



# WPI

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IMGD 5100:  
Immersive HCI

## Immersion & Game Play

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## What *is* Immersion?

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- “Being There”
- Being in *Flow*
- Natural interaction that recedes into the background
- Tapping into personal experience

## Being There: Remote Physical Environment

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- Phone
- Video conference
- Teleoperated robots

## Being There: Virtual Environment

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- Video game
- Immersive learning environment
  - Immersive chemistry
- Surgical simulation
- MMO

## Being There: Real Environment

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- Hand-held mobile device
  - iPhone/iPad/Android
  - DS/PSP
  
- In-vehicle system
  - Navigation
  - Traffic
  
- Augmented Reality (AR)

## Being There: Described Environment

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- Books
- Movies
- Phone sex

# What Makes a Good Game?

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- "A great game is a *series* of *interesting* and *meaningful choices made by the player* in pursuit of a *clear* and *compelling goal*."  
- Sid Meier
  
- "Natural Funativity"
  - Survival-skill training
  - Need to have player develop a set of skills with increasing levels of difficulty
  - Putting them to the test = mission, quest, level, *etc.*
  - Prize at the end (or in the middle)

## Structure of Games

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- Movies have linear structure
  - No choice by viewer
- Games must provide "interesting and meaningful choices"
  - Otherwise, user is not in control
- Random death is frustrating!
- Choices need to make sense in the context of the story



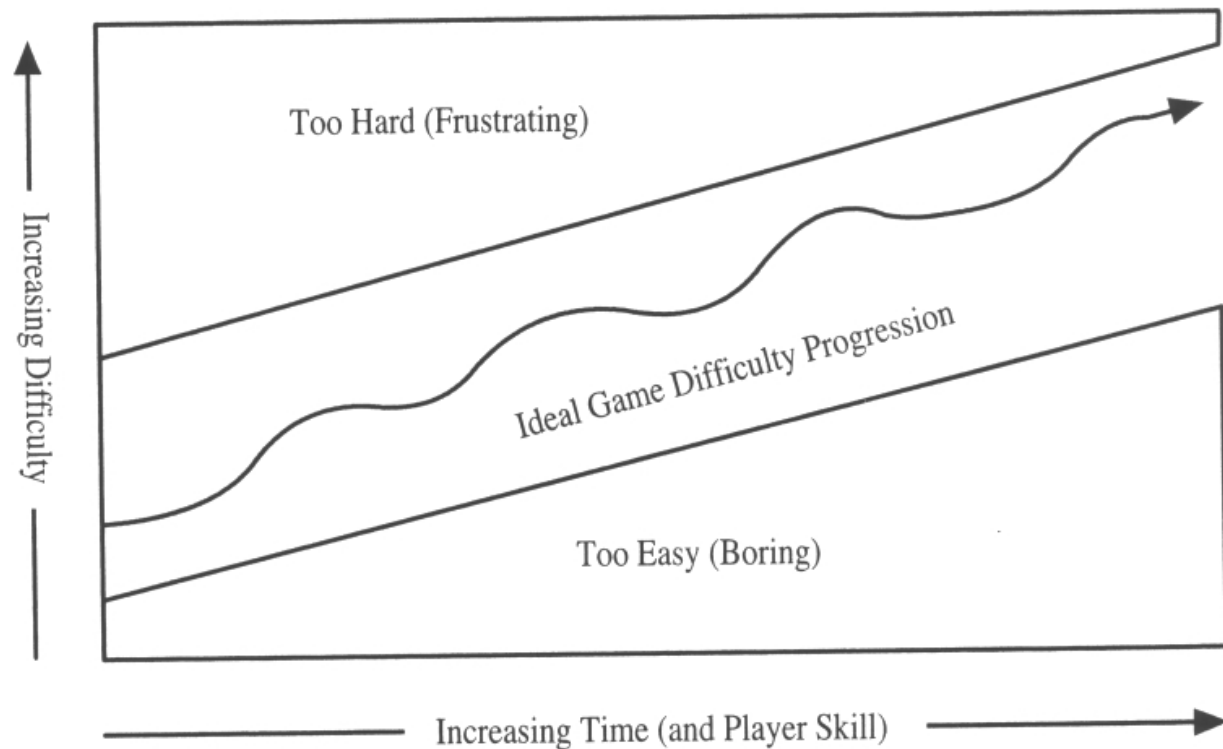
## Being in Flow

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- Introduced by Mihály Csíkszentmihályi
  - *Flow: the Psychology of Optimal Experience.*  
Harper Perennial, 1990
  - Heightened sense of perception
  - Highly focused on primary task
  - In the "sweet spot" between frustration and boredom
  
