

Jesper Juul is a Ph.D. student in computer games at the IT University of Copenhagen. He holds an M.A. in Nordic Literature with a master's thesis on interactive fiction.

He co-arranged the Computer Games & Digital Textualities conference in March 2001.

He also develops chat and multiplayer games in the company Soup.dk.

Games Telling stories? ^[1]

-A brief note on games and narratives

by Jesper Juul

Introduction

As questions go, this is not a bad one: Do games tell stories? Answering this should tell us both *how* to study games and *who* should study them. The affirmative answer suggests that games are easily studied from within existing paradigms. The negative implies that we must start afresh.

But the answer depends, of course, on how you define any of the words involved. In this article, I will be examining some of the different ways to discuss this. Lest this turns into a battle of words (i.e. who has the right to define "narrative"), my agenda is not to save or protect any specific term, the basic point of this article is rather that we should allow ourselves to make distinctions.

The operation of framing something as something else works by taking some notions of the source domain (narratives) and applying them to the target domain (games). This is not neutral; it emphasises some traits and suppresses others. Unlike this, the act of

comparing furthers the understanding of differences and similarities, and may bare hidden assumptions.

The article begins by examining some standard arguments *for* games being narrative. There are at least three common arguments: 1) We use narratives for everything. 2) Most games feature narrative introductions and back-stories. 3) Games share some traits with narratives.

The article then explores three important reasons for describing games as being non-narrative: 1) Games are not part of the narrative media ecology formed by movies, novels, and theatre. 2) Time in games works differently than in narratives. 3) The relation between the reader/viewer and the story world is different than the relation between the player and the game world.

The article works with fairly traditional definitions of stories and narratives, so as a final point I will consider whether various experimental narratives of the 20th century can in some reconcile games and narratives.

Telling stories

Everything is narrative / Everything can be presented as narratives

The first argument is a compelling one, as it promises a kind of holistic view of the world: Since we use narratives to make sense of our lives, to process information, and since we can tell stories about a game we have played, no genre or form can be *outside* the narrative.

The problem is that this really is an *a priori* argument.

Narratives may be fundamental to human thought, but this does not mean that everything *should* be described in narrative terms. And that something can be presented in narrative form does not mean that it *is* narrative.

Ideal stories / back-stories

A more interesting argument centres on the fact that most games have a story written on the package, in the manual, or in intro-sequences, placing the player's playing in the context of a larger story (back-story), and/or creating an ideal story that the player has to realise:



Space Invaders (Taito 1977)

If we play *Space Invaders* (Taito 1977), we are presented with an ideal story that we have to realise using skill. A prehistory is suggested in *Invaders*: An invasion presupposes a situation before the invasion. It is clear from the science fiction we know that these aliens are evil and should be chased away. So the title suggests a simple structure with a positive state broken by an external evil force. It is the role of the player to recreate this original positive state. This is, of course, a sequence often found in folk tales: An initial state, an overturning of this state, and a restoration of the state.

But it works in a different way: If we *play* Space Invaders, we find that we cannot actually restore the initial state; we cannot win since every wave of aliens is followed by another. As players we are fighting to *realise* an ideal sequence of events, but the actual playing is not this sequence.

Most modern, single player non-arcade games such as *Half-Life* (Valve software 1998) actually let you complete the game: through countless saves and reloads it is possible to realise the ideal sequence that Half-life defines. Obviously, only a microscopic fraction of the play sessions actually follow the ideal path, but Half-Life does succeed in presenting a fixed sequence of events that the player can then afterwards retell.[2] This means that some games *use* narratives for some purposes.

Similarities

The above Space Invaders example also means that games share some traits with narratives: Many games feature reversals such as movements from a lack to the lack being resolved. Jens F. Jensen has used this trait of Space Invaders to argue that computer games, while being deviant, are narratives (1988).

Additionally, many games have quest structures, and most computer games have protagonists (though this is less common in non-electronic games). As Janet Murray suggests in *Hamlet on the Holodeck*, such similarities would indicate that there is a promising future for digital storytelling and interactive narratives, that games and narratives are not very far apart.

It is also an oft-repeated but problematic point that game sessions are experienced linearly, just like narratives. (See Aarseth 1997 p.2.) I will return to this but briefly note that this idea ignores the player's experience of being an active participant - this experience is so strong that most people will involuntarily change bodily position when encountering interactivity, from the lean backward position of narratives to the lean forward position of games. And playing a game includes the awareness that the game session is just one out of many possible to be had from *this game*.

