Encoding liveness: Performance and real-time rendering in machinima

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ABSTRACT
Machinima is the appropriation of software-generated 3D virtual environments, typically video games, for filmmaking and dramatic productions. The creation and distribution technology of machinima tends to hide the nature of the performer, provoking consideration of a definition of 'liveness' that can accommodate the real-time rendering of screen content by game software in response to human input, or – at the extreme – *as if* there is human input in accordance with performance parameters coded by humans.

This paper considers the continuum of creative modes that machinima makers work on, and the differing aesthetic/technical decisions affecting the level of liveness in the finished production. Machinima films derive from captured gameplay, puppet-like live improvisational work, cinematic or televisual on-camera performances, and totally scripted performances produced using coded commands. Often, the real-time rendering capability of the game software is only critical at the point of image capture, but once the footage has been saved as a video file it is editing and post-production that becomes the focus of much machinima production. Even live improvisational pieces – whether performed in a real or virtual venue - are generally better known via their capture and distribution as video clips to a wider post-performance audience.

This paper also explores machinima making as a community of practice, that is a specific group with a local culture, operating through shared practices, linked to each other through a shared repertoire of resources. Digital performance communities of practice emerging from video games and machinima production can be seen as having levels of engagement with a range of other communities, most obviously the gameplaying, game modifying, CGI animation and filmmaking communities.

Consideration is given to how, from a dramatic viewpoint, the performers within a machinima production are also operating in much the same way as in-role improvisation occurs within the community of practice associated with process drama - a strongly framed environment defined by a 'digital pre-text' - the common digital environment that provides the agreed fictional context for the dramatic action to unfold in.

Author Keywords
Machinima, performance, live, real-time, cinema, drama

INTRODUCTION

> "By replacing the graphics with their own cartoon-like 3D graphics, and reprogramming the game technology to allow for character lip-synching and a virtual camera, the ILL Clan has transformed a fast paced game with marines and rocket launchers into a live, animated comedy show with talking lumberjacks".[19]

The core of machinima as a form of digital performance is the use of a 3D software engine to generate the on-screen content in real-time. Whether it is an off-the-shelf commercial game title like *The Movies*, a game engine modified expressly for machinima production such as the altered *Quake* used by ILL Clan, or a virtual world environment like *Second Life*, the software renders both the performance space and the performances taking place in it on the fly. More problematically for those wishing to discuss performance techniques, as a body of work machinima embraces recorded gameplay, puppet-like avatar control for live or 'on-camera' performance and coded animation sequences. The trend towards heavily post-produced stand-alone machinima video clips rather than game specific demo files has further blurred these performance approaches from the audience perspective. Most current machinima audiences know the product only as produced video clips, rather than files requiring specific game software for playback. Unlike traditional animation, the cinema and television forms with which it is commonly compared, machinima inherently generates an ambiguity for audiences concerning the status of the performer – to what extent is the human player/actor/coder or the real-time software engine responsible for the performances seen on the screen?

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The mass reproduction of performance?

If Auslander's [5] reading of liveness is brought into play here then the discussion can be reframed as one about the ontology of the performer rather than the nature of the performance [4]. He argues that "as historical and technological conditions have changed, so has the definition of liveness" [6]. For example, radio broadcast technology gave rise to a concept of 'live' as a means to differentiate between recorded performance and performance broadcast in the moment of its enactment. Prior to radio, audiences clearly understood the contextual differences between listening to a gramophone recording or experiencing a concert in person. However, the technology of radio literally created a medium between source and audience that effectively hid the nature of the performance. Similarly, the production and distribution technology of machinima tends to hide the nature of the performer, provoking consideration of a definition of liveness that can accommodate the real-time rendering of screen content by game software, in response to human input or – at the extreme – *as if* there is human input in accordance with performance parameters coded by humans. Auslander notes that an online conversation with real-time artificial intelligence (AI) software

> "undermines the idea that live performance is a specifically human activity; it subverts the centrality of the live, organic presence of human beings to the experience of live performance". [4]

