GDC

The Schema is Mightier Than the Sword

Using Player Cognition to Predict Gaming Behavior

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GAME DEVELOPERS CONFERENCE® | MARCH 19–23, 2018 | EXPO: MARCH 21–23, 2018 #GDC18

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Today's Talk: Cognitive Science in Games

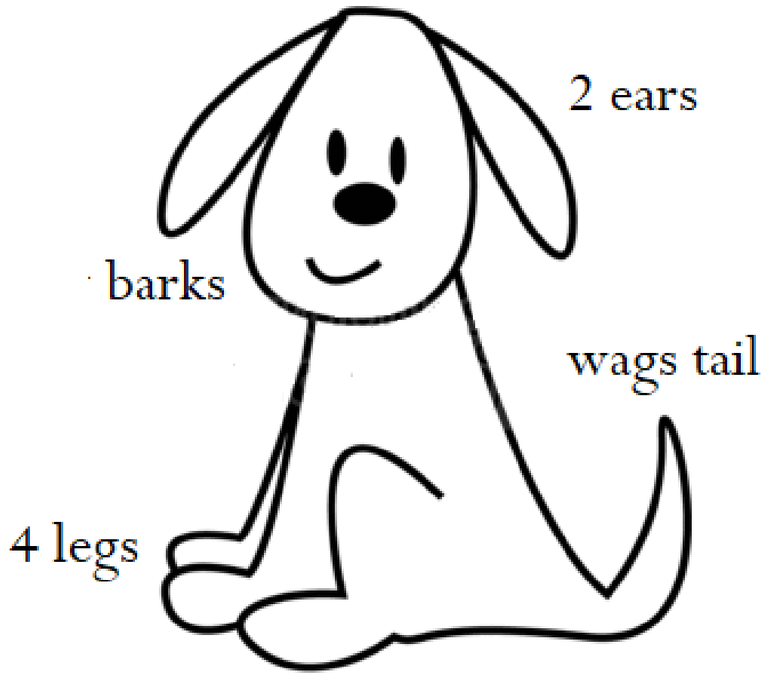
- How is cognition relevant to games and player outcomes?
- What are schemas? How do they predict behavior?
- How are schemas formed and activated?
- Under what conditions are schemas useful to explain decision making, information processing, and player choices?

What is a schema?

- An organized mental representation of stimuli to help relate concepts to one another
- Stored in long-term memory
- Can be very subjective, and based on individual experience

What is a schema?

- **Assimilation** is the process of fitting information into an existing mental framework (i.e., recognition)



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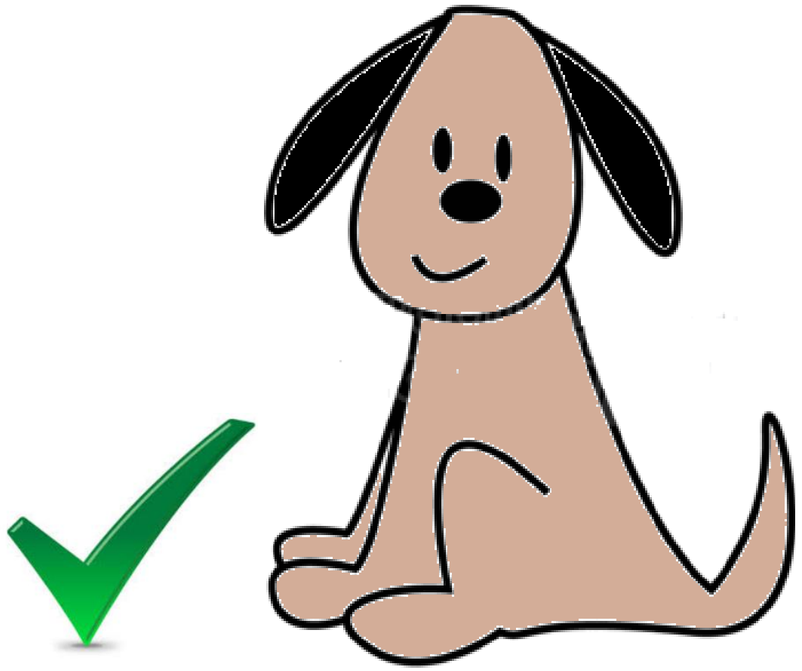

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- **Accommodation** is changing schemas to fit criteria and characteristics of new stimuli
- This explains the progression of simple mental concepts to more complex representational structures

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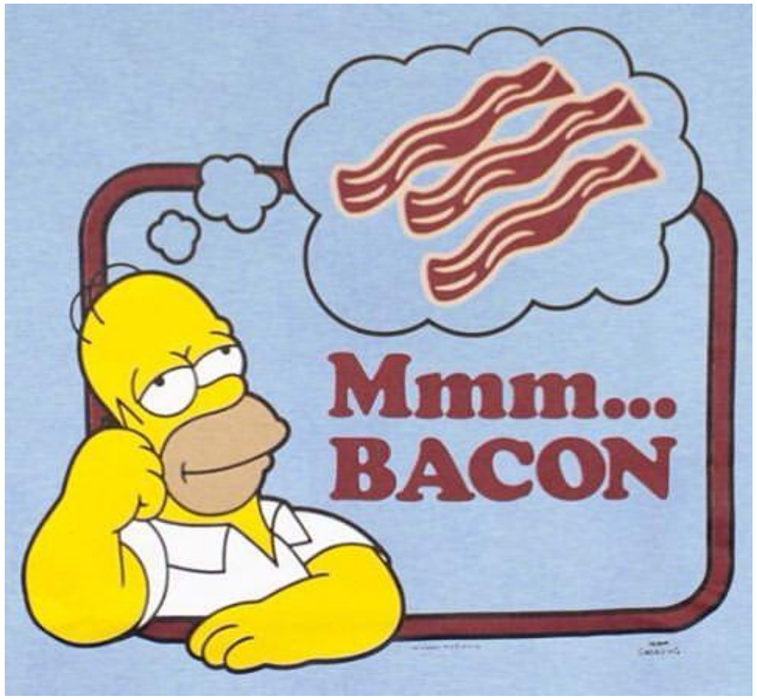
Schema Activation

