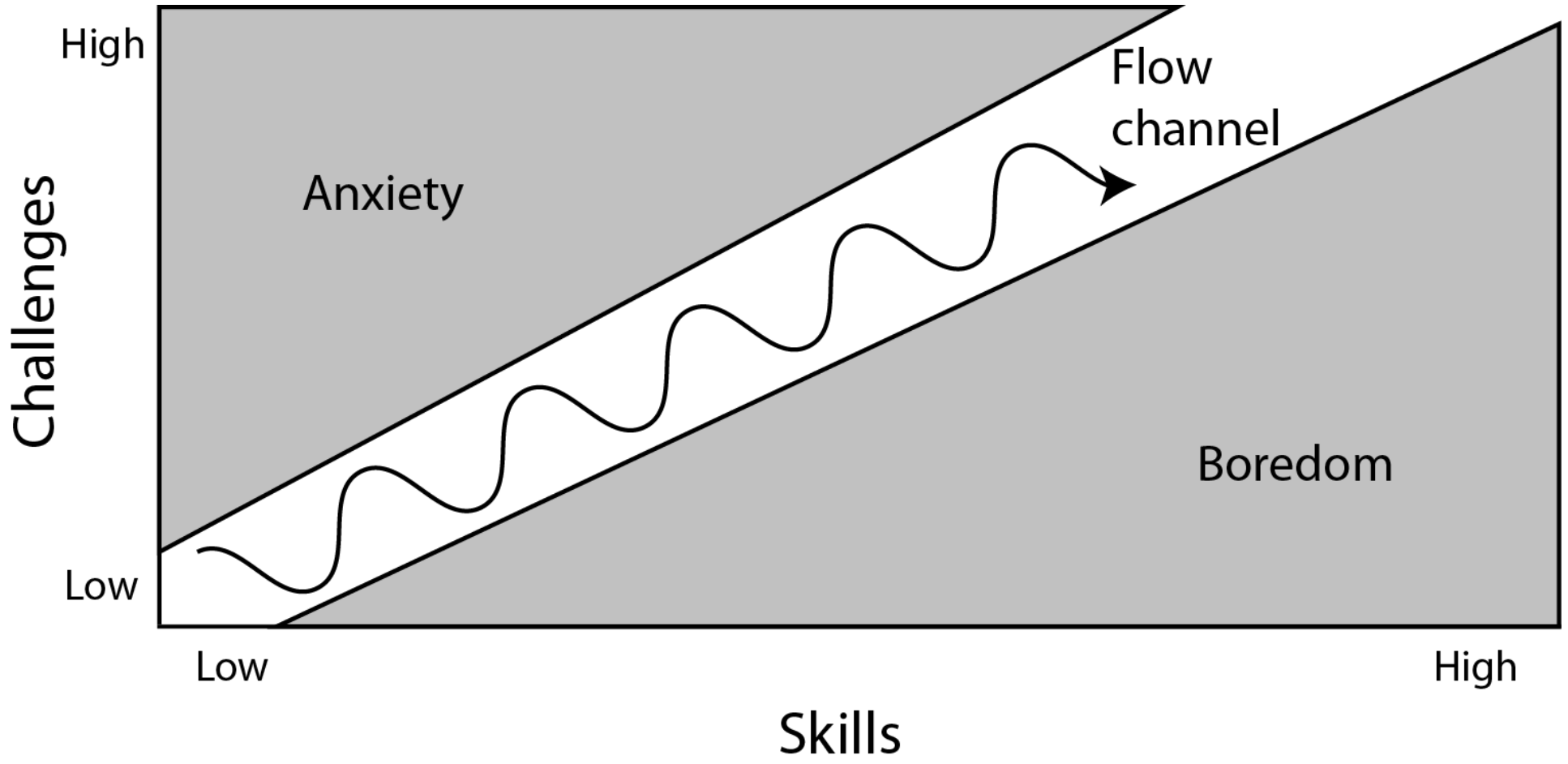
- **Model-based**: A set of categories or value ranges to assign to some part of a player's experience
- **Model free**: Looks for patterns of behavior without pre-existing hypothesis, drawing on statistical/machine learning techniques

