

## Animated war

Perspectives on resemiosis and authorship applied to two DIY film projects

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# Animated war: Perspectives on resemiosis and authorship applied to two DIY film projects

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## Abstract

In this feature article two DIY (do-it-yourself) film projects are examined from perspectives of resemiosis (transformations in meaning-making) and the textual production practices of contemporary multimedia authorship. These practices are considered as evolving in a complex media ecology. The two films analysed are *Gzim Rewind* (Sweden, 2011) by Knutte Wester, and *In-World War* (USA, expected 2011) by DJ Bad Vegan. The films are currently in production and involve many collaborators. Both films have themes of war and include film scenes that are ‘machinima’ – real-time animation made in 3D graphic environments – within live action film scenes. Machinima harnesses the possibilities of reappropriating digital software, game engines, and other tools available in digital media. War-related stories are resemiotized in the machinima film scenes as meanings are transformed in the story’s shift from a war game context to a film context. Thus machinima exemplifies how DIY multimedia storytellers explore new ways to tell and to ‘animate’ stories. The article contains four parts: an introduction to machinima and the notions of resemiosis and authorial practice; a presentation of DIY filmmaking as a practice that intertwines with new networked economics; an analysis of the two DIY film projects; and a discussion of implications including issues relating to IP (intellectual property) and copyrights when reappropriating digital assets from commercial media platforms.

## Keywords

authorial practice, DIY filmmaking, economics, machinima, remix, resemiosis, storytelling, transformation of meanings, virtual worlds, war video games

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This article explores how textual production practices across digital media platforms contribute to resemiosis – that is, transformations in meaning-making – in two cases of DIY (do-it-yourself) filmmaking. In each of the cases, the two DIY filmmakers develop stories about war using ‘machinima’ that incorporates extracts from war video games. Machinima is a storytelling and filmmaking practice that uses real-time 3D computer graphics rendering engines to capture animation from within video games, for example, *Second Life*, *Halo*, *The Sims*, or *Armed Assault*, in order to create a film. Thus machinima involves the redesign of creative contents across digital media platforms and can also be seen as a genre. The term refers to machine, cinema, and anime and represents one way for DIY cross-media authors to ‘animate’ stories.

Machinima is important to study as an example of a new form of authorial practice that harnesses the possibilities of reappropriating digital software, game engines, and other tools available in digital media. It gives rise to questions about who contemporary storytellers (‘authors’) are and what their practices are, and how meaning-making evolves through resemiosis in a media ecology. For we are witnesses to a paradigm shift toward an increasingly complex media ecology, characterized by the ease of finding and altering digital ‘texts’ and then republishing texts through various media distribution channels. Here, the term ‘text’ refers to an expanded notion of text, embracing multimodal, multimedia storytelling across video games, films, novels and so on.

The article is structured in four parts. It begins with a description of machinima as an innovative practice. Here I present notions relating to storyworlds of war, meaning-making, resemiosis and authorial practice which are relevant for understanding the two cases analysed in the article. Then I outline my approach to DIY filmmaking as a practice that is intertwined with economics, and may be said to drive alternative financial models, rapidly changing production and distribution patterns (see Jenkins, 2009). Following this, I describe the two DIY film projects and present my analysis, which draws on insights relating to semiotic and economic perspectives. Finally, I discuss the implications of resemiosis and authorial practice given the two DIY film cases and their media ecologies and I reflect on the potential in the DIY movement for telling alternative stories.

## **Machinima as innovation**

Machinima practice started with gamers filming their experiences in commercial video games in the 1980s, especially in first-person shooter games like *Quake*. Essentially, the real-time computer graphics rendering engines built into video games and simulation platforms were used to create real-time animation footage. This was not initially the intention of game designers, but has since been capitalized upon by game companies. There is a wide range of vernacular genres in machinima: comedy, fantasy, action, romance, music video and so forth, as seen on the popular *YouTube* channel Machinima.com.

A major challenge for machinima filmmakers is how to deal with copyrights and the boundaries of fair use of digital assets. The two cases that I examine in this article, *Gzim Rewind* (Sweden, 2011) by Knutte Wester and *In-World War* (USA, expected 2011) by DJ Bad Vegan, demonstrate the resemiosis of war-related stories. The cases are analysed using the concepts of resemiosis and authorial practices.

