What A ‘Photoshop of AI’ Will Look Like (or)

Defining the Future Role of the Technical Artist as an AI Tools Designer for Skilled Performers.

Chris ‘Topher’ Maraffi

www.performatology.com
topherm@soe.ucsc.edu
UC Santa Cruz
Artificial Intelligence (AI)

AI for NPC behavior in 3D RPGs is a major area of interest for games, but there has been a disconnect between academic AI and industry needs.
Photoshop of AI Debate: Chris Hecker (The Challenger)

- Structure VS Style (GDC 2008)
  - The textured triangle (graphics technology) has had the most impact on games, not AI. Why?
  - Decomposition of Structure (technology) and Style (aesthetics).
  - ‘We need a Photoshop of AI’ ...(PofAI).

http://vimeo.com/13958264
Adobe Photoshop

A popular digital painting and photo editing tool used by artists for creating 2D graphics (Hecker: ‘intuitive, expressive, frugal, blendable, and efficient’).
Artificial Intelligence (AI)

AI is one of the original areas of CS research going back to the ‘Turing Test’. AI researchers have mainly had a background in CS, cognitive psychology, and linguistics.
PofAI Revisited (FOG Symposium 2012)
- AI a broader problem than 3D graphics.
- Determines the symbolic meaning in a game.
- No universal solution, but a Photoshop for a particular type of AI may be possible (...my loophole).
- We need a new breed of engineer-designers for generating AI content.

PofAI Debate: The Underdog (Me)

- Arts Background...
  - Bachelors degree in Fine Arts Painting.
  - MFA in Digital Media with a performance animation focus.
  - Professional experience as designer, animator, and technical artist.
PofAI Debate: The Underdog (Me)

- Tools Background…
  - 10+ years teaching 3D character modeling and rigging.
  - Author of 3 technical books on Maya & Softimage.
  - Taught Photoshop in Digital Media classes at UCSC.
AI Background...
- Last 2 years a PhD student in Arnav Jhala’s Computational Cinematics Studio.
- Have proposed a Performatology approach to game AI.
- Motivation to combine machine learning with arts theory to improve NPC behavior.

Evolving Whirled PEAs
Several machine learning techniques have been used to isolate gestural content from style in motion capture data [5][6][7]. We are conducting data driven training of a neuro-evolutionary algorithm, HyperNEAT [8], on the gestural technique of skilled performers. In training PEAs to become better actors:

PEAs Actor Apprentice Training

INPUT
Edited Data from Skilled Performer

DATA DRIVEN NEURO-EVOLUTIONARY SIMULATION
- Modeling
- Recognition
- Prediction
- Mutation
- Synthesis

HyperNEAT CPPN/ANN

Mimic Module: Replication

Improv Module: Recombination

OUTPUT
Dramatic Presence with Expressive Character

Procedural Acting Tools
Although procedural tools for animators have been developed by Perlin [9], and story generation tools have been a strong area of research related to interactive narrative [10][11], other researchers have not taken a similar approach to developing procedural acting tools for embodied performers.

Inventing a New Indirect Acting Medium
- Procedural acting is different than avatar control [12], because it does not feature direct character manipulation, but distances the performer through data driven training of agent behavior. Distancing has been associated with increased performer control of a characterization:
In summary...

I do not have as much game industry experience as Hecker or as much academic AI experience as Mateas, but I do have insights on tools for artists, and how that could impact AI content creation for games.
So, Kermit and Jim might wonder…

What would a PofAI look like?
What has made Photoshop successful?

- Popular tool with professional *artists* (Amazon: 8,358 books).
  - Translates art *skills* to the digital medium through domain metaphors (canvas, brushes, palette, layers, masks and stylus).
  - As *intuitive* as traditional art tools; easy to learn but hard to master (24,062 books on Amazon for “painting techniques”).
Graphics for games are collaborative...

- Many artists employ a suite of digital tools (Photoshop, Maya, etc...):
  - Painting technique >> painting tools >> 3D textures.
  - Sculpting technique >> modeling tools >> 3D objects.
  - Puppetry technique >> animation tools >> 3D movement.
  - Sound, text, etc...
Both graphics and AI are equally large problems...

...in a general sense. But graphics for entertainment have been successful because the problem was contextualized into sub-problems.
As good as graphics are in games,...

...could they pass the equivalent of a Turing Test? A virtual environment that is indistinguishable from reality may be as intractable as simulated general intelligence.
3D and AI in *media*, however, can be...

- ...tractable artistic sub-problems:
  - 3D Animation = Produce a believable *sense* of environmental space or place through the world aesthetics, physics, and sound.
  - AI Reactivity = Produce a believable *sense* of character intelligence or personality through the NPC appearance, gestures, and voice.
Before artists got involved, engineers did computer ‘art’…

Lessons: 1 - Engineers make good technology. 2 - artists craft good content. 3 - But an engineer-artist had to first build a bridge (tool).
A pattern is emerging for a PofAI...

Compelling graphic content did not develop until digital tools were invented that professional *artists* wanted to use.
Style-Structure decomposition for graphics...

Style = Skilled Art Technique (Data)
Structure = Digital Art Tool (Tech)
Why is skilled art important?

The art techniques central to all modern games are the most ancient form of expression, going back 30,000 years.
How does game AI relate to art?

Because *artificial*, *art*, and *artifice* come from the same Latin root, ‘Artificium’. NPCs, like all animated characters, are only required to give the *Illusion of Life*.
Where is the *disconnect* in AI?

Traditional AI research has focused on the general (hard) problem of simulating human intelligence and emotions. NPCs are not general or real.
Captain Kirk wonders...

Could there be an ancient art form whose skilled practitioners specialize in generating symbolic behavior for fictive characters?
Of course, says Mr. Spock, that is only logical...

Performing artists have been portraying characters for as long as we know... so shouldn’t NPC behavior be based on their technique?
But who should design such tools?

There is already the role of an engineer-designer in the games pipeline, the *technical artist*, who builds tools for animation (style), and interfaces with the engineers (structure).
But don’t *confuse* the tool makers with the tool users...

I will pay you to put Jim Carey in your AAA game rather than me.

Believe me, Andy Serkis & Jim Carey are not ever going to code. Until we invent a PofAI, NPC acting will remain poor.
An actor's motivations and goals come from the script and director (structure), but *how* (style) they act is skilled technique. They are black boxes.
We are classifying performer mocap data to design Performative Embodied Agents (PEAs) with skilled acting features (structure), which will then be trained on specific actor technique (style).
A PofAI for artists should not change their right-brain creative process. Therefore it must have a natural and visual interface.
So, what will a PofAI for NPC Behavior look like?

- Indirect Performance Tool for Actors
  - Natural User Interface (like Kinect).
  - Domain Specific Language (Symbolic, FRP?).
  - Visual Performance metaphors (Gestures, poses, and scenes).
  - Genre filters for acting style transformations.
  - Gesture and voice interaction between performer (master) and PEAs (Apprentice).
  - Real-time reactive machine learning that mirrors the embodied training process of imitation and improvisation.
  - Works within script and directorial constraints.
The Performatologist is in...

Please gesture for discussion, Thanks!

Topher Maraffi (UCSC, CCS), more info: performatology.com

Advisor:
Arnav Jhala, UCSC Computational Cinematics Studio