Serious Games

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Abstract

The video games sector has already left the movie industry behind concerning sales figures and is now going for the music industry. Nothing seems to be able to stop its triumphant success. Bigger than ever before, the video games market no longer only serves the needs of pure entertainment. Video games are also used for advertising, to convey messages, form opinions and educate people. The phrase *serious games* arose around these games, that are not solely focusing on entertainment. This paper intends to give an overview of what is actually meant with *serious games* and to what extent these really succeed in influencing people. Moreover the functionality of games within two major areas of application is being considered.

Keywords: serious games, persuasive games, advergames, edugames, video games, educational, advertising, games, procedural rhetoric

1 Introduction

Throughout the course of human history games of all different kinds have influenced people's social practices. When George Parker (founder of the game company "Parker Brothers" initially known as "George S. Parker Company") at the end of the 18th and beginning of the 19th century released his first board games in the United States each of those was undisputable only a moderate success. Nevertheless they together changed the definition of leisure activity as "a gathering of four to six people around a game board with colourful pieces, die, and rules of play" [Smith 2006]. In that, they set the stage for later introduced and extremely successful games like "Monopoly" or "Sorry". Having people already convened around the table Parker added variations of card games to his repertoire and again changed, or at least expanded the notion of leisure entertainment, taking away the infamous image of card games, previously considered as mere means of gambling [Smith 2006].
The definition and re-definition of leisure has - of course - continued and was not only enforced by the gaming companies alone. Advances in electronics brought radio and television with them, which both became a major part of spare time activities. However, as the game industry started adopting those new technologies, their products reached whole new levels. Introducing new electronic gaming instruments empowered games in a way never experienced, making it possible to "go where no one has ever gone before". Changing along with them were the social practices of generations [Smith 2006].

Having pointed out that games do affect people in how they spend their leisure time, the question arises whether they can also influence other areas of life. Is there a purpose behind games other than entertainment? Are there even "serious games"?
When considering common behavior in nature the question is to be answered in the affirmative. Lots of animal cubs learn how to survive by playing with their fellows. It's probably safe to assume that almost everyone has already seen a documentary dealing with things of the kind. Considering that parents give toys to their baby boys and girls, which are supposed to help the kids to learn fundamental things in a playful way (e.g. matching colors and shapes), is another indication that games are made for more than just entertainment. Of course one could argue that the mentioned activities rather fall into the denomination of "play", differing from games mostly in the absence of rules. While this is undoubtedly true, the idea is still clear and refusing it because of this particular point would be nothing more than nitpicking.
Thus it can be stated that serious games exist (and always did), although the very expression primarily occurs in connection with video games, especially since the foundation of the *Serious Games Initiative* in 2002. Consequently, this paper intends to give an overview on serious video games, covering three major topics. Section 2 is going to deal with the definition of serious games. There are different opinions on this issue and two concrete concepts are going to be presented in a little more detail. Section 3 will focus on two specific areas that serious games are applied in, that is advertising and education. And finally the effectiveness of serious video games shall be examined in Section 4.

2 Definition of Serious Games

Since the term *serious games* itself, brings together two words that we wouldn't usually relate to each other, there's some kind of explanation needed. On the website of the annually held *Serious Games Summit* we find the following definition [SeriousGamesSummit]:

> *Serious Games are applications of interactive technology that extend far beyond the traditional videogame market, including: training, policy exploration, analytics, visualization, simulation, education and health and therapy.*

So we are dealing with games that do not primarily intend to entertain but to cause a certain effect within the people playing and thereby break out of their traditional game borders infiltrating and directly influencing the real world.
Given the above definition one might assume that serious games are solely a product of the video game industry, when in fact the very idea has its roots way back in early military research. "Königsspiel" by Christopher Weikhmann of Ulam was introduced in 1664, yet even before games were used for conflict simulation. But with those ideas being inherent to the military community they didn't make it out to the broad open public until sometime after World War II. At that time people (especially those actually involved in the war) became aware of the possible uses of games in learning and education, due to the simulators and wargames that were used for training during the war. Still this didn't generate any significant interest outside the military or governmental communities either. Not until the created games were used in entertainment. One of the most notable developments here was made by Charles Roberts, who wanted to improve his decision-making skills, thereby creating the first modern board wargame "Tactics" in 1952. [Smith 2006]
By that time not only military games have been developed. One of the most famous civilian games that would apply to Ian Bogost's definition of *persuasive games* [**?**], which we will discuss later, was "The Landlord's Game", patented in 1904 by Elizabeth Marie. It is considered the direct ancestor of the popular game "Monopoly"

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(see Figure 1). The game translated the economic principles and social injustices of Georgism into rules which made the players end up in complete poverty no matter how hard the tried. So the game, by personal experience, pointed out how the georgist system enriches landlords while, on the other hand, it impoverishes tenants [Svahn 2007].

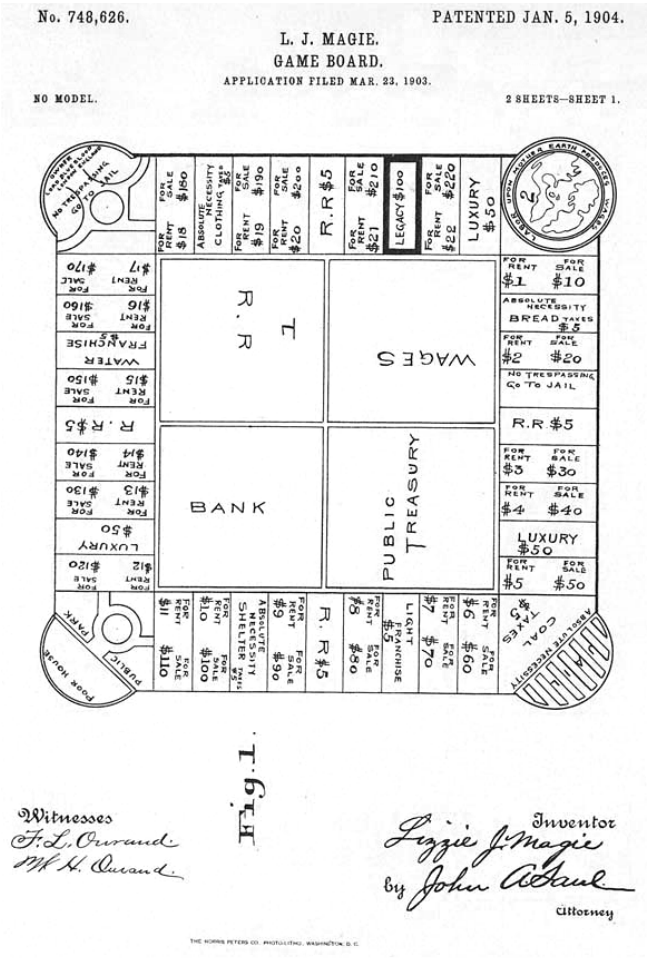

Fig. 1.

Figure 1: The printed patent drawing for the game board of Lizzie J. Magie's "The Landlord's Game. *Source: http://en.wikipedia.org/wiki/Image:BoardGamePatentMagie.png*"

So the concept of serious games already exists for a remarkably long time, yet there has never been so much attention paid to them as it is now. A whole "serious games movement" has emerged in recent years and the weapon of choice to get the message across is video games. This is not surprising at all, since for one thing video games enjoy a great and still growing popularity, by far outperforming traditional board and card games. Secondly they offer a great wealth of new technologies enhancing quality and facilitating distribution and communication.
While everybody pretty much agrees with the very general definition of serious games given above, that is to say "something" not primarily meant to entertain; there are still some very different notions of what actually makes a serious game and how and why they exert their influence. In the following there are two major approaches introduced.

