Café CS

#3: When Games Get Serious

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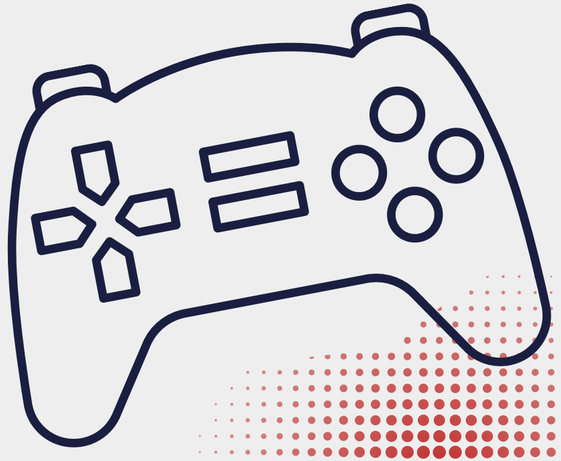

The Weight We All Carry

The days blur together.
Tasks repeat.
Motivation fades.
Life feels heavier than it should.

life is difficult

but we don't always feel it

Remember When We Fell Out of Time?

When hours feel like minutes.
When focus comes naturally.
When building feels joyful.
When you’re completely absorbed.

what if...

What if...

- What if tasks felt meaningful?
- What if progress was visible?
- What if motivation wasn’t a struggle?
- What if we solving problems was as easy as playing a game?

let's find out

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Overview

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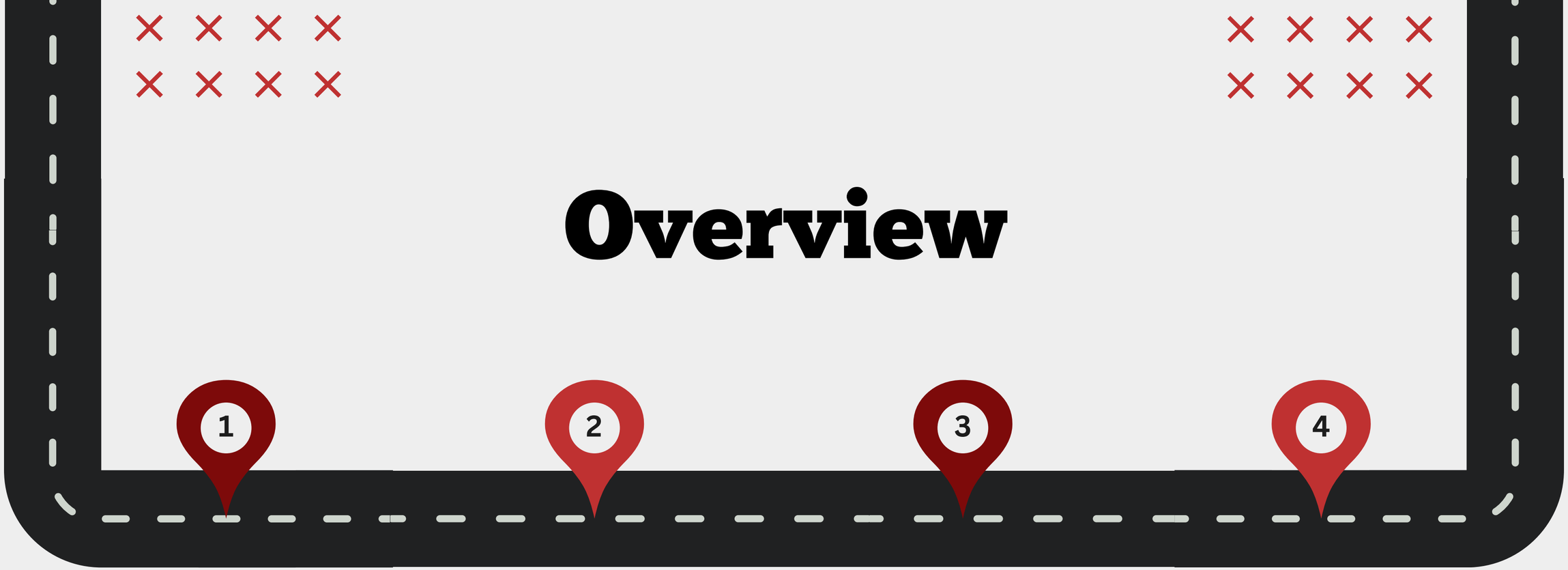

What Makes Games... Games?

- Rules
- Mechanics
- Psychology

Serious Games

- What they solve
- What they don’t
- Real examples

Why It Matters to You

- Data Science
- CS & Engineering
- Everyday Life

Where Do We Go From Here?

?

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What Makes Games... Games?

What Makes A Game... Game

A Rule-Based Formal System

Different Outcomes Are Assigned Different Values

The Player Feels Emotionally Attached to the Outcome

The Player Exerts Effort to Influence the Outcome

Defining Games Is Not An Easy Task

“

At its most elementary level then we can define game as an exercise of voluntary control systems in which there is an opposition between forces, confined by a procedure and rules in order to produce a disequilibrial outcome.