The rise of computer war video games and virtual worlds offers various kinds of interactive story-driven simulations or game play, often referring to war. War is a recurrent theme of myths, sagas, literature, films, video games as well as personal stories that are passed down and retold across time and cultures. In these processes of retelling, there are transformations of meanings

across different media platforms and contexts for viewing. Linguistically, representations of war are storyworlds, with characters, actions and settings. These storyworlds can be said to exist within a paradigm of reality or fiction (van Leeuwen, 2005). The representations of war open up for questions of meaning-making, authorship and ownership – for who has the ‘authorial rights’ to animate war, when it is a part of individual lives and collective folk culture? As Swedish DIY filmmaker Wester recounts in regards to *Gzim Rewind*:

I was in Kosovo, meeting Gzim, whom I have known since he was a boy in Sweden. He was now a teenager. I saw him playing this computer war game, which I thought was so strange because war is still obvious in Kosovo. I mean, just outside his house lie the ruins of their old house . . . But of course he was a teenager, playing war video games like everyone else. And that gave me this idea of his nightmare – as if happening inside or looking like a war video game – to show Gzim’s actual nightmares.

So I rewrote the film script for *Gzim Rewind* with machinima sequences . . . based on stories by Gzim and his mother (about witnessing a massacre). I found an American machinima filmmaker on achinima.com, Sgt Padrino, who gave me these fantastic moving images and I edited the machinima into my film. Then I showed this to the Bohemia Interactive game company, who own the rights to the game engine. But the company would not give me permission to use the machinima. Basically they don’t want their game to be associated with real war, which I can understand, but it makes me wonder. (Wester, 2011)

In this article, I attempt to grasp what Wester wonders about – namely, our complex media ecology with textual practices of remix, redesign and reappropriation. In the case of *Gzim Rewind*, a game company would not give Wester permission to publish machinima made with their game engine. The other DIY film project examined herein, *In-World War* by filmmaker DJ Bad Vegan, involves very different kind of negotiation with developers of a simulation platform.

### *My approach*

I analyse the two cases using the concepts of ‘resemiosis’ and ‘authorial practices’. Resemiosis concerns the complex transformations of contextualized and recontextualized meanings (Iedema, 2001, 2003). It relates to how an author uses particular ‘semiotic resources’ to enact their semiotic interest in a particular semiotic context and thus creates new and multiple meanings. In applying the concept of authorial practices, I view multimedia filmmakers as authors of evolving, cross-media texts. Any authorship has certain practices and traditions, which, especially in the case of machinima, involve readily remixing and reusing contents or assets from various digital media platforms. The capture and remix of digital contents entails dealing with intellectual property (IP) with respect to reappropriating video games such as for the purposes of machinima (see Coleman and Dyer-Witheford, 2007; Haefliger et. al., 2010).

My approach to DIY filmmaking is as a social phenomenon in which resemiosis and authorial textual production as a practice are intertwined with economics. As the meanings of storyworlds of war are transformed across semiotic contexts, the economic system of production and distribution is also dynamically altered. The projects of the DIY filmmakers in my two cases involve different practices: in one of the cases, a war game is reappropriated, in the other, a war simulation for military training purposes. Thus the two cases together provide an interesting basis for comparison of machinima vis-à-vis the representation of animated war.

My inspiration stems from various academic contributions relating to linguistics, drawing on dialogic theories of literature (Bakhtin, 1981), social semiotics (Machin and van Leeuwen, 2007;

van Leeuwen, 2005), and cultural studies approaches to the continual evolution of literature, games and film, and to network economics. Specific sources include Henry Jenkins (2006, 2009) who, amongst other things, examines reappropriation practices in a participatory gamer and fan fiction culture and in the DIY movement in relation to contemporary media ecology. He highlights that media convergent and media divergent tendencies co-exist because of different commercial and political interests in technology development and shifts are messy, that is, media platforms are not 'neatly' converging into some unified whole, but are disjointed and contradictory.