2.1 The "Game Impact Theory" - a technical approach

There obviously are different definitions and connotations of a game. Matthias Svahn in his paper on the use of games in advertising [Svahn 2007] cites Craig Lindley, saying:

> *[A] game is a goal-directed and competitive activity conducted within a framework of agreed rules.*

Most people, we assume, would intuitively agree with this definition, as it incorporates almost everything that we associate with games. A game is usually played against one or more (both human and artificial) competitors. It has a well defined end-state and follows a specified set of rules.
Roger Smith, anyway, takes a broader view on the issue. In his *Game Impact Theory* he extends the definition of games away from the activity, as given above, towards the notion of games as tools, by which these activities are executed. This might not be the first thing that comes to our minds when we think about it, but it still is completely valid. Considering for example a simple board game like "Monopoly". Explaining it to someone would probably include the way of playing, the rules and the goals, while it is to be doubted, that anyone would give a detailed description of the board, the cards or the tokens used. However, playing without the latter would be half the fun.
According to this perception of games Smith points out that technologies, used and created within the video games industry, are more and more integrated into applications of other industries, after they have established themselves in the entertainment sector. Thus defining serious games as:

> *When these applications are considered "serious business", like defense, medicine, city planning, and architecture, these tools are often referred to as "serious games".*

Table 1 gives an idea of how games and game technologies are being incorporated into different industries. In its right column, examples for various uses of these technologies within the given industries are listed.

2.1.1 Key Technologies

The reason why video games attract so much attention in new industries, can be found on a technological level. Video games make excessive use of special technologies, in order to provide a fun and realistic gameplay. Some of these might not have originated in the game industry, but were significantly improved there, due to the extraordinary demand for ever more engaging game experiences. Smith identifies six specific technologies as the reasons for the power inherent to video games.

1. **3D Engines:** With loads of efforts going into the development of ever better 3D engines they have undoubtedly become one of the most prominent features of modern video games. Figure 2 shows how the level of detail and realism increases along with performance rates making 3D engines objects of interest not only for gaming issues. Wide application areas can be found in simulation, medical imaging and architecture.

2. **Graphical User Interface (GUI):** Many electronic devices we are faced with in everyday life provide poor designed and complicated user interfaces, resulting in a reluctance of use. Video games strive hard to offer an easily-accessible and simple user interface in order to attract a big audience. The ultimate goal is for the user to be able to play the game without

Industry	Game Technology Impact
Military	Training soldiers and leaders in the tactics and strategies of war. Three dimensional modeling of equipment to illustrate or explore its capabilities.
Government	Ethics training for NASA. Project management training for the State of California.
Education	Augmenting classroom instruction in nearly every subject English, math, physics, history, etc.
Emergency Management	Training emergency responders, firefighters, FEMA agents, and others to deal with disasters.
Architecture	Visually promoting major hotel, casino, and office spaces to potential clients.
City & Civil Planning	Lay out and experimentation with public services for a population of constituents.
Corporate Training	Orienting people to company products, facilities, and policies. Pilot and safety training.
Health Care	Educating patients on treatments, rehabilitation, and managing anxieties. The next generation of workout videos.
Politics	Presenting political issues and consequences of political decisions. Promoting candidates.
Religion	Interactive versions of sacred texts. Tools to teach religious history.
Movies & Television	Alternative form of storytelling known as machinima. Tools for creating animation and 3D worlds.
Scientific Visualization & Analysis	Rapid display of objects under experimentation and physical forces acting on them. 3D display of data collected and analyzed.
Sports	Recreate live sporting events for review and for prediction of potential outcomes. Rehearse for critical one time events like Olympic ceremonies. Fantasy sports leagues in 3D.
Exploration	Prepare missions for NASA Mars Lander. Recreate environments around deep sea probes.
Law	Illustrate crime scene activities for judge and jury. Analyze crime scene data.

Table 1: Use of games and game technology in different industries. *Source: Smith, 2006*

ever having read a manual. Many games realize this by starting off with a familiarization stage, during which the user is faced with special tasks and interactively taught how to accomplish them.

3. **Physical Models:** Most modern video games, especially those belonging to the genres of "First or Third Person Shooter" implement a specific physics engine. Digital objects are treated as if they really had physical properties like weight, mass, stiffness, etc. Objects interact with each other and the world surrounding them according to their properties and the laws defined by the physics engine, creating the illusion of a real world experience; a feature desired in serious simulation applications as well.

4. **Artificial Intelligence (AI):** In order to provide interesting game-play it is essential for the player to interact with other characters. While those may be human in multiplayer environments, the same is not possible in single player games. Therefore these characters are controlled by an artificial intelligence, allowing them to act like a human player. At first being adopted from other industries research has shown that the latest advances in AI technology are made by the game industry long before they appear elsewhere.

Figure 2: Illustration of the tremendous progress in 3D graphics comparing the games Wolfenstein3D (1992) and Crysis (2007)

5. **Networking:** Lots of games provide the player with the ability to not only play alone, but to connect with other players around the globe sharing the game experience. By now there are games that do not even provide a real single player mode, the most popular being "World of Warcraft". Besides the actual gaming those often provide a medium for new communities and relationships.

6. **Persistence:** Early networked games offered a stage for play. Players met, played and the stage was cleared afterwards. Released in 1997, "Ultima Online" was the first game not only providing a stage but a real world, that kept on existing after the user logged off. Again "World of Warcraft" is the most prominent comparable game nowadays, supporting thousands of players simultaneously, being able to evolve over years and thus attracting long time players.

These core technologies are pushing hardware manufacturers to produce more powerful equipment, which again incites the game industry to come up with even better and technically more demanding applications. Industries using computers benefit of advances in hardware technology and in turn establish an industrial computing environment, which is able to run game technologies. This again enables the game industry to export their products or at least derivates of them as soon as an appropriate need is given.

Despite a possible need given, video game technology was not adopted simultaneously by all industries listed in Figure 1, since different industries have different requirements to be met by their tools. Having a technology well established within one area of ap-

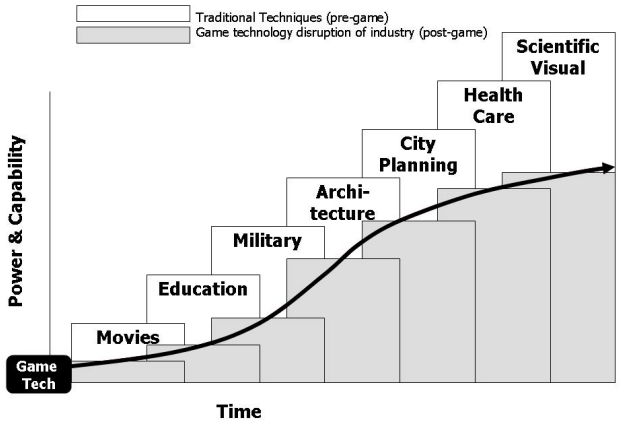

Figure 3: Game technology progresses into new industries step by step. *Source: Smith, 2006*

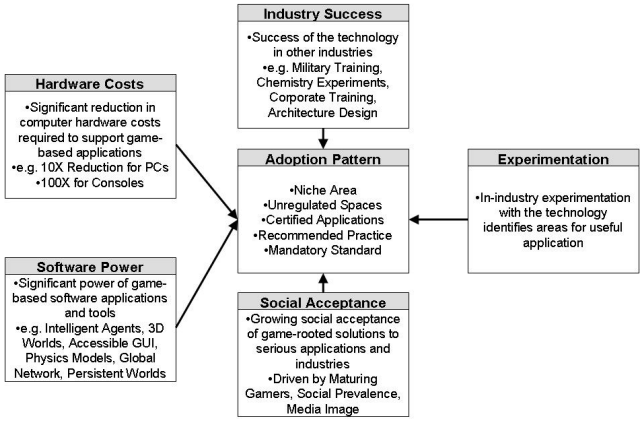

Figure 4: Five forces that drive the adoption of game technologies. *Source: Smith, 2006*

plication, this doesn't automatically imply that it is (already) suited to be applied elsewhere. Possible reasons for this are reliability, performance or cost. Technologies therefore jump from one market to the next, more demanding one, as illustrated in Figure 3.

2.1.2 Technologies on the Move

Since game technologies do not pervade all industries at the same time, the question remaining is, what drives the adoption of new technologies in previously unaffected areas. In reference to this, Smith names five core forces that make technologies spread between different industries. These forces are illustrated in Figure 4.