Is this it?

It is thus possible, in different ways, to view games as being in some way connected to narratives, but does this really answer the opening question? The above points would indicate that games and narratives do not live in different worlds, but can in some ways work together: A narrative may be used for telling the player what to do or as rewards for playing. Games may spawn narratives that a player can use to tell others of what went on in a game session. Games and narratives can on some points be said to have similar traits. This does mean that the strong position of claiming games and narratives to be *completely* unrelated (my own text, Juul 1999 is a good example) is untenable.

But we also have to look at differences.

The problem of translation

I will now use some narrative theory in an operation for

which it was not intended. The basic problem of *the narrative* is the fact that a narrative can never be viewed independently, *an sich*. We can never see the story itself; we can only see it through another medium like oral storytelling, novels, and movies. The classical argument for the existence of narratives is then the fact that a story can be translated from one medium to another:

This transposability of the story is the strongest reason for arguing that narratives are indeed structures independent of any medium.
(Chatman 1978, p.20)

Correspondingly, Peter Brooks says:

Narrative may be a special ability or competence that [...] when mastered, allows us to summarise and retransmit narratives in other words and other languages, to transfer them into other media, while remaining recognisably faithful to the original narrative structure and message. (Brooks 1984, p.3-4)

And this may seem somewhat unproblematic; we can never get everything between media, but at least something seems to get transported from medium to medium. A recounting of *Pride and Prejudice* the movie will be recognisable to somebody who has read the book.

Translating what?

This brings us to the problem of what we actually mean by saying that something can be translated from one medium to another. In a probably slightly limited view of narratives, narratives can be split into a level of discourse (the telling of the story) and the story (the story told). The story-part can then be split into two parts, *existents* (actors and settings) and *events*

(actions and happenings). (Chatman p.19) A story can then be recognised by having the same existents (with the same names) and the same events; this is what we usually mean by talking of "the same story".

This can be used the other way, as a test of whether the computer game is a narrative medium: If the computer game is a narrative medium, stories from other media must be retellable in computer games, and computer games must be retellable in other media. On a superficial level, this seems straightforward since many commercial movies are repackaged as games, *Star Wars* is an obvious example. The other way around, games transferred into movies are less common, but examples include *Mario Brothers*, *Mortal Kombat*, and *Tomb Raider*. Upon further examination, we will find the situation to be much more complex:

From movie to game: *Star Wars*

The arcade game *Star Wars* (Atari 1983) is based on the George Lucas movie of the same name (1977). In *the movie Star Wars*, an army of rebels fight a heroic battle against the evil galactic empire. The dramatic peak of the movie is when the rebel army and the protagonist *Luke Skywalker* must attack the evil empire's new weapon *the death star*. The *Star Wars* game is in three phases, in all of which the player controls a spaceship from the inside, presumably as *Luke Skywalker*. The first phase takes place in space, where we fight hostile spacecraft. The second phase is on the death star, fighting different objects on the death star surface. In the third phase we fly through a

tunnel in the death star to attack an exhaust port. This makes the death star explode. First phase corresponds to an in-movie battle before Luke flies to the death star - except that the rebel fleet is absent. Second phase has no clear correlate in the movie. The third phase corresponds to a scene in the movie - again with the rebel fleet being absent. If you complete the mission, the death star explodes. So the game copies a small part of the movie.



Star Wars (Atari 1983)

The primary thing that encourages the player to connect game and movie is the title "Star Wars" on the machine and on the screen. If we imagine the title removed from the game, the connection would not be at all obvious. It would be a game where one should hit an "exhaust port" (or simply a square), and the player could note a similarity with a scene in Star Wars, but you would not be able to reconstruct the events in the movie from the game. The prehistory is missing, the rest of the movie, all personal relations. Possibly we are even missing the understanding that we are fighting a death star (whatever that is). Finally the most obvious: If you do not complete the mission, this is unlike the movie; if you complete the mission, another death star

appears - which is also unlike the movie.