Henry Lowood, curator of the Machinima Archive,<sup>1</sup> has written extensively about the development of machinima and its relevance as documentation of storyworlds in commercial virtual worlds, video games, given their significance as cultural heritage. As Lowood (2008, 2009) points out, the US military has co-opted game cultures and game design from war video games and simulation platforms; in turn, machinima has co-opted from a spectrum of war representations. He makes a distinction between machinima production as 'libraries' for text production, on the one hand, and as 'archives' for performance of storyworlds, on the other (Lowood, 2009). 'Libraries' refer to an extension of the semiotic potential. For instance, a storyworld like *World of Warcraft* (WoW) is used as a library of representations to create stories that take artistic licence with the characters, scenes and storylines. The machinima filmmakers can thus be seen as authors who resemiotize the storyworld. In comparison, machinima as 'archives' refers to an alignment with a given storyworld and game engine. An essential point about the archives aspect is that the game developers remain 'authors', and the machinima filmmakers mainly document the game history and performances within the given storyworld.

David Machin and Theo van Leeuwen (2007) do not discuss machinima directly, but shed light on issues of power and ownership in our globalized media ecology. Their examples of globalization in media include the changes revealed through a discursive reading of war video games depicting conflicts in the Middle East. They point out that most first person 'shooter games' rarely show the personal impact of war, aside from introductory scenes which function as trailers and provide background on characters and events, or 'backstory'. Third person 'strategic games', often include more backstory, with information on aspects such as civilian casualties, as part of the game play.

As of 2001, the American game industry overtook Hollywood film earnings. The circulations of war stories in films and video games often involve the military, directly or indirectly (Crogan, 2009; Lowood 2009, 2008; Machin and van Leeuwen 2007; Turner, 2006). As Crogan emphasizes:

the emergence and success of computer graphics-based spaces of interactive entertainment and communications, such as video games and persistent online virtual worlds . . . is unthinkable without innovations resulting from the massive military-industrial research and development effort of Cold War America. (Crogan, 2009: 168)

Fred Turner (2001) posits that because Americans were distressed by the Vietnam War, they became torn between two compelling desires: to put the war behind them, and to commemorate it through films, books, games and so forth. The US-based military R&D and film/game industry has thus influenced our contemporary, globalized, digital technologies and storytelling. The authors just mentioned argue in different ways that, while the military pedigree of the computer age is frequently acknowledged in historical accounts (as is the anti-war counter-culture movement of the 1960s, see Turner, 2006), the military is rarely treated in assessing today's non-military digital culture. Unfortunately, I treat the influence of the military superficially, but hope it is still evident.

I also draw on insights from economic perspectives on copyright, meaning-making and networks. The economist Yochai Benkler (2006) discusses the importance of shared frames of meaning, how meanings are shaped, and by whom. Benkler's approach to the networked economy as influential for semiotics aligns with Lawrence Lessig's (2008) approach regarding issues of copyright control, innovation, freedom and creativity in the public and private domains. They suggest that our new, networked information economy, including the DIY movement in textual production, has possibilities for reshaping our frames of meaning. It offers opportunities for participation and transparency related in part to the digitality (the common code), the networking capacity of the internet, and the wide access to tools for cross-media production. As Benkler notes:

The practical capacity individuals and non-commercial actors have to use and manipulate cultural artifacts today, playfully or critically, far outstrips anything possible in television, film, or recorded music as these were organized throughout the twentieth century. (Benkler, 2006: 276)

For instance, Lessig actively supports Creative Commons.<sup>2</sup> Benkler and Lessig highlight the great opportunity today for all of us – as storytellers and as citizens – to navigate cultural networks and make them our own. What is at stake is how, and by whom, these shared frames of meaning develop.

## The two DIY projects and the dynamics of media ecology

*Gzim Rewind* is by Knutte Wester, Sweden. *In-World War* is by DJ Bad Vegan (real name Brant Smith), California. The films have some commonalities: both represent a main character and have (or have had) short machinima segments (2–10 min.) representing war as a type of flashback or dream scene that is a 'film within a film'. Both films are mainly live action but mix the representation of the live characters and settings with the animated characters and settings. However, the two films tell very different stories and draw on different, distinctive traditions of genre.

The two film projects have similar conditions of production: low budget, DIY productions by two young filmmakers collaborating with a network of volunteers and freelancers. The volunteers are loosely joined in networks that often communicate online and who participate as 'con amore'.<sup>3</sup> They both promote their activities online. Knutte Wester has had financial support from various Scandinavian grants for artists and new media as well as help from many collaborators, including assisting editors and musicians.<sup>4</sup> DJ Bad Vegan has financed his project from private sources, such as donations. Both are currently seeking showings through documentary and arts-oriented film festivals. The specific distribution channels are unknown now, but should include indie distribution networks and television.