1. **Cost advantage of hardware platforms:** As already stated earlier computer games are designed to reach as many customers as possible, which is why companies have to be very careful when it comes to system requirements. They do not want to create a product that forces the consumer to buy new hardware, but to use the commonly available hardware as efficient as possible. These consumer-workstations are up to a magnitude of order less expensive than professional ones and can provide similar, if not equal, performance (given the software they are running is sophisticated enough). Savings of this kind can be significant for various companies.

2. **Software Power:** This is where the six key technologies of modern video games, as previously described, come into play. A wide variety of application areas for these special technologies can be found in different industries.

3. **Social Acceptance:** Games and therefore game technologies have been considered as toys focused on play for long time. As a generation, which grew up with video games, is starting to invade all areas of business life, the level of acceptance for game technologies raises significantly. People are confronted with them more and more often in everyday life and start to recognize and appreciate the advantages they bring along.

4. **Other Industry Success:** In an obviously quite human way companies tend to be sceptical of new technologies at first, but more eager to adopt them, when success has been proven by others. Game technology was first applied by the television industry and military, as shown in Figure 3. Now, that it has been proved to be valuable, it is also used in medicine, architecture and scientific contexts.

5. **Innovative Internal Experiments:** Experimentation within the industry willing to adopt a new technology is essential. If these initial experiments succeed and new useful products are created the technology lends itself to further investigations and applications.

These being the five forces making game technologies attractive to new industrial areas, Smith also describes an adoption pattern they run through during integration. Starting out in niches, that are still very closely related to the initial use of the particular technologies they move into what Smith calls *unregulated spaces*. The use of the newly acquired methods for purposes other then initially intended begins here. As new processes and new goals are defined support grows within the industry and certified applications, that are accepted as proper solutions to specific problems, evolve. Henceforth, depending on the technologies' sustainable success, they become recommended practice and eventually mandatory standard in their new areas.

2.2 "Persuasive Games" - A Rhetoric Approach

Based on his theory of *procedural rhetoric* Ian Bogost holds a different view on what serious games are and why they are able to influence people [**?**]. Contrary to Smith he doesn't include the technologies modern video games are based on into his connotation of serious games and thus only talks about actual games. He claims that video games have a unique persuasive power, which enables them to go far beyond the borders of entertainment. Not only can they serve new explicitly defined purposes like e.g. learning or training. They even have the power to change the player's opinions and attitudes yielding long-term social change. The latter being an ability Bogost only concedes to *persuasive games*, he actually distinguishes them from serious games. Nevertheless in this paper Bogost's idea of persuasive games will be presented as a sub-class of serious games. Not in that the distinctions he makes shall be ignored, but in that this paper understands serious games as games

that serve a purpose other than entertainment. Hence both, persuasive and serious games as Bogost sees them match the concept used here.

In his 2007 book *Persuasive Games: The Expressive Power of Videogames* Bogost says:

> *I give the name persuasive games to videogames that mount procedural rhetorics effectively.*

To fully understand what persuasive games are and how they function, it is essential to first understand what is meant in *procedural rhetoric*.
Section 2.2.1 is going to give an introduction to procedural rhetoric. Section 2.2.2 will deal with how persuasive games implement procedural rhetoric and how they influence people, and will also shortly elaborate on Bogost's distinctions previously mentioned.

2.2.1 Procedural Rhetoric

Like the term *serious games*, *procedural rhetoric* too is not immediately intelligible, as again two things are brought together that one wouldn't possibly associate with each other. So before procedural rhetoric itself is going to be addressed a short explanation of the two terms is given.

Procedurality: The free online encyclopedia Wikipedia defines *procedure* in the following way [Wikipedia b]:

> *A procedure is a specification of series of actions, acts or operations which have to be executed in the same manner in order to always obtain the same result in the same circumstances.*

With this being a rather rigid concept Bogost extends and simultaneously relaxes the definition given a little, though not denying it. He claims that procedures can structure behavior, by providing a set of rules and a framework of operations which action takes place in. Procedures have expressive power, yet not in a way that art or literature have. They do so in a more subtle way by guiding people, in that they prescribe how to act and making it impossible to break out of certain borders.
Bogost even identifies procedural figures, forms and genres, which are terms usually associated with literature. He describes them in video games, which can be considered to have (at least) a procedural foundation, since they are a special piece of software. Software in turn consists of an amount of instructions and rules, which corresponds pretty well with the definition of procedurality previously given. Typical procedural figures found in video games are movements, physical interactions and lighting effects, as they all follow well defined principles. In combining all these (and many others) together into a game engine a procedural form is being created. This again serves as a basis for a wide variety of expressive artifacts. Bogost compares it to the literary form of a sonnet. He says that, on it's own, neither a sonnet nor a game engine really makes sense. They both are abstract constructs and only provide a way to formulate an expression.

> *A classical Newtonian mechanics simulation can easily facilitate both war (projectile fire) and naturalism (ballooning), just as a sonnet can facilitate both religious (John Donne) and amorous (Shakespeare) expression.*

Procedural genres again are made up of procedural forms. In video games classic examples would be the first-person shooter, strategy games and so forth.

Rhetoric: The term *rhetoric* sometimes doesn't have a good reputation, as people tend to associate it with "idle talk". It is frequently considered the questionable art of speaking elaborate and in a well-crafted way without conveying any real content, or answering any questions. Moreover, a common notion of rhetoric is that of speech used to deceive and conceal real intentions.
This connotation of rhetoric though is rather new. Originally it was thought of as a means of persuasion through speech, first appearing about 2500 years ago in Plato's *Gorgias*. In ancient Greece the term *rhetoric* meant "public speaking for civic purposes" [**?**], which again often dealt with persuasion in some way. Very common examples were (and still are) court hearings. While citizens then had to defend themselves in a persuasive speech this is now done by professionals, but the ways of doing so are basically still the same. Lots of rhetorical figures and locutions have been created to aid in the purpose of persuasion. One of these, the *enthymeme*, shall be described here as it will be used later.
According to Wikipedia [Wikipedia a]:

> *An enthymeme is an informally stated syllogism (a three-part deductive argument) with an unstated assumption that must be true for the premises to lead to the conclusion.*

An enthymeme poses a statement on some issue but avoids to give the receiver the background knowledge needed to fully apprehend it. It omits assumed facts that would actually be necessary to prove that the proposition is true. An example given by Bogost in his discourse on rhetoric is "We cannot trust this man, as he is a politician". Here is how this enthymeme works:

1. Politicians are not trustworthy. (Omitted)
2. This man is a politician.
3. Therefore, we cannot trust this man.

With rhetoric actually closely related to oratory and the spoken word it is worthwhile noting that it is by no means a unique feature of speech only.
With the emergence of photography, film and television the new field of *visual rhetoric* came into play. Images as well have the ability to mount arguments and thereby change peoples' minds. One might argue that they even have a greater power behind them, as visual impressions are usually easier and faster perceived and treated by human beings. As pictures are more vivid than written or even spoken word this makes them attractive to their use in advertising. Not everybody agrees though that advertisers use visual rhetoric. It is argued that advertisements don't really persuade, in that they produce arguments. They rather intend to trigger certain stimuli in people, resulting in the purchase of a product.
In these highly computerized times a new subfield called *digital rhetoric* is being created. It is characterized by computer-related means of "communication", like e-mail, electronic slides, websites, blogs, etc. [Losh]. It can be argued that there actually is no such thing as digital rhetoric, since it just deals with a new presentation of old contents. Still, the world wide web for example provides whole new ways of presenting and explaining ideas by means of hypertext and linking, which again legitimates the term digital rhetoric.

Combining the two terms introduced above Ian Bogost suggests the new field of *procedural rhetoric* and describes it as

> *the practice of using processes persuasively, just as verbal rhetoric is the practice of using oratory persuasively*

and visual rhetoric is the practice of using images persuasively.