Conceptually-driven (controlled) "top-down processing"



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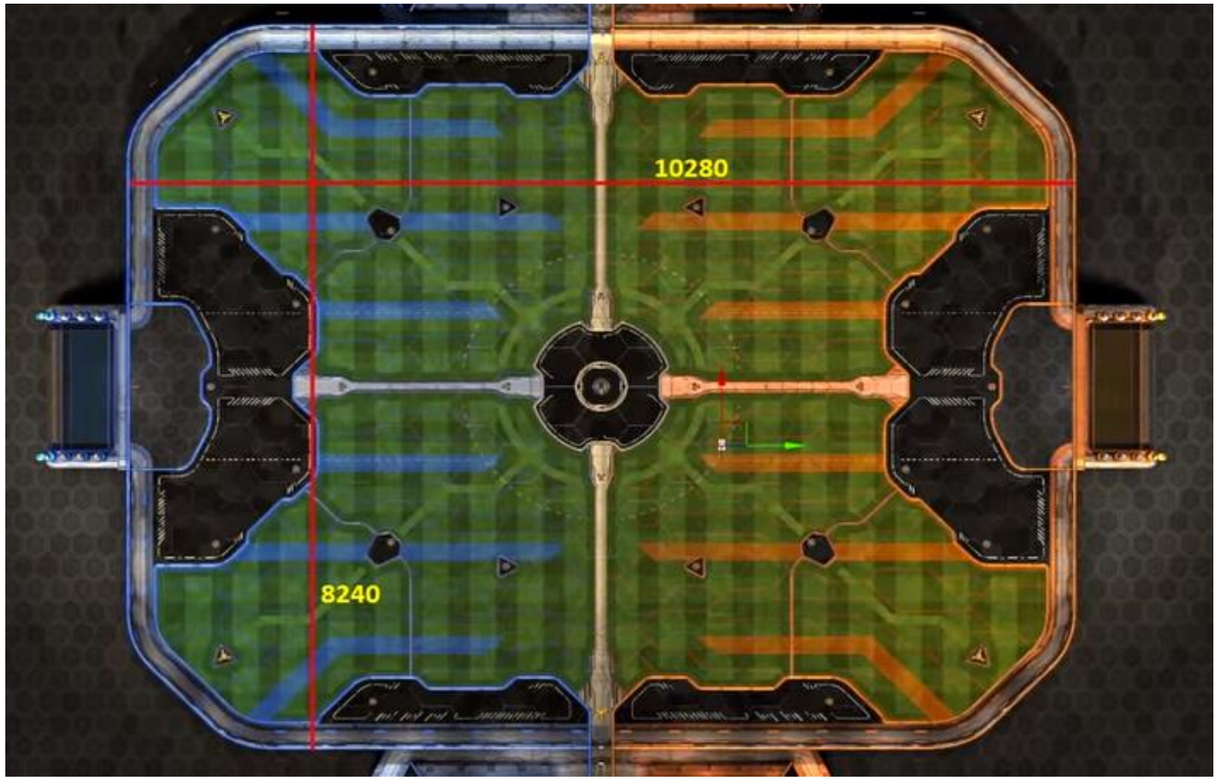

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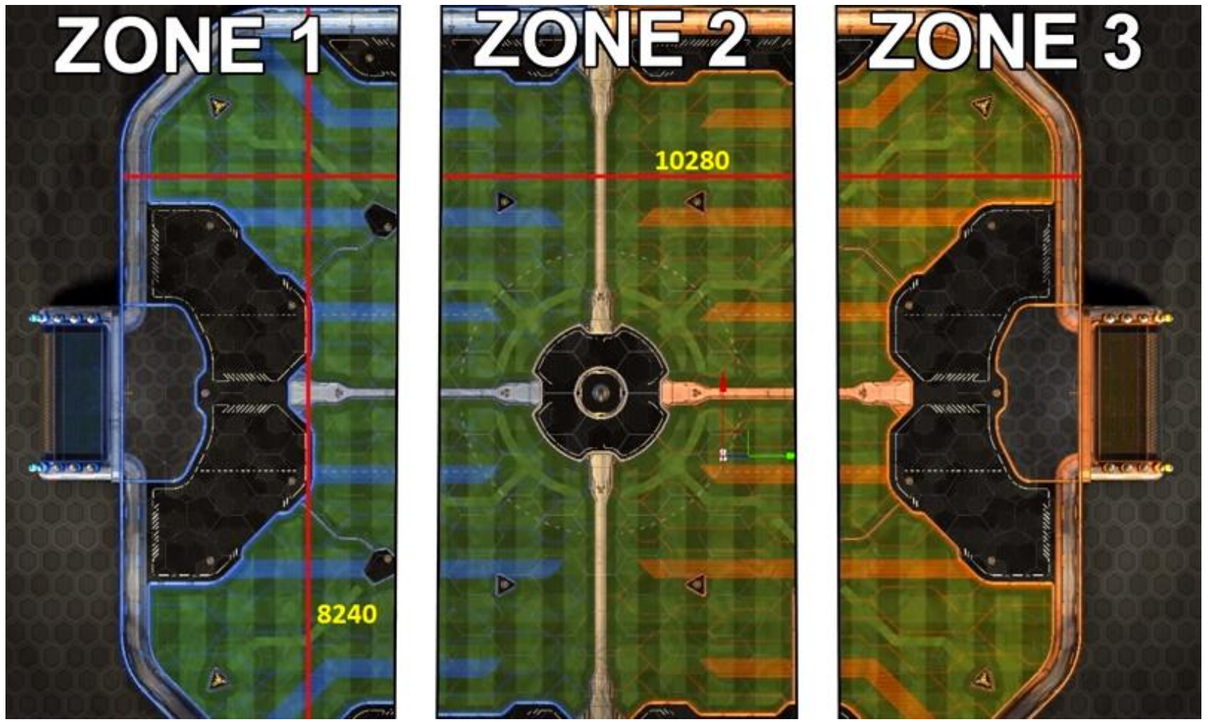