Thus, *Star Wars* the game can not be said to contain a narrative that can be recognised from *Star Wars* the movie: Most characters from the movie are missing, and the few events that are included in the game have become simulations where the player can either win or fail. The same thing goes for the second batch of *Star Wars* games. *Star Wars: Racer* (Lucasarts 1999) features the race sequence of *Star Wars: Episode I* (Lucas 1999), but only that.[3]

From game to story

I will only briefly be covering game-story translations, since they are fairly uncommon. If we look at the *Mortal Kombat* (Midway games 1993) game, it is a fighting game (beat'em'up) where different opponents (humans or computer players) battle in an arena. It is thus a dynamic system that allows many different people to interact with many different outcomes. The *Mortal Kombat* movie (Anderson 1995) is not a dynamic system, but a story with a specific set of characters entering a *Mortal Kombat* game and playing through with specific outcomes. The fairly non-descript game characters and open player positions become more detailed movie characters; the simulation is converted into specific events.

Correspondingly, if we recount a game of chess, our playing of the entire *Half-Life* game or a multi player game of *Starcraft*, the existents and events will be transferred, but not the dynamic systems.[4] Our retelling will not be a game, and in fact much of the

vast journey that it takes to complete Half-life would be excruciatingly dull if retold in any detail.

The concept of existents is best suited for physical games, where the number of manipulable elements is, at least in principle, finite. Problem is that programs are basically existent-creating machines: Computer games allow for the easy production of infinite numbers of existents, many action games in fact come with a infinite number of existents in the form of opponents. The other problem with the concept of existents is that it in itself does not specify what attributes of the existent are important, whereas game rules feature a strict hierarchy of important and non-important features - Erving Goffman calls this the "rules of irrelevance". (Goffman p.19)

We should also note that most modern games feature cut-scenes, i.e. passages where the player cannot do anything but most simply watch events unfolding. Cut-scenes typically come in the form of introductions and scenes when the player has completed part of the game.

It is then possible to describe in a more general way how games get translated into narratives, and how narratives get translated in to games:

A table of narrative - game translations

| Movies / Novels etc. | Game |
|-----------------------------|--|
| Existent | Existent <i>or</i> Continuous production of existents (i.e. hordes of opponents) |
| Event | Event (cut-scene) <i>or</i> Simulation with multiple outcomes |
| Sequence of events | Selected events as events or simulations <i>or</i> Ideal sequence of events that the player has to actualise by mastering the simulations[5] |
| Character | Character (cut-scene) <i>or</i> Player position (game) |

Note that both directions of the translation leave plenty of room for improvisation and carry many optional operations. In short, games based on movies tend to pick a few select action sequences, which are then simulated in game sequences - as we saw with Star Wars. Character description and development is either ignored or done in cut-scenes (since this is too hard to

implement in game form). Working from game to movie, the game is no longer a game, but is rather presented as specific game sessions, played by specific characters, with specific outcomes. The characters also tend to become more developed: Tomb Raider's heroine Lara Croft acquires much more of a past and personality in the Tomb Raider movie.

Time, game, and narrative

Narrative is a ... double temporal sequence ... : There is the time of the thing told and the time of the narrative (the time of the signified and the time of the signifier). This duality not only renders possible all the temporal distortions that are commonplace in narratives (three years of the hero's life summed up in two sentences of a novel or in a few shots of a "frequentative" montage in film, etc.). More basically, it invites us to consider that one of the functions of narrative is to invent one time scheme in terms of another time scheme. (Christian Metz, quoted from Genette 1980, p.33)

In the classical narratological framework, a narrative has two distinct kinds of time, the *story time*, denoting the time of the events told, in their chronological order, and the *discourse time*, denoting the time of the telling of events (in the order in which they are told). To read a novel or watch a movie is to a large extent about reconstructing a story on the basis of the discourse presented.

In a verbal narrative, the grammatical tense will necessarily present a temporal relation between the time of the narration (narrative time) and the events told (story time). Additionally, it is possible to talk of a third time, the reading or viewing time (Genette, p.34).

While movies and theatre do not have a grammatical tense to indicate the temporal relations, they still carry a basic sense that even though the viewer is watching a movie, now, or even though the players are on stage performing, the events told are *not* happening *now*.

In Eisenstein's account there is the sense that the text before us, the play or the film, is the performance of a "prior" story. (Bordwell, p.15) We cannot necessarily describe this as a specific temporal relation (hence "prior") but there is a fundamental distance between the story time and discourse time. As Christian Metz notes in the above quote, narratives rely heavily on this distance or non-identity between the events and the presentation of these events.

Time in the computer game



Doom II, level 2.

If we then play an action-based computer game like *Doom II* (ID Software 1994), it is hard to find a distance between story time, narrative time, and reading/viewing time. We may find a representation, and as a player you try to reconstruct some events from this representation: The blocky graphics can be interpreted so far as the player controls a character, whose facial expression is represented in the bottom centre. On the illustration this person has been

cornered by a large pink monster, whose hostile intents are clearly identifiable. Players are attacked by monsters; puzzles must be solved to get to the next level.