# Model-based: 4 Major Models

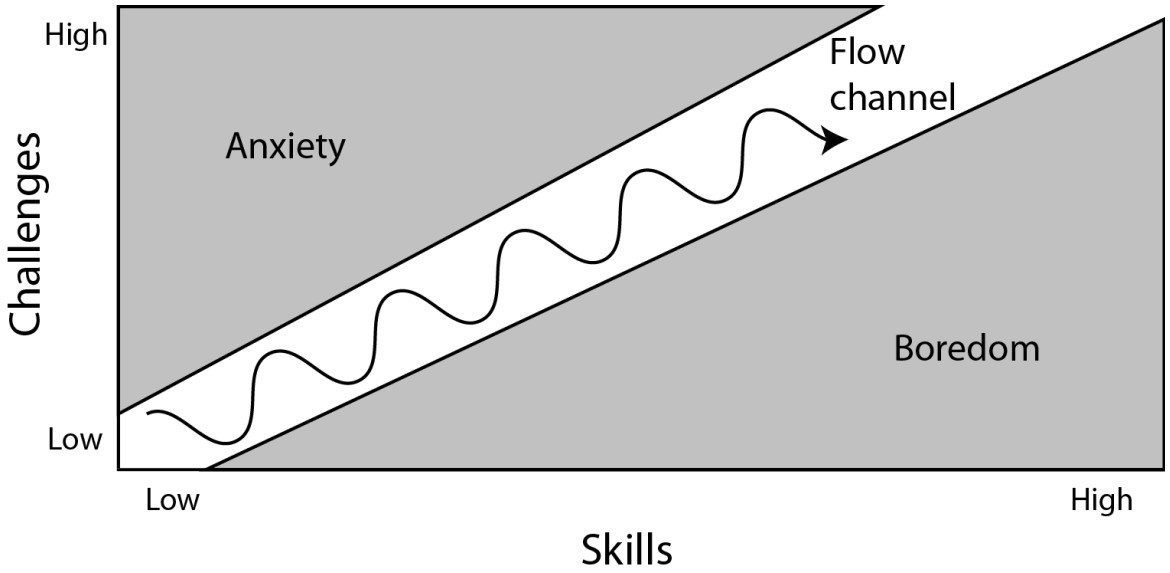
- **Note:** This is not to say that there exists only four models, but that vast majority can be understood as derivatives of these four

1. Flow (Position in space)
2. Bartle's player types (Categories of play style)
3. Elo's performance rating (Continuous value)
4. Drama Management (Difference between target value and current value)

# Flow


High
Low
Challenges
Anxiety
Flow
channel
Boredom
Low
High
Skills

# Mario Kart: Flow


**Input**: Skills (player placement in race), and Challenges (power-ups of enemies)

**Output**: A position in space.

**Decision:** What do we do about it?

# Flow

- Advantages
  - Intuitive
  - Matches player experience
- Disadvantages
  - Need to design reliable measures for player challenge and skill, not possible in all games
  - Difficult for non-competitive multiplayer games

# Bartle’s Player Types

- Originally designed for Multi-User Dungeons (think extremely early, text-based MMO)
- Four classes
  1. Killers
  2. Achievers
  3. Socializers
  4. Explorers

# Bartle's Player Types

- Most commonly used today in the design of MMORPG's, to motivate these different "types" of players

- Example: World of Warcraft
  - Experience for killing mobs (killer)
  - completing quests (achievers)
  - exploring (explorers)
  - battlegrounds (socializers)

# Player Types within a game Example: Dragon Age Prototype

Five types, what motivates?