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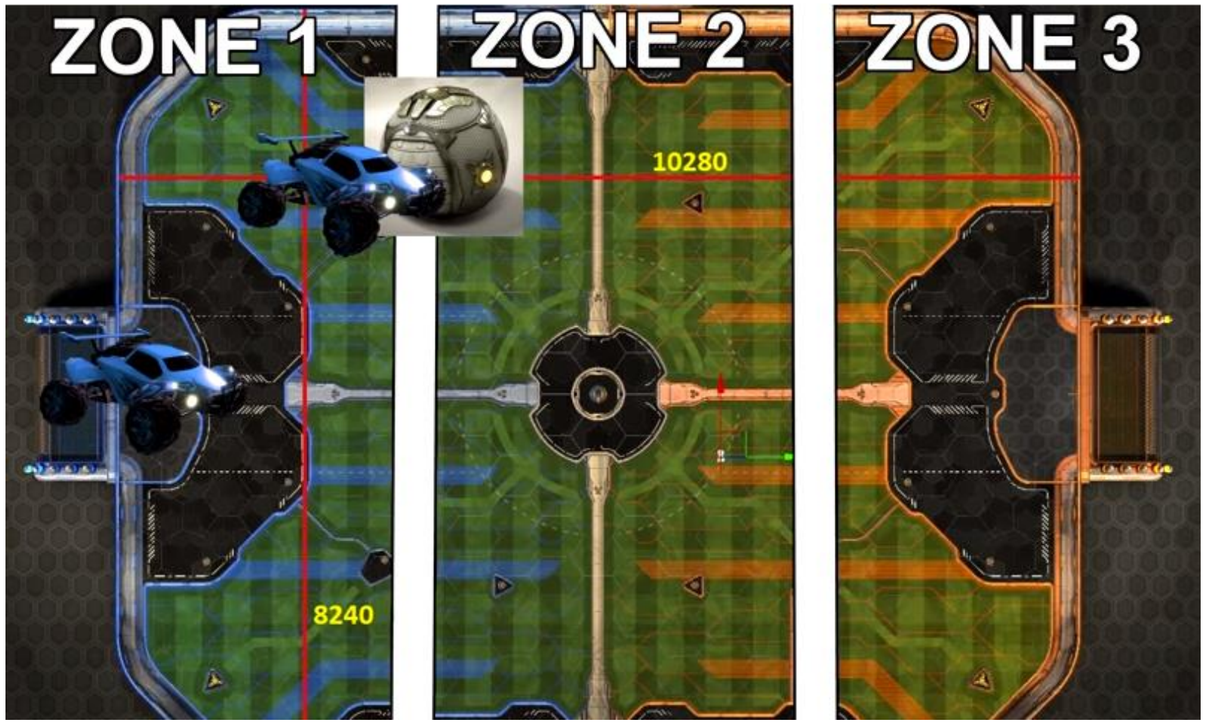

Schema Activation

Data-driven (automatic) “bottom-up processing”

Schema Activation

Data-driven (automatic) “bottom-up processing”

Destiny 2

Schema Activation is Complicated

Can top-down and bottom-up processing occur simultaneously?