- Athletes often report this
  
- Video gamers too

## Flow

- Getting the balance right is the key to success



M. Csikszentmihalyi,  
"Flow, The Psychology of  
Optimal Experience"

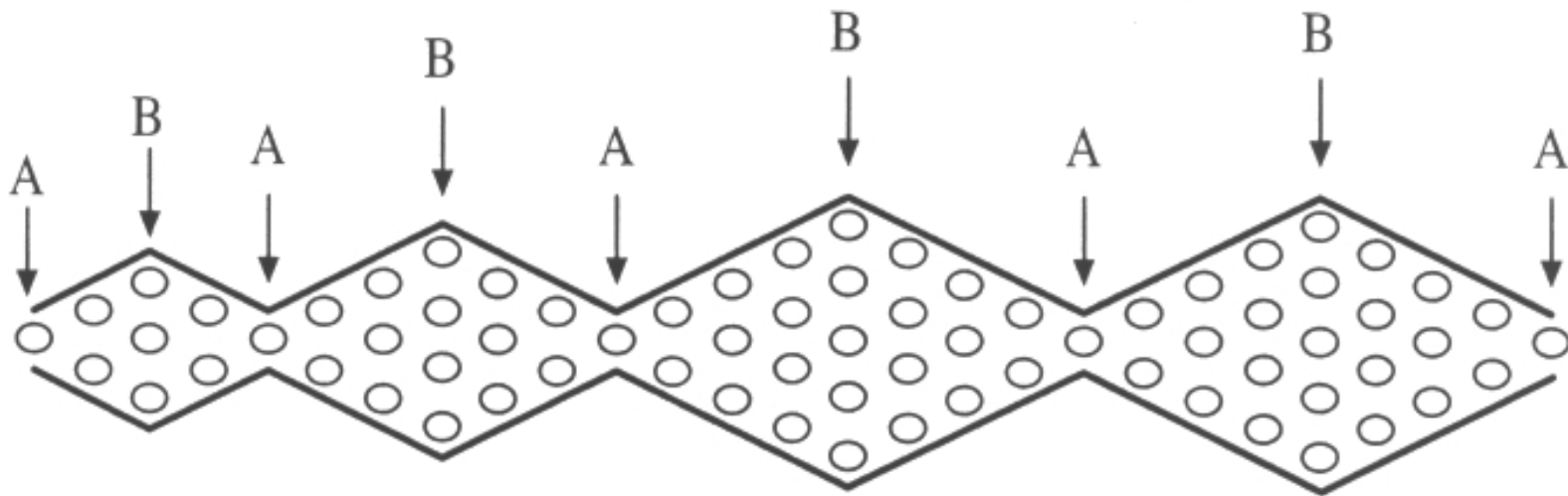
FIGURE 2.1.8 *A better flow.*

Chapter 2.1, *Introduction to Game Development*

# Convexity of Game Play

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- Need to provide choices



**FIGURE 2.1.6** *A series of convexities.*

## Flow: Sample Game

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- flOw
- Game written by Jenova Chen
- Research into adaptive difficulty
  - How can we keep people in flow?
  - Player doing poorly, make it easier
  - Player doing well, make it harder
- Play Demo
- <http://www.jenovachen.com/>