## The evolution of machinima in the two DIY film projects

The two cases exemplify distinctive forms of resemiosis in which layers of meanings evolve from one media platform and storyworld to others such that meanings are recontextualized and transformed. Their authorial practice with machinima unfolds in quite dissimilar ways, in part because of their access to the media platforms and how they gain (or do not gain) permission from the companies who develop and own the media platforms.

(1) *In-World War* is a science fiction story set around the year 2075. The main character is a beta tester working on a program related to the war on terror. He wakes up in different cities and bodies every day and has trouble distinguishing the virtual from the real. The DIY filmmaker DJ Bad

Vegan has developed the project with collaborators, including a volunteer team who have helped to make a machinima scene. This scene was captured in 2009 using the *Online Virtual Environment* (OLIVE) developed by Forterra Systems (Mayo et al., 2006), one of several companies in a chain of platform developers.<sup>5</sup> ‘Virtual Baghdad’ is (or was) one of the OLIVE role-playing environments, designed to enable US soldiers to practise teamwork, leadership, and communication in a setting simulating Baghdad.

In making the scene, DJ Bad Vegan made creative use of the existing virtual Baghdad in OLIVE and its inventory of assets, such as military weapons, uniforms, and vehicles. Avatars were adapted with facial articles that resembled the live actors of *In-World War*, and a virtual replica of the futuristic-looking communication device used in the live-action footage was created for the machinima. The performers in the film scene were the all-volunteer team which consisted of a retired US Army officer, and several professional role-players located in the USA and Canada. Several members of the team were experienced OLIVE users including the former Forterra Vice President and Virtual Stage Manager. They organized the troupe of performers/avatars. The scenes in virtual Baghdad for *In-World War* were thus organized from within the company that had owned the rights to their assets and platform, and captured with the assistance of a professional team. Permission to use the resulting footage was given to the DIY filmmaker at no expense.

(2) *Gzim Rewind* is a documentary film about current events. The film is composed as a ‘rewind’ from 2010 and backwards to Gzim’s childhood and flashbacks of war. The main character is Gzim, who fled the war in Kosovo in 2003 as a child and stayed briefly in a Swedish asylum centre. While there, he befriended Knutte Wester, and was eager to have Wester tell his story. Wester has continued to document Gzim’s life, his subsequent return to Kosovo and teenage years. Gzim has recurrent flashbacks of war, including a massacre. As mentioned, Gzim reflects on these flashbacks with Wester and his mother, and Wester starts to envision them as reminiscent of the shooter war games that Gzim plays. The flashbacks were scripted as machinima in collaboration with Sgt Padrino, a young amateur machinimator, who captured scenes in the shooter war game *Armed Assault 2*.

Wester wrote to Bohemia Interactive (BI) in late 2010 concerning the machinima scenes captured in *Armed Assault 2*. The following is an excerpt from his email:

I am writing to ask for your permission to use and distribute a few machinima scenes within my film *Gzim Rewind*.

... The machinima scenes were made for free by an amateur machinimator in the US who uses the name Sgt Padrino. The collaboration and the result are fantastic. Sgt Padrino chose your game because it looked like the war flashbacks described by Gzim.

The machinima scene is a short part of the film, but it is so important for the film, and I hope that you see my use of *Armed Assault 2* as a benefit to your company.

As recounted earlier, BI turned down Wester’s appeal because they did not want their game to be associated with the real war represented in the machinima. Upon getting this rejection by BI, Wester was forced to revise the scenes using machinima, as well as related scenes. The rejection coincided roughly with the introduction of a new, external film editor, Björn Kessler, and editor consultant, Janus Billeskov Jansen<sup>6</sup>. Their editorial process after the rejection is explained by Wester as follows.

In the end, there was only one part that I so much wanted from this machinima material. So, I printed the machinima film, not all the frames, but like one still from every second, and then I drew each of them by hand with ink, and photographed them, and brought them back into editing. And it became a lot better, fantastic . . . I couldn't have done the ink drawings with this kind of realistic or 3D filmish look otherwise, it is something that's difficult to imagine.

But what we lost was this kind of connection where Gzim is playing the war video game at the computer, we also edited that out because that scene didn't make sense.

