CE810 GD2

CE810 - Game Design 2 Recap

Joseph Walton-Rivers & Piers Williams Monday, 14 May 2018 University of Euros

CE810 - Game Design 2

Recap

Joseph Walton-Rivers & Piers Williams Monday, 14 May 2018

University of Essex

CE810 GD2 Game Design CE810 GD2

Game Design

Game Design



1. Games have rules 2. Rules are important

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└─Game Design └─ Rules

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1. Games have rules 2. Rules are important





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Game Design

Rules

Games have rules
 Rules are important
 Too many rules ⇒ Not fun

- 1. Games have rules
- 2. Rules are important
 - Too many rules ⇒ Not fun

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Game Design

Rules

Games have rules
 Rules are important
 Too many rules ⇒ Not fun
 Too few rules ⇒ Not fun

- 1. Games have rules
- 2. Rules are important
 - Too many rules ⇒ Not fun
 - Too few rules ⇒ Not fun

• These slides are 'borrowed' from Prof. Bartle's slides.

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-Richard's Hierarchy

☐Richard's Hierarchy

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Richard's Hierarchy

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-Richard's Hierarchy

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These slides are 'borrowed' from Prof. Bartle's slides. · Although we've used a different font.

Richard's Hierarchy

• These slides are 'borrowed' from Prof. Bartle's slides.

· Although we've used a different font...

Although we've used a different font. · We're recapping this because it's important to what we're

Richard's Hierarchy

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- These slides are 'borrowed' from Prof. Bartle's slides.
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- These slides are 'borrowed' from Prof. Bartle's slides.
- · Although we've used a different font...
- · We're recapping this because it's important to what we're doing
- · also, you've done exams since then...



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-Richard's Hierarchy

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Richard's Hierarchy

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-Richard's Hierarchy

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Richard's Hierarchy

- Tokens (aka entities)

- Tokens (aka entities)

Rules

Tokens (aka entities)

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2018-05-25 -Richard's Hierarchy - Tokens (aka entities) ☐Richard's Hierarchy

Richard's Hierarchy

- Tokens (aka entities)
- Rules

Features

2018-05-25 -Richard's Hierarchy ☐ Richard's Hierarchy

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Richard's Hierarchy

- · Tokens (aka entities)
- · Rules
- Gameplay

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Richard's Hierarchy

└─Richard's Hierarchy

Rules Features Sameplay

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• Features

4

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Richard's Hierarchy

Things that can act or be acted upon



• Things that can act or be acted upon



└─Tokens



└─Tokens



• Things that can act or be acted upon

• Game Rules **directly** concern tokens



Tokens

- Things that can act or be acted upon
- Game Rules **directly** concern tokens
- In computer games, tokens are usually the programming objects/entities

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-Richard's Hierarchy

└─Tokens

Things that can act or be acted upon Game Rules directly concern tokens In computer games, tokens are usuall the programming objects/entities

Tokens

- Things that can act or be acted upon
- Game Rules **directly** concern tokens
- In **computer** games, tokens are usually the programming objects/entities
 - They **may** have associated assets

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└─Tokens

Things that can act or be acted upon Game Rules directly concern tokens the programming objects/entities - They may have associated assets







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- They may have associated properties



• Things that can act or be acted upon

- Game Rules **directly** concern tokens
- In **computer** games, tokens are usually the programming objects/entities
 - They may have associated assets
 - They may have associated properties



└─Tokens



• Rules refer to **tokens** and each **other**

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example

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Company of Heroes by Relic entertainment implemented this

└─ Rules

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· Rules refer to tokens and each other

6

└─ Rules

- Rules refer to **tokens** and each **other**
- Features emerge from rule interactions

Rules

- · Rules refer to **tokens** and each **other**
- Features emerge from rule interactions
- Example:



Rules

- Rules refer to **tokens** and each **other**
- Features emerge from rule interactions
- Example:
 - Rule 1 Artillery kills infantry with no cover.



Company of Heroes by Relic entertainment implemented this example

· Rules refer to tokens and each other

Features emerge from rule interactions
 Example:
 Rule 1 - Artillery kills infantry with no cover.

