



# Mind Your Step: Avoiding 3 Common Pitfalls in AI Development

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**GAME DEVELOPERS CONFERENCE** March 14-18, 2016 · Expo: March 16-18, 2016 #GDC16





# Mind Your Step: Avoiding 3 Common Pitfalls in AI Development

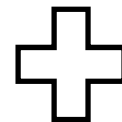
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# INSOMNIAC GAMES



# Mind Your Step:

- High level AI design concepts

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- High level AI design concepts
- Divided into three parts:



# Mind Your Step:

- High level AI design concepts
- Divided into three parts:
  1. Your AI Does Not Excel In the Abstract and Generic

# Mind Your Step:

- High level AI design concepts
- Divided into three parts:
  1. Your AI Does Not Excel In the Abstract and Generic
  2. The Buddy AI Is Not Your Friend

# Mind Your Step:

- High level AI design concepts
- Divided into three parts:
  1. Your AI Does Not Excel In the Abstract and Generic
  2. The Buddy AI Is Not Your Friend
  3. Escalation Is The Mother Of All Challenge



# Mind Your Step:

- Memorable experiences

# Mind Your Step:

- Memorable experiences

50%

# 1. Your AI Does Not Excel In the Abstract and Generic

Or : How to create memorable behavior.

## Abstract Bot System

**Goal:**

Create AI that is 'unique' and 'memorable' !

**Approach:**

Mix and match existing behavior components?

## Abstract Bot System



### **Pitfall:**

Failing to create something memorable  
out of abstract systems!

## Abstract Bot System (Example)

Movement 1

Movement 2

Movement 3

Awareness 1

Awareness 2

Awareness 3

Combat 1

Combat 2

Combat 3



## Abstract Bot System (Example)

Walking

Flying

Swimming

LOS Aware

Omni Aware

Audio Aware

Ranged

Melee

AOE

---

Combine Components

## Abstract Bot System (Example)

Walking

Flying

Swimming

LOS Aware

Omni Aware

Audio Aware

Ranged

Melee

AOE

Flying

+

LOS Aware

+

AOE

## Abstract Bot System (Example)

Walking

Flying

Swimming

LOS Aware

Omni Aware

Audio Aware

Ranged

Melee

AOE

Walking

+

Audio Aware

+

Melee

## Abstract Bot System

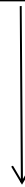
Super efficient, since we write components once.

## Abstract Bot System

Super efficient, since we write components once.

Doesn't answer the important question :  
What does the player experience?

Abstract Bot System (components)



Player-Centric Bot Design (mechanics)

How does the player interact?



## Player-Centric Bot Design

Walking

Flying

Swimming

LOS Aware

Omni Aware

Audio Aware

Ranged

Melee

AOE

How does the player interact?

## Player-Centric Bot Design

Catch

Flank

Run Away

Take Cover

Move Fast

Strafe

Run & Gun

Close-Up

Snipe

---

How does the player interact?

## Player-Centric Bot Design

Catch

Flank

Run Away

Take Cover

Move Fast

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Run & Gun

Close-Up

Snipe

Flank

+

Take Cover

+

Snipe

## Player-Centric Bot Design

Catch

Flank

Run Away

Take Cover

Move Fast

Strafe

Run & Gun

Close-Up

Snipe

Catch

+

Move Fast

+

Run & Gun

## Player-Centric Bot Design

Catch

Flank

Run Away

Take Cover

Move Fast

Strafe

Run & Gun

Close-Up

Snipe

---

This helps, but is it memorable?

## Player-Centric Bot Design

Catch

Flank

Run Away

Take Cover

Move Fast

Strafe

Run & Gun

Close-Up

Snipe

Memorable

Memorable

Memorable

---

Do we need a “memorable” category?



## Player-Centric Bot Design

Catch

Flank

Run Away

Take Cover

Move Fast

Strafe

Run & Gun

Close-Up

Snipe

Memory A

Memory B

Memory C

---

Do we need a “memorable” category?

## What IS Memorable ?

Neuroscience :

## What IS Memorable ?



## What IS Memorable ?

Neuroscience :

“Emotional arousal”

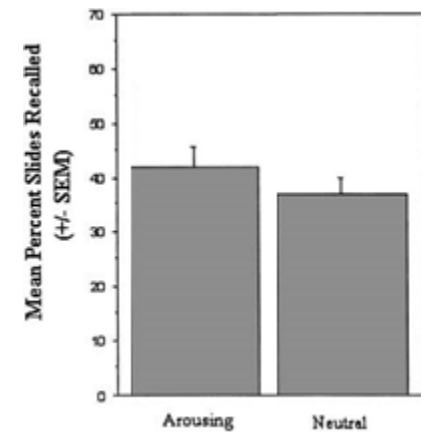
James L. McGaugh et al, Memory and Emotion

## What IS Memorable ?

Neuroscience :

“Emotional arousal”

James L. McGaugh et al, Memory and Emotion



## What IS Memorable ?

Neuroscience :

“Emotional arousal”

James L. McGaugh et al, Memory and Emotion

- Moments that are connected with strong emotions.