So we lost something of this reference to a sort of global use culture. But my other editors said that even if we had gotten the permission from BI, we should have edited these scenes out, because it's trying to bring one issue too many into the film.

Partly as a consequence of the rejection by BI, Wester reedited – and resemiotized – the scenes with machinima and with Gzim playing war video games. Wester kept only one machinima-inspired scene in *Gzim Rewind*, redrawing some still frames from the machinima scene. The 3D graphic look of a war video game in the machinima becomes transformed into Wester's hand-drawn ink drawings. So the influence of what Wester calls the 'realistic or 3D filmish look' of a war video game is retained in the animation of Gzim's nightmare in the resulting film. Thus *Gzim Rewind* does not have actual machinima, but a sort of resemiotized machinima. However, Sgt Padrino has uploaded the three machinima scenes made in *Armed Assault 2* for *Gzim Rewind* on YouTube.<sup>7</sup>

## Comparing the two DIY film projects

The permission to reappropriate and resemiotize the two specific platforms (*OLIVE* and *Armed Assault 2*) in these two cases progressed quite differently. For the *In-World War* film project, DJ Bad Vegan has negotiated rights to use the footage derived from the digital assets in the virtual world. He resemiotized the virtual Baghdad in *OLIVE*, creating new avatar characters according to his authorial intention. He even collaborated directly with staff from Forterra Systems who work 'con amore' to support his efforts. In contrast, in the *Gzim Rewind* project, Knutte Wester and his collaborator Sgt Padrino conceived of the machinima and produced it before making contact with the video game company BI.

It can seem puzzling that BI allows the machinima scenes from *Gzim Rewind* on YouTube. The machinima as isolated scenes are arguably different, because the meanings are not embedded in the whole film *Gzim Rewind*. BI is usually lenient about machinima on YouTube, which is a nexus for machinima. Also, YouTube can be seen as a network for all kinds of homemade, garage cinema and has its own media ecology (Jenkins, 2009). From the perspective of resemiosis, the context of viewing alters meaning. The experience of viewing a video in YouTube or in a cinema theatre or television set alters the meanings of a text because of the embedding of the meaning-making in the viewing context. The viewing context contributes to determining the genre and whether the machinima of the massacre represents reality within the paradigm of real war or within the paradigm of fictional game war. The distribution for a documentary film like *Gzim Rewind* has a media ecology that we can expect to include broadcast via Swedish national TV. The animated nightmare of Gzim will be interpreted as a more serious text and refer more to real war on a serious TV channel than when shown on YouTube.

As discussed earlier, war and the experience of soldiers and civilians provide compelling topics for storytelling. These stories may now be redesigned more readily without the big budgets of



Hollywood films and the video game industry. Returning to Lowood's point about machinima, filmmakers' reuse of libraries for textual production is relevant for the example of *Gzim Rewind*. Wester goes counter to the *Armed Assault 2* game's storyworld because the massacre shows a backstory to this kind of first-person shooter game. *Gzim Rewind* as a storyworld resemiotizes *Armed Assault 2* radically through its representation of witnessing a massacre. The first-person shooter game gives players an illusion of moving around in the game's storyworld, while the machinima film scenes are not interactive (the film audience cannot move around in the film's storyworld) and the scenes are filmed from the point of view of a witness to the brutalities of soldiers. Wester and Sgt Padrino take great authorial freedom with *Armed Assault 2*. The outcome is that BI claim their rights as the game 'authors' to deny this reappropriation.

### **Discussion: The implications of resemiosis and authorial practices with machinima**

I have analysed the two DIY film projects in terms of issues of resemiosis and authorial practice. The two DIY film projects illustrate the redesign of creative contents across media digital platforms – how contemporary authors harness the semiotic possibilities of reappropriating digital media, such as making machinima. Thus, the film projects are also useful as a basis for discussion of issues of copyright. They also raise questions about shifts in contemporary storytelling or authorship and the evolution of meaning-making through processes of resemiosis. Furthermore, these film projects have implications about the degree of freedom authors exercise in order to tell stories, especially stories with critical perspectives on global media discourse pertaining to war.