Procedural rhetoric mounts arguments not by describing them in written or spoken words, nor does it by showing actual situations in an image or video. It inscribes them into procedures, defining rules of behavior and constructing dynamic models. Thus when executing these procedures the intended meaning is inevitably communicated and perceived not only by the outcome, but also by the process of execution. Bogost sees the need for this new form of rhetoric given, as computers, and in turn software and especially video games, continuously pervade our world more and more. With these being procedural mediums, as discussed previously, traditional rhetorical fields no longer suffice to describe their functionality in persuasion.
As pointed out earlier, visual rhetoric benefits from a much higher vividness than traditional verbal rhetoric, making it more persuasive in turn. An objection already raised in the face of advertising may state that pictures do not really bring forward arguments but in fact manipulate the observer. The same two things apply as well for procedural rhetoric.
Bogost presents a table created by Charles Hill, that deals with the vividness of different representational levels, ordering them from most to least vivid information (see Figure 5).

Most Vivid Information	actual experience
	moving images with sound
	static photograph
	realistic painting
	line drawing
	narrative, descriptive account
	descriptive account
	abstract, impersonal analysis
Least Vivid Information	statistics

Figure 5: "A comprehensive continuum of vividness." *Source: Bogost, 2007*

It can instantly be seen, that procedural representation wasn't even mentioned by Hill, so the question is where to fit it within the given continuum. Considering the second most vivid representational form, that is "moving images with sound" and comparing it to modern video games, which can be seen as a means of procedural representation, the similarities are remarkable. Video games do as well produce moving images and sound, but, in that they allow user interaction, they do a lot more. Allowing the user to control the action on screen, steering it into particular directions, the experience becomes even more appealing. Of course it still isn't real but nevertheless to be placed above "moving images with sound" as the second most vivid form of representation. On the contrary there are procedural representations that do not provide such a wealth in visual and acoustical output, nor do they offer rich possibilities for interaction. Mathematical simulations for example only require numerical input once and output their results as diagrams, tables or even just a single numerical value. This again makes them more akin to "abstract, impersonal analysis" or even "statistics". Anyway, since this paper deals with games it is, for our purposes, safe to assume that the vividness of procedural representations is to be settled at a rather high level.
Concerning the question whether procedural rhetoric is able to actually mount arguments, it can be stated that it certainly isn't in such a direct and intuitive way verbal representation is. Arguments are communicated in a more subtle way, as they are not explicitly formulated, but transcribed into functionalities and rules. Hence these arguments are not that much perceived, they are rather experienced during execution. Though this way of communicating ideas is indisputably not the most familiar way of arguing, it is no less valid. In fact it possibly even holds a lot more potential.
Games that successfully mount procedural rhetoric present arguments in a way that resembles the previously mentioned rhetorical figure of the enthymeme. They set up an environment in which the player has to achieve certain goals and provide him with tools and abilities to do so. The player is free to do whatever he wants to do but the game imposes upon him a certain behavior, which he has to adopt in order to succeed. The game therefore only provides a framework and the missing part of the argument to be mounted has to be filled in by the player through action. Of course one might sense the intention behind a game from its rules and the possible actions to be taken. But just like the reader (or listener) has to come up with the unmentioned assumption to fully comprehend an enthymeme, the player has to effectively take the actions in order to succeed *and* to learn the lesson intended.

2.2.2 Persuasive Games

A definition of what Bogost calls *persuasive games* has already been given. His notion of persuasion in video games differs significantly from earlier approaches, as for example used in arcade games. These games accept coins as payment and their primary goal was to persuade the player to insert more coins. Therefore a lot of effort was put into the game design and into fine gameplay balancing . The purpose of these games though is not to provide an meaningful, interesting and aesthetic game, but to create a game that earns the operators as much money as possible. One way to achieve this goal is *partial reinforcement*. A concept initially deployed in slot machines, which, every once in a while spit out coins, rewarding and reassuring the gambler in hopes of driving him to spend even more money. This principle is implemented in video games by means like occasional upgrades, score-doubling or unlocking of additional levels. While the analysis of arcade games might give information about how to design games that players are compelled to and eager to finish, this is not the kind of persuasion Bogost means when he speaks of persuasive games.
Exactly contrary to arcade games persuasive games intend to draw the player's attention away from the game world towards the real world. They are not an end in itself, but want to influence the player, altering his opinions, by making claims about real world processes. As games become more popular and arouse more public interest it doesn't even have to be solely the game, but the mere fact that it is produced and distributed that can have a persuasive effect. "The Howard Dean for Iowa Game", Bogost himself together with Gonzalo Frasca designed in 2003 for the presidential election campaign was the first game ever to support a candidate running for president. Although it did mount procedural rhetoric it was also the publication of the game itself, that had a certain effect. It implicated that Dean stood for technological progress and fresh, new ideas. Another example of the kind is "Tactical Iraqi", which will be explained in further detail in Section 3.2.1. The game was created by the U.S. Army to aid soldiers in learning the Arabic language. Elizabeth Losh though assumes that this might have not even been the primary purpose in developing the game. In a discussion on "Tactical Iraqi" at *Water Cooler Games*, a website that deals with the use of video games beyond entertainment, Losh writes:

> *Despite what the researchers thought they were doing, perhaps it was primarily intended to SHOW the teaching of Arabic to policy makers and the general public not actually TEACH Arabic more effectively. Traditional classroom teaching doesn't make for a good media spectacle, but a video game might.*

Again the game itself does implement procedural rhetoric, but the main goal, as Losh suggests, may have been to draw the public's

Figure 6: Screenshot from ”Congo Jones and the Loggers of Doom”

Figure 7: Screenshot from ”The McDonald’s Video Game”

attention away from the strictly military operation in Iraq. Showing that a lot of effort is put into teaching soldiers the local language shall give the impression, that a peaceful intervention is the Army’s primary intent. This for sure is a rhetorical gesture as well, but it certainly is not of a procedural nature.
In the following two games that attempt to deploy procedural rhetoric shall be shortly presented.

”Congo Jones and the Loggers of Doom” (see Figure 6) is the sequel to ”Congo Jones and the Raiders of the Lost Bark”. Both are games about deforestation, sponsored by *The Rainforest Foundation* and can be played on their website. The player first controls a monkey, then a native in order to map the local peoples’ land, which the game argues ”is often the first step to the legal protection of rainforests”. The game is basically a jump’n’run, in which the player has to jump from platform to platform dodging flying chainsaws in order to safely reach the end of each level. It may succeed in raising awareness about the issue but, if at all, it doesn’t achieve this by raising an appropriate procedural rhetoric. There is simply a different game-play borrowed and a new graphical skin mapped onto it. The procedural rhetoric of a jump’n’rum though is not really suited for the issue of concern, since jumping over canyons and avoiding obstacles doesn’t really have anything to do with deforestation.

An example in which procedural rhetoric is mounted successfully is ”The McDonald’s Video Game”. A game created by the italian Molleindustria, a social critic group which ”aims to reappropriate video games as a popular form of mass communication.” [Molleindustria] It deals with McDonald’s business practices and puts the player in control of four different sections of the production process. The player has to simultaneously manage the pasture in South America, the slaughterhouse, the restaurant and the headquarter office.
In South America (see Figure 7) cattle is raised and soy is cultivated, in order to provide the slaughterhouse with a sufficient amount of cows. Since there is only a limited amount of space one can chop down the rain forest, destroy indigenous people’s villages or corrupt the mayor to convert their corn fields into soy fields. The slaughterhouse is where the cows are finally fattened, slaughtered and processed for their use in the restaurants. Bottlenecks here can be bypassed by mixing the soy fed to the cows with industrial waste, hormones and even meat and bone meal. The player can decide whether to kill diseased animals, or slaughter and process them anyway. In the restaurants one can hire personnel, which tends to complain, when over-worked. It is up to the player whether he improves the working atmosphere or simply fires troublemakers. Finally the headquarter office is where all the strings run together. Here, the player can look up current sales figures and develop new marketing strategies. Since it is possible, that the measures taken in other stages of the game arouse public disapproval one is offered the opportunity to corrupt politicians, health officers, nutritionists and climatologists.
Soon the player has to find out that, no matter how hard he tries, he cannot avoid taking questionable actions in order to survive. Thus, after a short time, he finds himself exploiting the indigenous population of South-America, genetically modifying soy crops and fattening up his cows with hormones. In that, the game deploys procedural rhetoric just in the same way that it was described earlier. It sets up an environment in which everything is possible. The player is free to choose either the ”righteous” or the ”felonious” way, yet the logics and rules of the game will eventually force him to strike the latter path. He is thus persuaded of the fact that he won’t succeed in acting upright. This special form of persuasion again is very powerful as the player isn’t just presented an argument, but forced to act out a special situation. He hence experiences the circumstances and consequences personally, which again corresponds perfectly with the results of the previous discussion on the vividness of procedural rhetoric.