Rules

- · Rules refer to **tokens** and each **other**
- Features emerge from rule interactions
- Example:
 - Rule 1 Artillery kills infantry with no cover.
 - Rule 2 Artillery makes craters.



- - · Rules refer to tokens and each other
 - Features emerge from rule interactions
 - Example:
 - Rule 1 Artillery kills infantry with no cover.
 - Rule 2 Artillery makes craters.
 - Rule 3 Craters provide cover for infantry.



Rules refer to tokens and each other
Features emerge from rule interactions
Dample:
- Rule 1 - Artillary late interact was no cosec.
- Rule 2 - Artillary makes crater.
- Rule 3 - Costers provide cover for inflantry.

- - Rules refer to tokens and each other
 - Features emerge from rule interactions
 - Example:
 - Rule 1 Artillery kills infantry with no cover.
 - Rule 2 Artillery makes craters.
 - Rule 3 Craters provide cover for infantry.
 - The emergent feature is "Defences need to be managed"



- · Rules refer to tokens and each other
- Features emerge from rule interactions
- Example:
 - Rule 1 Artillery kills infantry with no cover.
 - Rule 2 Artillery makes craters.
 - Rule 3 Craters provide cover for infantry.
- The emergent feature is "Defences need to be managed"
- Rules **together** with features form the **mechanics** by which gameplay emerges



· Rule 3 - Craters provide cover for infantry. The emergent feature is "Defences need to be managed" Rules together with features form the mechanics by which

Features emerge from rule interactions

· Rule 1 - Artillery kills infantry with no cover



games.

• Features are what makes this game different to other

CE810 GD2 2018-05-25 -Richard's Hierarchy └─ Features

· Features are what makes this game different to other

└─ Features

- Features are what makes this game different to other games.
- In terms of mechanics, this usually means ways to organise tokens

└─ Features

- Features are what makes this game different to other games.
- In terms of mechanics, this usually means ways to organise tokens
- · it can mean ways to organise rules

└─ Features

- Features are what makes this game different to other games.
- In terms of mechanics, this usually means ways to organise tokens
- · it can mean ways to organise rules
- Features emerge from interactions between game rules

Features

- Features are what makes this game different to other games.
- In terms of mechanics, this usually means ways to organise tokens
- it can mean ways to organise rules
- Features emerge from interactions between game rules
- · Gameplay emerges from iterations between features.

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-Richard's Hierarchy

└─ Features

· Features are what makes this game different to other In terms of mechanics, this usually means ways to

- Gameplay emerges from iterations between features



"A series of interesting choices"

– Sid Meier

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└─Gameplay

Richard's Hierarchy

"A series of interesting choices"





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-Gameplay

"A series of interesting choices" - Sid Meier In the same way that features emerge from rule interactions, gameplay emerges from feature interactions

"A series of interesting choices"

- Sid Meier

• In the same way that features emerge from rule interactions, gameplay emerges from feature interactions



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-Gameplay

In the same way that features emerge from rule interactions, gameplay emerges from feature interact
 Gameplay is what players do in the game to have fun

"A series of interesting choices"

"A series of interesting choices"

– Sid Meier

- In the same way that features emerge from rule interactions, gameplay emerges from feature interactions
- Gameplay is what players do in the game to have fun

8

Gameplay

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—Gameplay

- Sid Meier

In the same way that features emerge from rule interactions, gameplay emerges from feature interactions.

Gameplay is what players do in the game to have fun
There are subjective degrees of gameplay.

"A series of interesting choices"

"A series of interesting choices"

– Sid Meier

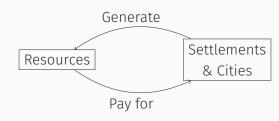
- In the same way that features emerge from rule interactions, gameplay emerges from feature interactions
- · Gameplay is what players do in the game to have fun
- · There are subjective degrees of gameplay

8

Feedback Loops

Positive Feedback Loops

 In a positive feedback loop, the better you do something the easier it becomes.