## Convexity + Flow

- Utilizing both can lead to a great game

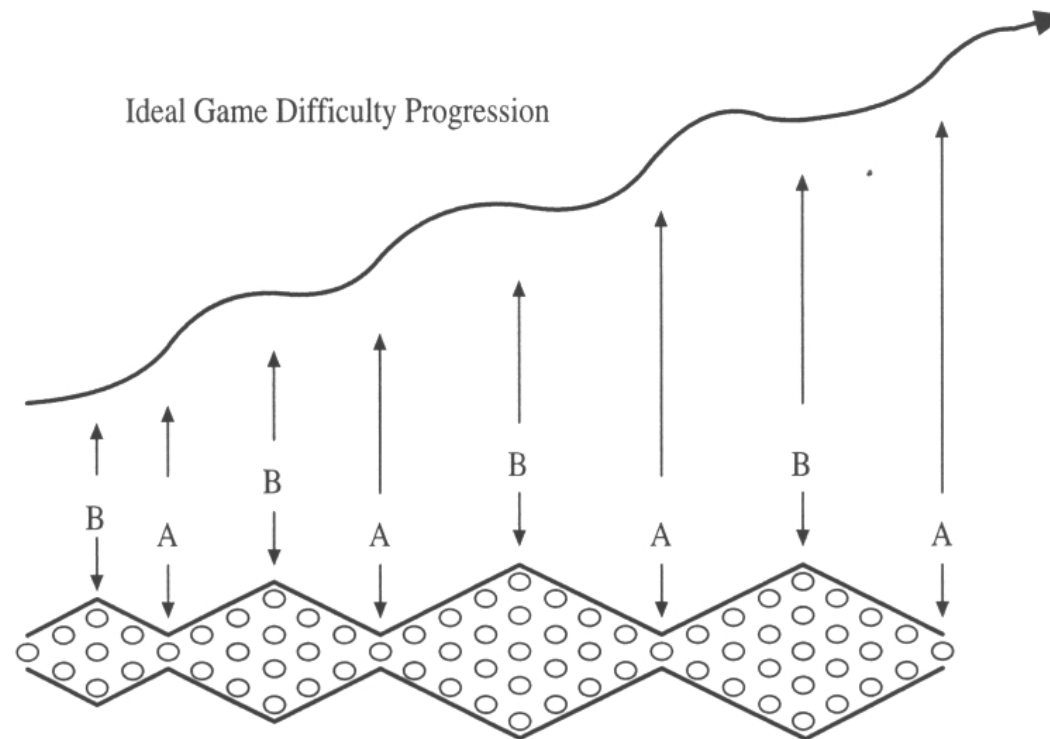


FIGURE 2.1.9 *Better flowing through convexities.*

## Characterizing Flow

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- ❑ A challenge activity that requires skills
- ❑ The merging of action and awareness
- ❑ Clear goals
- ❑ Direct feedback
- ❑ Concentration on the task at hand
- ❑ The sense of control
- ❑ The loss of self-consciousness
- ❑ The transformation of time

## Natural Interaction

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- Recedes into the background
  - Low cognitive load for interaction techniques
  - Visual (and other) feedback can be easily digested
  - Low cumber

## The Role of Personal Experience

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- We all filter our senses
- Variations in sight, hearing, etc.
- My childhood versus yours
- My mood
- Can we harness this?



## Deconstructing *Petrified*

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- First-person, multi-player, team-based horror/survival game
- Two teams
  - Humans (*Mortals*):
    - People trapped in the cemetery
    - Need to survive until dawn
  - Statues (*Watchers*):
    - Tombstones
    - Need to convert Humans to Statues

# Deconstructing *Petrified* (cont.)

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- Main game mechanics
  - Watchers (Statues) can
    - Move when not being looked at by Mortals
    - Occupy another unoccupied statue anytime
    - Swipe at Mortals (short-range attack)
  - Mortals (Humans) can
    - Look at Watchers
    - Move freely
    - Work together

## ***Petrified:*** Walkthrough (1/6)

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## ***Petrified:*** Walkthrough (2/6)

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## ***Petrified:*** Walkthrough (3/6)

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## ***Petrified:*** Walkthrough (4/6)