- Fighters (combat)
- Power Gamers (gaining special items)
- Tacticians (creative thinking)
- Storytellers (complex plot)
- Actors (dramatic actions

http://www.aaai.org/Papers/AIIDE/2007/AIIDE07-008.pdf

# How it worked

- Each player has a vector
  - (Fighter,  MethodActor, Storyteller, Tactician, PowerGamer)
- Every action is tagged with one or more of these roles.
- Every time a player takes an action, update the value of the vector index of the associated role(s).
- System chooses reward to incentivize the maximal role(s)

# Example

- Player A has vector (F: 0, MA: 0,S: 0,T: 0,PG: 0)
- Player A asks for a reward for a quest, an action which is strongly tagged with the PowerGamer role (value of 100)
- Player A now has a vector (F: 0, MA: 0,S: 0,T: 0,PG: 100)

- Later on Player A will be offered more powerful items if their vector remains unchanged

# Player Types

- Advantages
  - Can allow designers to understand player base
  - Can broaden the appeal of a game
- Disadvantages
  - Different games/genres need their own player types designed, a tricky task
    - E.g. “Whales” in free-to-play mobile games
  - In-game usage of this model requires a lot of extra knowledge authoring

# PQ1 https://forms.gle/hA5L4c9qn1oYEhxC9 https://tinyurl.com/guz-pq20a

Pick a genre or game you are familiar with (not Dragon Age or a super similar RPG), what are the major player types you would imagine exist for it?

How could the game adapt itself to appeal to each of these player types?

# My Answer

Pokémon

- **Tactician**: Wants to be the very best that no one ever was, make the game more challenging
- **Collector**: Wants to catch ‘em all, increase Pokémon spawn rates for uncaught Pokémon
- **Anime hero**: Wants to befriend certain Pokémon and use them throughout the game. Make the game easier, have NPCs comment on Pokémon.

# Elo's Performance Rating

Algorithm:

- For each win, add your opponent's rating plus 400
- For each loss, add your opponent's rating minus 400
- Divide this sum by the number of played games

Formula:(Total of opponents' ratings + 400(Wins –Losses))/
Games

Arpad Elo

# Quick Note: Elo rating naming confusion

Many games do not make use of this exact rating algorithm, but you will still hear references to “Elo rating”/Elo hell

This phrase often refers to any algorithm to update player skills given wins/losses and prior player skills. (Skill-based Match Making)