Positive Feedback Loops

- In a positive feedback loop, the better you do something the easier it becomes.
- Your lead will increase if being ahead gives you an advantage



CE810 GD2 -Feedback Loops Positive Feedback Loops

feedback loop, the

Positive Feedback Loops

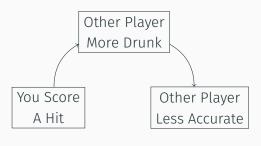
better you do

easier it becomes Your lead will increase if being ahead gives you a advantage

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Positive Feedback Loops

- In a positive feedback loop, the better you do something the easier it becomes.
- Your lead will increase if being ahead gives you an advantage
- · Unstable and not good between players

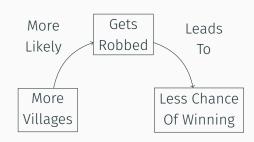


CE810 GD2 2018-05-25 -Feedback Loops Positive Feedback Loops Positive Feedback Loops feedback loop, the better you do easier it becomes Your lead will increase if being ahead gives you an Unstable and not

advantage

Negative Feedback Loops

 In a negative feedback loop, the better you do something the harder it becomes.



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Feedback Loops

Negative Feedback Loops

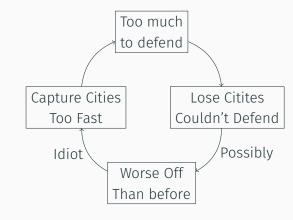
In a negative feedback loop, the better you do something the harder it becomes.

| More | Gets | Leads | To | To | More | Cof Willagos | Lead Chance | Cof Winning | Cof W

Negative Feedback Loops

Negative Feedback Loops

- In a negative feedback loop, the better you do something the harder it becomes.
- · Your lead will decrease if being ahead gives you a disadvantage



CE810 GD2 2018-05-25 -Feedback Loops ☐ Negative Feedback Loops feedback loop, the harder it becomes. ahead gives you a

Negative Feedback Loops

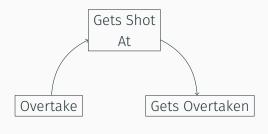
better you do

Your lead will decrease if being

disadvantage

Negative Feedback Loops

- In a negative feedback loop, the better you do something the harder it becomes.
- Your lead will decrease if being ahead gives you a disadvantage
- Very good at all levels of gameplay



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Feedback Loops

Negative Feedback Loops

In a negative feedback loop, the better you do something the Mandeir I becomes 'Observation and State of State

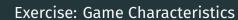
Negative Feedback Loops

levels of gameplay

CE810 GD2 Game Parameters -810

Game Parameters

Game Parameters



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-Game Parameters

Exercise: Game Characteristics

Identify characteristics of a game genre, e.g. 2D Arcade Games

Exercise: Game Characteristics

Question

Identify characteristics of a game genre, e.g. 2D Arcade Games

· Game Rules

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☐Game Parameters

- Game Rules ☐ Answer: Game Characteristics

- · Game Rules
- Object Types

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└─Game Parameters

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Answer: Game Characteristics

Answer: Game Characteristics

12

- · Game Rules
- Object Types
- · Vehicle Physics

2018-05-25 —Game Parameters Answer: Game Characteristics

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• Game Rules

- · Object Types
- Object Types
- Vehicle Physics
- · Input Controls

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Object Types
 Vehicle Physics
 Input Controls

- · Game Rules
- Object Types
- Vehicle Physics
- Input Controls
- Weapon Systems

2018-05-25 -Game Parameters

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Input Controls - Weapon Systems

Answer: Game Characteristics

12

- · Game Rules
- · Object Types
- · Vehicle Physics
- · Input Controls
- Weapon Systems
- · Game Views



- · Game Rules
- · Object Types
- Vehicle Physics
- · Input Controls
- · Weapon Systems
- · Game Views
- Level Designs



- · Game Rules
- · Object Types
- Vehicle Physics
- · Input Controls
- · Weapon Systems
- · Game Views
- · Level Designs
- · Al Behaviour

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Game Parameters

Game Parameters

Collect Types

I work of prices

I was controlled

Contro

- 12

Collisions?

Collision Matrix

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When is a level cleared??