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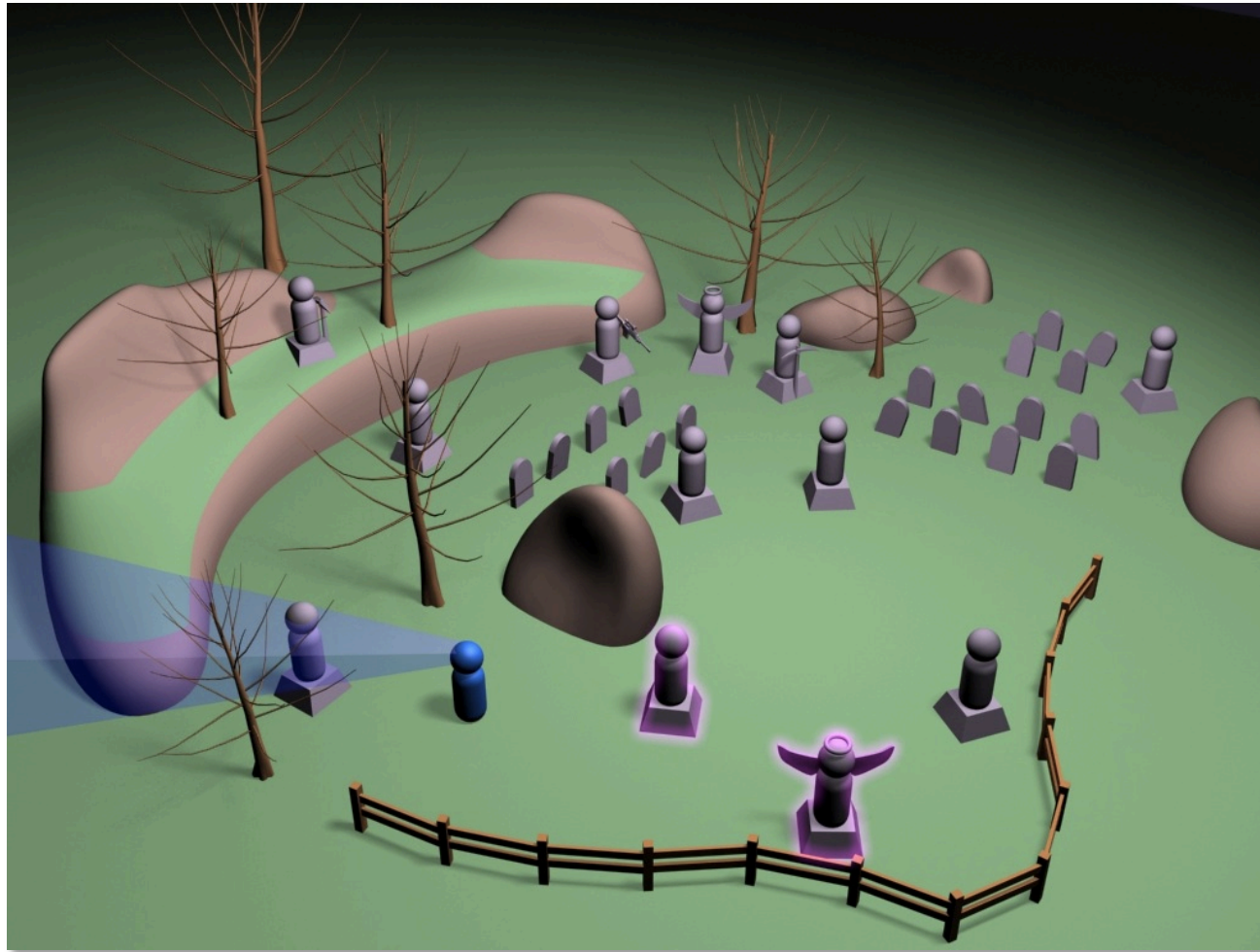
## ***Petrified:*** Walkthrough (5/6)

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## ***Petrified:*** Walkthrough (6/6)