# Elo Rating

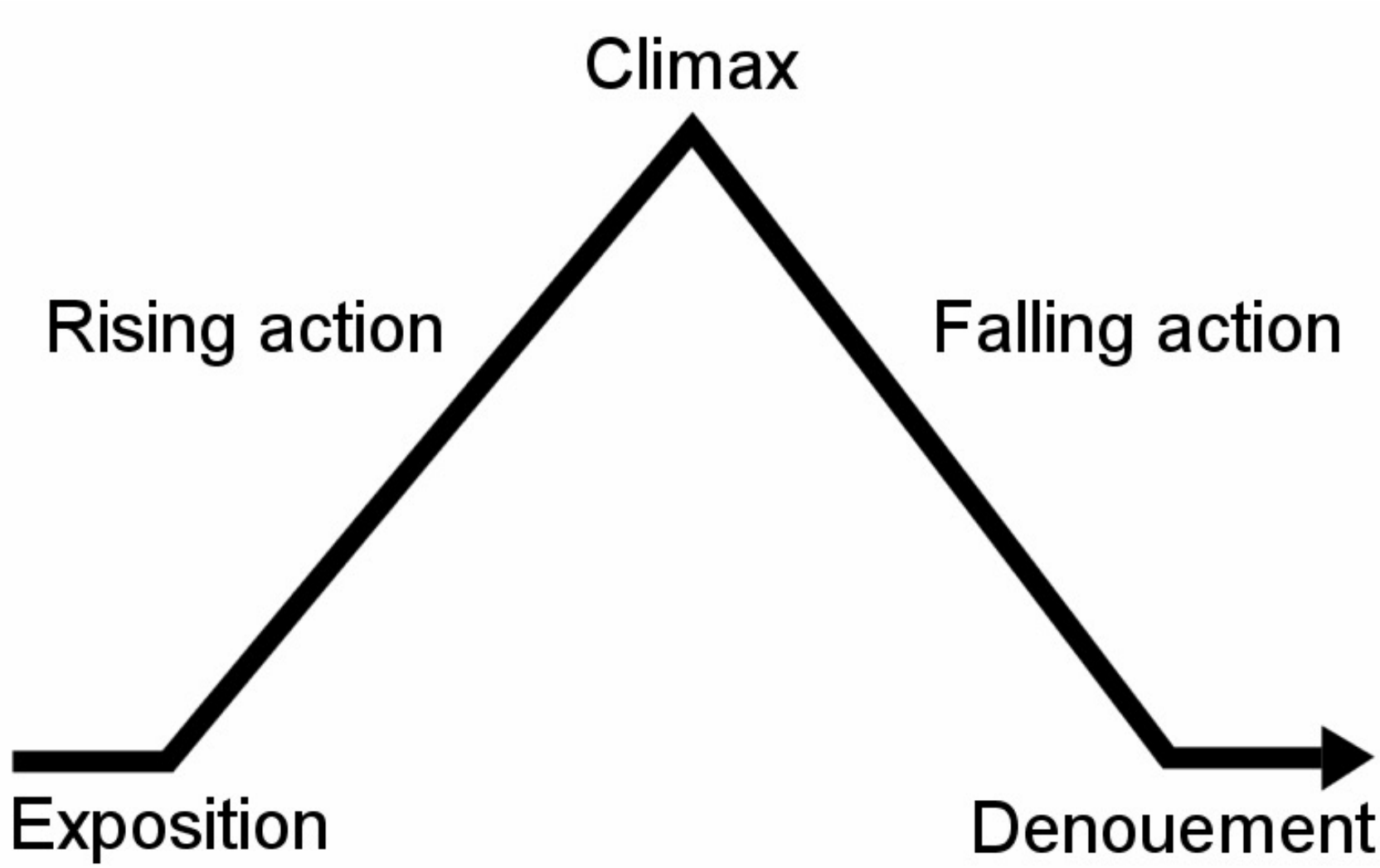
- Advantages
  - Requires very little designer authoring
  - Does a surprisingly good job of keeping competitive games fair
- Disadvantages
  - Player's do not like seeing this value drop
    - Solution: Many games have "hidden" true Elo ratings
  - Limited to competitive experiences
    - Only makes sense when comparing players to others

