CS/INFO 4154:
Analytics-driven Game Design

Class #1:

Overview
Registration status

- Class is full
  - Long waitlists for both programmers and designers
- Enrolled students: *must stay registered*
Outline

• A brief description of CS/INFO 4154
  • Why should you take this class?
  • How is this course structured?
  • How will you be evaluated?

• The science of effective brainstorming

• Game mechanics

• Paper prototyping
Outline

- A brief description of CS/INFO 4154
  - Why should you take this class?
Why should you take this class?

That’s How We Roll, 2014
Releases

facebook

NEWGROUNDS

KONGREGATE
External reviews!

**Box!**
Rating: 4.1/5 (41 votes)
Platform: Flash
Categories: bchoi, browser, flash, free, game, jsytryn, kma, ndiebold, platform, puzzle, rating-y, rsong, schen, speats

It's the classic story. Boy goes adventuring, boy gets trapped in a cube (nevermind how!), boy faces danger and must use his wits and never-ending supply of crates to escape. Though really it's your cleverness that is needed to get the boy out in Box! an interesting and engaging puzzle platform game created by Jeremy Cytryn, Renchu Song, Sam Chen and Will Peck, with art by Kevin Ma and Natalie Diebold, and music from Brigid Choi. Use the [arrow] keys to walk and jump. Press [space bar] to deploy a box in the direction you are facing, and again to destroy a box you are looking at, including ones above and below you. Use [WASD] to look around the corners of the cube to see what's ahead, or to make sure you won't die a fiery death if you drop down.

**Thermo**
Rating: 4/5 (35 votes)
Platform: Flash
Categories: awolfers, browser, dcarpenter, flash, free, game, gren, jgross, kjin, platform, puzzle, rating-y, rason

In water, heat rises and cold sinks. That's the premise behind Thermo, the temperate and mercurial new platformer by Andrew Wolfers, Daniel Carpenter, Grace Ren, Joel Gross, Kelvin Jin, and Robyn Nason. (Did I leave anybody out?) In each of the 30 levels you need to first open the exit portal and then get to it... somehow! The activator and portals aren't necessarily where you can get to them, and that's where water comes in. Floating masses of water are strategically-placed throughout the levels allowing you to use your special abilities, if you have them. Passing between red contacts heats you up, enabling you to rise if you start out in water. You'll continue to rise until you hit an overhead surface at which point you'll fall just as you ordinarily would, though you can steer your descent. Blue contacts let you create an ice platform under you while in water. Yellow contacts enhance either ability... you can create up to three ice platforms in water if you're cold, and walk on the ceiling if you're hot! Dull grey contacts return your temperature to normal, but leave any platforms or ceiling-walking abilities if they're active.
忍者の空間切断アクションパズル  Kirigami

空間を切断して移動させる能力を持つ忍者のアクションパズルゲーム。主人公の忍者キャラを操作し、手裏剣を取るのが目標です。
ステージ内の何もない場所をクリックし、そのままドラッグしてラインを引いて隔離すると空間が切断されます。（切断中は時間が停止）
切断された空間はドラッグしてスライド移動させることができる。適切な位置まで動かしたしたらDONEボタンで確定して終了。（キャンセルは×ボタン）
床や壁を切断したり画面外へ移動させることはできません。
規定のカット回数 (PAR) 以内でクリアすると☆がつきます。
（情報：名無しさん）

【開発方法】
ロード終了後、PLAY⇒レベル選択⇒チュートリアルから開始
※IE以外のブラウザが必要

【操作】
ドラッグ：空間の切断、スライド移動
[A] D [ ] L R：キャラの左右移動
[W] [ ] U D：ジャンプ
[R]：リセット
※アンドロイドではショートカットキーがないので画面上のボタンで
Typical semester

- ~100,000 players
- ~3 minutes average play time
- = 300,000 minutes
- roughly *seven months* of human attention
Hello Worlds!
Hello Worlds!