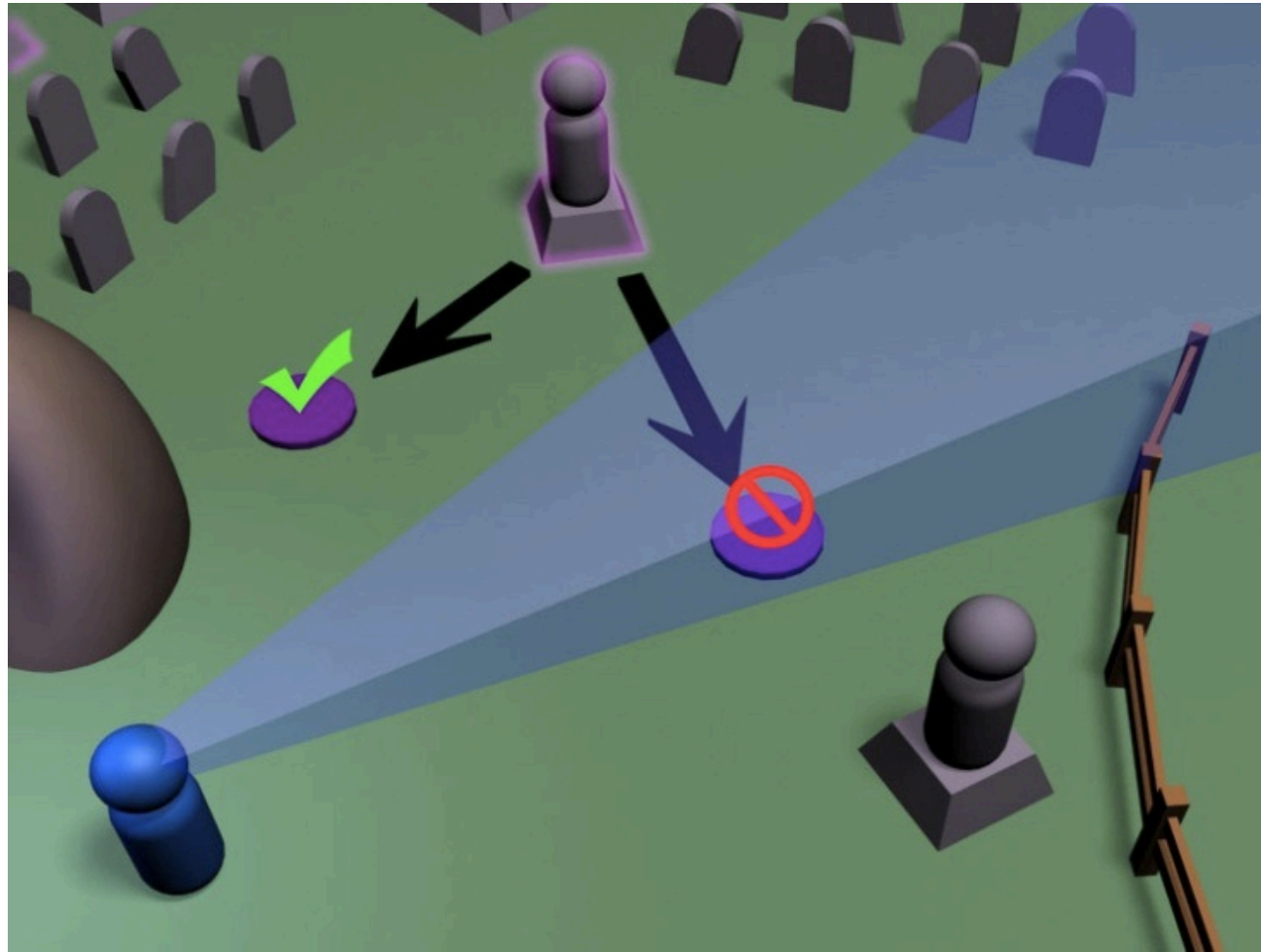
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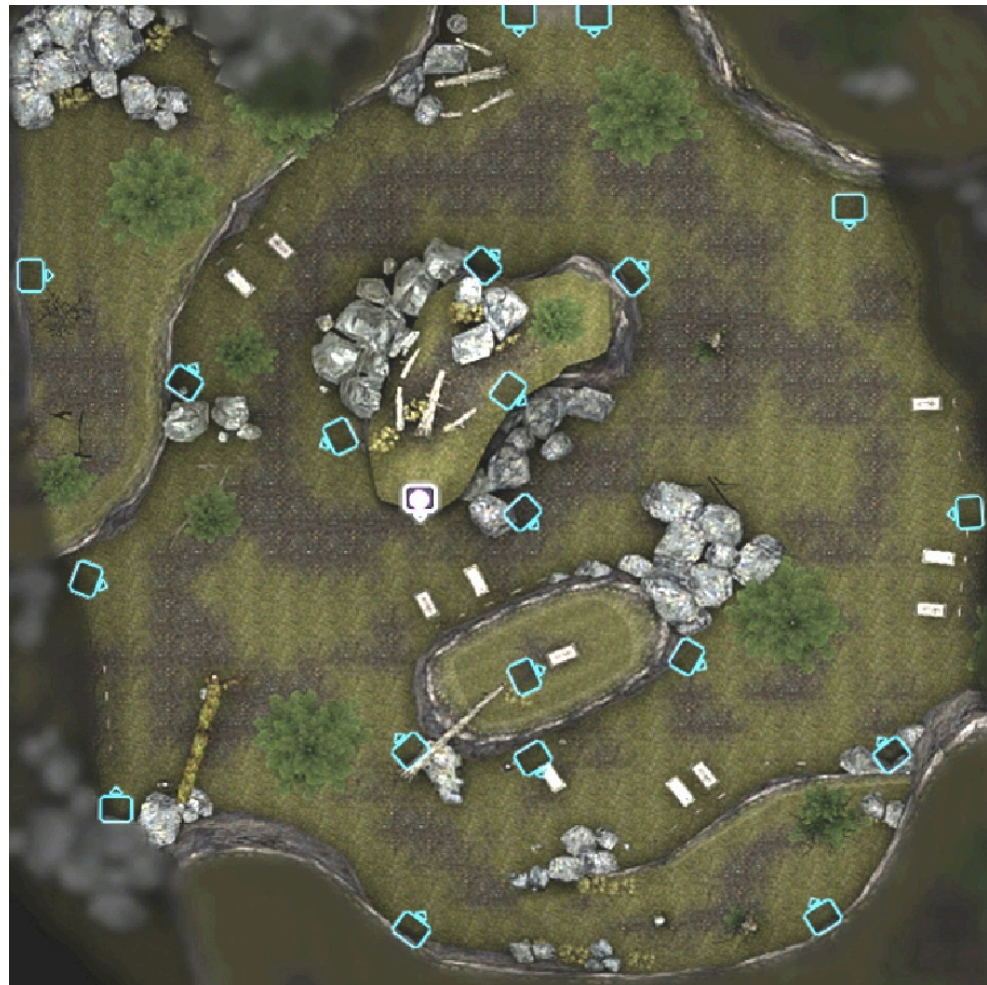
## ***Petrified:*** Watcher Movement