However a key difference between machinima and other mediated performance forms such as radio is that machinima inherently generates its own content as part of the interaction with the performer, whereas a radio station does not. The use of so-called bots, agents or artificial characters in video games and machinima is perhaps the ultimate mediatization of performance possible with contemporary technology. It is now not uncommon to see these agents interacting within game worlds, and it is technically possible for two bots to engage in a chat session. For example, Non-Player Characters (NPCs) in the game *Elder Scrolls IV – Oblivion* go about their daily 'lives' according to assigned goals and personal characteristics. They will seek food when hungry, shop with their favourite merchant, and fight other NPCs to achieve a goal or pursue quests independently of interaction with the player character. If a player never encounters these NPC's during a course of the game, then their roles will perhaps have been played out entirely as data calculations within the game engine, rather than as on-screen performances. When the player's character is within earshot these NPC's can engage in limited conversations with each other, drawing from a set of pre-recorded phrases often based on major events within the *Oblivion* world. For those like Phelan who wish to assert the traditional dichotomy of live versus mediated performance, the argument becomes one of presence and reproduction:

> "only life is in the present. Performance cannot be saved, recorded, documented or otherwise participate in the circulation of representations of representations: once it does so, it becomes something other than performance". [26]

In particular, performance is seen as something that occurs before a limited audience (limited by the physical capacity of the performance space) and that disappears and cannot be repeated once enacted. In many respects this is similar to videogame play which, if viewed as a form of performance, could meet those criteria. Performance theorist Richard Schechner [27] proposes that the difference between "ordinary behavior" and "acting" is one of reflexivity, where professional actors are always aware that they are acting. McGonigal [23] feels that videogame play is often a role based strategic activity where reflexive performance is part of a conscious deliberately assumed belief. In the improvised role-based performance form known as process drama, this convention is characterised as the assumption of a role persona. O'Neill [25] describes process drama being used to explore a problem, situation, theme or series of related ideas or themes through the use of the artistic medium of unscripted drama; process drama's strategies for improvised role-play would seem closely related to some of the role conventions emerging in video games and virtual spaces [11]. Blau argues that although some theatrical performances can appear so "thoroughly coded and familiar" as to give equal status to mediated or virtual performers, a proper sense of liveness stems from human "liabilities":

> "stage fright, lapses of memory, a stomach ache on stage, a coughing fit, unscripted laughter—that give a local habitation, in the body, to the succinct and apposite admission of imperfection that no bot will move us by—"We are all frail"—no less the myriad inflections of a performance that, intended or unintended, really make it live". [8]

Machinima's origins in live videogame play, and more especially the 'capture' (digital recording of data in real-time) and replay elements of elite game play, suggest the possibility for a revised interpretation of liveness that takes into account more recent technological and production developments. Is there, for example, a difference between recording human interaction with a computer game and recording on-camera performance in front of a video camera? Machinima production has more recently turned towards recording of the on-screen output of the performance in a more traditional filmic approach, rather than recording gameplay data such as keystrokes and mouse moves for later replay within the game engine. Certainly, the process of capturing performance suggests consideration has been given to what parameters are required to provide reasonable 'fidelity' of liveness when reproduced for an audience. In the game environment, capturing of performance means recording not only the on-screen (on-camera) appearance of the scene, and the

characters' actions within it, but also metadata about the characters' variable states (for example health levels, scores, inventories, experience points) that can affect a character's abilities and appearance.

In a virtual world, these are perhaps the "liabilities" that lend the subtle variations that virtual performances are often assumed to lack. For instance, producers choosing to use *The Sims 2* for machinima development must continually confront the difficulties in dealing with software 'actors' prone to mood swings and relationship problems. Unlike von Kleist's [29] 19th Century view of puppets where performance is achieved through the elimination of self awareness, the interaction within the digital world of a reflexive performer and a software responsive avatar produces a sense of empathy which simulates much of the "liveness" Blau proposes.

One of the earliest forms of machinima, the game demo, challenges the notion that performance cannot be saved, recorded and shared. Here, the player's in-game performance is captured - digitally recorded - as sequences of interface input (e.g. keyboard and mouse commands), and stored as binary data. If the player moves their character forward and shoots a weapon, the character's changing co-ordinates in the 3D space and the player's command actions are recorded and stored as data in the demo file. It is capturing the player's input to the virtual world, and defining the virtual worlds' responses. When the demo file is replayed, the software engine can replicate the same input over and over, feeding the data to the game world and characters. An analogue equivalent is the old pianola or player piano, where holes punched in a roll of paper captured a pianist's 'input' - essentially key and pedal press sequences over time - which could then can be fed into the piano to mechanically reproduce the song.

