

# Performatology: A Procedural Acting Approach for Interactive Drama in Cinematic Games

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## 1 Introduction

We define a Performatology approach as combining performing arts theory with AI to design Performative Embodied Agents (PEAs) that simulate skilled acting. Our position is that NPC characters for interactive drama, in the traditions of theater and cinema, should be animated by agent behavior modeled on the physical acting of live performers. We propose that agent behavior problems related to generating embodied fictive characterizations are at least in part gestural acting problems that have been addressed in the arts domain. Actors, puppeteers, and animators have successfully portrayed fictive characters that are both believable and appealing to audiences, and therefore similar agent generated characters should attempt to simulate their techniques. Our research has two main motivations:

1. Improve real-time agent characterizations by simulating actor gesture style.
2. Provide skilled performers with procedural acting tools for interactive drama.

Several machine learning techniques have been used to isolate gestural content from style in motion capture data [1][2], with the capability of modeling, predicting and synthesizing new motion data in a consistent style [3]. Our methodology uses a similar process to study the virtuosity of live performers in offline data, to translate their methods into procedural acting parameters, and then to generate online agent characterizations in a similar style. To this end we are currently conducting data driven training of a neuro-evolutionary algorithm, HyperNEAT [4], on the gestural rhythms of skilled performers to model general acting principles and specific actor preferences for a characterization. The concept of procedural acting treats an agent as a target actor's apprentice, analogous to a star's understudy or double who learns to do an impression of the star's characterization in case of their absence. The live actor trains the agent offline through improvising on a mocap stage in the intended role or persona, with similar testing data serving as a fitness function for simulated agent mimicry. The process, consisting of gesture modeling, recognition, prediction, and synthesis, is designed to increase the amount of recognizable acting presence displayed in online PEAs behavior.

## 2 Performatology Influences

Performatology draws on the subset of performance theory that studies skilled performance for enacted entertainment. Most game related research has been focused on performance as play or as non-skilled performative behavior, with some noting that skill is not relevant to such performance [5]. However, our position is that professional actors in theater and cinema are in the business of producing meaning through their virtuosity, with dramatically enacted characters being a direct product of their artifice. Performance studies show that trained actors employ extra movements in their gestures not displayed in the naturalistic behavior of non-actors [6], and gesture studies have also found notable differences between professional and amateur performers [7] [8]. Performance theorists have described everyday gestures as utilitarian and efficient to minimize energy expended in reaching a stated goal, while trained actors have the hidden goal of creating maximum drama in a scene by adding subtle codified movements that require extra energy to perform.

In performance studies these extra gestures have been classified as pre-expressive attributes that form the foundation of semiotic acting technique by regulating the actor's choices that affect posture, balance, and rhythms [9]. Skilled actors traditionally embody these meta-acting codes by imitating the genre content displayed by other actors as part of the actor apprenticeship process. Pre-expressiveness makes the performer more readable as a character type, allowing them to better capture and direct audience attention. For instance, an attribute often exhibited by live performers is anticipation, where the performer moves slightly in the opposite direction before moving towards a final goal. Disney animators classified many of these attributes when studying live actors during the production of early animated films like Snow White [10], and then incorporated them into their animation principles. Performance studies have closely identified pre-expressive attributes with an actor's stage or screen presence, related to projecting a persona that is believable and appealing to audiences. We hypothesize that pre-expressive techniques can be isolated in the gesture data of skilled performers, and then modeled as meta-acting parameters to improve acting presence in agent behavior.

## 3 Procedural Acting Tools

Although procedural tools for animators have been developed by Perlin [11], and story generation tools have been a strong area of research and development related to interactive narrative [12] [13], to our knowledge other researchers have not taken a similar approach to developing procedural acting tools for embodied performers. The difference between our performing arts approach and literary performative approaches is we don't consider enacted drama to be a subset of narrative, but contend that embodied performance and character acting are at least partially created by the live performer. Theorists have dubbed a literary fallacy the idea that enacted performance is entirely generated out of the text, because the script is always underspecified in theater and cinema [14]. Actors are given the freedom to improvise and develop a character within authoring and directorial constraints, and in some forms of enacted entertainment there is no script. There are many examples of scenic business, bits, and

gags in theater and cinema that are dramatic but also unrelated to the greater narrative of a story. Expanding narrative to encompass performance is the equivalent of using the ‘All the world’s a stage’ argument to expand acting to encompass story, which lacks useful boundaries for designing cooperative micro-agents that generate creative artifacts based on collaboration.

Our Performatology research is influenced by classical acting theory on full-body gesture, where the actor is treated as a black box, rather than modern internal acting methods. Consequently we are focusing on simulating physical technique, deferring psychological motivations to other areas of research related to emotions [15] High-level story motivation and mise-en-scene direction can be input as constraints on PEAs acting from authorial agents. By modeling actor preferences that drive low-level gesture patterns, we are exploring ‘how’ a good performer acts, not ‘why’ or ‘what’ they do. For instance, we are interested in how a character moves when directed to walk across a room in a specific context. Every good actor will perform such a maneuver in a unique way, and the same actor will perform variations in multiple performances, but also display general content and style consistencies that define their persona. Since PEAs training features a target actor exploring the character space, simulated improvisation as well as mimicry is central to our process. Other performance oriented research on the improvisation of skilled actors has been done, finding basic principles for improvisation, and developing non-gestural improvisational micro-agents [16].

Our Performatology approach differs from other methods that employ mocap blending or avatar control [17] [18]. Avatar control functions like puppetry with the performer directly manipulating the real-time character’s behavior. While natural user interfaces like the Kinect sensor may allow an avatar to reflect some of a performer’s virtuosity, the resulting performance is subject to puppeteer errors. Our method addresses behavior not directly controllable through avatar control, but could be used for avatar enhancement. Parametric motion blending requires the use of edited sequences and transitions from a mocap library, providing refined motion but lacking real-time flexibility. We find artistic advantages in taking an indirect procedural acting approach, treating the generation of character motion as an AI acting problem rather than a graphics animation problem. Additional information on the formulation of our Performatology approach can be found in [19].

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