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## ***Petrified:*** Watcher “Swapping”

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## Question for Discussion: Is *Petrified* Balanced?

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- ❑ Does one team have an advantage?
- ❑ If you were a Mortal, how would you play?
- ❑ If you were a Watcher, how would you play?
- ❑ What improvements/changes could you make to the game?

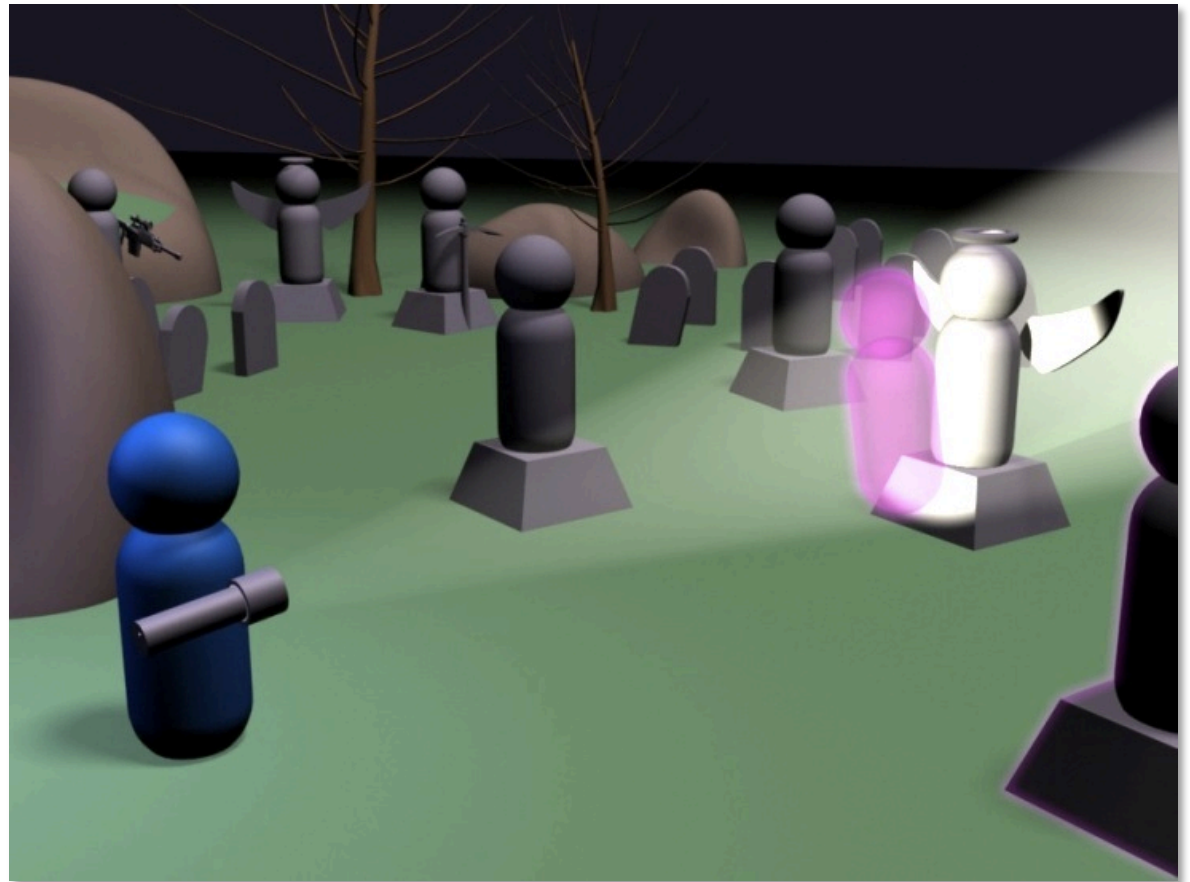
# ***Petrified Modifications:*** Flashsticks