”

Elliot Avedon and Brian Sutton-Smith

From Idea to Play

Game Design Document (GDD)

A blueprint for the entire game — concept, rules, story, mechanics, visuals, sounds, UI, everything.

Core Gameplay Loop

The smallest circle of repeated actions that make the game engaging.

Game Mechanics

The rules and systems that define how the player interacts with the world.

Game Systems

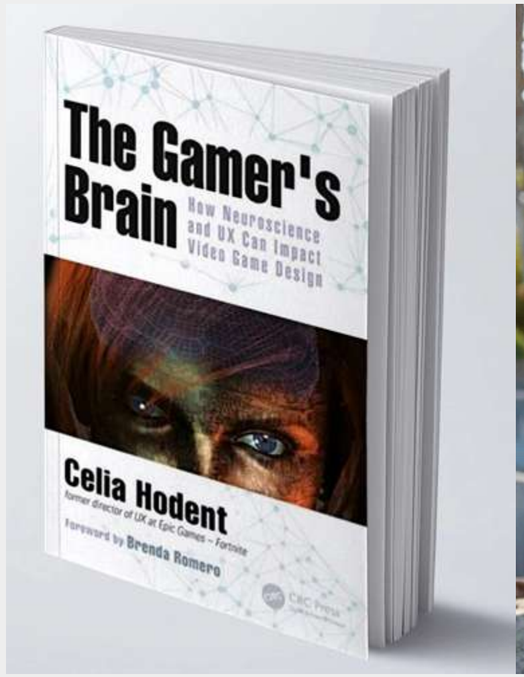
Collections of mechanics interacting with each other.

Level Design

Designing the physical spaces, puzzles, challenges, and pacing of the game.

And...

The Psychology Behind Games



Why We Play

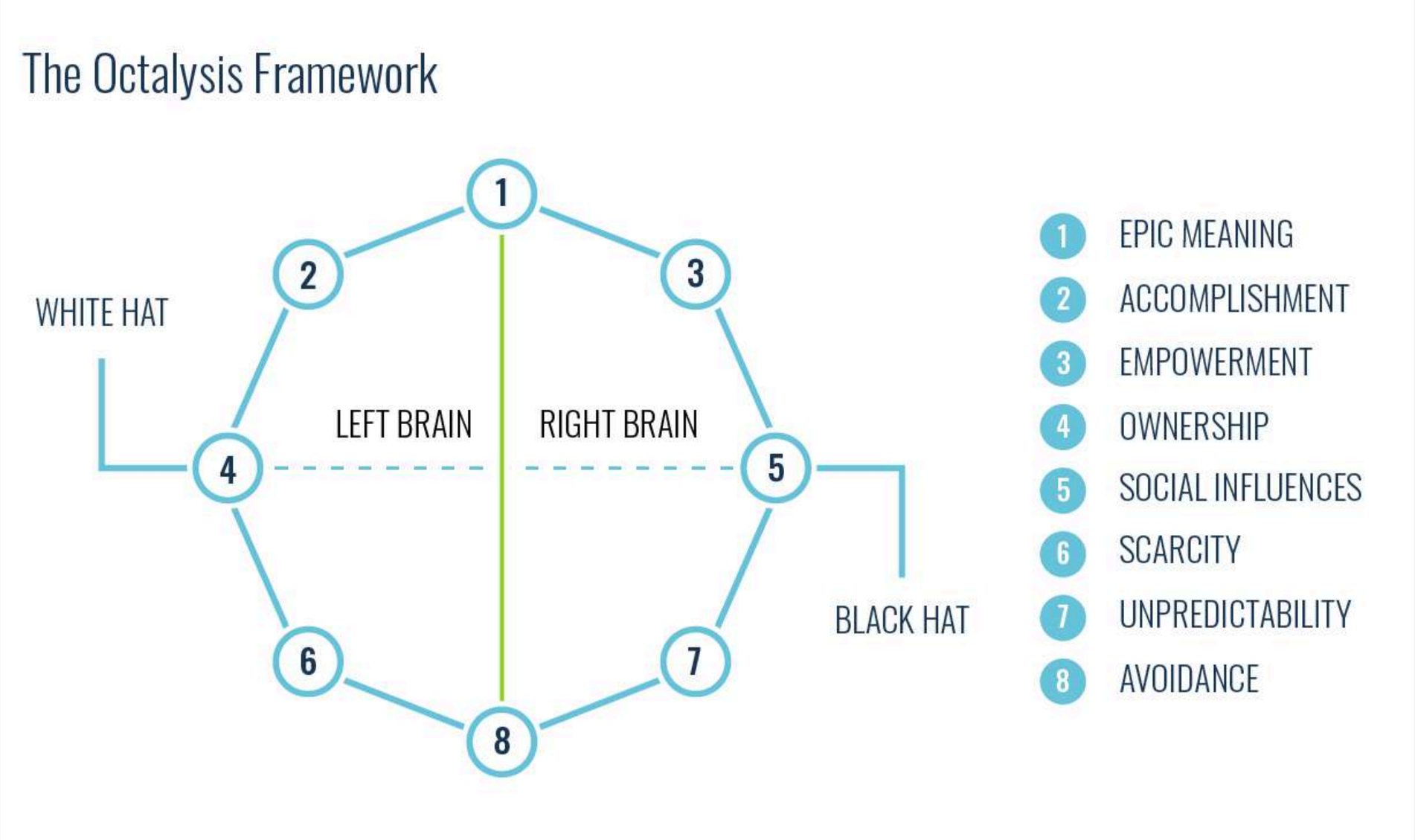
- Autonomy
- Competence
- Relatedness
- Intrinsic vs extrinsic motivation

