CE810 - Game Design 2

Evaluating Performance

Joseph Walton-Rivers & Piers Williams

Tuesday, 15 May 2018

University of Essex

Player experience
Collection of events that **occur** to the player **during** the game

What is Player Experience?

Scenario
Jeffrey is playing an online RTS game, and he is playing with a friend online against two other people.

Question
Which of these are a part of the player experience and which are not?

Losing a Unit
Laundry Finishing
Collecting resource
New message in chat window
Unit Moving

What is Player Experience?

Scenario
Jeffrey is playing an online RTS game, and he is playing with a friend online against two other people.

Question
Which of these are a part of the player experience and which are not?

Losing a Unit	Yes
Laundry Finishing	
Collecting resource	
New message in chat window	
Unit Moving	

What is Player Experience?

Scenario
Jeffrey is playing an online RTS game, and he is playing with a friend online against two other people.

Question
Which of these are a part of the player experience and which are not?

Losing a Unit	Yes
Laundry Finishing	No
Collecting resource	
New message in chat window	
Unit Moving	

What is Player Experience?

Scenario
Jeffrey is playing an online RTS game, and he is playing with a friend online against two other people.

Question
Which of these are a part of the player experience and which are not?

Losing a Unit	Yes
Laundry Finishing	No
Collecting resource	Yes
New message in chat window	
Unit Moving	

What is Player Experience?

Scenario
Jeffrey is playing an online RTS game, and he is playing with a friend online against two other people.

Question
Which of these are a part of the player experience and which are not?

Losing a Unit	Yes
Laundry Finishing	No
Collecting resource	Yes
New message in chat window	Yes
Unit Moving	

What is Player Experience?

Scenario
Jeffrey is playing an online RTS game, and he is playing with a friend online against two other people.

Question
Which of these are a part of the player experience and which are not?

Losing a Unit	Yes
Laundry Finishing	No
Collecting resource	Yes
New message in chat window	Yes
Unit Moving	Yes

Metrics

Collect data on how players/bots work

Activity
What kinds of features can we collect?

- High-level human experience

Data from humans

- High-level human experience
  - Final game scores?

- High-level human experience
  - Final game scores?
  - **How** long did they play for?

Data from humans

- High-level human experience
  - Final game scores?
  - **How** long did they play for?
- Biosignals

Data from humans

- High-level human experience
    - Final game scores?
    - **How** long did they play for?
- Biosignals
    - **Where** did they look?

Data from humans

- High-level human experience
  - Final game scores?
  - **How** long did they play for?
- Biosignals
  - **Where** did they look?
  - Galvanic skin response

Data from humans

- High-level human experience
    - Final game scores?
    - **How** long did they play for?
- Biosignals
    - **Where** did they look?
    - Galvanic skin response
    - BCI

Data from humans

- High-level human experience
  - Final game scores?
  - **How** long did they play for?
- Biosignals
  - **Where** did they look?
  - Galvanic skin response
  - BCI
- Surveys and interviews

Data from humans

- High-level human experience
  - Final game scores?
  - **How** long did they play for?
- Biosignals
  - **Where** did they look?
  - Galvanic skin response
  - BCI
- Surveys and interviews
  - Likert Scales

- High-level human experience
  - Final game scores?
  - **How** long did they play for?
- Biosignals
  - **Where** did they look?
  - Galvanic skin response
  - BCI
- Surveys and interviews
  - Likert Scales
  - **Why** did you feel that way?

- Internal State

- Internal State
    - Will depend on bot **architecture**

Data from bots

- Internal State
  - Will depend on bot **architecture**
  - Measure state visits in FSM

Data from bots

- Internal State
  - Will depend on bot **architecture**
  - Measure state visits in FSM
  - Did the game make **full** use of the AI?

- Internal State
    - Will depend on bot **architecture**
    - Measure state visits in FSM
    - Did the game make **full** use of the AI?
- How many times does a bot face a **difficult** choice?

- Internal State
  - Will depend on bot **architecture**
  - Measure state visits in FSM
  - Did the game make **full** use of the AI?
- How many times does a bot face a **difficult** choice?
  - What is a difficult choice?

- Final Score distribution

- Final Score distribution
- Game Duration

- Final Score distribution
- Game Duration
- Score "Drama"

- Final Score distribution
- Game Duration
- Score "Drama"
- Statistical distribution of states

- Final Score distribution
- Game Duration
- Score "Drama"
- Statistical distribution of states
- Degree of challenge

- Variability of scores
- Skill-depth

Action Sequences

Data from either

- Actions taken
- Record the sequence of button-pushes

Entropy

- Sometimes used to **interpret** aspects of player experience

Entropy

- Sometimes used to **interpret** aspects of player experience
  - $H(X) = \sum_{i=1}^{n} P(x_i)I(x_i) = -\sum_{i=1}^{n} P(x_i) \log_2 P(x_i)$

Entropy

- Sometimes used to **interpret** aspects of player experience
  - $H(X) = \sum_{i=1}^{n} P(x_i)I(x_i) = -\sum_{i=1}^{n} P(x_i) \log_2 P(x_i)$
 - Take a fair coin - how much entropy?

