Lecture 6: Human Input/Emotion

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Chris Crawford Follow-up

“I dreamed of computer games encompassing the broad range of human experience and emotion!”
Three Technologies

• Technology of human facial expressions
  – Show characters emoting
  – Put one of 100s of expressions on any character

• Artificial personality
  – The algorithms of human behavior
  – How people feel, behave, react

• Language of emotional expressions
  – Not just “stab”, “shoot”, “take”, ”give”, ”talk”
  – Talk about feelings and emotionally significant events
Timeline

1962
Spacewar!

1966
Eliza

Not much innovation, according to Crawford

1972
Pong

1983
Crawford’s Gossip Game

1992
Dragon Speech

2005
Facade (Mateas and Stern)

2010
Kinect/Project Natal Milo

2012
Prom Week

What’s changed in the last 23 years?
What’s changed?
What still needs work?

- Technology of human facial expressions
- Artificial personality
- Language of emotional expressions
- Sensor technology, detecting human body/face/emotion
Gossip

Facial expressions, artificial personality! … to some extent.

Now in iOS app form: “Teen Talk” by Chris Crawford and Bill Maya →
Tech #1: Facial Expressions in Games

How far have we come with games having emotive characters?
Facial expressions in Façade

https://www.youtube.com/watch?v=ZW4CUQcaaRU&index=6&list=PLZIGjyH4dFS3MKgfKGYcHnWA73sxxXRuM
Crawford says

“Façade is without a doubt, the best actual working interactive storyworld yet created.”
Facial expressions in games

• Games specifically about people’s emotions?
• Cut scenes?
• What about the facial expression of the player?
  – We’ll get back to this
Open problem: Recognizable, transferrable expressions on stylized faces
6 basic facial expressions
21 facial expressions? (2014)
Cross-cultural differences in expression perception

<table>
<thead>
<tr>
<th>Emoticon Style</th>
<th>Horizontal Style</th>
<th>Vertical Style</th>
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<tbody>
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<td></td>
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Expression based on the **mouth shape** (popular in Western countries)

Expression based on the **eye shapes** (popular in Eastern countries)

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Figure 8: Fraction of emoticon-containing tweets per day, divided by total number of tweets per day from that country, for six representative emoticons. The yellow squares indicate the US and the red circles indicate Japan.
Hypothesis

• Expression problems:
  – How many are there? Six? Twenty-one? More?
  – Do we emote and recognize expressions consistently?

• It’s really hard to make games/interactive media based around systems we don’t fully understand
  – Facial expressions

• Popular in games because we DO understand:
  – Physics, collision, navigation
  – Resource management, stats, simulations
  – Game theory, competitive strategy
  – Puzzles with easily-encoded rules
Tech #2: Artificial Personality

How far have we come with *algorithms of human behavior* in games?
I'm so happy to be here at Prom with you, Monica. You're my snookie-wookums forever and always.
The Restaurant Game: crowdsourcing game behavior
The optimal time to play The Restaurant Game is between 7pm and 9pm in your respective time zone. The Restaurant is open 24-7, but playing at the optimal time ensures there will be others online to play with you.

https://www.youtube.com/watch?v=gMjZ5Zam23Y
The Restaurant Game, Jeff Orkin quote

• This project attempts to address two frustrations I experienced as a professional game developer.
  1. Convincing human social behavior is difficult to model with existing hand crafted AI systems.
  2. Play testing by people outside of the development team typically comes too late to have a major impact on the final product.
• This experiment aims to generate AI behaviors that conform to the way players actually choose to interact with other characters and the environment; behaviors that are convincingly human because they capture the nuances of real human behavior and language.
Sleep is Death
More human-powered human behavior
Hypothesis

• It’s really hard to make games/interactive media based around systems that are so nuanced and can have so many possibilities
  – Artificial personalities
Tech #3: Language of Emotional Expression

• “We need to allow our players to interact with the characters in an emotionally significant fashion.”

• Are we there yet?

• Does the type of interaction fit the significance?
Human Input

- **Faces**
  - Face tracking
  - Identity recognition
  - Expression recognition

- **Body and Hands**
  - Body pose
  - Gesture recognition
  - Identity

- **Voice**
  - Speech recognition
  - Identity

- **The bad**
  - Not reliable yet
  - Often over-hyped

- **The good**
  - Drives new technology
  - Maybe it will work soon!
Face and Body Tracking with Kinect

• E3 2009
  – Milo Demo
  – Project Natal/Kinect
Face and Body Tracking with Kinect

• E3 2009
  – Milo Demo
  – Project Natal/Kinect

• “Amazing” interactivity
• Glitchy and unreliable
• Because sensor is meant for games, it’s affordable
Kinect-inspired Technology

- Kinect Fusion
- Matterport
- Project Tango
- Etc.
Kinect Fusion

Input RGB

Reconstruction

Input depth

1x speed
Project Tango
New gaming platform?

https://www.youtube.com/watch?v=Qe10ExwzCqk
Body Tracking vs. Face Tracking
https://vimeo.com/29348533
Face Substitution with Jason Saragih’s Face Tracker
Face (position) Tracking: works pretty well
Facial Expression Recognition

• Most expression recognition systems only use 6 basic expressions
• Don’t have enough training data to work well in real-world conditions

• BeFaced game
  – Match-3 game that uses your face
  – Face is now a button that is super hard to press, accidentally presses other buttons sometimes

• IMMERSE project here at UCSC
  – DARPA funded, cultural training situation “game”

• Meme Quiz
  – Uses unreliability as part of the game
Expression Recognition 101

Aligned and cropped face
Grid of HOG features

[0.4, -0.2, ..., -7.9]
Feature vector (concatenated HOG features)
The player must match three tiles and then make the facial expression to gain points.

https://www.youtube.com/watch?v=cprnx3XXlOo
Meme Quiz

Imitate one of these expressions to quiz the computer!
Face/expression tracking will improve

- Depth cameras will help
- More training data will help
- Maybe this technology should be funded by game companies and not just defense contractors

- Check out what we can do with just photos and video
Total Moving Face Reconstruction – Supasorn Suwajanakorn

https://www.youtube.com/watch?v=C1iLVAUiC7s
Hypothesis

• It’s really hard to make games/interactive media based around sensor systems that aren’t reliable yet
  – Face, body, hand sensors and cameras

• But making the sensors cheap and available (and hackable) drives innovation
Eliza Effect?

• Super-simple technology that seems amazing on the surface, until you realize how primitive it is
Reading

• Expressive Processing Chapter 3