Flow: The State of Total Absorption

- Balance between challenge and skill
- Clear goals + immediate feedback
- Deep focus + “losing track of time”
- Flow → peak engagement

Octalysis – Yu-kai Chou's Framework

Not fully scientific — but very useful for thinking about motivation.



Let's Review

- Rules
- Mechanics
- Psychology

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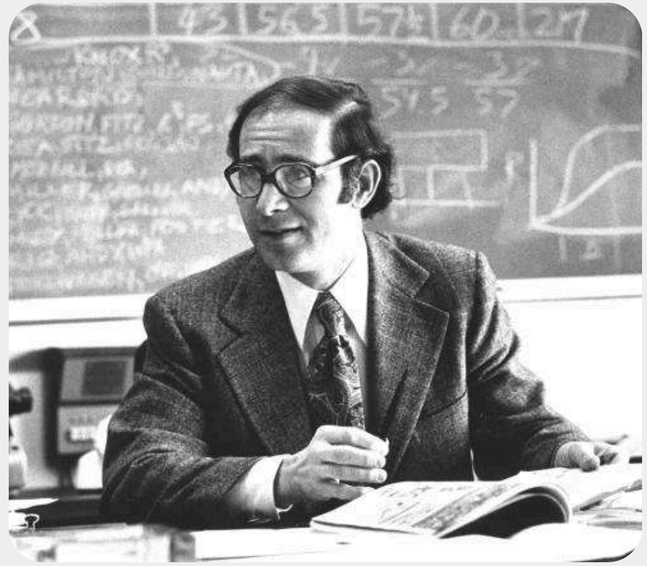
Serious Games

Serious Games

Where did it come from

- Term coined by Clark C. Abt in the 1970s
- Defined as games with explicit, carefully thought-out educational or training purpose
- Not just “for fun,” but not excluding enjoyment
- Can be digital or analog



What does it mean?

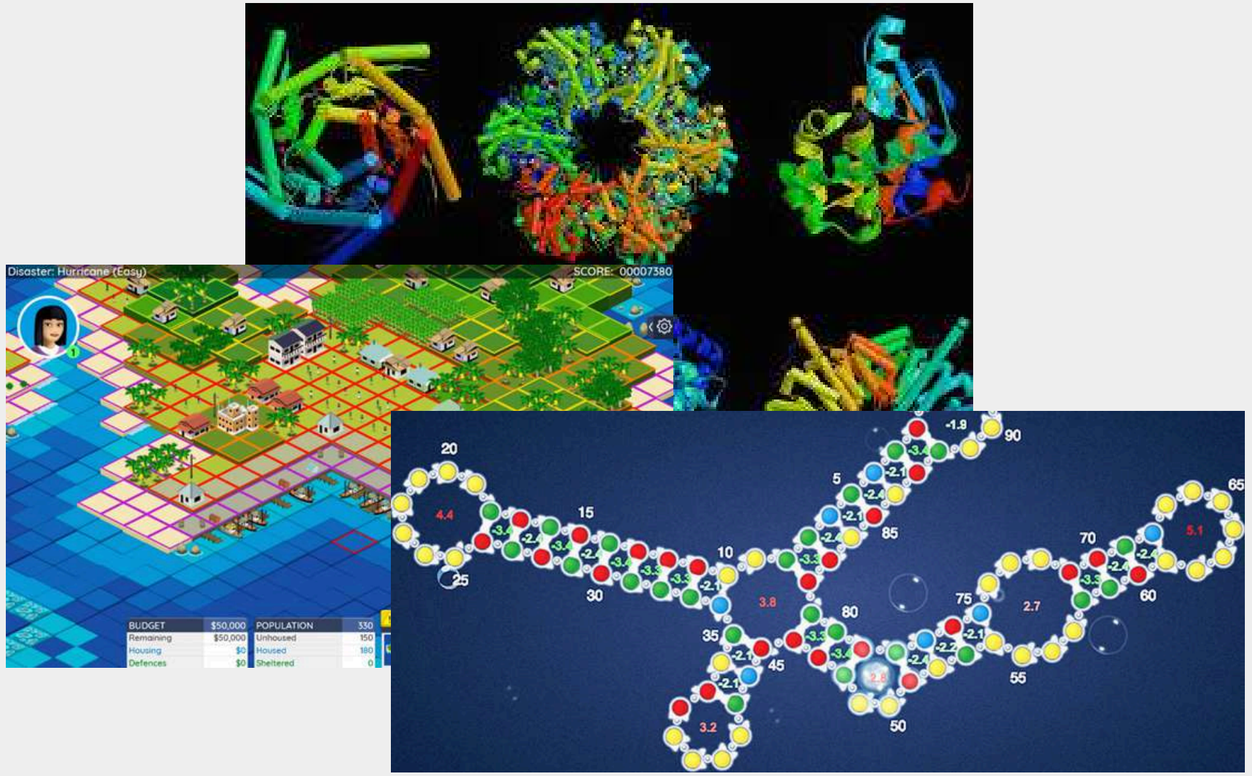
- Structured for a real-world purpose (education, training, behavior change)
- Clear learning or experiential objectives
- Feedback and evaluation built in (not just entertainment)
- Designed to be engaging but mission-driven