Entropy

- Sometimes used to **interpret** aspects of player experience
  - $H(X) = \sum_{i=1}^{n} P(x_i) I(x_i) = -\sum_{i=1}^{n} P(x_i) \log_2 P(x_i)$
  - Take a fair coin - how much entropy?
  - $H(\text{fairCoint}) = \sum_{i=1}^{2} (\frac{1}{2}) \log_2(\frac{1}{2}) = -\sum_{i=1}^{2} (\frac{1}{2}) \times (-1) = 1$

Entropy

- Sometimes used to **interpret** aspects of player experience
  - $H(X) = \sum_{i=1}^{n} P(x_i)I(x_i) = -\sum_{i=1}^{n} P(x_i) \log_2 P(x_i)$
  - Take a fair coin - how much entropy?
  - $H(fairCoint) = \sum_{i=1}^{2} (\frac{1}{2}) \log_2(\frac{1}{2}) = -\sum_{i=1}^{2} (\frac{1}{2}) \times (-1) = 1$
  - How about an unfair coin? What is the entropy for a coin of probability 0.9?

Entropy

- Sometimes used to **interpret** aspects of player experience
  - $H(X) = \sum_{i=1}^{n} P(x_i) I(x_i) = -\sum_{i=1}^{n} P(x_i) \log_2 P(x_i)$
  - Take a fair coin - how much entropy?
  - $H(fairCoint) = \sum_{i=1}^{2} (\frac{1}{2}) \log_2(\frac{1}{2}) = -\sum_{i=1}^{2} (\frac{1}{2}) \times (-1) = 1$
  - How about an unfair coin? What is the entropy for a coin of probability 0.9?
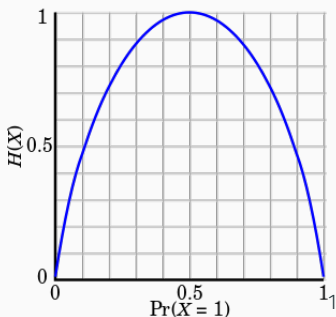
A Game Example

loc	visits	p(loc)	calc
0,0	10	0.067	$0.067 \log_2(0.067)$

loc	0	1	2
0	10	20	15
1	12	35	13
2	15	20	10

| 150 | Total: | |

A Game Example

loc	0	1	2
0	10	20	15
1	12	35	13
2	15	20	10

loc	visits	p(loc)	calc
0,0	10	0.067	$0.067 \log_2(0.067)$
0,1	12	0.08	$0.080 \log_2(0.008)$
0,2	15	0.1	$0.100 \log_2(0.100)$
1,0	20	0.134	$0.134 \log_2(0.134)$
1,1	35	0.234	$0.234 \log_2(0.234)$
1,2	20	0.134	$0.134 \log_2(0.134)$
2,0	15	0.1	$0.100 \log_2(0.100)$
2,1	13	0.0867	$0.0867 \log_2(0.0867)$
2,2	10	0.067	$0.067 \log_2(0.067)$
	150	Total:	

Exercise

Now you try - in Java. Download the here and calculate the entropy

- How **good** is a player?

- How **good** is a player?
- What is the **issue** with win rates?

- How **good** is a player?
- What is the **issue** with win rates?
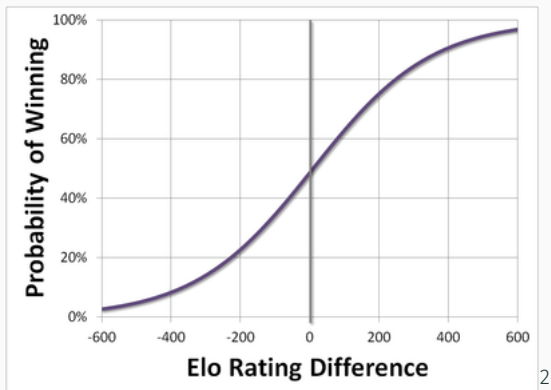- If $A > B$ and $B > C$ is $A > C$?

- Elo is based on probability

- Elo is based on probability
- $Elo(A) - Elo(B) = P(A \text{ beats } B)$

Elo Ratings

- Elo is based on probability
- $Elo(A) - Elo(B) = P(A \text{ beats } B)$

[2]