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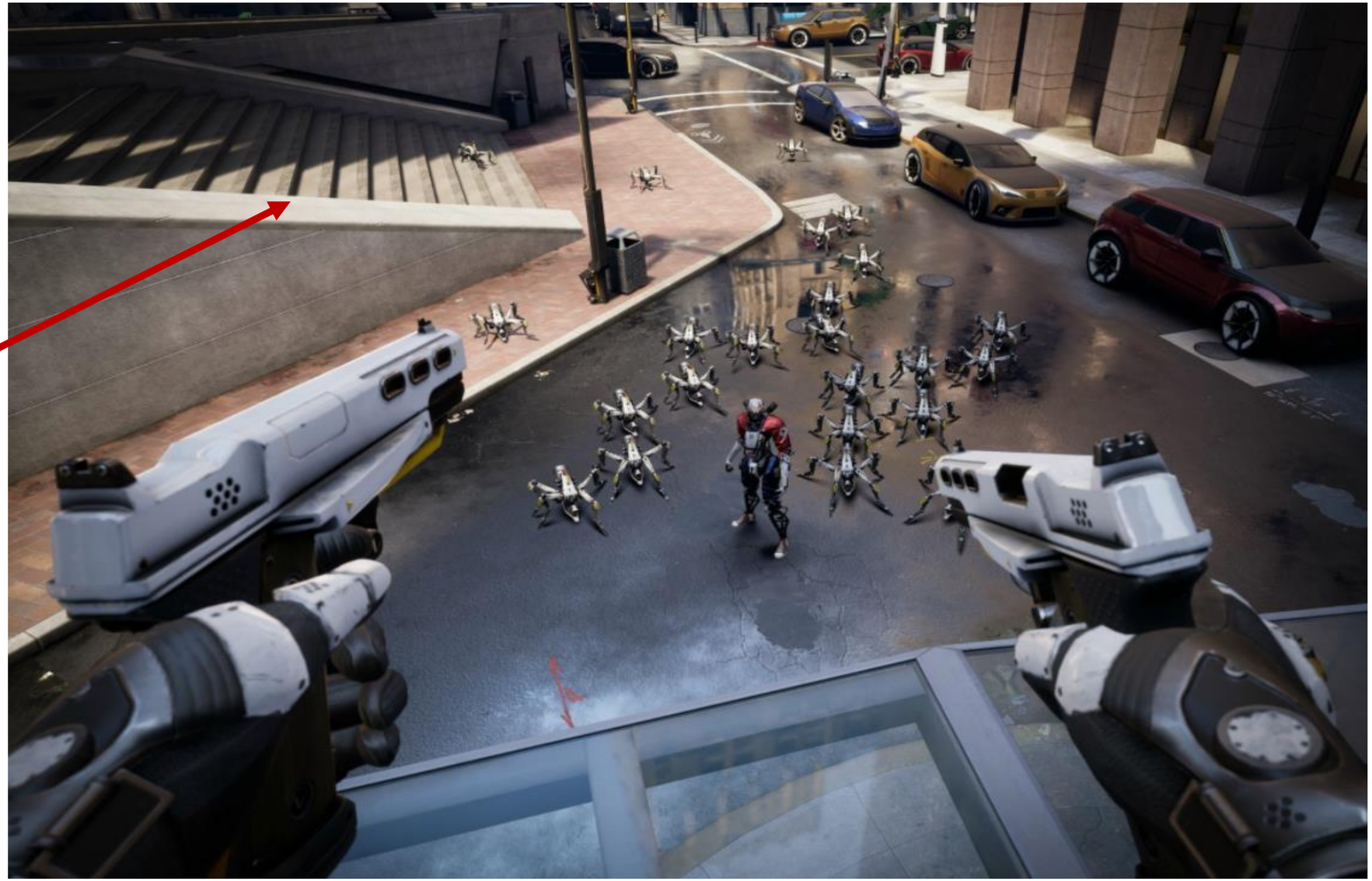
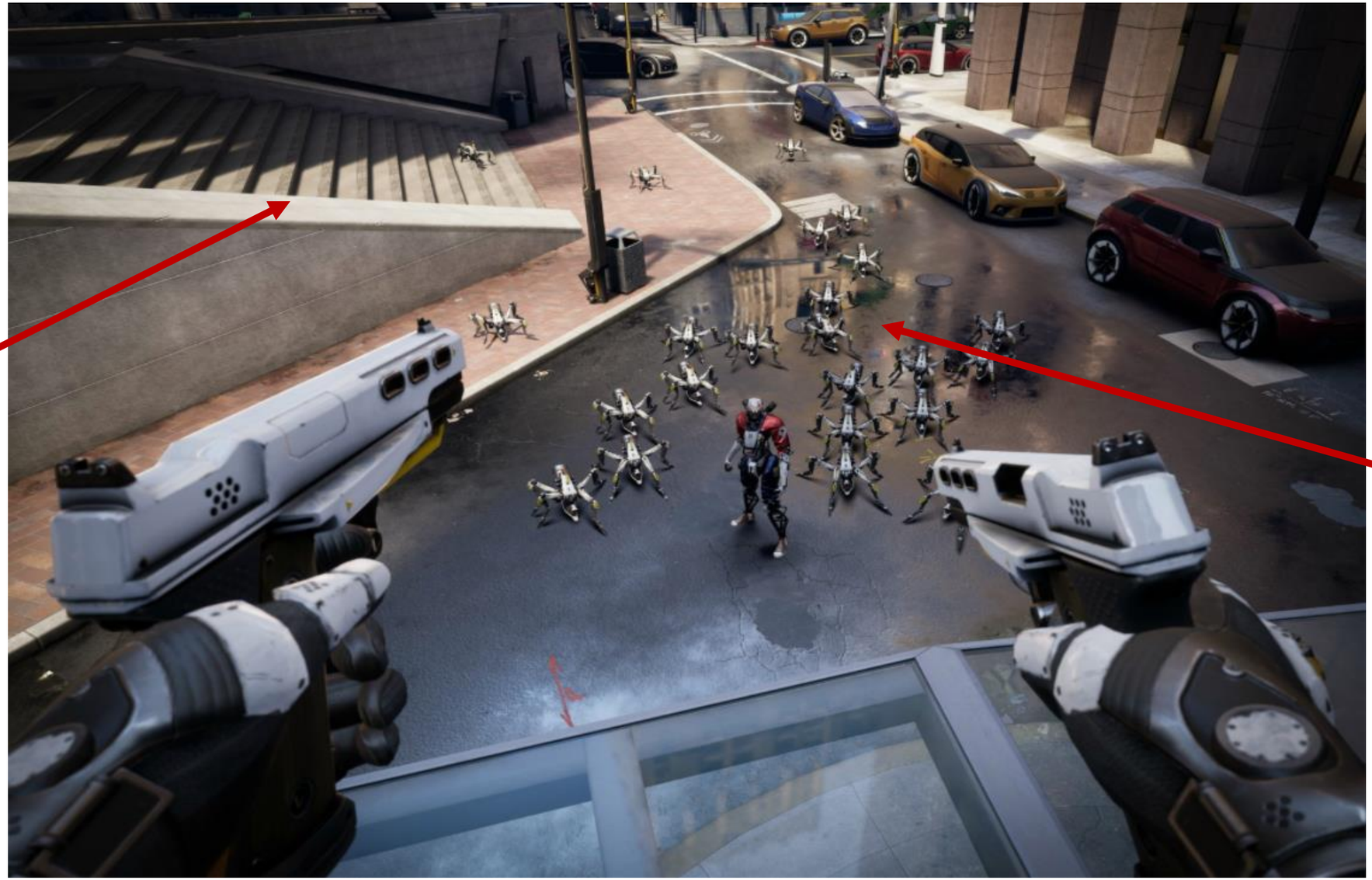
Can top-down and bottom-up processing occur simultaneously?

The player understands where to go to get to the check-point (top-down)



Robo Recall



The player understands where to go to get to the check-point (top-down)

But enemy agents arrive to block the intended path (bottom-up)

Robo Recall

Predicting Player Attention – The Role of Schemas

Conceptual Fluency: recognition feels good, and it is a powerful reinforcer

Players have a long history of working with schemas (or mental ‘rules’) in games

Heart – health (or affection)