I suggest that the issue of authorship be viewed from the perspective of the evolution of semiosis in our complex, contemporary media ecology, where digital remix and reappropriation are part of a long tradition of assemblage from many semiotic resources. We need to discuss what sorts of rights contemporary cross-media authors have to reappropriate and recontextualize digital assets. It is important to examine the implications of ownership for learning, literacy and sharing knowledge. Specifically, how do we want to regulate and encourage innovative authorial practices? My point is that the issues of resemiosis and authorship raised in the light of the DIY movement in film are pertinent for social production and welfare at large because ownership of digital assets and language are resources that have to do with knowledge-sharing, collaboration, development of ideas and innovation.

Returning to Benkler and Lessig's arguments regarding copyrights and intellectual property, they propose that if we restrict access and freedom to remix, we thereby restrict economic and social opportunities for growth. Benkler reviews how processes of creation or innovation inevitably involve sharing and reworking ideas from our past, or standing on the shoulders of giants. The implications for a more 'participatory creativity', therefore include our access to knowledge, our ability to share and innovate, and our development of literacy and democracy. Authorship thus relates to learning and to building knowledge. For it is through the attention to representation (to language), that our critical, semiotic reading (or literacy) can be increased. In turn, this participatory creativity can effect economic and social growth. The two cases analysed in this article indicate that collaboration and the knowledge shared in social networks are extremely valuable.

The budgets available to DIY, semi-professional or amateur filmmakers are usually shoestring. Therefore, the potential for inexpensively animating complicated scenes, such as shots of battles in a virtual Baghdad or Kosovo, has great appeal for economic as well as practical and semiotic reasons. Machinima exemplifies the complexities and diversities of linguistic practices in a

participatory, media convergence culture, as Jenkins suggests (2006). The rise of inexpensive digital tools makes it possible for DIY filmmakers to animate war scenes without having to set up an expensive animation studio.

The transformations of language practices are due in part to digital media platforms. This raises various implications across the public and private domains. Given the two examples in this article, I want to leverage the paradigm shifts of a 'networked economy', the impact on the film and game industries (including their relationships with the military), and the rising DIY movement. From a socio-cultural linguistic perspective, the standardization of meaning-making (Machin and van Leeuwen, 2007) affects our reading, playing and viewing, sense of identity within families, culture, nation-states, and notions of enemy. Therefore, an exploration of examples of alternative types of stories, as created by DIY filmmakers, who are not part of Hollywood models or game conglomerates, is interesting. They offer alternative viewpoints such as that of Gzim who witnesses war and grows up in Sweden and Kosovo, or visions of how the war on terror affects the future.

I would like to make a final point about the evolution of language. Bakhtin (1981) proposes that (literary) texts are always intertwined with one another and constantly evolving. In interpreting a text, authors, readers or viewers, always draw on past texts and knowledge of genre conventions and activate familiar signs and symbols. Machinima as a user-driven practice of redesign is useful as a springboard for understanding resemiosis and authorial textual production practices and for considering the implications of redesign on intellectual property and the evolution of language. Machinima has potential as an innovation that creates new genres and transgresses the boundaries between contemporary media platforms. It demonstrates the continual evolution of language.<sup>8</sup>

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### Notes

1. Machinima Archive, based at Stanford University: <http://www.archive.org/details/machinima>
2. Bohemia Interactive (2000–2011) <http://forums.bistudio.com/>; Lessig on Creative Commons <http://www.dig-mar.com/Commentaries/lessicCC.htm> (Lessig, n.d.).
3. DIY project websites: <http://www.inworldwar.com> (In-World War, 2010–2011) and <http://www.gzimrewind.com> (Wester, 2011). My contact with the two filmmakers started in 2009 and involves discourse analysis and virtual ethnography.
4. *Gzim Rewind* musical score: Peter Bryngelsson (nightmares), Fredrik Mjelle (theme).
5. *OLIVE* is now marketed by SAIC in North America, who purchased Forterra Systems, 2010: <http://www.saic.com/products/simulation/olive/> (SAIC, 2011). Forterra redesigned *OLIVE* based on the 3D realtime engine of the virtual community There.com (1998–2010). See There.com (2011).
6. Kessler is paid, but acclaimed film editor Jansen consults 'con amore'.
7. Machinima scenes by Sgt Padrino are available on YouTube, See <http://www.youtube.com/watch?v=Nppgljv38P0> (Sgt Padrino, 2011).

8. For a more detailed account of my application of dialogic theory to machinima, see Frølunde (in press).

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## Biography

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