A digital game demo file can be shared among other players, and replayed at will with the appropriate game software. The experience of viewing a demo file is functionally akin to watching a film or TV program. While some formats allow control over camera or point-of-view positions during replay, the viewer has no control over the captured scenes and action being rendered in real-time by the game software. Yet there is a contextual and experiential sense in which the viewer is aware that this is not an animated film. As Lowood describes [22], it can be eerily like inhabiting "the shell of the ghosts of players" – seeing the game experience through their eyes. As technically precise as many of these virtuoso demos are, there is still a sense that you are watching a human-generated performance. Online archives collect and store these past performances of game players, in the same way pianola rolls are collected by musicologists for the performances of the musicians they contain.

These demos are grounded in fan-based cultural practice. What better way to learn from another player's experiences in a first-person perspective game than to step into their shoes and relive the experience through their eyes? But in a society culturally attuned to the televisual, this 'ghost in the shell' experience can only go so far. The development of tools to turn these demo files into movie files - viewable without the need for proprietary game software - or to allow post-recording production decisions such as alternative and external camera positions (recamming), illustrates a move from merely recording gameplay to creating narrative forms aesthetically closer to TV and cinema. Despite this shift, all machinima inherently requires real-time rendering within the 3D game software of the original source content, including the original performance, whatever the level of post-production included in the final product.

The level of liveness and direct human player input is most evident in forms of machinima designed for live performance, either within a persistent virtual game world, or in front of a live audience. For example, there are performers such as New York's ILL Clan that work in the area of live improvisational performance, generating real-time shows using the game engine as the virtual strings for their puppet show. These performances enacted before a live audience strengthen the sense that this is a more traditional performance, albeit totally mediated through virtual environments and characters. Unlike a real-world stage performance, the software is creating the lighting, sets, and characters on the fly in real-time; but the action and plot and performances unfold at a human pace. Other live performances may be enacted in virtual worlds, where characters come together and act out a scenario in real-time, while the audience views the performance through the eyes of their own character/avatar. Examples of this include the trend of music video style dance routines enacted in *World of Warcraft*, or virtual rock concerts in *Second Life*.

The machinima performance style in which liveness is perhaps most questionable is the use of pre-coded scripts to trigger events. The scenario design tools used to create game levels also allow machinima producers to script elements such as the performance of non-player controlled characters ('bots'), and environmental factors such as lighting, sound effects and camera positions. These machinima productions are technically the closest to the Computer-Generated Imagery (CGI) animation process that renders a sequence frame-by-frame. The critical distinction is that the machinima production will rely on the game software to render the pre-coded sequence in real-time. While human-controlled characters may participate in the scene at the same time as it is being rendered, some producers prefer to produce entirely automated sequences of custom animation. One of the key criteria for differentiating, and thus examining, different forms of machinima therefore becomes the real-time involvement of the player/performer. An examination of some of the prize categories for one of the key machinima contests, the annual Machinima Festival [3] or 'Mackies' reveals two of machinima's basic performance styles:

- Best Virtual Performance

- Best Voice-Acting

Neither of these categories is necessarily privileged over the others by the machinima community. Virtual performance presumably encompasses both real-time avatar manipulation using player controls and custom animation (i.e. scripted or coded sequences, or modification of game content); and both demonstrate a level of technical expertise beyond mere gameplay. Thus, customisation of the game environment is seen as worthy for recognition as a form of virtual performance, as the real-time or (live or encoded) puppetry of on-screen characters, or voice acting which may occur in real-time or in post-production. Interestingly, although machinima production still often requires a high level of gameplay skill to create the desired on-screen performance, this aspect is not recognised in the award categories. This illustrates the growth of machinima from a means of sharing the accomplishments of skilled gameplay to a means of generating virtual performances for a wider audience. These awards represent more traditional filmmaking skills such as scriptwriting, directing, editing, visual design and cinematography, highlighting that regardless of the emphasis placed on a particular technique machinima generally aims for on-screen performances that meet a TV or cinematic aesthetic.