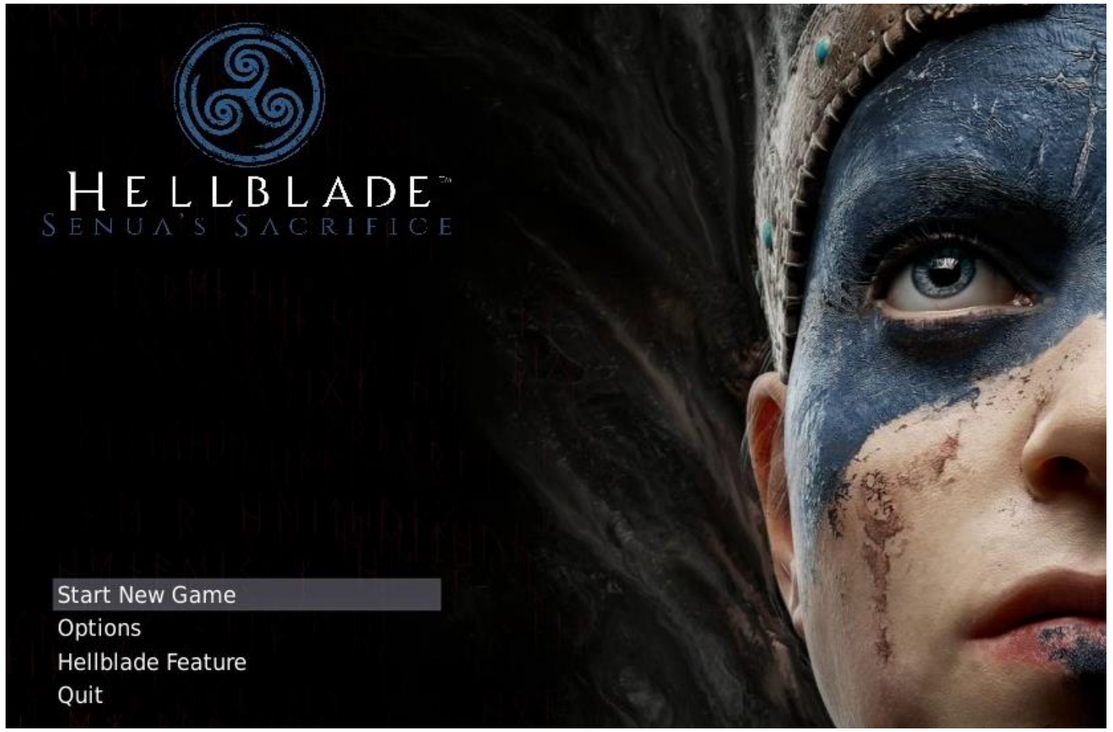
Trophy – achievements

Hourglass – time

Predicting Player Attention – The Role of Schemas

Conceptual Fluency = Game Schema Consistency

Schema match



Players have a long history of working with consistent schemas (or mental 'rules') about a **Start Menu:**

New Game – at the top

Exit Game – at the bottom

Schema match


Schema match
OBDUCTION
New Game
Load Game
Settings
Credits
Quit
English

Schema inconsistent (mismatch)

This is known as **conceptual disfluency.**

It creates “attentional blink” when a stimulus goes against what is mentally anticipated or expected.

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Image source: Cage of Thrones

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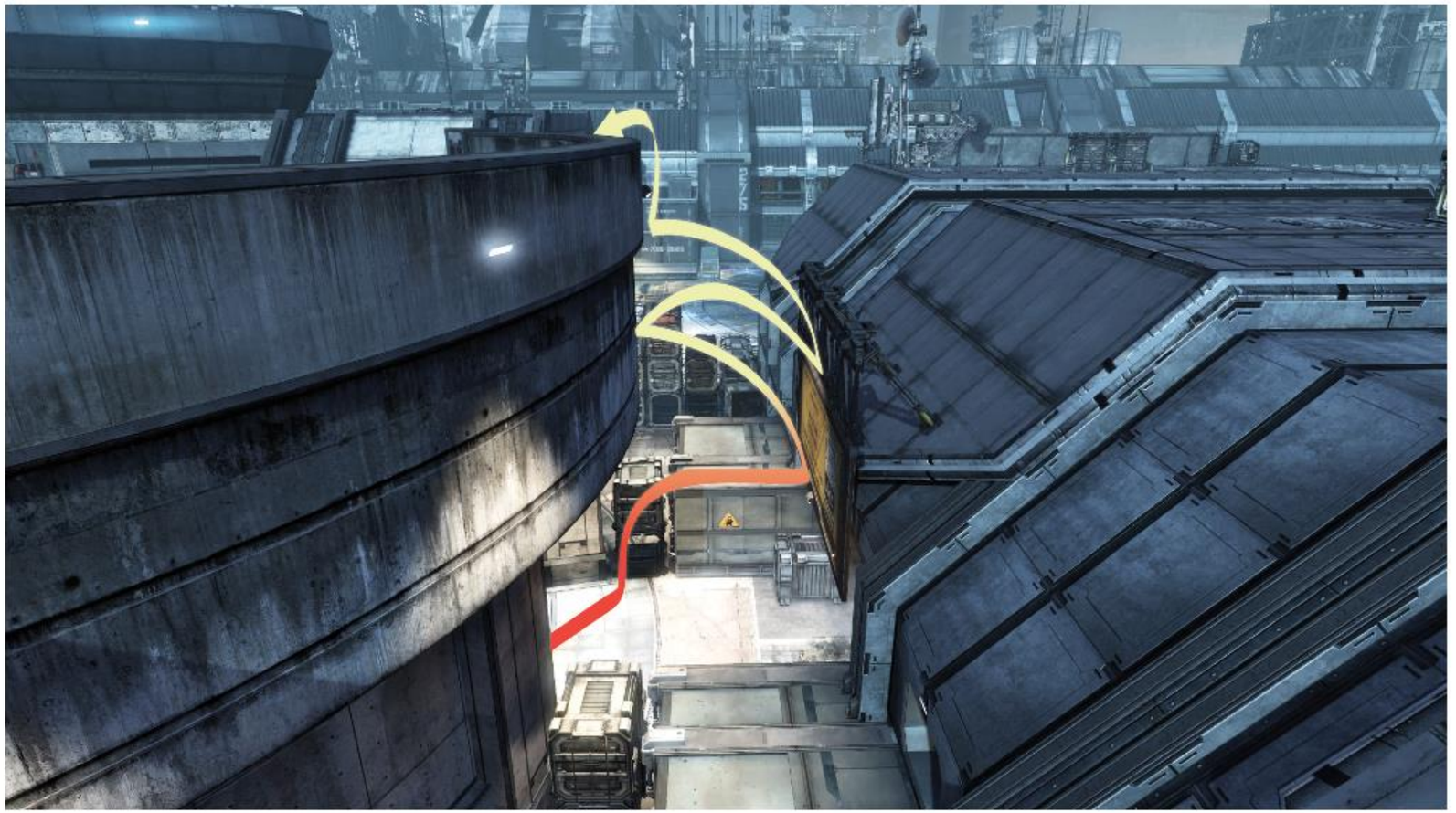
Predicting Knowledge Formation – The Role of Schemas

Cognitive Mapping

A **mental map** that relates player preferences and perceptions within a spatial matrix.