-Game Parameters

└─Game Rules

- Points, lives/health/ammo gained and lost

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- Collision Matrix

-Game Parameters

└─Game Rules

· Points, lives/health/ammo gained and lost

- Reward Structure

When is a level cleared??

· Collisions?

· Reward Structure

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-Game Parameters

└─Game Rules

Reward Structure Game State transition structure

- Collisions?
- Reward Structure
- · Game State transition structure

Collision Matrix

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- · Points, lives/health/ammo gained and lost
- When is a level cleared??

- Collisions?
- Reward Structure
- · Game State transition structure
- Fundamental

- Collision Matrix
 - Points, lives/health/ammo gained and lost
 - When is a level cleared??

└─Game Rules

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Game Parameters

- Fundamentall
- Small charges can radically after the gam
- Game Rules

Reward Structure

· Collisions?

- Reward Structure
- Game State transition structure
- Fundamental
- · Small changes can radically alter the game

- · Collision Matrix
- · Points, lives/health/ammo gained and lost
- When is a level cleared??



Things to:

14

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└─Object Types

- Things to:

Things to: Shoot

CE810 GD2 2018-05-25 ☐Game Parameters └─Object Types 14

Things to:
 Shoot

- Things to:
 - Shoot
 - Collect

14

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☐Game Parameters

- └─Object Types

Things to:
 Shoot
 Collect

- Things to: Shoot

 - Collect Jump on

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☐Game Parameters

└─Object Types

Things to:
 Shoot
 Collect
 Jump on

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└─Object Types

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· Things to:

- Things to:
 - Shoot

 - Collect
 - Jump on Protect

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CE810 GD2 └─Game Parameters

└─Object Types

- Things to: Shoot
 Collect
 Jump on
 Protect

Things to:

- Shoot
- Collect
- Jump on
- Protect Infect

14

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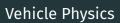
└─Object Types

- Things to: Shoot
 Collect
 Jump on
 Protect - Infect - Bounce Off

Things to:

- Shoot
- Collect
- Jump on
- Protect
- Infect
- · Bounce Off

14



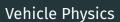
How do actions affect the movement of the vehicle?

15

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CE810 GD2 -Game Parameters

· How do actions affect the movement of the vehicle?



└─Vehicle Physics

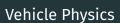
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-Game Parameters

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· How do actions affect the movement of the vehicle?

· How do actions affect the movement of the vehicle? • Left - right?



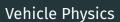
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- -Game Parameters
 - L-Vehicle Physics
- Up Down?

· How do actions affect the movement of the vehicle?

- How do actions affect the movement of the vehicle?
- · Left right?
- · Up Down?



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-Game Parameters └─Vehicle Physics

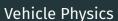
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- Car-like?

- · How do actions affect the movement of the vehicle?
- Left right?
- · Up Down?
- · Car-like?

How do actions affect the movement of the vehicle?

15



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- Car-like? - Asteroids-style space ship?

How do actions affect the movement of the vehicle?

- How do actions affect the movement of the vehicle?
- Left right?
- Up Down?
- · Car-like?
- Asteroids-style space ship?

15

└─Vehicle Physics









Vehicle Physics

-Game Parameters

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· Thrust always on?

How do actions affect the movement of the vehicle?

- How do actions affect the movement of the vehicle?
- Left right?
- Up Down?
- · Car-like?
- Asteroids-style space ship?
 - Thrust always on?

15

- · Car-like?
- 2018-05-25 └─Vehicle Physics

Vehicle Physics

- How do actions affect the movement of the vehicle?
- Left right?
- Up Down?
- · Car-like?
- Asteroids-style space ship?
 - Thrust always on?
 - · Drag?

CE810 GD2 2018-05-25

-Game Parameters

└─Vehicle Physics

Vehicle Physics

How do actions affect the movement of the vehicle?

- Up - Down? · Car-like? - Asteroids-style space ship?

· Thrust always on?

Vehicle Physics

How do actions affect the movement of the vehicle?
Left - right?
Up - Down?