Who Creates Them?

- Specialized Studios (SGI, Virtual Heroes, BreakAway)
- Universities & Research Labs
- Corporations + Public Institutions

Domains of Serious Games Applications

- Healthcare & Medicine
- Science & Research
- Education & Learning
- Public Safety & Disaster Preparedness
- Corporate & Professional Training
- Military & Defense
- Urban Planning & Social Policy



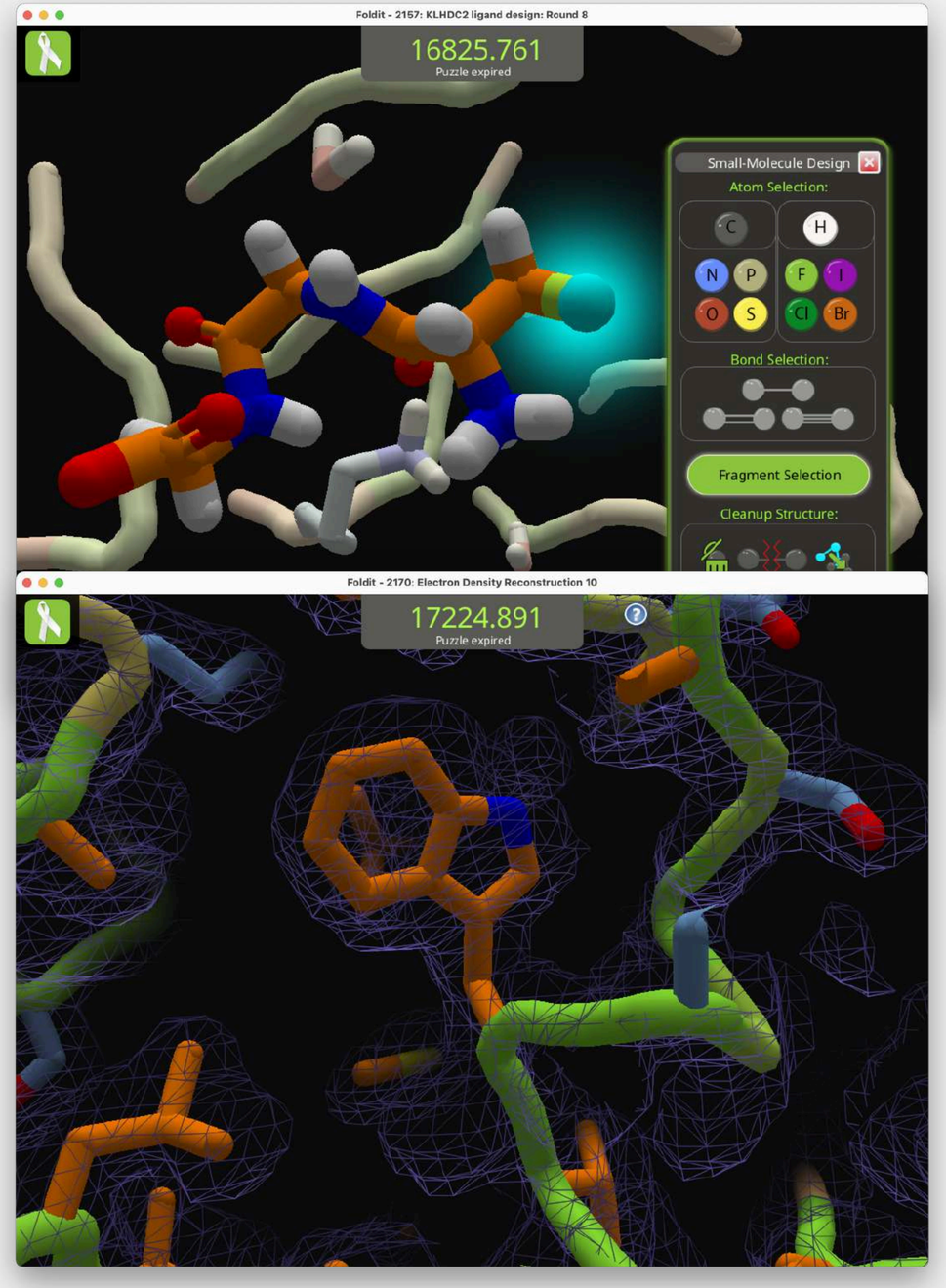
Re-Mission(2006): When a Video Game Improved Cancer Treatment