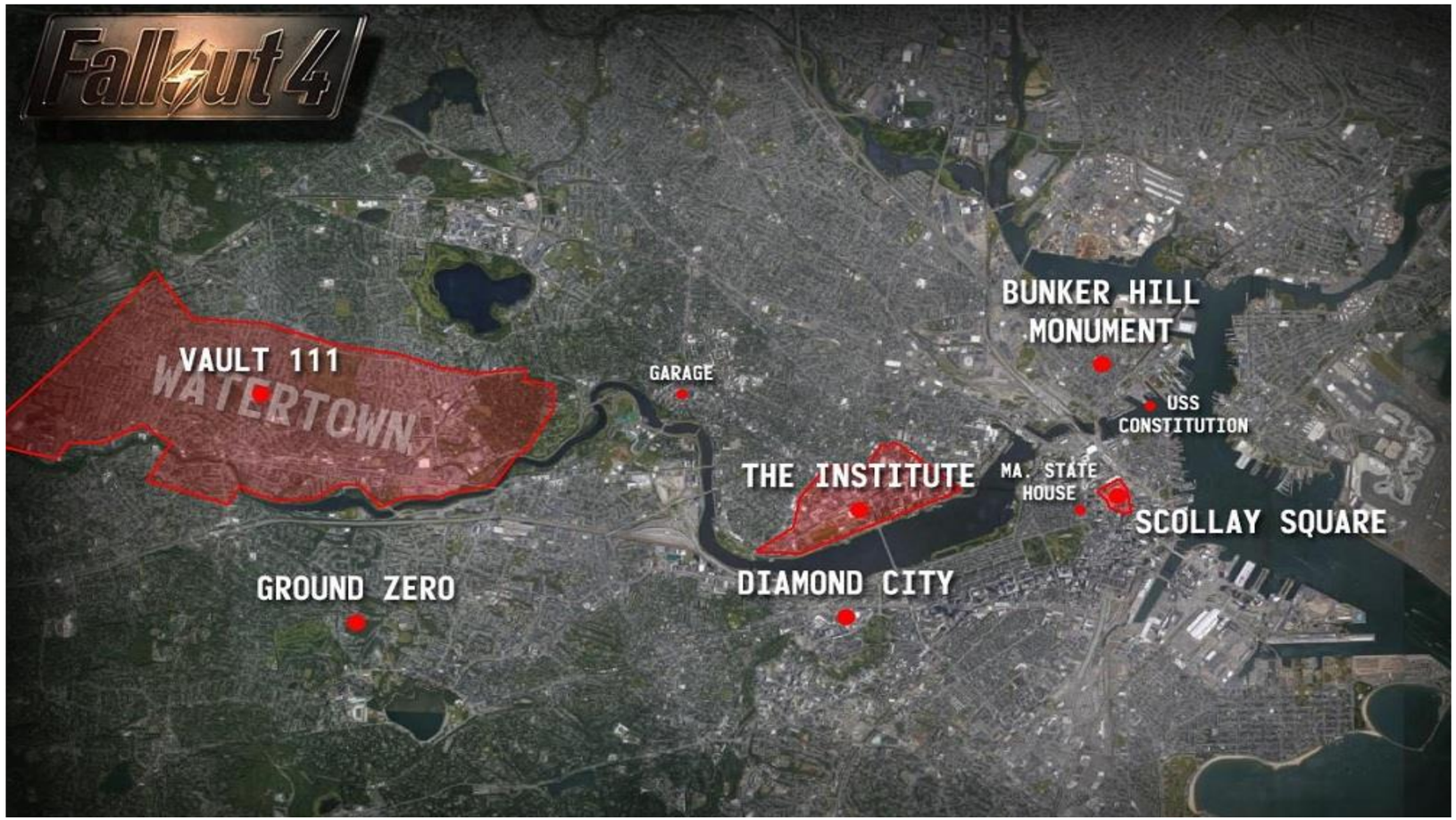
These mental representations assist player decision-making and drive information processing.