As already mentioned, Bogost distinguishes *serious games* from *persuasive games*. It has also been pointed out that this paper holds a different view on this issue but Bogost’s distinction shall nevertheless be shortly examined. He claims that *serious games* are solely created to support the needs and interests of the institutions they emerge from. Educational games are going to pursue educational goals only; first responder games will simulate disasters and terrorist attacks in order to train and prepare; and military games like ”America’s Army” will always just satisfy military needs, like the recruitment of new soldiers in the given example.
Persuasive Games on the other hand have the potential to alter people’s opinions. In that they can portray real world processes they also have the potential to suggest improvements, or even whole new processes. They do not have to conform to given behavior, but can raise objections and critique. And finally the deployment of strong procedural rhetorics may even have the potential to yield social change.

3 Contexts of Serious Games

With different application areas of serious games already mentioned (compare Figure 1), this section intends to give insight into two contexts where they are used. Context here refers to the very basic intent of a game and there shall be two major purposes observed here. Section 3.1 is going to deal with the use of games in advertising, subsequently referred to as *advergaming* and will take a rather theoretical approach. Section 3.2 in turn will cover the field of educational gaming or *edugaming* and points out how these games work in practice, describing the game "Tactical Iraqi".
Speaking of advergames here doesn't mean, that these games are solely used in commercial advertising campaigns. Advergaming deals with convincing the player of a certain idea. As these ideas can range from the benefits of joining into military service , like with "America's army", to calling attention to bad business practices, like with "The McDonald's Video Game", they do not necessarily intend to sell a product. Persuasive games for example exclusively aim at convincing people of an idea, although Bogost would possibly argue that the very term *advergames* refers to games, that do not persuade, but manipulate [**?**]. Mattias Svhan's definition of the four types of advergaming though brings forward one type, that matches the definition of persuasive games pretty well [Svahn 2007]. So, when taking a broader view at the issue one can assign every game that tries to persuade the player of something to advergaming, yet there of course are different levels of sophistication. Similar thoughts can be applied to educational games. It doesn't matter whether these are high tech virtual reality training simulations, as in flight simulators, or simple language learning tools executed on a home desktop computer. The basic intention behind all of them is the improvement of the player's skills.

3.1 Advergaming - A Theoretical Approach

With a growing interest in advergames, the question arises what these games actually are and how they exert their influence on players. Mattias Svahn, in his paper *Future-proofing advergaming* defines an advergame, based on Lindley's definition of a game as the following:

> *A goal-directed and competitive activity conducted within a framework of agreed rules wholly or partially designed and produced with the intent of actively or passively assisting in the carrying and dissemination of a message designed to persuade the player to change a behaviour in the world outside the magic circle of the game.*

In the following, two different views on this special subject shall be given, the first one being rather basic, focusing on advergames' use in actual advertising only. The second approach corresponding to a broader view on advergaming.

3.1.1 Advergames to Sell Products

Since usual ways of online advertising, most prominently the web banner, have proven to be of only moderate, if even any, success, Jane Chen and Matthew Ringel emphasize the importance of games in advertising branch. In their 2001 paper [Chen and Ringel 2001], they find that many websites incorporate games in order to encourage traffic and then again present their contents in the form of banners. The game itself, they claim, could serve this purpose even better. In turn Chen and Ringel name three ways of inscribing advertising content into video games.

1. **Associative Advergaming:** The goal in this type of advergame is to match the theme of the game to the product to be sold. A product targeted at a special group of consumers should, for one thing, be promoted in a game that appeals to the same social group. Secondly it is desirable, that the product in a real world situation too is associated with the subject of the game. The example given by Chen and Ringel was part of "Jack Daniel's" 150th anniversary campaign. It was a 3D pool game, which had the company's logo imprinted on and around the pool table.

2. **Illustrative Advergaming:** This format includes the advertised product directly into the gameplay. The player is not only able to, but most likely forced to interact with it, in order to succeed. A game by "General Mills Cinnamon Toast Crunch" is described, in which the player has to "collect his wind-scattered breakfast cereal before the start of school."

3. **Demonstrative Advergaming:** In demonstrative advergaming, the product is becoming a central part of the game. Not only in that it has to be interacted with for a successful completion of the game, but also its features are described and the benefits are accentuated. "Nike" for example launched a 3D basketball game, in which the features of a selected basketball shoe were directly mapped onto the gameplay.

The choice of the methods depends on the product to promote and the financial background of the marketing campaign. While the first two formats are rather easy to implement and therefore cheap, demonstrative advergaming requires more sophistication in development and is consequently more expensive. They nevertheless are usually more appealing and offer interesting gameplay.
Not only do Chen and Ringel present different formats of advergames, but they are also concerned with how these are distributed and published. Four of the most common ways to do so are explained as follows.

1. **Game Aggregation Sites:** Publishing a game at a game aggregation site benefits from the immense popularity of these sites. Game Aggregation Sites are among the most highly frequented sites on the internet. The drawback is that, as a result of its nature, these sites often host a huge number of games. Thus competition not only with other products, but also with other, possibly more exiting non-advertising games is enforced.

2. **Advertiser's Sites:** Presenting the advergame directly on the advertiser's corporate site brings the users wishing to play directly to the site as a whole, resulting in better awareness of the product. It might occur that nobody, or only already interested customers will ever know of the game. So in order for the game to unfold its promotional power, the game itself will have to be promoted.

3. **Third Party Sites:** These are sites that are neither affiliated with games nor with the advertising company itself. The intention behind placing games on sites like these is often to get through to a special target audience. Since the game itself also draws attention to the site traffic is increased and the hosting site benefits as well. This again may lower placement cost, or improve placement location.

4. **Viral E-mail:** Spreading a game by e-mail can be very effective, as the distribution follows an epidemic pattern. Provided, that people receiving the game in their mailbox are willing to forward it to friends and acquaintances. In order to reach the aspired goal, special considerations go into the design of games that are to be propagated via e-mail. Most viral games implement special gameplay encouraging distribution by "ap-

pealing either to the players competitive or collaborative nature." [Chen and Ringel 2001]

The success of these methods is mostly dependent on the way a game is incorporated into an advertising campaign. If the game is the central part of the campaign the publishing on game aggregation sites and special third party sites may turn out to be useful. If on the other hand a lot of effort is put into other promotional means, it might suffice to place the game on the advertiser's site, or make use of e-mail distribution [Middleton and Harper 2003].