## What IS Memorable ?

Neuroscience :

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- Moments that are connected with strong emotions.
- Stress hormones can strengthen memory

## What IS Memorable ?

Neuroscience :

“Emotional arousal”

James L. McGaugh et al, Memory and Emotion

- Moments that are connected with strong emotions.
- Stress hormones can strengthen memory
- Emotional moments in gameplay?

## What IS Memorable in Video Games?

“Emotional arousal” goals\* in gameplay :

1. Affection
2. Synergy
3. Aversion

\* subjective, success not guaranteed

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 1 : Affection

➤ Bonding moment

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 1 : Affection

- Bonding moment
- “Lovable” behavior ?

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 1 : Affection

Playing fetch with D.O.G.  
in Half-Life 2..



Half-Life 2, Valve, 2004

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 1 : Affection

Meeting Boo Boo in Sunset  
Overdrive..





## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 1 : Affection

- Friendly exterior
- Positive feedback
- Looks for attention





## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 2 : Synergy

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 2 : Synergy

➤ Collaboration

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 2 : Synergy

- Collaboration
- Codependence

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 2 : Synergy

Getting a lift in Journey



Journey, Thatgamecompany, 2012

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 3 : Aversion

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 3 : Aversion

➤ Dislike, Betrayal

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 3 : Aversion

- Dislike, Betrayal
- Taunting

## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 3 : Aversion

Wesker, Resident Evil 5



Resident Evil 5, Capcom, 2009

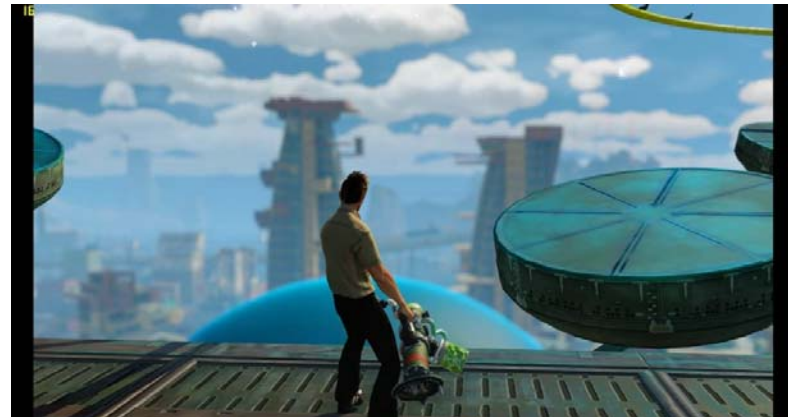


## What IS Memorable in Video Games?

How can we create an “emotional connection” ?

Example 3 : Aversion

Fizzie, Sunset Overdrive



Recap:

- Is about how the player interacts with the AI.

## Recap:

- Is about how the player interacts with the AI.
- Emotional connection strengthens memory.

## Recap:

- Is about how the player interacts with the AI.
- Emotional connection strengthens memory.
- Often requires one-off behaviors.



## 2. The buddy AI Is not Your Friend

Or : How to design buddy AI around the needs of the game.

## Buddy AI Design

Buddy AI:

“AI driven agents that are companions to the player and an important part of his/her experience.”



## Different Kinds Of Buddy AI





## Buddy AI Design

**Goal:**

Create a memorable Buddy AI.

**Approach:**

Model AI behavior after the player's needs..

## Buddy AI Design



**Pitfall:**  
Building up Player entitlement

## Buddy AI Design

### Example:

- The buddy AI can revive you.

## Buddy AI Design

### Example:

- The buddy AI can revive you.
- No revive economy.

## Buddy AI Design

### Example:

- The buddy AI can revive you.
- No revive economy.



## Buddy AI Design

### Example:

- Buddy AI supports combat.

## Buddy AI Design

### Example:

- Buddy AI supports combat.
- Doesn't track player progress.

## Buddy AI Design

### Example:

- Buddy AI supports combat.
- Doesn't track player progress.



Call of Duty: Black Ops, Treyarch, 2010



## Buddy AI Design

### Example:

- The buddy AI gives you ammo.

## Buddy AI Design

### Example:

- The buddy AI gives you ammo.
- No rules when or how much.

## Buddy AI Design

### Example:

- The buddy AI gives you ammo.
- No rules when or how much.



Bioshock Infinite, Irrational Games, 2013

## Buddy AI Design

Player entitlement:

- “Spoiling” the player



## Buddy AI Design

Player entitlement:

- “Spoiling” the player
- Different expectations



## Buddy AI Design

### **Goal:**

Create a memorable Buddy AI.