Cognitive Mapping 101 – "Route mapping" schemas



Titanfall

Cognitive Mapping 101 – "Survey mapping" schemas

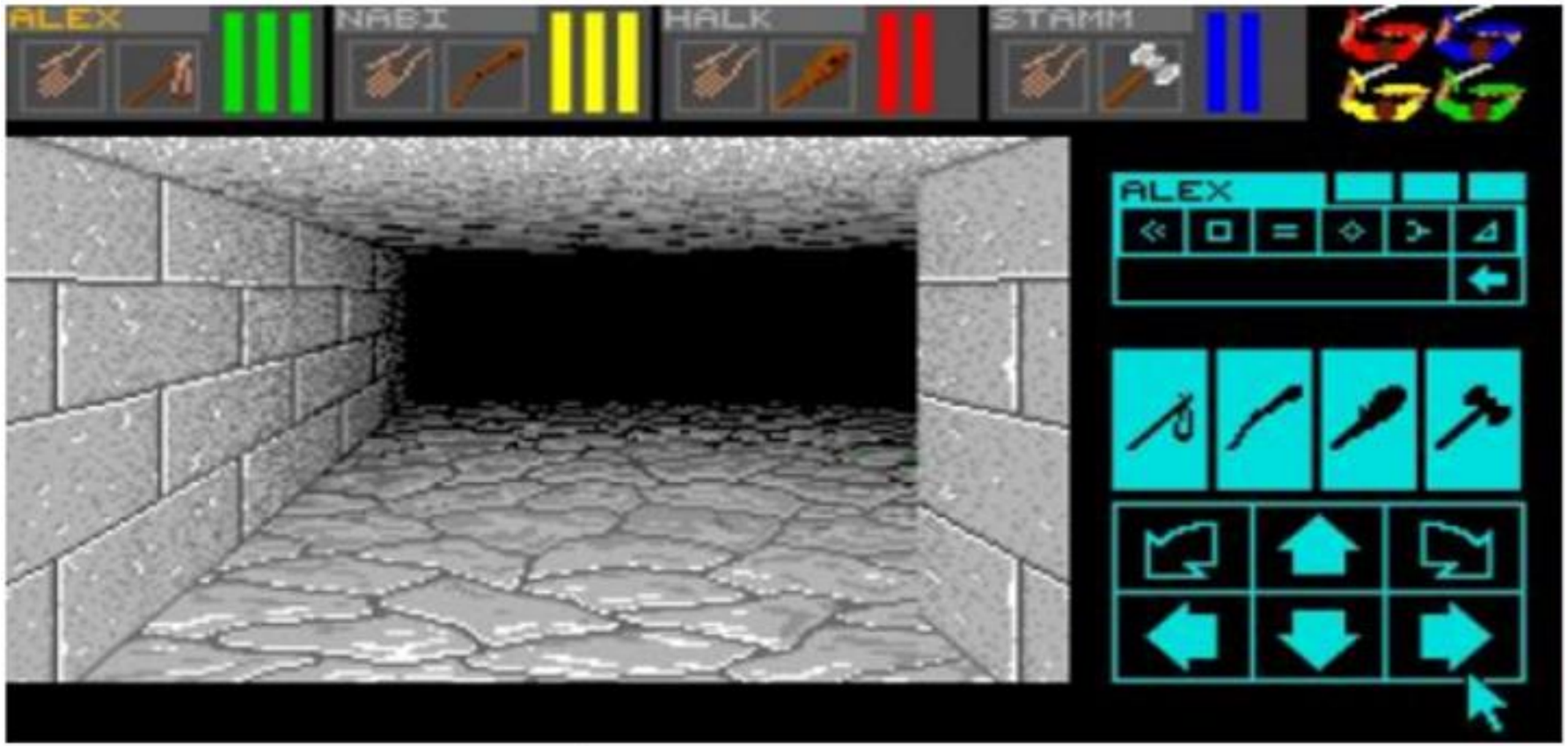


Cognitive Mapping 101 – "Survey mapping" schemas

Overwatch


Location of the super top secret area, a second Bowser fight, and the Laser Suit
Twin Bridges
Vanilla Dome
Top Secret Area
Donut Plains
Soda Lake
Forest of Illusion
Yoshi's Island
Valley of Bowser
Flying ship from SMB3
Yoshi's House
Chocolate Island
mapstalgia.com

Cognitive Mapping Schemas



Dungeon Master

Cognitive Mapping Schemas

Firewatch

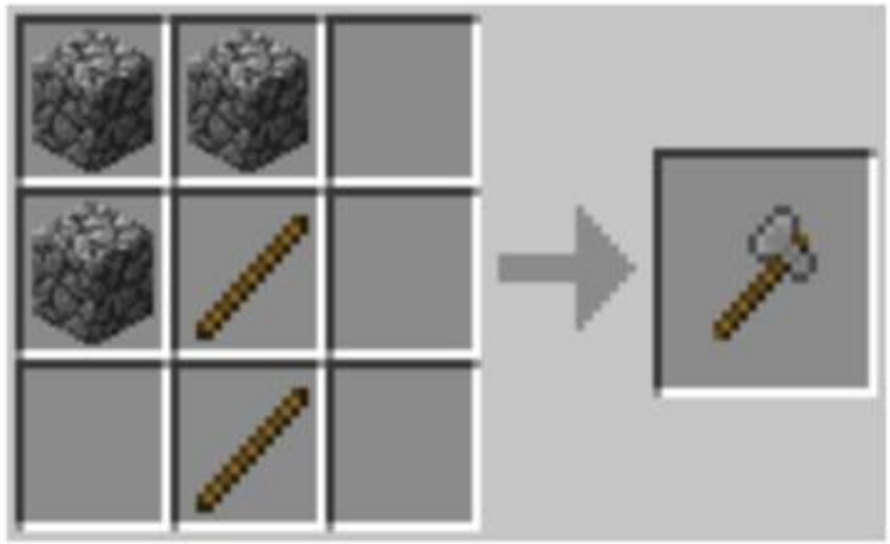
Predicting Knowledge Formation – The Role of Schemas

We have a tendency to compare new stimuli with what is already established in existing memory schemas (“category judgments”)

Models of Recognition

"Template and feature matching"

Incoming sensory information is compared to copies (templates) in long-term memory



Minecraft

Models of Recognition

"Template and feature matching"