3.1.2 Advergames to Sell Ideas

Svahn is not completely satisfied with the methods Chen and Ringel suggest. He for example argues that the different types of advergaming are not mutually exclusive. A realistic racing game is definitively demonstrative, since the player steers a virtual car, that is designed to have the same properties and features of his real world pendant. But as the player obviously has to interact with the car the game can also be considered to be illustrative. Given the product that is to be promoted the game can even be associative as well. One could argue, that demonstrative games generally are almost certainly also illustrative and associative. The most pressing objection Svahn raises though, is that the system doesn't allow for a broader view on advergames. There always needs to be a special product or a brand label that is to be interacted with, or at least displayed. Alternative ways of advertising a product or an idea are completely omitted. In "I Love Bees" an alternate-reality game created to promote the science fiction first-person-shooter "Halo 2" the product never appeared. In the course of the game it could be suspected that the whole thing was a publicity stunt, but proof wasn't given until the very end, when players were invited to several cinemas where they could exclusively play "Halo 2" before the official release. This concept of an advertising game can impossibly be described by the model that Chen and Ringel endorse. Their model works fine for "small games, advertising fast moving consumer goods" [Svahn 2007]. It has to fail though when it comes to larger game types, promoting not only products, but opinions and ideologies.
Svahn also argues that different media have different characteristics and convey messages in a different way and some even have the possibility to speak through themselves. While advertising was easy with traditional media like radio and television, which were only able to replay ready-made content, this changes with the emergence of advergames. Very much in the sense of procedural rhetoric, which has already been covered here, Svahn claims that play can in itself be designed to communicate messages. Furthermore he advises against the risk of shallow advertising by ignoring the persuasive power of play and just stuffing brand images into generic games. Thus he introduces "a new system of understanding advergaming" [Svahn 2007].

The system Svahn proposes, defines advergames not by means of particular game design properties or by the way brand labels are included. He rather describes them according to the dominance of play over the promotional message, or vice versa. This makes it possible to understand where on the three levels of game design (simulation, narrative and gameplay), the inscription of the message takes place.

> *This is done by setting up a metaphorical measure in the form of a sliding scale where at one end the play and game is the dominant party and the rhetoric/brand message incidental and on the other end the mirrorimage opposite situation where the whole play concept down to the media choice of play-as-a media in itself is designed to serve the rhetoric/brand message.*

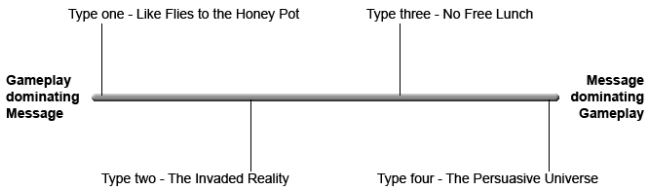

Figure 8: A new system for the categorization of advergames. *Source: Created by the author*

The scale shown in Figure 8 is actually continuous, but Svahn, however, introduces four significant types of games, which shall aid in understanding how the concept works. The four types of games are discussed in the following.

1. **Like Flies to the Honey Pot:** Games of this kind do not have any form of advertisement factored directly into them. They are independent applications that are simply surrounded by advertising material, to which they are supposed to draw the users' attention. Since the game itself is by no means related to any promotional intentions this type of games is to be placed on one end of the scale. The gameplay not only dominates the message, there *is* not even a message to be dominated.

2. **The Invaded Reality:** Sometimes referred to as in-game advertising this is what approximately corresponds to Chen and Ringel's *Associative Advergaming*. Brand labels are placed within the game, but they cannot be interacted with and don't serve any vital purpose for the gameplay. A prominent example of this type of game is "Need for Speed" (see Figure 9), where every once in a while during a race, the player drives past a "Burger King" restaurant. The appearance of the brand logo on the road side doesn't have any influence on the game. In fact it wouldn't make any difference, if it was replaced by another company's logo, or even removed completely. Some games of this kind are even designed to enable a connection to a dynamic ad-insertion network, which regularly changes the advertisements in the game.
   With the promotional content being completely interchangeable without any difficulty, the message is still dominated by the gameplay. Nevertheless it has gained a little more importance, as it is now perceived along with the game and not separate from it.

3. **No Free Lunch:** When the primary intent of category one and two games still was entertainment and advertising was just in some way attached to it, this changes with this kind of games. They often are the centerpiece of an advertising campaign and therefore "may not cost any money to play, but there is no free lunch" [Svahn 2007]. Their sole purpose is to promote a certain product or idea. Much more effort is put into the design of these games in order to effectively communicate the intended message. Contrary to type two games, where the content was inscribed into the simulation level only, it is now moved and incorporated into the gameplay level. In most cases this is achieved by importing product-related items, or even the product itself into the game. Yet this is mostly why, even though the gameplay carries the message, it is not part of the message itself, which significantly distinguishes these games from category four games.
   The game could easily be visually redesigned, with the basic engine and gameplay staying the same, and would still be valid, only serving another purpose. Figure 10 shows a

Figure 9: "Burger King" advertisement in the racing game "Need for Speed"

screenshot from "Mojo Master", an example for this kind of games, released by the deodorant manufacturer "Axe". The goal was to seduce as many women as possible and the primary means to achieve this goal were conversational moves like, for example, the right pick-up lines at the right time. But aside from these the player also had special items, like "Axe" deodorants and shower gels, at his disposal, which happened to turn out useful.
This game, of course, could be easily altered to serve the purposes of *any* manufacturer of body hygiene products, because the act of play still is decoupled from any message.

Figure 10: Screenshot from the game "Mojo Master"

4. **The Persuasive Universe:** In this sort of games every single aspect of a game is designed to serve the promotion of one single idea. It is factored deep into the gameplay, so the act of playing the game itself conveys the message to the player. Brand logos, or any other visible hints no longer need to be embedded and displayed. The game itself has become a

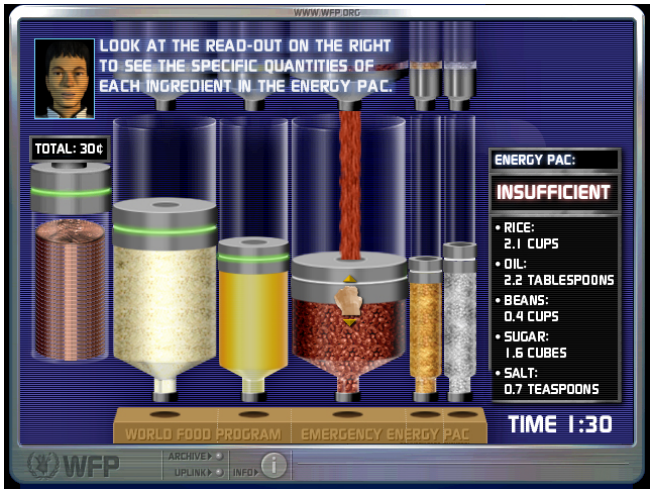

Figure 11: Figuring out a healthy diet for only 30 cents a day is one of the task in the game "Food Force"

rhetorical medium, which qualifies this type of games as *persuasive games*, as introduced by Ian Bogost and discussed in section 2.2.2
One of the examples given by Svahn is "The Food Force" (see Figure 11), which was produced for the "United Nations World Food Program". The player, along with a team of specialists, is sent to a fictional island, which is devastated by drought and civil war. Based on real world proceedings, there are six missions to be accomplished, all dealing with how the island's starving people can be supported.
With this category the opposite end of the scale is reached. The promotional message now dominates every aspect of the game. In fact, the game would not even exist without it.

3.2 Edugaming - A Practical Approach

Besides the use of games in promoting (both commercial and ideological) messages, another area, where games are employed, is education. With learning and playing being two activities that are usually thought of as mutually exclusive, this might actually be the very reason why education can benefit from the use of games. While learning is most commonly experienced as a duty, or even an annoying chore, gaming is a fun activity, something done when, in fact, *off-duty*. Learning is enforced, gaming happens voluntarily and people, by human nature, perform activities, that they actually *chose* to perform way more enthusiastically than those, that are forced upon them. So factoring educational content into video games, in a way that preserves their engaging nature, can yield significant success in learning outcome. When confronted with an appealing challenge, presented within an equally appealing setting players are willing to take considerable effort, in order to master it. Loads of teenagers spend hours on playing commercial computer games each day. They pursue particular game specific goals, but alongside also improve their gameplay skill and thus become ever more sophisticated in the matter of the game. Just like that, educational content can be almost unconsciously absorbed, provided that it has been integrated into the gameplay in a sufficiently subtle way. Not only do games provide a more exciting and appealing way, that educational content can be presented, but they also change the way the learning process actually functions. Video games completely change the context of learning by creating a virtual world, which

the user is put into and forced to interact with. Things are not perceived in an abstract way, detached from their usual context. They immediately get a meaning, in that the player can instantly apply his newly acquired knowledge. In fact he might have even only acquired it, in order to get a specific action done. Thus, the learner can easily keep up a connection between abstract ideas and their practical significance, an aspect frequently neglected in traditional teaching [Shaffer et al. 2005].
Moreover, also games that do not even intend to train or teach can have an educational impact on its players. While there may be an argument about whether or not games can positively influence abilities like hand-eye coordination or reflexes, it is a matter of fact that, especially large multiplayer games lead to the development of new communities. These allow for the sophistication of social skills and can possibly provide insight into social processes, the player wouldn't be able to experience in the real world. An accordant example is the presidential election, that was held in Alphaville, a town in "The Sims Online", in April 2004. 21 year old Arthur Baynes, incumbent president, ran against Laura McKnight, a 14 year old middle school student. The election campaigns, just like real world campaigns, contained everything from valid arguments to muckraking accusations and taught everybody involved a lot about real world politics [Shaffer et al. 2005].