Machinima forms and the performance ecology

Although machinima performances may ultimately be captured and edited and distributed as movie files, they often start with live gameplay and a desire to test the possibilities for storytelling allowed by the game world. Often however, producers will use the resources available in the game, and draw on or expand the game world in a fashion typical of much fan fiction as described by Jenkins:

> "Fandom generates its own genres and develops alternative institutions of production, distribution, exhibition, and consumption. The aesthetic of fan art celebrates creative use of already circulating discourses and images". [20]

Game engines are generally not designed for moviemaking, although some contain the tools that make it possible. Machinima films often pay homage to, or build upon the existing storylines and characters presented in the game titles. Machinima makers are typically fans of the games they use to create their works. Even if a machinima-maker chooses to buy a particular game title as a production platform, rather than as a game *per se*, a certain amount of gameplay will inevitably be required to develop an understanding of its machinima capabilities. The different affordances of the game engines adopted for machinima are reflected in the different types of performances made possible, and therefore evident in machinima archives. Some games allow relatively easy puppet-like control over on-screen performances (*Halo*, *Half-Life, World of Warcraft*), some are preferred for the combinations of scripted bot performances and human-controlled avatars they allow (*Unreal, Half-Life*), and some titles deliberately include machinima-like capture and playback tools as part of the game experience (*The Sims*, *The Movies*).

These performative approaches signal a change in the ecologies of performance [21] operating in the online world. This concept proposed by Kershaw includes the complicated and unavoidable interdependencies between every element of a performance and its environment. In the online world the change includes the even more complicated digital interdependencies between every element of a digital performance and its mediated environment. These interdependencies mean that a change in one element will effect change in all the rest. This includes approaches to dramatic role, characterisation and the meanings and the mobility of those approaches within the cultural context of the particular performance style [5]. In the case of machinima, perhaps what we are seeing in Auslander's terms

> "... is not so much the incursion of media-derived 'technics' and techniques into the context of live performance but, rather live performance's absorption of a media derived epistemology". [5]

This interdependency has led to the development of a range of very different performance forms all often lumped under the title of machinima. Taking a cue from Guattari [17] it may be possible to reframe the concept of machinima into an ecology of 'incorporeal species' that exist in the digital environment. In this way the relationship between the different levels of performance liveness within the variations of machinima can be differentiated and described. This ecology includes live puppetry for real world or virtual audiences, game demos for replay in a software engine, and scripted character and camera interactions. Currently the most familiar form of machinima in this ecology takes a strongly televisual or cinematic production aesthetic, with multiple avatar interaction captured as video files and edited in postproduction. The use of non-linear video editing packages such as *Premiere* or *Final Cut Pro* to produce machinima films is now part of a very large community of practice, in which techniques and knowledge are developed and shared among people bonded by a common interest. The machinima community blends with other learning communities such as those based around short film production, and even film schools, in which machinima is increasingly seen as a means of experimenting with film forms. The Australian Film, Television and Radio School, for example maintains a virtual island in the *Second Life* environment for use by students as a machinima production and screening space. This cinematic leaning of the machinima production community is often reflected in the language used in online support forums and discussion groups. For example, in the machinima online portal, Machinima.com [1] the following forum descriptions provide a key to this favoured approach; *Filmmaking Tips & Tutorials, Gameplay Recording &*

Capturing, Video Editing, Audio Recording, & other post-production and Director tools

The language of cinema dominates the machinima production world, with these products often referred to as 'films' when more accurately they are commonly produced and distributed as digital media files. As the form evolves it is possible new terms will become widely accepted to describe the output of this process, but for now film and filmmaking remain common descriptions of the product and process of machinima.

Discussion of performance techniques is not so clearly delineated. Getting on-screen characters to do what you want, when you want, is often seen as a technical filmmaking problem to be overcome rather than a question of dramatic/theatrical direction. Typical of the computer community, these techniques are often framed as 'hacks' or 'work arounds' - techniques for circumventing the perceived limitations of the game engines being used. The artistic or dramatic aspects of performance tend be subsumed by discussions of the technical aspects, for example how to go about wrangling emotionally unstable *Sims* characters, or how to add distinctive character traits to otherwise identical on-screen avatars in *Halo*.