It is clear that the events represented cannot be *past* or *prior*, since we as players can influence them. By pressing the CTRL key, we fire the current weapon, which influences the game world. In this way, the game constructs the story time as *synchronous* with narrative time and reading/viewing time: the story time is *now*. Now, not just in the sense that the viewer witnesses events now, but in the sense that the events are *happening* now, and that what comes next is not yet determined.

In an "interactive story" game where the user watches video clips and occasionally makes choices, story time, narrative time, and reading/viewing time will move apart, but when the user can act, they must necessarily implode: it is impossible to influence something that has already happened. This means that *you cannot have interactivity and narration at the same time*. And this means in practice that games almost never perform basic narrative operations like flashback and flash forward.[6] Games are almost always chronological.

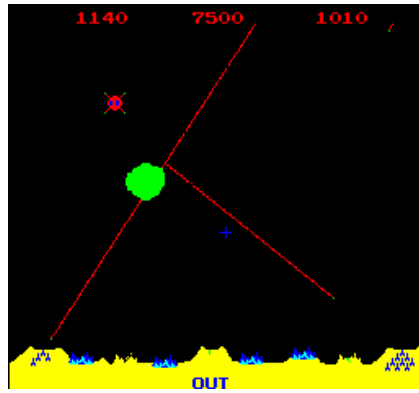
This article is not about all the intricacies of time in games (see Juul, forthcoming). Let us simply note that games may also have a speed that is not equal to the playing time - a day & night in the online multi player game EverQuest takes 72 actual minutes to complete, and a game played in 2001 may be labelled as taking place in 1941. But playing a game requires at least

points or periods of temporal convergence where the time of the game world and the time of the playing merge - and the player can actually *do* something.

The player and the game

The next major question is less structural and more oriented towards the reader: How does the player and the game interact?

Movies and other stories are largely about humans (or anthropomorphic things) that the viewer/reader identifies with cognitively. It is basically boring to view/read fictions without anthropomorphic actors. This is not true for games. Games with no actors represented on screen have appeared throughout the history of the computer game.[7] Many of these have been extremely popular. An early example is *Missile Command* (Atari 1980), where a number of cities are attacked by missiles that you then have to destroy using rockets from three missile batteries. The player is not represented on screen as an entity or actor, but only sees the results of his/her actions. It would be possible to create a "job description" for the player - a soldier controlling missiles: a typical hero. It is harder to understand *Tetris* (Pazhitnov 1985), where you must combine a series of falling bricks.



Missile Command (Atari 1980)



Tetris (Atari's 1986 version.)

Tetris does not have a visible actor either, and it does not seem possible to construct any actor controlling the falling bricks. "Tetris - the movie" does not seem like a viable concept. But Tetris is incredibly popular, and nobody is disputing its status as a computer game.

But how can computer games be abstract and without points of identification, and yet be interesting? - No matter how variable or even absent the protagonist in computer games, the player is always constant. The reader/viewer need an emotional motivation for investing energy in the movie or book; we need a human actant to identify with. This is probably also true

for the computer game, only this actant is always present - it is the player. The player is motivated to invest energy in the game because the game evaluates the player's performance. And this is why a game can be much more abstract than a movie or a novel, because games involve the player in a direct way.

This discrepancy raises many issues. In a game, the player works to reach a goal. The thing is then that this goal has to mimic the player's situation. It seems, for example, that a game cannot have the goal that the player should work hard to throw the protagonist under a train.[8] As a player, the goal has to be one that you would conceivably want to work for.[9]

A final argument: The avant-garde fallacy

There is a final counter-argument to the points set forth here: The problem with my description of story as having existents and events, my description of time, my description of the player/game relation as unique could be this: That I am ignoring the experimental narratives of the 20th century, works that do not simply subscribe to the story/discourse duality, activate the reader much more, and do not have a sense of being past or prior. We can explore this with a few select examples.

Jean-Luc Godard's *Pierrot le fou* would serve as an example of a movie where it is hard to construct a coherent story due to numerous temporal skips and distanciations such as the actor's addressing the camera. This foregrounding of the discourse has a

sense of immediacy that would make it ripe for a game adaptation - if only we could figure what the game should be about.