1.5 million plays
Why should you take this class?

real-world impact, *this semester*
The Internet is cruel…

“worst FEZ knock off ever” - Trethan

“boring…” - DrSexus

“too simple to be really enjoyable.” - Bananamama

“well then fuuck this game” – danut2

“was this entire game designed to annoy the piss out of people?” - stevenbee
… but occasionally rewarding

“not bad” - LeSooper

“It had been a while since I found an idea so original and so well executed. Well done!!” – olycape

“I love it!” – duckyflotsam

“30 minutes well-spent :)” – link_2012
Outline

• A brief description of CS/INFO 4154
  • Why should you take this class?
Outline

- A brief description of CS/INFO 4154
  - Why should you take this class?
  - How is this course structured?
Course Staff

Instructor: Erik Andersen

TA: Zikai Wen

TA: Paul DeVito
Credentials
Course Website

- Syllabus information is here
- Should be up-to-date within a 2-week horizon
- Check with me about dates further in the future
You

Your teammates
Adobe Flash, 1996 - 2020

Game requirements

- **Deploy to Newgrounds and Kongregate**
- In Haxe, HTML5, or Unity
- See website for help and resources
- Instructors/TAs can help
- However, you’re generally on your own
Development cycles

Playtesting/release → Postmortem report

Work very hard → Revise plan
Development cycles

1. Paper
2. Alpha
3. Beta
4. Friends
5. Newgrounds
6. Kongregate

Releases!
Releases: analytics

logging server
Friction points
Heatmaps
Improvement across releases

Average Playtime Per Player

- FRIENDS: 93.5106383
- NEWGROUNDS: 157.3775982
- KONGREGATE: 284.0444357
# Semester Schedule

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 2</td>
<td>Paper Prototyping</td>
</tr>
<tr>
<td>Week 3</td>
<td>Design Document</td>
</tr>
<tr>
<td>Week 4</td>
<td>Panic</td>
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<tr>
<td>Week 5</td>
<td>Alpha Prototype</td>
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<tr>
<td>Week 6</td>
<td>Develop</td>
</tr>
<tr>
<td>Week 7</td>
<td>Beta Prototype</td>
</tr>
<tr>
<td>Week 8</td>
<td>Develop</td>
</tr>
</tbody>
</table>

- **Pre-production**
- **Development**
# Semester Schedule

<table>
<thead>
<tr>
<th>Week 9</th>
<th>Friends Release</th>
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<tbody>
<tr>
<td>Week 10</td>
<td>Friends Postmortem Report</td>
</tr>
<tr>
<td>Week 11</td>
<td>Revise</td>
</tr>
<tr>
<td>Week 12</td>
<td>Newgrounds Release</td>
</tr>
<tr>
<td>Week 13</td>
<td>Newgrounds Postmortem Report</td>
</tr>
<tr>
<td>Week 14</td>
<td>Thanksgiving</td>
</tr>
<tr>
<td>Week 15</td>
<td>Revise</td>
</tr>
<tr>
<td>Week 16</td>
<td>Kongregate Release</td>
</tr>
<tr>
<td>Week 17</td>
<td>Final Postmortem Report</td>
</tr>
</tbody>
</table>

Release!
Work outside of class, per week

- 16+ hours: 18%
- 5-8 hours: 20%
- 9-15 hours: 60%
- 2-4 hours: 2%

Source: 2014 and 2015 course evaluations
Releases are particularly intense

- If something goes wrong, you must deal with it immediately
Please Drop Responsibly

You

Your teammates

operating systems
Class types

- Lecture
- Playtesting
Lectures

- What can game analytics tell us about:
  - does audio matter?
  - does anyone read tutorials?
  - do secondary objectives increase play time?
  - what is the optimal level of difficulty?
  - how important is novelty?
  - who pays for games these days and how much?
  - what is the impact of game balance?
  - is Pokémon GO dangerous?
  - can game players contribute to science?
  - can people learn useful skills from playing a game?
Example

Hello Worlds

Refraction

8978 players

Andersen et al. CHI 2011
With audio, engagement…

A) increased
B) decreased
C) increased AND decreased
D) didn’t change
With audio, engagement...