Developed by: HOPELAB

- Designed for **young cancer patients undergoing treatment**
- Players control a nanobot fighting cancer cells
- Clinical trials showed improved treatment adherence
- One of the first serious games **backed by rigorous scientific research**

Foldit(2008): Gamers Solved a Problem Scientists Struggled With for **15 Years**

Developed by: University of Washington



- Launched in 2008 by University of Washington's **Center for Game Science** + UW **Department of Biochemistry**
- A **citizen-science puzzle game** focused on protein folding
- Players manipulate 3D protein structures to find stable, low-energy shapes
- Uses the **Rosetta molecular modeling** software as its scientific backbone
- Demonstrated that non-experts can outperform algorithms in specific folding tasks
- In 2011, Foldit players **solved the M-PMV** retroviral protease structure—**unsolved** by scientists **for over a decade**
- Player-generated solutions have been used in peer-reviewed **scientific papers**

3DiTeams(2007): Healthcare Team Training in a Virtual Environment

Developed by:

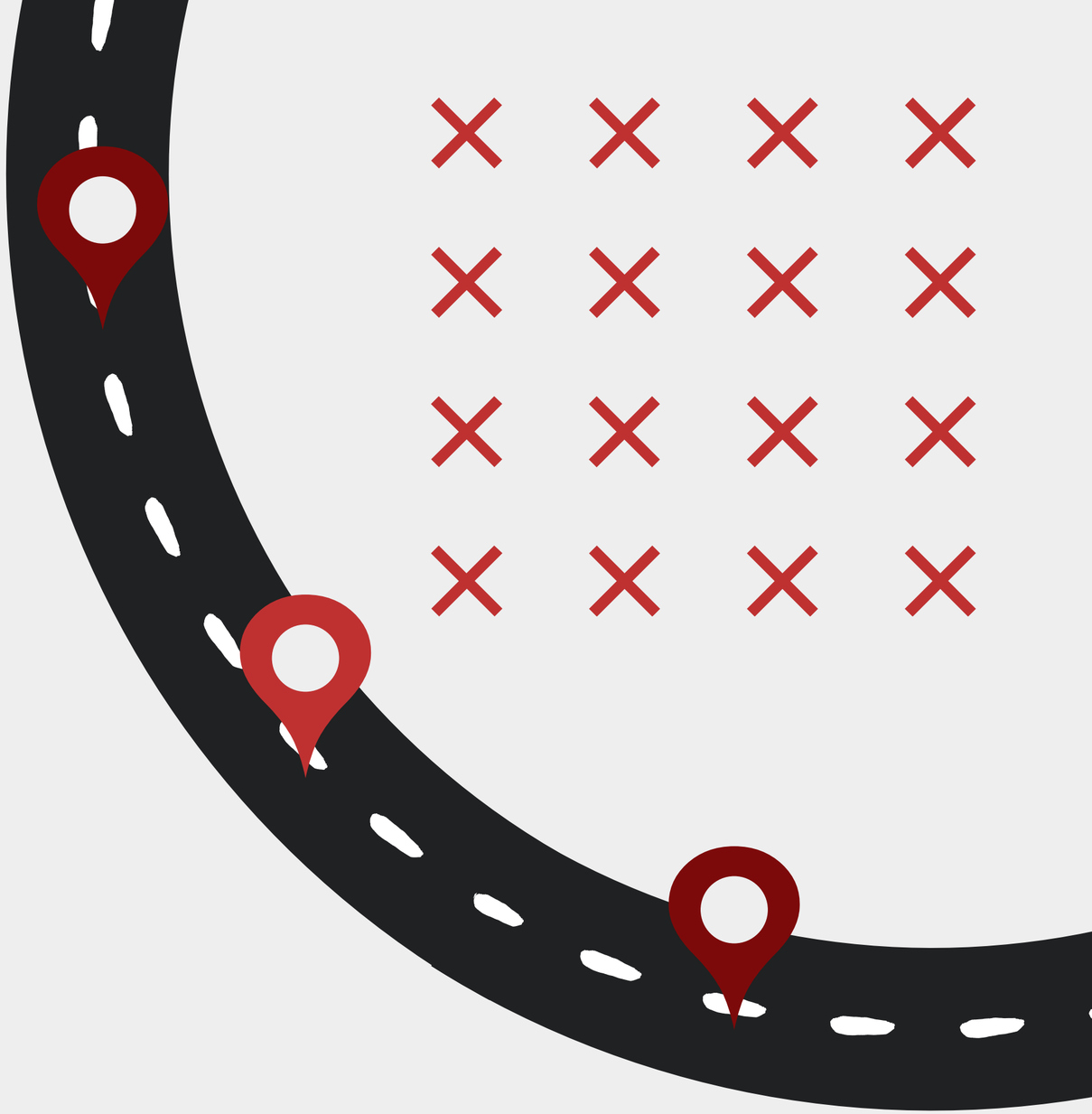
VIRTUAL HEROES

DukeHealth

- Designed for **medical education** + **team training**
- Managed by **Duke's Human Simulation & Patient Safety Center**
- Public debut in 2007 (ASA Annual Meeting, San Francisco)
- Presented at TeamSTEPPS, Games for Health, NC ALT Summit