### **Approach:**

~~Model AI behavior after the player's needs..~~

Model behavior after what's good for the game..

## Buddy AI Design

What can it do for your game?

## Buddy AI Design

What can it do for your game?

1. Teacher
2. VIP
3. Soldier



## Buddy AI Design

What can it do for your game?

1. Teacher

- Explains the world

## Buddy AI Design

What can it do for your game?

### 1. Teacher

- Explains the world
- Leads the way

## Buddy AI Design

What can it do for your game?

### 1. Teacher

- Explains the world
- Leads the way
- Does not fight

## Buddy AI Design

What can it do for your game?

### 1. Teacher

- Explains the world
- Leads the way
- Does not fight



Bioshock Infinite, Irrational Games, 2013

## Buddy AI Design

What can it do for your game?

### 2. VIP

- Purpose of game/mission

## Buddy AI Design

What can it do for your game?

### 2. VIP

- Purpose of game/mission
- \*Cannot die

## Buddy AI Design

What can it do for your game?

### 2. VIP

- Purpose of game/mission
- \*Cannot die
- Codependence

## Buddy AI Design

What can it do for your game?

### 2. VIP

- Purpose of game/mission
- \*Cannot die
- Codependence



Last of Us, Naughty Dog, 2013



## Buddy AI Design

What can it do for your game?

### 3. Soldier

- Supports combat

## Buddy AI Design

What can it do for your game?

### 3. Soldier

- Supports combat
- Death irrelevant

## Buddy AI Design

What can it do for your game?

### 3. Soldier

- Supports combat
- Death irrelevant



Halo, Bungie, 2001-2010

## Buddy AI Design

Buddy AI:

- Why should the player care?

## Buddy AI Design

Buddy AI:

- Why should the player care?
  - Emotional connection

## Buddy AI Design

Buddy AI:

- Why should the player care?
  - Emotional connection
  - Character and story

## Buddy AI Design

Buddy AI:

- Why should the player care?
  - Emotional connection
  - Character and story
  - Codependence

## Buddy AI Design

Recap:

- Prevent entitlement



## Buddy AI Design

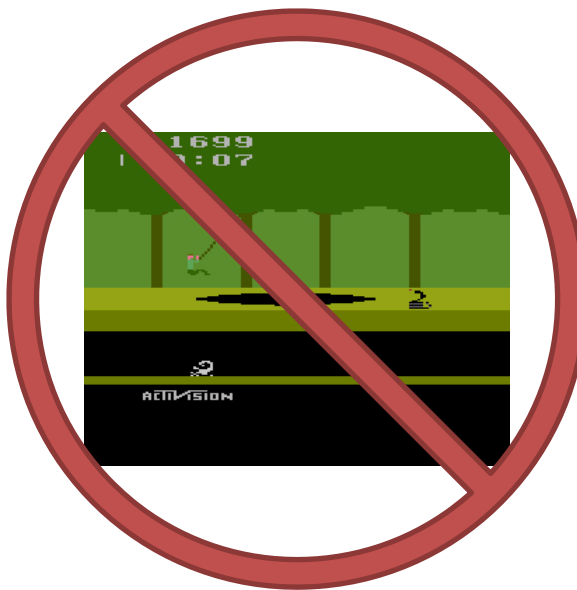
Recap:

- Prevent entitlement
- Design for the needs of the game

## Buddy AI Design

Recap:

- Prevent entitlement
- Design for the needs of the game
- Motivation through story/emotion



# 3. Escalation Is the Mother Of All Challenge

Or : Why repetition is better than its reputation.

# Mind Your Step:

- Memorable experiences

# Mind Your Step:

- Memorable experiences
- Challenge?

Stress hormones can strengthen memory..

Stress hormones can strengthen memory..

“Ice water trial” (Enhancing memory, James McGough) :

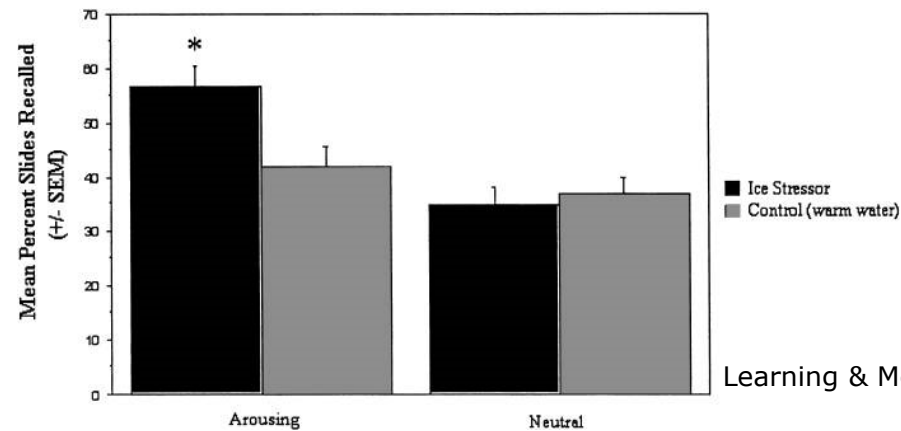




## Stress hormones can strengthen memory..

“Ice water trial” (Enhancing memory, James McGough) :

- Emotional arousal + stress hormones = +50% memorable



Learning & Memory, 2003

## Escalation Is the Mother Of All Challenge

### **Goal:**

This combat is too short/easy, fix that!