Having pointed out shortly how and why video games have the potential to significantly aid educational purposes, there shall be one example, based on the research conducted by Elizabeth Losh in [Losh 2005] and [Losh 2006], is briefly described. Admittedly this is probably not the first application that comes to mind, when thinking about educational games, however, it fits well into the current worldwide political situation and hence might be of interest.

3.2.1 Language Learning with "Tactical Iraqi"

"Tactical Iraqi" is a language learning game, which originated at the Center for Advanced Research in Technology for Education (CARTE) at the Information Sciences Institute of the University of Southern California. The development was, amongst others, heavily supported by several U.S. military departments, as there was a critical shortage of Arabic speakers in the armed forces. The game is based on the "Unreal Tournament 2003" engine, which, within *eight months*, was freed from any code used to display violence, or gore effects. It features a speech recognition system and a social simulation tool, called *PsychSim*. The game consists of three major parts: the Mission Game, the Skill Builder and the Arcade Game.

The Mission Game, that is the centerpiece of the game, is shown in Figure 12. Not only does it aim at displaying the setting as realistic as possible, but also at achieving a high degree of *social realism*. The virtual characters involved are designed to act according to real world rituals and manners, which involves everything from usual greeting phrases to the consumption of non-alcoholic beverages only.
Acting as Sergeant John Smith, the player has to rebuild a girls' school in Iraq. In order to achieve his goal Smith not only has to act in public spaces but is also forced to enter private areas and not all citizens are well disposed to him. Some characters mistrust him and don't want to have anything to do with him, others are even hostile, swearing and cursing at him. Depending on the player's language and negotiation skills people can either be convinced of Smith's good intentions and henceforth cooperate, or access to critical regions is restricted. Of course there are no weapons or martial art tricks available, so the only support Smith can rely on is an Arabic speaking female squad member, that can come up with suggestions.
Learning the language itself is a big part of the game, yet there's more to actual language than just spoken words. Therefore, besides speech, the game's focus also lies on paralinguistic learning, as special gestures and signs do not bear the same meaning, when used in different sociocultural contexts. A commonly used *thumbs-up* for example "can have a highly insulting inverse meaning, while removing one's eyeglasses demonstrates knowledge of a regionally-specific gesture of respect." [Losh 2005]

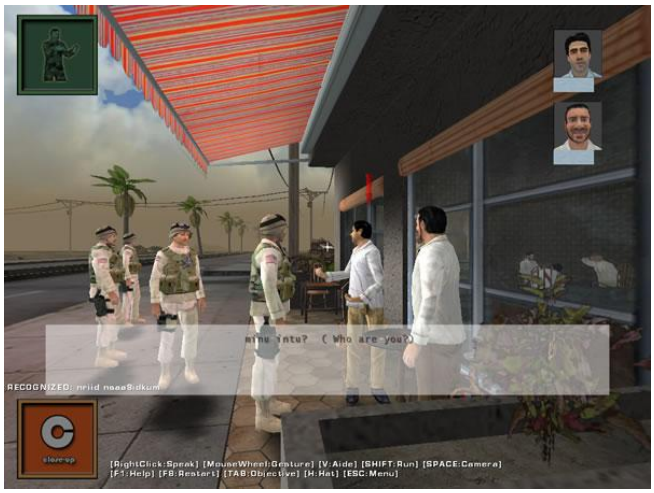

Figure 12: Asking citizens for information in "Tactical Iraqi"'s Mission Game

The Skill Builder, shown in Figure 13, is basically a classical language learning tool. It provides several interactive exercises, providing the player with knowledge about vocabulary, pronunciation, grammar and cultural issues, all things needed to get along in the Mission Game. Supervised by a virtual tutor, that checks pronunciation and syntax, the learner has to repeat phrases, answer correctly in a dialog and take evaluation quizzes. The Skill Builder has proven to be a useful tool although language needs to be learned and trained in situational context, as has been shown in commercial language learning software.

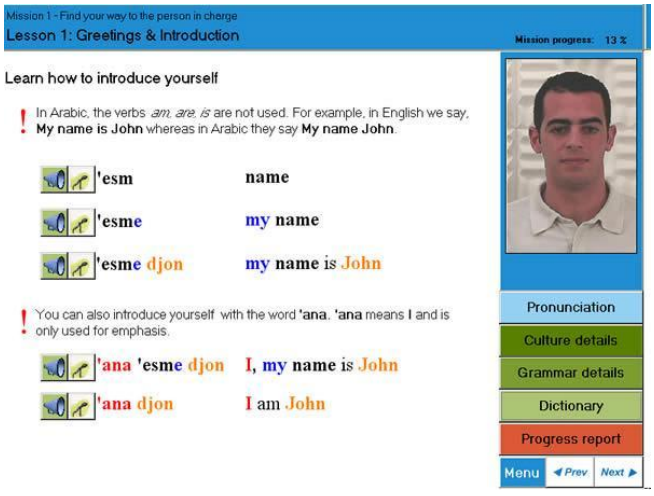

Figure 13: Classic language learning in "Tactical Iraqi"'s Skill Builder

The Arcade Game, shown in Figure 14, gives a further opportunity

to improve one's Arabic skills. The player controls his character by correctly naming directions. While running through the level he picks up items and "enemy elements of different colors periodically appear to be destroyed" [Losh 2005]. The latter being commented by Lewis Johnson, principal investigator in the project, with "You had to put in something you blow up" in order to make the game enjoyable and interesting. Contrary to the other parts of the game, quick response time is needed here, which aids in "speeding up the acquisition of prepositional and descriptive phrases" [Losh 2005]. Losh though criticizes that the Arcade Game completely neglects any cultural aspect and directly relates linguistic knowledge to destructive power.
On the other hand it is argued that the game serves its purpose, in that it is relatively easy and fun to play, while still supporting the learning process. Although learners reported, that they liked to play the Arcade Game as a diversion from their study in the Skill Builder, they never actually stopped practicing. This opportunity to change pace encourages the learner to spend more time with the application, while otherwise being quickly bored and annoyed [Johnson et al. 2005].