- Training setting: **virtual field hospital or emergency room**
- Players act as doctor, nurse, technician, or observer
- **Instructor briefs team**; patient arrives; team must assess + treat
- Instructor can control patient vitals or use physiology engine
- Scenario ends with patient stabilization + telephone handoff
- Final step: group debriefing / after action review
- **Video playback** used for reflection on communication + teamwork

Clarifications

- Serious Games Can’t Fix Every Problem
- You Can’t Just Add Facts and Expect Learning
- Content Alone Isn’t Enough
- Not the Same as Gamification

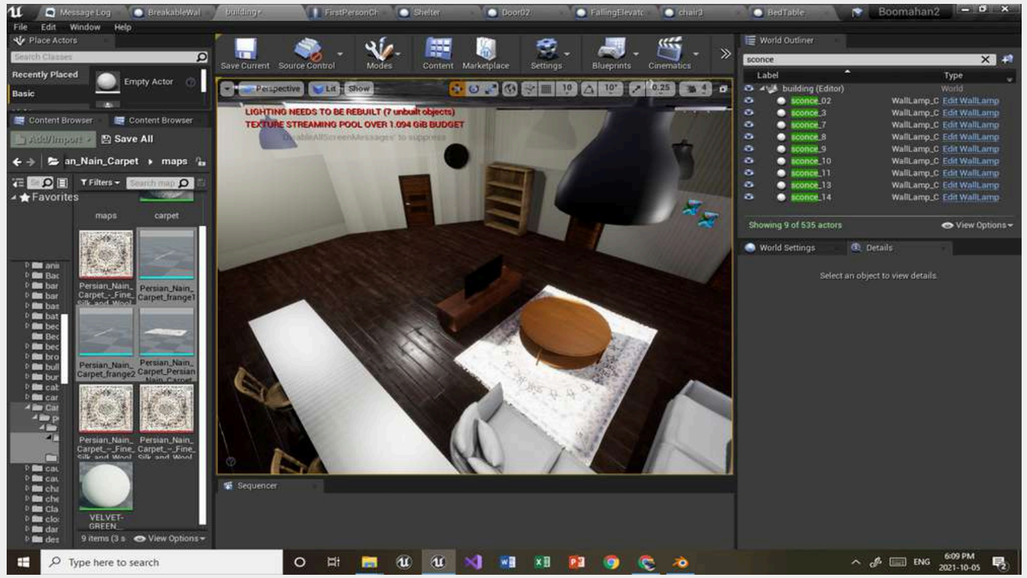


My Personal Experience

Designing A Serious Game

Developed by: the Dream Makers

- Developed as a team of four, roughly four years ago.
- A first-person simulation game designed to put players inside realistic earthquake scenarios.
- Planned to include multiple environments — apartments, schools, public spaces, and open areas — each requiring different safety responses.
- Intended to teach the full cycle of earthquake preparedness: actions before, during, and after an earthquake.
- Player decisions and reactions were fully recorded for assessment, enabling evaluation of learning effectiveness.
- Originally created as a prototype with plans for expansion into a larger educational platform (currently paused).
- Awarded Second Rank in the Serious Games Prize (SeGaP) 2021.