### **Approach:**

Repeat behavior # times.

## Escalation Is the Mother Of All Challenge

*"Repetition is the mother of learning, the father of action, which makes it the architect of accomplishment."* (Hilary H. Ziglar)

## Escalation Is the Mother Of All Challenge

Repetition:

- Increase of skill over time

## Escalation Is the Mother Of All Challenge

Repetition:

- Increase of skill over time
- Feeling of accomplishment

## Escalation Is the Mother Of All Challenge

Repetition:

- Increase of skill over time
- Feeling of accomplishment
- Reuse of established mechanics

## Escalation Is the Mother Of All Challenge



**Pitfall:**  
Cheapening the experience for the player.

## Escalation Is the Mother Of All Challenge

### **Goal:**

This behavior/battle is too short, make it longer.

### **Approach:**

~~Repeat behavior # times.~~

Destroy multiple “weakspots” or “turrets” to progress.



## Escalation Is the Mother Of All Challenge

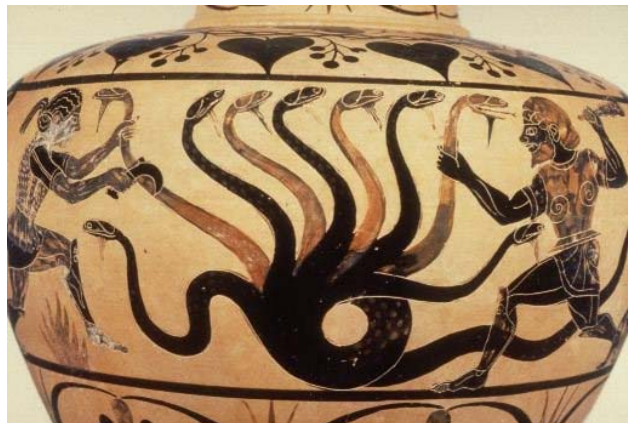
### **Approach:**

Destroy multiple “weakspots” or “turrets” to progress.

- Cutting off the heads of the Hydra.

## Escalation Is the Mother Of All Challenge

Cutting off the heads of the Hydra.



## Escalation Is the Mother Of All Challenge

Cutting off the heads of the Hydra.



## Escalation Is the Mother Of All Challenge

Cutting off the heads of the Hydra.



## Escalation Is the Mother Of All Challenge

- The Hydra gets weaker, the combat de-escalates. ☹



## Escalation Is the Mother Of All Challenge

The Greeks were smart : the heads grew back!





## Escalation Is the Mother Of All Challenge

### **Goal:**

This behavior/battle is too short, make it longer.

### **Approach:**

~~Repeat behavior (3) times.~~

~~Destroy multiple "weakspots" to progress.~~

Grow more heads as you progress!

## Escalation Is the Mother Of All Challenge

Escalate the combat:

- Wounded animal



## Escalation Is the Mother Of All Challenge

Escalate the combat:

- Wounded animal
- Add “heads” in the process

## Escalation Is the Mother Of All Challenge

Escalate the combat:

- Wounded animal
- Add “heads” in the process
- Scale combat intensity

## Escalation Is the Mother Of All Challenge

Escalate the combat:

Build escalation into your AI behavior!



## Escalation Is the Mother Of All Challenge



Herker, Sunset Overdrive

- Dangerous on its own

## Escalation Is the Mother Of All Challenge



Herker, Sunset Overdrive

- Dangerous on its own
- Collects smaller enemies

## Escalation Is the Mother Of All Challenge



Herker, Sunset Overdrive

- Dangerous on its own
- Collects smaller enemies
- Throws them at you..



## Escalation Is the Mother Of All Challenge



Norton, Sunset Overdrive

- Boss battle with phases

## Escalation Is the Mother Of All Challenge



### Norton, Sunset Overdrive

- Boss battle with phases
- Grows spikes on his back over time



## Escalation Is the Mother Of All Challenge



### Norton, Sunset Overdrive

- Boss battle with phases
- Grows spikes on his back over time
- Starts setting the city ablaze as you progress

Recap:

- Repetition in the mother of all learning.

## Recap:

- Repetition in the mother of all learning.
- Escalation is the mother of all challenge.



Thank you for playing!