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Skyrim

Models of Recognition

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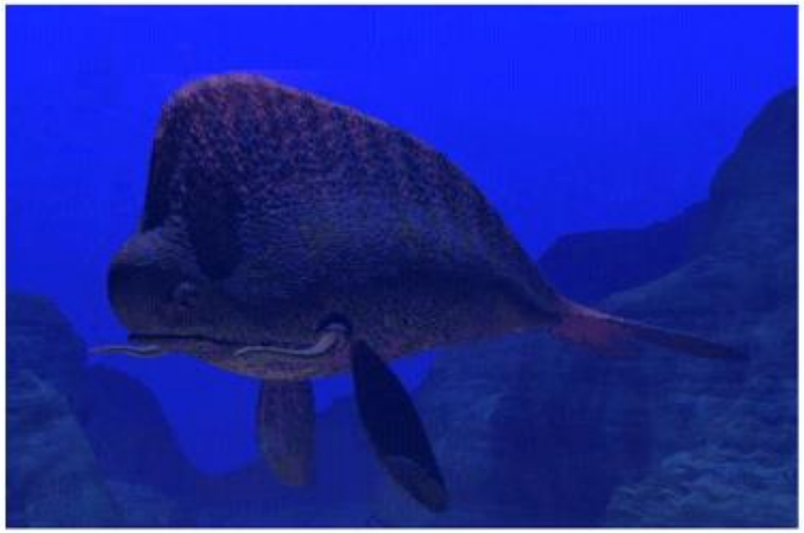
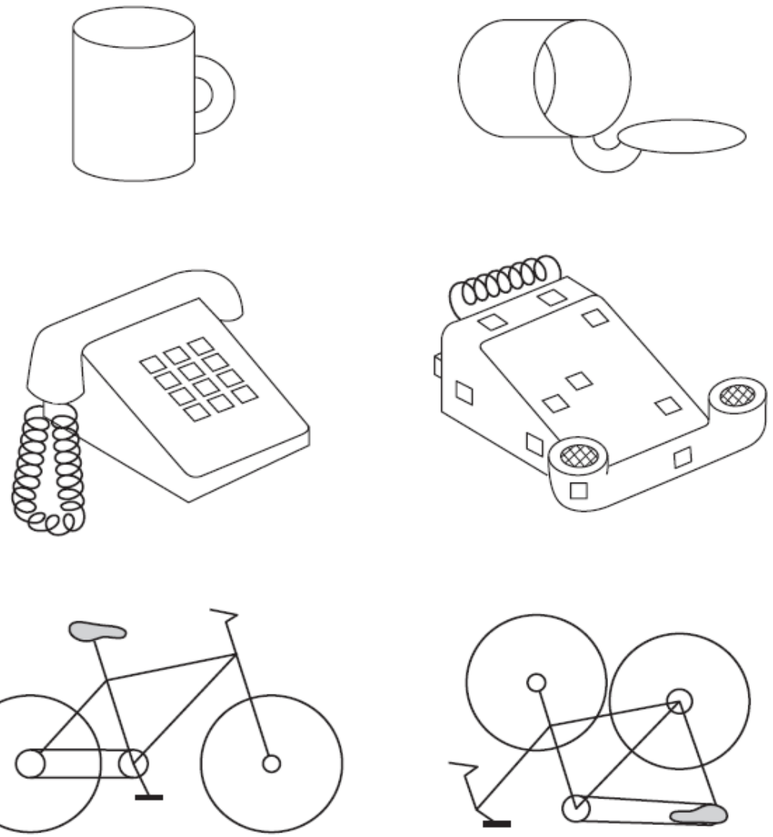


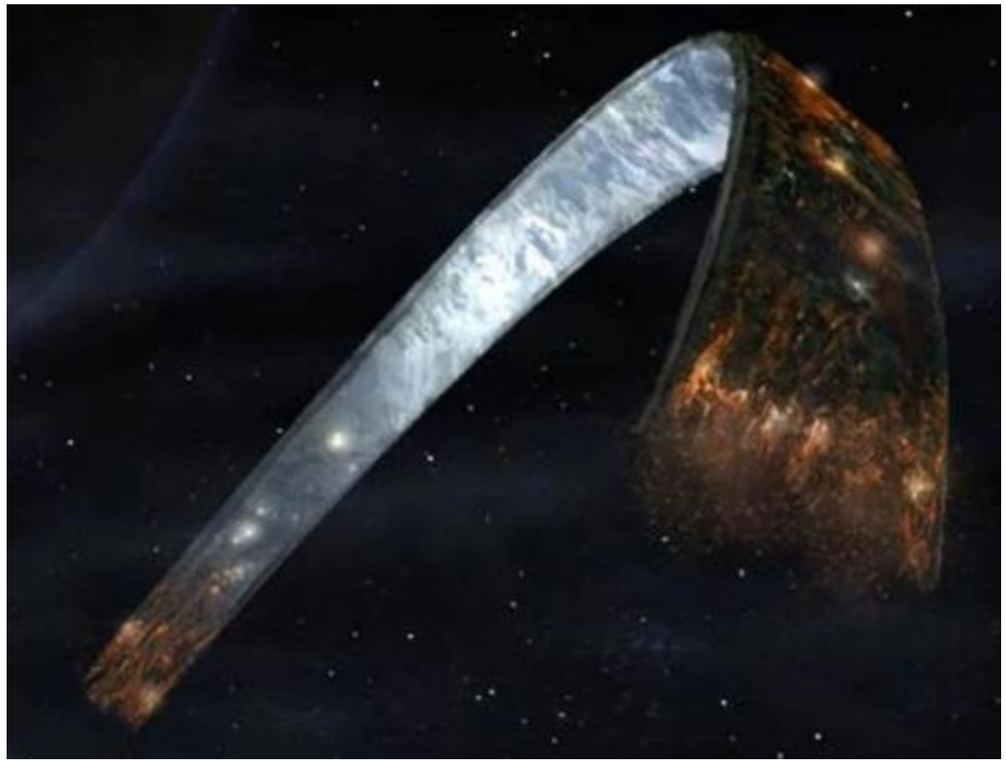
Riven

Models of Recognition

"Recognition-by-Components"

Finding the basic "building blocks" of (visual) stimuli





Halo

Fallout 3

Limbo

Models of Recognition

"Configural Models"

Analysis based on deviations from the prototype

Assassin's Creed

Models of Recognition

"Configural Models"

Analysis based on deviations from the prototype

Elite: Dangerous

Models of Recognition

"Configural Models"

Analysis based on deviations from the prototype

Overwatch

Final Thoughts and Take-Aways

- Schemas help to understand player perceptions, and better predict how they sort and process information, as well as onboarding, and attentional focus
- Schema violations are okay – but use wisely or risk overreliance on more systematic, deliberate, and controlled thinking (vs. automatic processing)
- Flow is an **automatic cognitive process**. Schemas help players achieve flow.

Final Thoughts and Take-Aways

- How to virtually guarantee the absence of flow in your game!

  1: Place users under heavy cognitive load, which demands constant schema activation and change (…flow state is lost)

  2: Too much "stop and think" will interrupt automatic schema activation (…flow state is lost)

  3: Loss of immersion when players stumble via: "Wait, what am I doing?" **Controlled cognitive processing** takes over (…flow state is lost)

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