# Left4Dead AI Director (warning: blood)

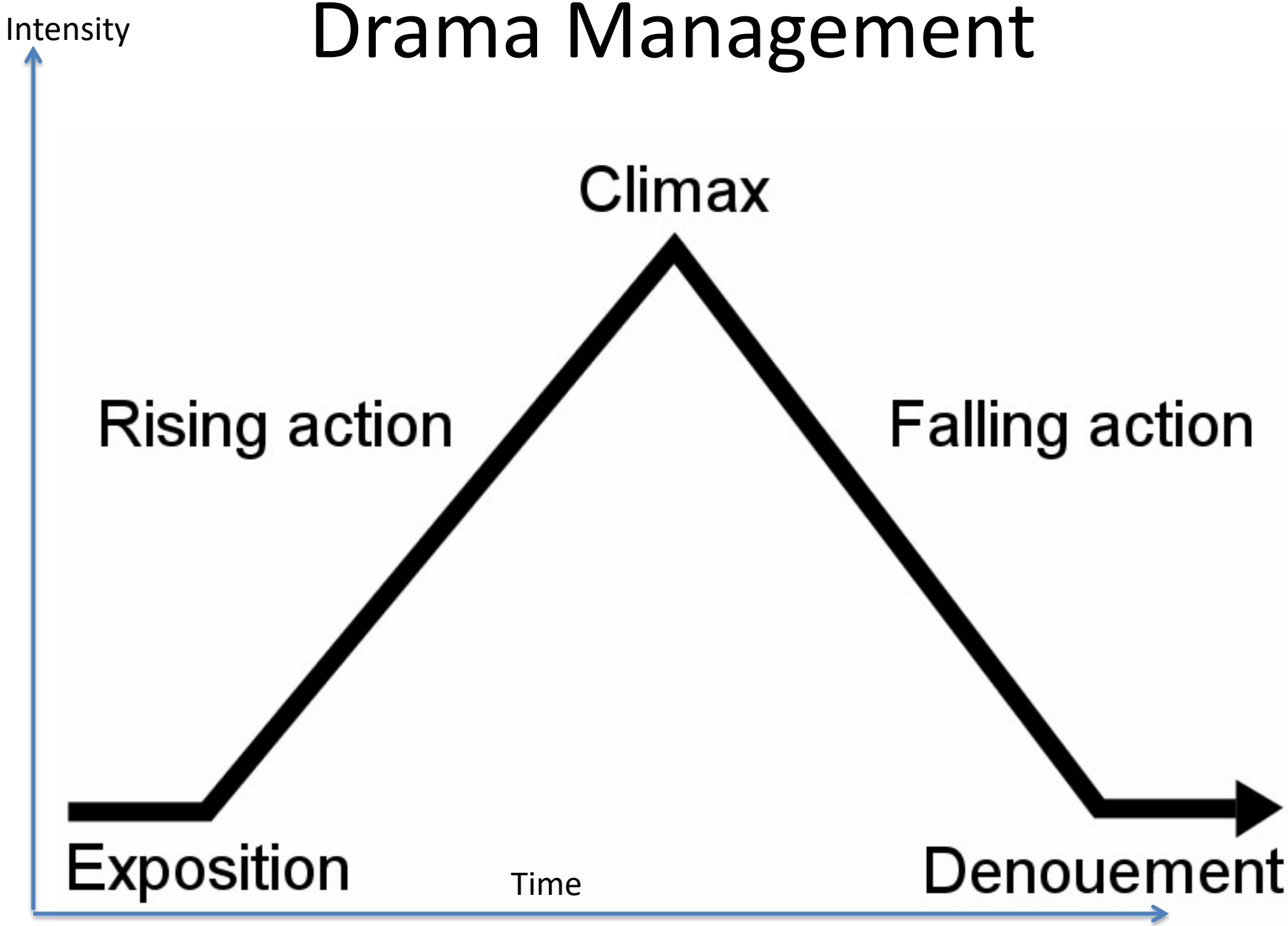
Example (7:08):

https://youtu.be/zDBNQxzZc2o?t=428

# Drama Management



# Drama Management



# Left4Dead AI Director

Constantly measures player “intensity”

- Intensity increases when attacked/killing
- Players hit max when incapacitated
- Players slowly drop intensity when nothing is happening and reset at the start of a new stage
- (This is a lot like challenge in flow)