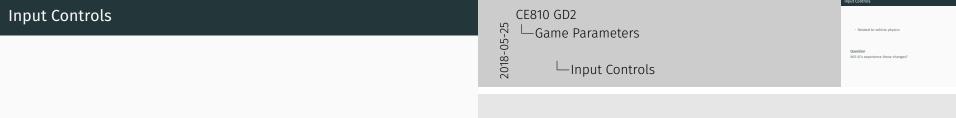
- Car-like? Asteroids-style space ship?
 - Thrust always on?
 - · Drag?
 - Rotation friction?

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Game Parameters

- the do action affect the movement of the whicia?
- that right?
- to so loan?
- carried?
- Assembly against along?
- long against along?
- long against along?
- long against along?
- fination from ?

Vehicle Physics

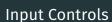


Related to vehicle physics

Question

Will AI's experience these changes?

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-Game Parameters

└ Input Controls

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Question

Will Al's experience these changes?

· Related to vehicle physics · How the ship is controlled?

Related to vehicle physics

• How the ship is controlled?

Question Will AI's experience these changes?

Input Controls

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- -Game Parameters

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· How the ship is controlled? · Classic arcade or one touch controls? Will Al's experience these changes?

└ Input Controls

- Related to vehicle physics
- How the ship is controlled?
- · Classic arcade or one touch controls?

Question

Will AI's experience these changes?

• Things to vary include:

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CE810 GD2 2018-05-25 └─Game Parameters

- └─Weapon Systems

Weapon Systems

- Things to vary include:

• Things to vary include:

Fire rate

└─Weapon Systems

└─Game Parameters

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Fire rate

Weapon Systems

Game Parameters

Weapon Sys

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└─Weapon Systems

- Weapon Cooldowns

Weapon Systems

Fire rate

- · Things to vary include:
 - Fire rate
 - Weapon Cooldowns

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-Game Parameters

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- Weapon Cooldowns · Weapon firing angles └─Weapon Systems

Weapon Systems

Fire rate

Things to vary include:

- Fire rate
- Weapon Cooldowns
- Weapon firing angles

CE810 GD2 2018-05-25 └─Weapon Systems

-Game Parameters

- Weapon Cooldowns

Weapon Systems

Fire rate

Things to vary include:

- Fire rate
- Weapon Cooldowns
- Weapon firing angles
- Bullet velocity

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Game Parameters

└─Weapon Systems

Fire rate
 Weapon Cooldowns
 Weapon firing angles
 Bullet velocity
 Bullet Time to Live

Weapon Systems

• Things to vary include:

- Fire rate
- · Weapon Cooldowns
- Weapon firing angles
- Bullet velocity
- Bullet Time to Live

Game Parameters

Game Parameters

Weapon Systems

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Things to vary include:
- File rate
- Waapon Cooldowns
- Waapon file angles
- Waapon file angles
- Builst valicity
- Builst Time to Live
- Guided / Unguided

Weapon Systems

- · Things to vary include:
 - Fire rate
 - · Weapon Cooldowns
 - · Weapon firing angles
 - Bullet velocity
 - Bullet Time to Live
 - · Guided / Unguided

☐Game Parameters

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└─Weapon Systems

Fire rate
 Weapon Cooldowns
 Weapon firing angles
 Bullet velocity
 Bullet Time to Live
 Guided / Unguided

Weapon Systems

- Things to vary include:
 - Fire rate
 - · Weapon Cooldowns
 - · Weapon firing angles
 - Bullet velocity
 - Bullet Time to Live
 - Guided / Unguided
 - Damage

2018-05-25 └─Weapon Systems

CE810 GD2 -Game Parameters

 Weapon Cooldowns - Bullet Time to Live · Guided / Unguider - Damage - Size

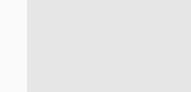
Weapon Systems

Fire rate

• Things to vary include:

- Fire rate
- Weapon Cooldowns
- Weapon firing angles
- Bullet velocity
- · Bullet Time to Live
- Guided / Unguided
- Damage
- Size





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· 2D/3D, CO/PO

└─Game Views

- Fixed or Panning? Scrolling? Zooming viewport?
- Can radically alter nature and difficulty of a game