# ***Petrified Modifications:*** Balancing the Mortals

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- ❑ Flashstick compensates for weak Mortals
- ❑ Skilled Mortal can survive forever



# ***Petrified Modifications:*** Balancing the Watchers

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- Range Attack Balances Watchers
  - Mortals cannot “camp out”
- Provides incentive for Watchers to move about/chase Mortals
- (Show Clip)

## Petrified

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## Presence: The Sense of Being There

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- Immersive technologies can give your senses the feeling of *being there*
- Other things can too
  - The way virtual characters react to you
  - The depth with which you can interact with the environment
  - The invisibility or naturalness of the interface
  - The lack of distractors (e.g., cables)



## Measuring Presence

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- How could we measure if someone feels “present” in a game or other virtual environment?
- Is this a yes/no measurement?
- How could we discover the *depth* of presence?

## Measuring Presence (cont.)

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### □ Questionnaires

- How could we do this?
- What kinds of questions could we ask?

### □ Behaviors

- Duck!

### □ Physiological measures

- Heart rate
- Sweat
- Breathing

## Presence Questionnaires

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### □ Slater Usoh Steed (SUS)

- Usoh, M., Arthur, K., Whitton, M., Bastos, R., Steed, A., Slater, M., & Brooks, F. **Walking > Walking-in-Place > Flying in Virtual Environments**. *Computer Graphics, Proc. of SIGGRAPH* 1999, pp. 359–364.

### □ Witmer & Singer

- Witmer, B.G., Singer, M.J. Measuring **Presence in Virtual Environments: A Presence Questionnaire**, *Presence*, 7(3), June 1998, pp. 225–240.

### □ Problems

- Questions are very important to get right!
- Measurement is done after the fact

## Behavioral Measures of Presence

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- Watch the user, see how they react
  - More realistic reactions mean more presence
- Hard to measure *depth* of presence...
- ...but easy to know when you see it!
- Could be sound too (e.g., screams)
- Problems
  - You may have to invent/incorporate “events” to trigger behaviors

# Physiological Measures of Presence

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- Can instrument the person with sensors
  - Heart rate monitor
  - Galvanic skin response (or skin conductance)
    - Measure amount of sweat
  - Breathing rate/regularity
- Hard to fake
- Problems
  - Some measures take time to settle
  - May need to calibrate a baseline
  - Need to wear stuff (could we use heat map?)

## Your Turn!

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- Break up into groups of 4-5
- Come up with a scenario where we could measure presence
  - Hardware?
  - Scene?
  - Actions?
- What measures would you use and why?

## Gameplay

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- ❑ From your readings, what do we know about constructing immersive games?
- ❑ What should we do to improve chances?
- ❑ Can we design “standard” things into games to make them more immersive?