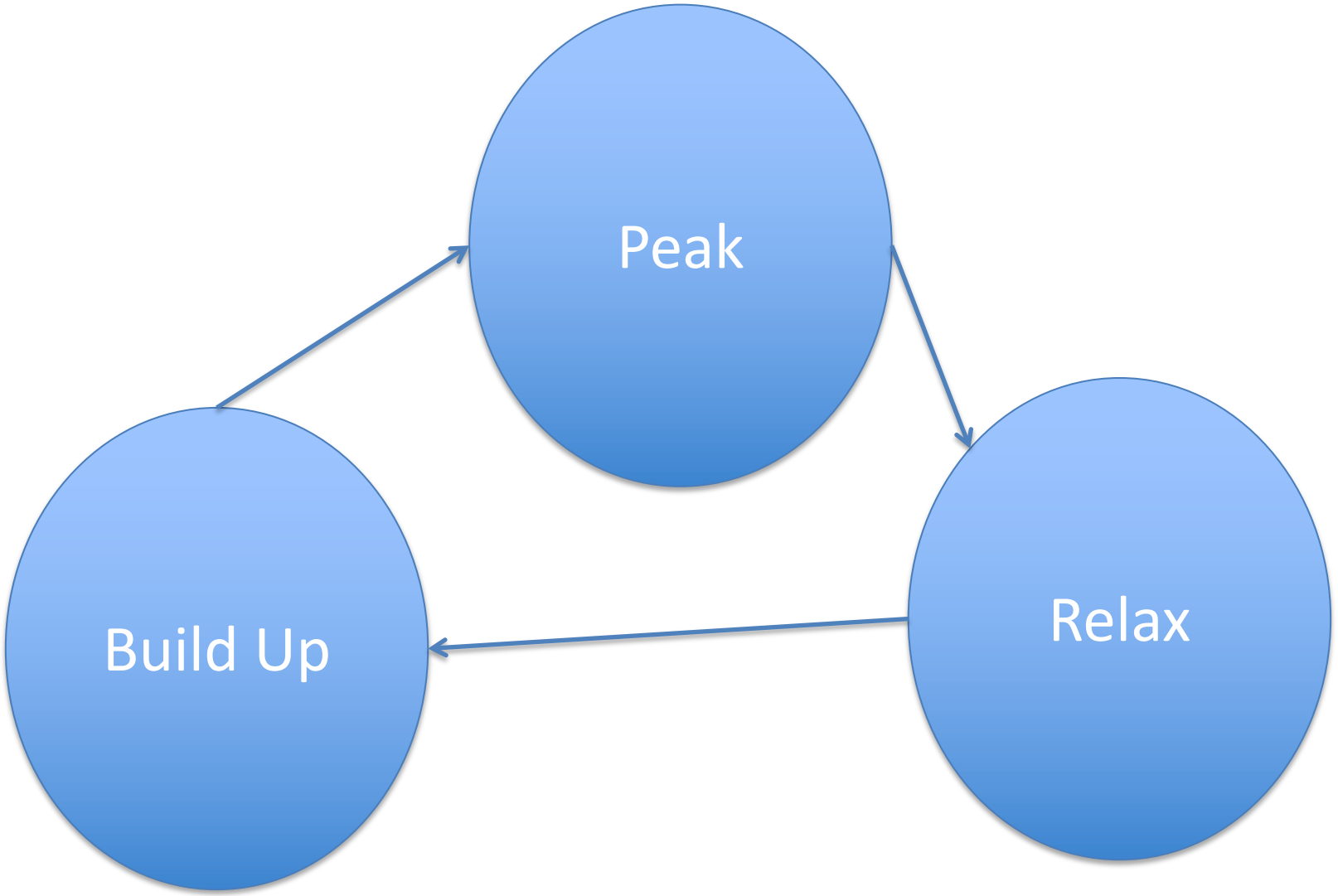
https://medium.com/@t2thompson/in-the-directors-chair-the-ai-of-left-4-dead-78f0d4fbf86a

# Left4Dead AI Director

Three “modes”

- **Build up**: AI Director attempts to increase tension
- **Peak**: Intensity reaches max, director stops spawning enemies
- **Relax:** Director spawns helpful items/alters path to decrease tension

# AI Director as FSM



# Lots of Games have AI Directors (Not always well executed)

Remnant: From the Ashes


https://www.gamedeveloper.com/design/combat-co-op-and-proc-gen-inside-the-design-of-i-remnant-from-the-ashes-i-

Back 4 Blood

https://www.escapistmagazine.com/back-4-blood-game-director-lacks-tension-left-4-dead-ai-director/

# Drama Management Summary

- Advantages
  - Most effective, highly praised
  - Gives players another level of strategy
- Disadvantages
  - Fair amount of authoring (less than Player Types, more than Flow)
  - All the downsides of FSMs

# Summary

Authoring burden for using in a game:
Player types > Drama Management > Flow > ELO

Ability to use outside a game: Player types only

Ultimately: These models are built from a designer's perspective of player behaviour, not the reality of that behaviour being used to inform a model.

# Quiz 3 Review (time-permitting)

- **Be able to run**: Behavior Trees, Forward Planning, Backward Planning, Partial Order Planning, and Hierarchical Task Networks
- **Remember/Know about:** Today's player modelling methods, other decision making approaches, and path planning approaches