And during the creation of *Naked Lunch*, William Burroughs writes the follow explanation to Allen Ginsberg:

[...] the usual novel *has happened*. This novel *is happening*. (Burroughs 1993, p. 375)

It may be obvious that the more open a narrative is to interpretation, the more emphasis will be on the reader/viewer's efforts *now*. The difference between the now in narratives and the now in games is that first now concerns the situation where the reader's effort in interpreting obscures the story - the text becomes *all* discourse, and consequently the temporal tensions ease. The now of the game means that story time converge with playing time, *without the story/game world disappearing*.

Games rely on having goals that can be deciphered by the player and something obstructing the player's possibility of reaching the goals. Narratives are basically interpretative, whereas games are formal. Or, in cybertextual terms, stories have an interpretative dominant, whereas games have a configurative dominant. (Eskelinen 2001.) While readers and viewers are clearly more active than some theories have previously assumed, they are active in a different way.

The idea of using experimental narratives to answer the opening question suffers from the problem that the very emphasis on interpretation and ontological instability that would make the narrative more

immediate and thus closer to the game, in itself would make a game unplayable.[10]

Conclusion

I would like to repeat that I believe that: 1) The player can tell stories of a game session. 2) Many computer games contain narrative elements, and in many cases the player may play to see a cut-scene or realise a narrative sequence. 3) Games and narratives share some structural traits. Nevertheless, my point is that: 1) Games and stories actually do not translate to each other in the way that novels and movies do. 2) There is an inherent conflict between the *now* of the interaction and the *past* or "*prior*" of the narrative. You can't have narration and interactivity at the same time; there is no such thing as a continuously interactive story. 3) The relations between reader/story and player/game are completely different - the player inhabits a twilight zone where he/she is both an empirical subject outside the game *and* undertakes a role inside the game.

Even if this article has been somewhat structural in its orientation, I would like to state that I think we need to consider games as fairly formal structures that in complex ways spawn and feed player experiences. This means that we cannot afford to ignore the effect of interactivity: The non-determined state of the story/game world and the active state of the player when playing a game has huge implications for how we perceive games. Even if we were to *play* only a single game session of a hypothetical game and end up performing exactly the same sequence of events that

constitute *Hamlet*[11], we would not have had the same experience as had we *watched* Hamlet performed. We would also not consider the game to be the same object as the play since we would think of the game as an explorable dynamic system that allowed for a multitude of sequences.

The narrative turn of the last 20 years has seen the concept of narrative emerge as a privileged master concept in the description of all aspects of human society and sign-production. Expanding a concept can in many cases be useful, but the expansion process is also one that blurs boundaries and muddles concepts, be this is desirable or not. With any sufficiently broad definition of x , everything will be x . This rapidly expands the possible uses of a theory but also brings the danger of exhaustion, the kind of exhaustion that eventually closes departments and feeds indifference: Having established that everything is x , there is nothing else to do than to repeat the statement.

Using other media as starting points, we may learn many things about the construction of fictive worlds, characters ... but relying too heavily on existing theories will make us forget what makes games games: Such as rules, goals, player activity, the projection of the player's actions into the game world, the way the game defines the possible actions of the player. It is the unique parts that we need to study now.

These are both descriptive and normative issues. It does not make much sense to describe *everything* in the same terms. It also is quite limiting to suppose that all cultural forms *should* work in the same way. The

discussion of games and narratives is a relevant one and I can not hope to close it here. This article has argued for telling the difference.

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Notes

1. Parts of this article have previously appeared in a different form in Kritik #135. Copenhagen: Gyldendal 1998.
2. Note that multi player games rarely contain ideal sequences but rather allow the players to replay the same setting with new results - think of Chess or Starcraft. As such they are very far from narratives. On the other hand, the retelling of a game session in a single player game ("*and then I ... and then I ... and then I ...*") is less interesting than the retelling of a multi player game since the latter can include intrigues, lies, and deceit between people ("*we had agreed to combine forces on the eastern front, but only in the end did I realise that she was actually conspiring with Joe*").
3. This also relates to the maturation of the game industry: The first Star Wars movie resulted in one computer game, the latest movie has spawned somewhere around ten different games on different platforms featuring different pieces of the movie or of the Star Wars universe.
4. The other major problem is that games are formalised and rule-bound and as such better suited for physics & firearms than for existential problems, since the latter are not easily formalised. (See Juul 2000) This means that some events are very, very hard to create as dynamic systems.
5. The ideal sequence is much harder to actualise than the numerous non-ideal sequences - this is what makes it a game.
6. Flash forward is more of a problem than flash back, since describing events in the future means that the player cannot do anything.
7. Traditional board and card games tend to be much more abstract than computer games.
8. The Anna Karenina example was presented by Marie-Laure Ryan (2001).
9. This does not rule out ironies, but all examples I know of work by putting the player in an active position doing things normally considered negative: Destroying houses and killing people in Rampage (Bally Midway 1986), killing pedestrians in Death Race (Exidy 1976) and Carmageddon (Sales Curve Interactive 1997). I know of no games where the goal of the player is to die or be destroyed.
10. This still leaves open numerous unexplored possibilities such as multiple contradictory goals, games of Tetris that cause the destruction of famous artworks in another window on the screen etc.. The point is that we should not expect (or demand) that game experiments mimic narrative experiments.
11. *Hamlet* is actually a poor choice for game adaptation since it (like many narratives) has several scenes where the protagonist is absent, and thus gives the audience more information than is available to the characters. Such common devices of knowledge and suspense are not in any obvious way implementable in a game format where audience and protagonist are the same person.