In this strongly cinematic approach, the content is still created in real-time by the game software, but it is the audio/visual (on-screen) element that is captured and edited in post-production. In this sense, for the performers it is very similar to performing for a camera. The use of multiplayer environments can allow for ensemble scenes. In many cases, a player/performer will even take on the role of the camera – using the first person perspective of a player to see the action through their eyes/lens. Again, this is a technical work around to producing the content in a cinematic form, rather than a performative decision. Material is then captured using in-game tools, or specialised software, which records the screen action as a video format file. This can then be imported into editing software and post-produced using the same techniques as video and cinema. It is not surprising that this approach has produced some of the most popular and best-known machinima, as it lends itself to traditional story-telling genres and techniques. There are feature and short films, drama, talk shows, documentaries and sitcoms. This type of production can make use of pre-scripted game elements, or producers will modify characters or sets to produce a suitable milieu for their piece. Remixing content is an important element here, with a proliferation of crossover projects. These projects attempt to shortcut the production process by relying on established franchises, story worlds, even the direct use of plots and scenes from movies.

Machinima as a community of practice

Although regularly touted as a form of cheap and easy CGI animation, making machinima can actually be a time consuming and technically difficult exercise, primarily because most game software is not designed to accommodate this re-purposing. Those titles that do support in-game recording and exporting (*The Sims 2*, *The Movies*), or are complemented by accessible and powerful content modification tools (*Quake*, *Second Life*, *Neverwinter Nights*, *Unreal*, *Half-Life*) are clearly favored by producers. Not all machinima is simply about extending what Sutton describes as the existing "dramatic property" [28], with extensive modification of in-game characters, environments, props, music, and effects becoming almost a technical production sub-genre in itself. However most games are not easy to work with as filmmaking tools, and many producers find it difficult to create projects beyond the game 'world'. From a review of current online machinima archives it would appear that individual producers tend to become familiar with one or two game platforms, and stick to them to develop their films. This may also be driven in part by the game fan mentality, and the complementary game modification industries that accompany some titles. Figure 1 shows just some of the popular game titles used by machinima producers, illustrating the range of genres underlying this practice.

Figure 1: A screenshot showing some of the popular game titles used by machinima producers (www.machinima.com) [3]

Despite these variations, the continuum of machinima production points to the formation and development of a community of practice that may provide a methodological framework for further exploration of liveness in machinima performance.

A community of practice, of which machinima is a good example, is a specific group with a local culture, operating

through shared practices, linked to each other through a shared repertoire of resources. They are what James Gee [15] describes as a way of "…seeing, valuing, being in the world". These communities of practice as outlined by Lave and Wenger [30] provide participants with a focused repertoire of knowledge about, and ways of addressing, shared problems and purposes. One of the interesting shifts within interpersonal communication, which also applies to machinima, was that in the past communities of practice were bound by spatial boundaries and proximity, the workplace, the studio or the office. With the advent of the online world, digital communities of practice sprang up based on shared interest, not shared location. They have now developed in such a way that even a relatively specialised form of machinima will most likely have an online community of practice based around it.

Communities of practice approaches exist as an emerging research methodology as well as providing a site for the examination of the range of practices that make up the continuum of the machinima sub-genres. Benzie, Mavers, Somekh & Cisneros-Cohernour [7] propose that Lave and Wenger's ideas about communities of practice can be used as a theoretical framework for research, and refer to Brown et al's [9] case studies to support this position. Machinima, which is in Wenger's terminology a relatively young community of practice, probably falls into the early coalescing stage, whereby there is a significant growth in membership as a wider awareness of the form brings together previously isolated practitioners, or attracts new members. As such it provides a useful site for research into the evolving connection between live and mediated performance. The boundaries of the community are still being formed and tested, but there is an air of excitement over the potential of machinima as a new creative visual art form. Among the commonalities being discovered and developed into shared practices are the elements of in-role performance articulated in the different styles of machinima production.