A) increased
B) decreased
C) increased AND decreased
D) didn’t change

Andersen et al. CHI 2011
Lectures

- What can game analytics tell us about:
  - does audio matter? ✓
  - does anyone read tutorials?
  - do secondary objectives increase play time?
  - what is the optimal level of difficulty?
  - how important is novelty?
  - who pays for games these days and how much?
  - what is the impact of game balance?
  - is Pokémon GO dangerous?
  - can game players contribute to science?
  - can people learn useful skills from playing a game?
Lectures

- Often involve group activities

Class types

Lecture

Playtesting
Playtesting classes

• Attendance required
• Bring what you have!
• Alternate between:
  • observing people playing your game
  • playing other games
  • fixing problems
• Instructor and TAs give feedback
• Will sometimes include external playtesters
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  - How will you be evaluated?
Grading: A *Woeful Errand*

Source: *Superbrothers: Sword and Sworcery*
Grading

- **Game** (60%)
  - Newgrounds Release (20%)
  - Kongregate Release (40%)

- **Analytics** (25%)
  - Friends Postmortem Report (5%)
  - Newgrounds Postmortem Report (10%)
  - Final Postmortem Report (10%)

- **Participation** (15%)
  - Attendance (15%)
  - Possible penalties for problematic pass/fail submissions
Game grades

- Opinion of the course staff
  - does it meet the requirements?
  - is it fun? groundbreaking?
- Evidence of real-world impact
  - rating
  - number of players
  - comments
  - walkthroughs
  - blog posts
<table>
<thead>
<tr>
<th>Grade</th>
<th>Characteristics</th>
<th>Impact</th>
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<tbody>
<tr>
<td>A+</td>
<td>experience of a lifetime</td>
<td>best of the month,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>attracts external attention,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hundreds of thousands of players</td>
</tr>
<tr>
<td>A-/A</td>
<td>very fun, addictive, imaginative, polished</td>
<td>frontpaged, wins prizes,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tens of thousands of players</td>
</tr>
<tr>
<td>B/B+</td>
<td>sometimes fun, but lacks polish, minor flaws</td>
<td>good but not a standout,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thousands of players</td>
</tr>
<tr>
<td>Grade</td>
<td>Characteristics</td>
<td>Impact</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>C+/B-</td>
<td>complete and playable, but fun only occasionally, not original, clearly flawed,</td>
<td>average, hundreds of players</td>
</tr>
<tr>
<td></td>
<td>team ignored feedback</td>
<td></td>
</tr>
<tr>
<td>C-/C</td>
<td>complete, but not playable, not fun, crashes</td>
<td>low, tens of players</td>
</tr>
<tr>
<td>F/D</td>
<td>incomplete</td>
<td>ones of players</td>
</tr>
</tbody>
</table>
Analytics grades (reports)

• Does it meet the requirements?
• Is it readable?
• Are there *awesome* charts and graphs?
• Are claims well-justified?
Group grades

- Game (60%)
- Analytics (25%)
- Participation (15%)
Group grades

Group grade \[\rightarrow\] individual modifiers \[\rightarrow\] Individual grade
Individual modifiers

- Based on **peer evaluations** and **observations of course staff**
- Two peer evaluations: middle and end of course
  - Slacking off will decrease individual grade
  - Abandoning team will result in C/D/F
Participation

- Game  (60%)
- Analytics  (25%)
- Participation  (15%)
Participation: Attendance

- Attendance taken on playtesting days
  - Marked in black on the course website schedule
- Expected on *all* days – frequent group activities
- May affect how peer evaluations are interpreted
Stalemate Resolution Associate

Source: Portal 2
FERPA Disclosure Notice

- Your name, netID, group, team name, and game name will be posted on the course website.
- During Friends, Newgrounds, and Kongregate Releases, your team will broadcast your game.
- During playtesting sessions, your team will show your game in class. This may involve playtesters who are not members of the class.
- Some class activities will ask your team to post summaries of discussions to Piazza.
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- The science of effective brainstorming
Which is a better use of time?

make many pots

spend all your time making one awesome pot
Which is a better use of time?

- no $5
- no fame
- 1 hour

- no $100
- no fame
- 10 hours

- lots $500
- lots of fame
- 100 hours
Recognize this game?

Source: *Braid*
Source: Braid
Minecraft
$2.5 billion difference

Infiniminer  Minecraft
Which is a better use of time?