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References

Literature

- Aarseth, Espen J.: *Cybertext: Perspectives on Ergodic Literature*. Baltimore & London: Johns Hopkins University Press, 1997.
- â€™Aporia and Epiphany in *Doom* and *The Speaking Clock*: The temporality of Ergodic Art" In: Marie-Laure Ryan (ed.): *Cyberspace Textuality: Computer Technology and Literary Theory*. Bloomington: Indiana Press, 1999.
- Bordwell, David: *Narration in the Fiction Film*. Wisconsin: The University of Wisconsin Press,

1985.

Brooks, Peter: *Reading for the Plot*. Cambridge, Massachusetts: Harvard University Paperback Edition, 1992. (New York: Knopf, 1984)

Burroughs, William S.: *The Letters of William Burroughs 1945-1959*. Ed. by Oliver Harris. London: Penguin Books, 1993.

Chatman, Seymour: *Story and Discourse: Narrative Structure in Fiction and Film*. Ithaca: Cornell University Press, 1978.

Eskelinen, Markku: *The Gaming Situation*. Paper presented at the Digital Arts and Culture conference, Providence April 2001.

Genette, Gerard: *Narrative Discourse*. Ithaca: Cornell University Press, 1980.

Goffman, Erving: *Encounters: Two studies in the Sociology of Interaction*. London: The Penguin Press, 1972. (The Bobbs-Merrill Company, Inc. 1961)

Jensen, Jens F.: "Adventures in Computerville: Games, Inter-Action & High Tech Paranoia i Arkadia". In *Kultur & Klasse* 63. Copenhagen: Medusa 1988.

Juul, Jesper: *A clash between game and narrative*. M.A. Thesis. 1999.
<http://www.jesperjuul.dk/thesis>

â€œWhat computer games can and can't do. Paper presented at the Digital Arts and Culture conference, Bergen August 2000. <http://www.jesperjuul.dk/text/WCGCACD.html>

â€œGame Time. (Forthcoming.)

Murray, Janet H.: *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*. New York: The Free Press, 1997.

Ryan, Marie-Laure: *Beyond Myth and Metaphor: The Case of Narrative in Digital Media*. Keynote speech at the Computer Games & Digital Textualities conference, Copenhagen March 2001.

Movies

Anderson, Paul: *Mortal Kombat*. 1995.

Godard, Jean-Luc: *Pierrot le Fou*. 1965.

Lucas, George: *Star Wars*. 1977

â€œStar Wars: Episode 1. 1999.

West, Simon: *Tomb Raider*. 2001.

Games

Atari: *Missile Command*. 1980.

â€œStar Wars. 1983.

â€œTetris. 1986.

Bally Midway: *Rampage*. 1986.

Blizzard Entertainment: *Starcraft*. 1998.

Core Design Ltd.: *Tomb Raider*. Eidos Interactive 1996.

Exidy: *Death Race*. 1976.

Lucascarts: *Star Wars: Episode 1: Racer*. Lucascarts 1999.

Midway Games: *Mortal Kombat*. Acclaim 1993.

Pazhitnov, Alexey: *Tetris*. Spectrum Holobyte, 1985.

Sales Curve Interactive: *Carmageddon*. PC Game, Interplay 1997.

Taito: *Space Invaders*. 1977.

Valve Software: *Half-life*. Sierra 1998.

Verant Interactive: *EverQuest*. Sony Online Entertainment 1999.

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