Let's Review

- What they solve
- What they don’t
- Real examples

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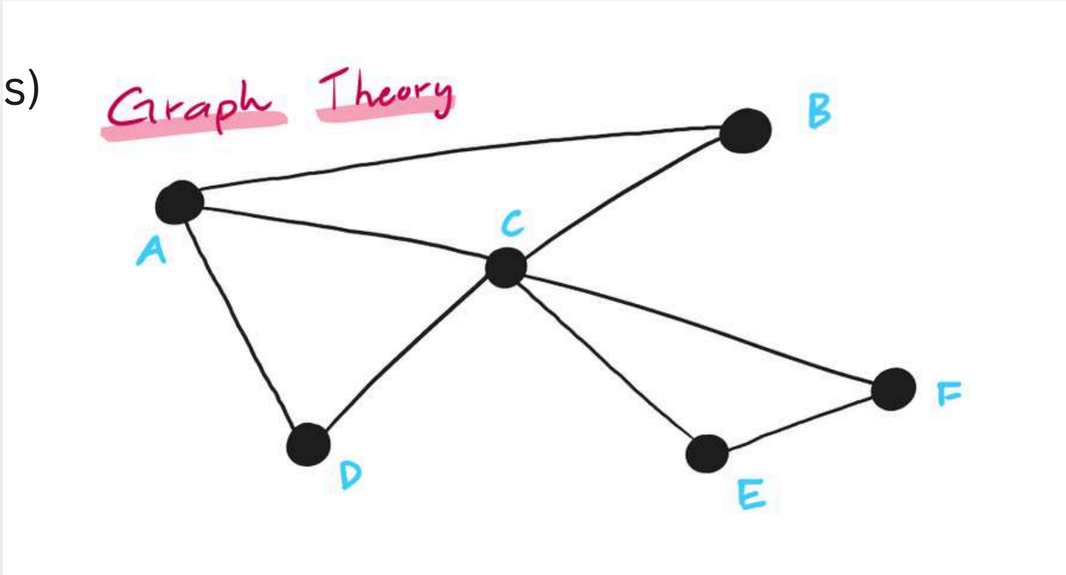
Why It Matters to You

For those who love to code

If you are a developer

Games Push the Limits of Computer Science

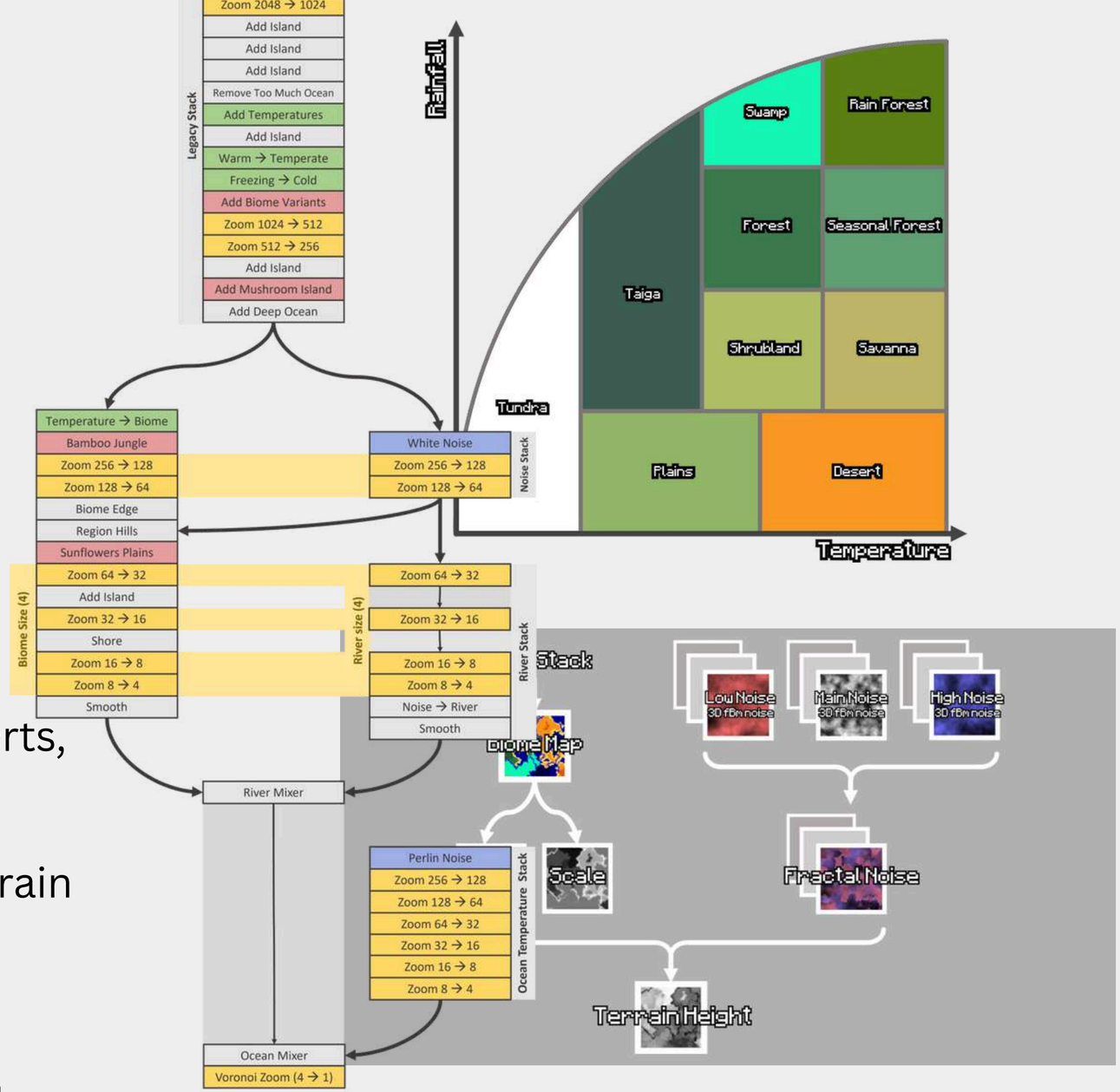
- Procedural generation → Minecraft terrain (noise functions)
- Spatial partitioning → QuadTrees, BSP trees
- Pathfinding → A*, Dijkstra, navigation meshes
- Physics engines → Havok, Box2D
- Real-time rendering → Shaders, OpenGL/DirectX
- Multiplayer networking → Client prediction, rollback



Want to reignite your interest in CS?