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Level Design

• Significant impact on difficulty and interest

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· Significant impact on difficulty and interest

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Level Design

- Significant impact on difficulty and interest
- Ms. Pac-Man classic example

- 19

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Game Parameters

Level Design

arameters

- · Significant impact on difficulty and interest
- Ms. Pac-Man classic example
 - Levels differ in maze layouts

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-Game Parameters

└─Level Design

Levels differ in maze layouts
 Parameters such as speed of Ms. Pac-Man and Ghosts

- · Significant impact on difficulty and interest
- Ms. Pac-Man classic example
 - · Levels differ in maze layouts
 - · Parameters such as speed of Ms. Pac-Man and Ghosts

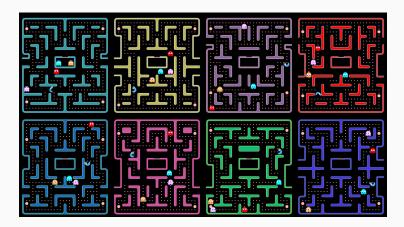
- · Significant impact on difficulty and interest
- · Ms. Pac-Man classic example
 - · Levels differ in maze layouts
 - · Parameters such as speed of Ms. Pac-Man and Ghosts
- For asteroids focus on speed, size, and movement of the Asteroids

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Game Parameters

- Significant impact on difficulty and interest
- Min. Pier Man Classic counting
- Level Design

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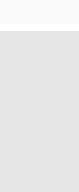




Al Behaviour CE810 GD2 2018-05-25 ☐Game Parameters - Complex problem └─Al Behaviour

· Complex problem

21



· Complex problem

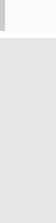
• Interesting AI can make or break a game

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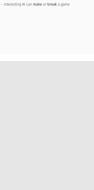
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-Game Parameters

└─Al Behaviour



Complex problem



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-Game Parameters

Keeping Al intelligent without being too powerful is hard

Complex problem

- · Complex problem
- Interesting Al can make or break a game
- Interesting AI can make or break a gameKeeping AI intelligent without being too powerful is hard

· Complex problem

• Interesting AI can make or break a game

• Need to **monitor** the player and tweak

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- -Game Parameters
 - └─AI Behaviour

- Complex problem Need to monitor the player and tweak
- Interesting AI can make or break a game

· Keeping AI intelligent without being too powerful is hard



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-Al Behaviour

- Interesting AI can make or break a game Need to monitor the player and tweak

- Complex problem
- Interesting AI can make or break a game
- · Keeping AI intelligent without being too powerful is hard
- Need to **monitor** the player and tweak

• Towards the **desired** player experience ...

· Towards the desired player experience.

Complex problem

Evolution

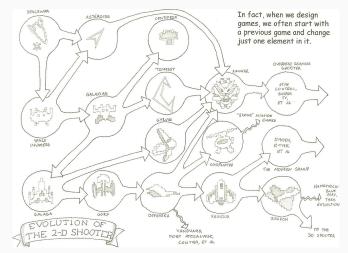


Figure 1: Mechanics are like a game's DNA, and they often evolve from earlier games [2]



SpaceWar 2p pvp Asteroids ships fighting

Space Invaders Marching columns, single dimension of movement

Asteroids Combined the two

Galaxian Simple improvement to Space Invaders

Galaga Seguel to Galaxian - Added tractor beam

Defender - 2D movement and rescuing

Choplifter - Reskin of Defender

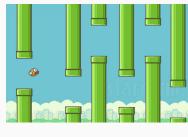
Xevious - Mario style scrolling aircraft

Zaxxon - Isometric view

'Inspiration'

There are great opportunities for mining minor variations on existing games





CE810 GD2
Game Parameters

"Inspiration"



2018-05-25

CE810 GD2
Game Parameters

References

Lecture slides for ce810, part 1.
2018.

R. Koster.
Theory of fun for game design.
* O'Reilly Media, Inc.*, 2013.

R. Bartle.

R. Bartle.
Lecture slides for ce810, part 1.

2018. R. Koster.

Theory of fun for game design.

" O'Reilly Media, Inc.", 2013.

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