- make many pots
- spend all your time making one awesome pot
The hypothesis

Source: David Bayles, Ted Orland (2001)
Art & Fear: Observations on the Perils (and Rewards) of Artmaking
Larger-scale experiment

“Parallel prototyping leads to better design results, more divergence, and increased self-efficacy”

Steven P Dow, Alana Glassco, Jonathan Kass, Melissa Schwarz, Daniel L Schwartz, Scott R Klemmer

CHI 2011
Scenario 1

Design

Design

Dow et al. CHI 2011
Scenario 1: Share One

Meeting Room

Final Design

Final Design
Scenario 2

Design 1

Best Design

Design 3

Design 1

Best Design

Design 3

Dow et al. CHI 2011
Scenario 2: Share Best

Meeting Room

Final Design

Final Design

Dow et al. CHI 2011
Scenario 3

Design 1

Design 2

Design 3

Dow et al. CHI 2011
Scenario 3

Design 1

Design 2

Design 3

Dow et al. CHI 2011
Scenario 3: Share Multiple

Meeting Room

Design 1
Final Design
Design 3

Design 1
Final Design
Design 3

Dow et al. CHI 2011
Large-scale evaluation

Wear the ribbon and remember.

FACE AIDS

Dow et al. CHI 2011
Which did the best?

Share One

Share Best

Share Multiple

Dow et al. CHI 2011
Effect of sharing multiple designs

+5%  +15%  +25%  +35%  +45%

Dow et al. CHI 2011
Clicks per million impressions

Dow et al. CHI 2011
1 tip of good design:

improve your design by 25% by simply using this one weird tip
Spend time *making* or *testing*?
Egg drop
Experimental Conditions

Iterative group
- Design
- Test
- Design
- Test

Non-iterative group
- Design
Some of the products
# Effect of iteration

<table>
<thead>
<tr>
<th>worse</th>
<th>same</th>
<th>better</th>
</tr>
</thead>
</table>

Dow et al. CHI 2011
Effect of iteration

+25%  +50%  +75%  +100%  +125%
Maximum height reached

- Iterative: 6
- Non-iterative: 3
Key Lesson of this Class #1

Generating, sharing, and testing multiple ideas leads to better outcomes.

Ideas are valuable even if not used.
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• The science of effective brainstorming

• Game mechanics
Game Mechanics
Actions

- **Verbs** that describe what the player can do
  - Walk
  - Run
  - Jump
  - Shoot

- Might not involve an avatar
  - Build
  - Swap
  - Rotate
What are the actions?
What are the actions?
Actions tend to map to a single input

- button press
- key press
- click on something
- drag something
Game Mechanics

- Actions
- Interactions
Interactions

- Things that happen *because* of an action
- Player does not have direct control
What are the interactions?
What are the interactions?
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• The science of effective brainstorming

• Game mechanics
Outline

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- The science of effective brainstorming
- Game mechanics
- Paper prototyping
Assignments 1, 2 & 3: Paper Prototypes

• Each team will prototype *three different* ideas
• Will have time in class to work on prototypes
• Not graded!
• Prototype #1 due Wed 8/29
  • (11:00am, submit a picture)
• Prototype #2 due Fri 8/31
  • (11:00am, submit a picture)
• Prototype #3 due Wed 9/5
  • (11:00am, submit a picture)
Mon | Wed | Fri
---|---|---
8/25 Overview
8/28 Brainstorming
8/30 Paper Prototyping 1
9/1 Paper Prototyping 2
9/5 Paper Prototyping 3
9/7 Converging
Mon

8/28
Brainstorming

Wed

8/30
Paper Prototyping 1

Fri

8/25
Overview

9/1
Paper Prototyping 2

9/5
Paper Prototyping 3

9/7
Converging

Attendance will be taken
Key considerations

- Sense of achievement
- Interestingness of decisions
- Difficulty scaling
Sense of achievement

Source: Center for Game Science: https://www.youtube.com/watch?v=IdrraeJyhoQ
Interestingness of decisions

“a game is a series of interesting decisions”

(GDC 2012)

Sid Meier
Difficulty scaling
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• Game mechanics

• Paper prototyping
Customer service
Wild MISSING NO. appeared!
Attendance will be taken