Learn How MineCraft Generates Terrinas

- Infinite worlds via procedural generation
- Noise functions create heightmaps → define terrain elevation
- Biomes applied on top of heightmaps → forests, deserts, mountains
- Blocks generated based on biome + height → final terrain
- Uses spatial partitioning (QuadTrees, chunks) for memory & performance
- CS concepts: algorithms, data structures, procedural generation, noise, chunking



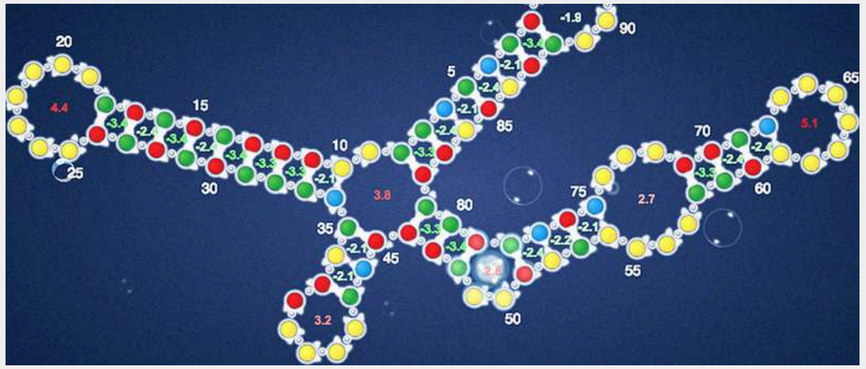
Alan Zucconi

For curious minds in AI, data,

and beyond...

If you are interested in data, ML, or AI

- Serious games as data-gathering platforms
- Collect human decisions, strategies, and patterns in structured environments
- Crowdsourcing complex problem solving
  - Protein folding → Foldit
  - RNA design → EteRNA
- Training AI & ML algorithms
  - Use human-generated solutions to improve models
  - Examples: reinforcement learning from human gameplay



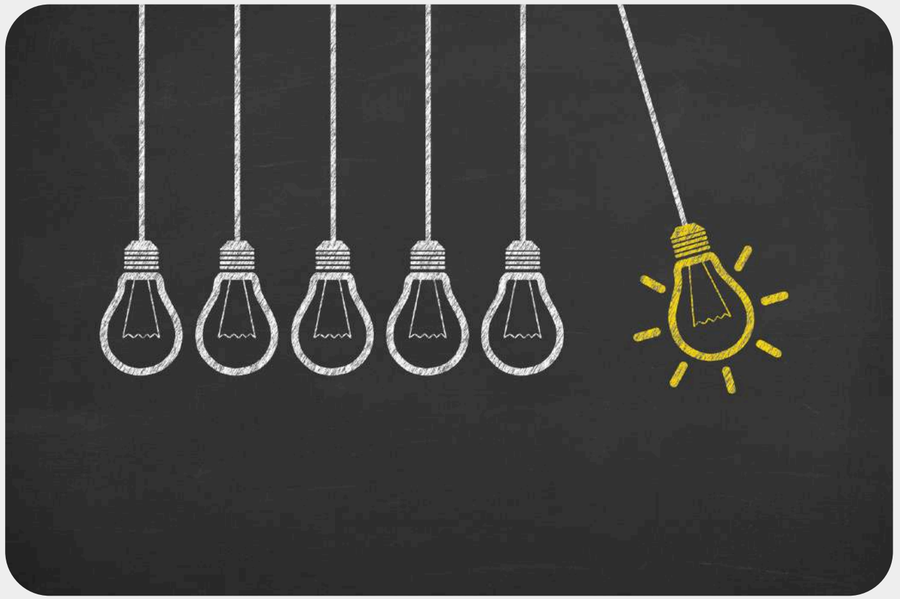
- Behavioral and social data analysis
  - Studying cooperation, negotiation, communication patterns in multiplayer simulations
- Simulations for research
  - Disaster preparedness games (Stop Disasters!) → measure responses to hazards
  - Traffic or urban planning simulators → collect data on decision-making

For those who want to make

an impact

If you want to make a difference...

- These concepts aren’t limited to game development
- Tools for education, health, science, and social good
- Influence behavior and teach skills in real-world contexts



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What Now?

Let's Return to the Main Question

Can Games help us navigate life better?

Three Takeaways

Games are powerful because they create meaningful systems.

Serious games work when they solve real problems through design, not decoration.

Game-thinking helps you build better products, better systems, and better habits.

What's Next?

You Decide

Thank You