Improvised performance in machinima and process drama

Communities of practice do not exist in isolation. They form boundaries with other communities, or contain members who move between communities sharing knowledge and information. Digital performance methodologies emerging from video games and machinima production can be seen as having levels of engagement with a range of other communities, most obviously the gameplaying, game modifying, CGI animation and filmmaking communities. From a dramatic viewpoint the performers within a machinima production are also operating in much the same way as in-role improvisation occurs within the community of practice associated with process drama - a strongly framed environment defined by a 'digital pre-text' [10], - the common digital environment that provides the agreed fictional context for the dramatic action to unfold in. Some machinima performers are forced to interact with the real-time rendered world of the game engine in a way that is partly improvised because the game environment is partly autonomous. If machine generated 'bot' characters appear on the screen or physical features of the rendered environment change during the performance, then the performers may have no choice but to respond dramatically to their changed circumstances. In some performances, the game interface cannot be completely avoided and must be integrated or accepted as part of the production process, such as the presence of a gun crosshair icon on-screen in a first-person/camera point of view. A key factor in most machinima production is that the game environment is not a passive performance space; the game engine may push back at the actions of the performer/player in ways that hinder the machinima production, but which would be consistent with game oriented behaviour.

While the performance of the actors has a fluid interactive and improvised nature that mirrors the improvisational strategies of process drama, it is not the whole story. Most machinima genres also incorporate some element of post-production. In this way the producer acts more like a film documentarist or an actor/producer/director than following the production model and work divisions that occur in TV or cinema production. Consequently, there are as yet no widely recognised machinima 'actors', although there are recognised and respected producer/performers. Often that respect stems from good gameplay and technical understanding of the software, rather than perceived acting ability. The producers of machinima often see the performance element of their productions in a technical light, where getting the machinima characters to perform is difficult enough without attempting to direct the performers in a way that produces an emotional engagement of empathic acting for the audience. An example of this is the machinima content produced for an episode of the animated TV series *South Park*. The animators used real-time game play in the *World of Warcraft* online multiplayer environment to generate some of the content, but not without some of the problems inherent in using a live gamespace and gameplayers, as animator Eric Strough describes:

> "The tough part was trying to get the in game characters to "act". They are limited and stiff. For example, it was hard to get them to stop on their mark. … As for goofing around, the game players would have to wait awhile in between takes so they would challenge each other to duels and tell each other to go screw off by using game chat. They would break into dance and balance themselves on top of fences". [2]

Perhaps the most appropriate model of performance is to see machinima as a filmed and edited version of an improvised performance much in the same way as process drama has been recorded and edited for broadcast. A well-known early example is *Three Looms Waiting*, a BBC Panorama production of Dorothy Heathcote's work in process drama. However, it must be noted that unlike

process drama, machinima performances are enacted within the limitations of the on-screen role persona. Unless they possess the skills to alter the game representations of character appearances, props, and sets, machinima performers are working with pre-constructed elements. Also, the game world may simply not allow for unfettered subversion of the environment and game goals, and producer/performers may be forced to work with or around the game's responses to their actions. There are also the improvisational films such as *Secrets and Lies* of Mike Leigh which attempt as he explains, "to get the actors involved from the word go to create a world that really does exist, whether we point a camera at it or not… film should aspire, in a sense, to the condition of documentary." Leigh's vision is to depict ordinary life, 'real life', unfolding under extenuating circumstances. In *Secrets and Lies* for example, although Leigh is credited for writing the screenplay, most of the performances were actually improvised, with Leigh providing each of the actors with their roles, and requiring them to make up their own lines [24].

Machinima, improvised film and process drama when presented in this way possess a feeling of immediacy and ease with performance conventions, which provide the spontaneity and freshness of the forms. Of course machinima is a continuum of evolving performance conventions and the level at which the performers are scripted varies from improvised speech through to written scripts, and mirroring the performance conventions within process drama and improvised cinema. The performance connections are even stronger when considered in terms of semiotic production of meaning. Because machinima, improvised film and process drama exhibit the multimodal 'open text' that Eco [12] describes as characteristic of contemporary communication, they are all oriented towards the production of improvised original texts that respond reflexively to the environment they are set within. In machinima terms, this requires technically and performatively that the performers accept they must be in the same virtual space at the same time, responding to the same digital pretext. This could be in the form of a computer network, or simulated world for example *Second Life* or *World of Warcraft*, where machinima productions occur without a physical meeting of participants.

Role Protection and Role Distance

The concept of the dramatic frame is operating in machinima, where the player/performer is engaging 'as if' the situation is real [16]. But there are a range of dramatic conventions and levels of improvisation that in turn provide different levels of protection for the performer. The performer can choose between a close identification with their character, or an observer perspective that is more distant from the action. This level of protection and distance from role identification means performers are willing to experiment at extreme levels of behaviour in order to discover how to operate within the performance environment. This is a clear extension of the risk taking and learning behaviours exhibited as part of gameplay. Novice players of a video game are often allowed, even encouraged, by the designers to experiment in the early stages of the game before moving on to more challenging tasks or levels.

This penalty-free behavior reflects what psychologist Eric Erikson[13] has called a psychosocial moratorium, which James Gee [14] succinctly sums up as "a learning space in which the learner can take risks where real world consequences are lowered". In game studies this concept is widely known in terms of Huizinga's 'magic circle' [18], which describes how game spaces are different to the real world in terms of rules and outcomes. In process drama this concept has come to be known independently as 'Role Protection', where the personal 'Role Distance' from the consequences of actually being in the event have been elaborated and structured for different learning outcomes.

The player/performer within machinima always has the option to select from a range of distance and protection conventions [10]. The most obvious position is immersion in the action of unstructured first-person participation. This full role while providing high levels of involvement and activity is one that provides minimal levels of emotional protection for the participants. For example, in video game terms the 'first-person shooter' (FPS) position provides full role with least protection as the player experiences the world through the eyes of the character. Within videogames, FPS game forms are often based on reflex action and physical controller skills and depend on an ever-growing body count of increasingly ferocious adversaries for success. As gameplay gives way to machinima production, the FPS mode is more often used as a camera position to record the up-close action occurring within the dramatic frame. Thus the performer in machinima has a greater sense of Role Protection than that of a player in the game.

Within process drama, first-person full role and immersion in the event is usually the culmination rather than the starting point of any improvisational drama. First-person 'in-the-event' drama requires a background understanding of the context and high levels of group trust to operate in a situation with minimal Role Protection. In terms of machinima, this type of performance is most likely to occur in live performance, in a situation requiring improvisational skills before a live audience. Each performer is directly responsible for the unfolding narrative. This minimal Role Distance can often be overly confronting or challenging for performers within both drama and machinima, and so the participant/player can choose a greater Role Distance and stand back from the action by the assumption of a signed or attitudinal role. The performer can become a central character without assuming full role by 'signing' the role they have adopted through costume, name, career path or some other attribute. This is the level of Role Protection evident in much current machinima, where the role

performances are often shaped by familiarity with the characters or character types from gameplay or game back-story. To move even further away requires only the agreement of the player to take on an attitude of a character in the drama for it to operate – to act 'like' a certain character would be expected to behave. In machinima, this extreme distance may take the form of pre-scripted actions for non-player characters to act out under the control of the software engine.

Within these incorporeal species that make up the evolving ecology of machinima there exists a continuum of performance conventions that mirror the conventions of process drama on the one hand and improvised cinema on the other, each one containing a specific level of liveness as outlined by Auslander. While all variations ultimately depend on the game engines for their dramatic frame, they occupy different niches and different communities of practice have developed around them. This performance range includes:

- Live puppet machinima operating for a physically present audience, or a virtual audience in a shared game space
- Demos and 'speed runs' working as game engine replay
- 'Recamming' demo data files using software to alter game engine replay
- Scripted 'bot' and camera interaction, possibly combined with live puppet machinima
- Multiple avatar interaction captured as video files and edited in postproduction.

It would be useful if research into the range of machinima sub–genres in this developing ecology of performance could be categorised in more detail. As the communities of practice within machinima develop into more extensive and differentiated forms it would also be valuable if discussion within the field were precise enough to categorise discrete performance genres within the same range of technical conventions. Machinima currently covers an evolving and complex range of contemporary technological performance forms that requires a concomitant level of sophistication in its analysis. Underlying the energetic ongoing development of machinima as a performance form remains the inherent ambiguity of its nature as the product of real-time software rendering which allows for differing interpretations of liveness.

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