Figure 14: The Arcade Game in "Tactical Iraqi"

"Tactical Iraqi" is certainly not a standard language learning game. Characters the player has to interact with in classical applications are patient and friendly throughout. While these, at most, express polite confusion, the interlocutors in "Tactical Iraqi" are prone to yell at Smith, insulting and even threatening him with physical harm, should he take any unpopular actions. Smith is an outsider, trying to gain access to a society, whose majority of members is suspicious of him. Thus the learner spends a significant amount of play time on convincing the virtual characters to trust him, which leads to an important point of criticism. With respect to the main use of the application in the training of soldiers involved in the U.S. intervention in Iraq, it is questionable whether basing language training on one special task is reasonable. The player's only goal is to rebuild the girls' school and all the virtual characters are designed to either provide or reject help. Of course there are general conversation skills conveyed, as for example in the fourth chapter when Smith is asked about his family background, but these are only very basic and the off-topic discourses are rather superficial. In a real world situation though soldiers are likely confronted with profound questions, for example about the unpopular political agenda pursued by the U.S. government. The game though doesn't equip learners with the knowledge needed to conduct a substantial conversation, which can lead to significant shortcomings in real world situations. Another issue, criticized by Arabic speakers who reviewed the game, was that the iraqi characters didn't speak any English at all. At least the local authorities would certainly be able to, at least, make use of a mixture of both languages, supporting a successful communication. Developers though, countered that a feature that allows for hybridized language, would exceed the speech recognition software's capabilities.
There are certainly more then the above points of criticism, some of them not even concerned with the functionality of the game itself. Elizabeth Losh, as already mentioned before, demurred that the game might have not even been released, primarily in order to meet the lack of Arabic speaking U.S. soldiers in Iraq, but to detract attention from the military intervention. Others, like Gonzalo Frasca, together with Ian Bogost co-editor at *Water Cooler Games*, go one step further. In a discussion on the website, entitled *Shame on Tactical Iraqi*, Frasca argues that the mere development of games for *any* military purpose is virtual accessory to murder [Frasca 2006].

> *You know what, whoever designs videogames to train invasion forces deserves my pity. They are pulling the trigger with every single line of code they create, with every single page of design doc they write [...] This freakin' war is so wrong for so many reasons and it totally disgusts me. And I am disgusted about people who are accomplices to murder, even if they may not realize it while sipping their lattes in sunny California. You are not and will never be my colleagues. The Army money that funds your projects is tainted with blood and what you are doing is just simply wrong. Unlike the poor guys taking the bullets in the frontline, you guys had an education. You should know better. Shame on you!*

4 The Effectiveness of Serious Games

Serious games have undoubtedly been gaining more and more publicity and importance in recent days. A new movement is emerging within the game industry, followers of which pursue their goals with remarkable passion and devotion. Companies have been founded, exclusively devoted to the development of serious games. Eventually, with all the attention paid to these, the question arises, whether all the effort is even worth it. The game developer community would certainly answer, that video games, as a matter of fact, have the potential to influence people, their opinions and their behavior. And, indeed, statistics are impressive and seem to prove the developers to be right. According to the producers there are over eight million user accounts registered for the game "America's Army" by now. The previously discussed "Food Force" has been downloaded even one million times within the first six weeks after its release. These statistics are, in fact, impressing, yet they do not really answer the question. They show, that there is significant interest in the games, but whether or not players are affected by the messages the games intend to convey can not be told from these numbers. [Lavender 2007]
Contrary to the development of serious games, there has been hardly any effort put into the evaluation of their actual effectiveness. Still, in the following, a case study on the issue, conducted by Wee Ling Wong et al. [Wong et al. 2007], shall be presented, yielding interesting results.

The study deals with the game "Metalloman", shown in Figure 15, developed at the University of South California, which intends to teach physiology concepts to undergraduate students. The learning matter, that is delivered in the game, is not simplified and generally players are not just presented contents, but they are enabled to

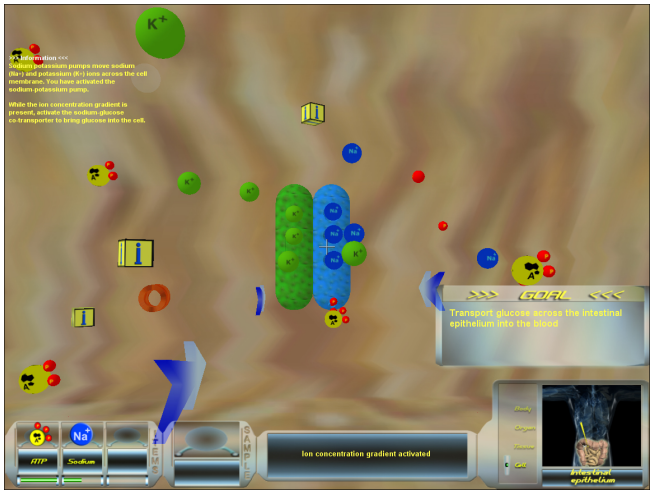

Figure 15: Screenshot from the game "Metalloman"

actively experience them. Thus the game was carefully designed, to find a good balance between the successful mediation of educational content and an engaging, fun gameplay. Metalloman is a superhero like character, that has to accomplish various missions, all concerning the human physiology. He has access to the human body at several different scales, ranging from the entire body, to groups of single organs or to the cells at a molecular level. Navigation between the different levels of detail happens by successfully unlocking so called wormholes. Mission goals, according to Wong et al., are achieved by:

- identifying sample structures to unlock wormholes.
- collecting substance items.
- using these substances to reactivate processes.

The game-inherent interactivity enables the students to autonomously figure out a connection between biological substances or structures and associated physiological functions. Previous empirical usability test have shown that "Metalloman", in fact is "supportive, unobtrusive and effective for learning" [Wong et al. 2007]. Wong et al. intend to validate these results, by examining whether and, if so, to what degree new media, and especially video games, have a positive influence on learning outcome. They argue that interactivity and media richness are the most significant features of new media, both of which might have the potential to affect the learning process by either drawing attention to the subject matter, or increasing enjoyment and thus enhancing motivation. In accordance, they formulate two research questions, as follows.

1. *Learning effects of interactivity: Specifically, can deeper learning be attributed to an interactive media format versus a non- interactive media format?*
2. *Learning effects of a combination of both interactivity and media richness: Specifically, can deeper learning be attributed to an enriched interactive multimedia format versus an interactive hypertext format?*

The experiment included 100 students, all non-science majors and therefore unequipped with profound preliminary knowledge about the subject. Considering gender, video game literacy and prior knowledge they were divided into 4 groups, each of which was presented the same content, but through different media. The presentational forms were characterized by media richness, ranging from high, over moderate, to low, on the one hand and interactivity, or non-interactivity on the other hand. A classification is given in Figure 16.

	High media richness	**Moderate media richness**	**Low media richness**
Interactive	Game **(I)**	Hypertext **(III)**	
Non-interactive	Replay **(II)**		Text **(IV)**

Figure 16: Comparison of the four formats used in the Ling Wong study. *Source: Wong et al., 2007*

Group I was given the game and had to play one common training mission and one specific-content mission. Matched pairs between group I and II were formed and the recorded gameplay of group I members were subsequently shown to the according members of group II. This allowed for an analysis of the importance of interactivity in the learning process. Participants of group III were presented a hypertext version of the game "including the narrative context and screenshots from the game" [Wong et al. 2007]. Group IV was provided with plain written text fragments taken from the game, enriched though with pictures.
In order to evaluate the effective gain in knowledge, participants of all groups had to take multiple choice tests on "vocabulary, processes, and cause-and-effect relations" [Wong et al. 2007]. Tests were administered before and after the confrontation with the respective media and there was a maximum of 10 points to be earned. Additionally, to check the sustainability of the different methods' effects, a follow-up test was held one week after the "treatment". Media effects on (amongst others) usability, enjoyment and interest in topic were measured with 5-point Likert-scales right after the media consumption. The following results were obtained.

1. **Knowledge:** Formats, both high and moderate in media richness, lead to a significant increase in knowledge and were able to sustain these effects. Interactivity in the matched pair analysis did therefore not result in better learning performance. Group IV, being provided with written material, low in media richness only, did not register any mentionable knowledge gain. The results can be seen in Figure 17.
2. **Usability:** Group IV reported, by far, the best usability. The game was experienced least usable, but neither game-replay, nor hypertext produced significantly better results, as shown in Figure 18.
3. **Interest:** Figure 19 shows that the results measuring gain of interest in the topic appear to be inverse to those measured concerning usability. The interactive formats, game and hypertext, produced the best, yet still rather moderate results. Written text only wasn't able to raise any considerable interest in the participants.
4. **Enjoyment:** The text format was the least popular way of learning, while game and hypertext were enjoyed most. Group II, watching a gameplay video, appreciated the experience less than group I and III, but still significantly more than the text group. Figure 20 shows the results.

The study reveals that new formats, able to display material in a variety of different media, do perform better in mediating educational

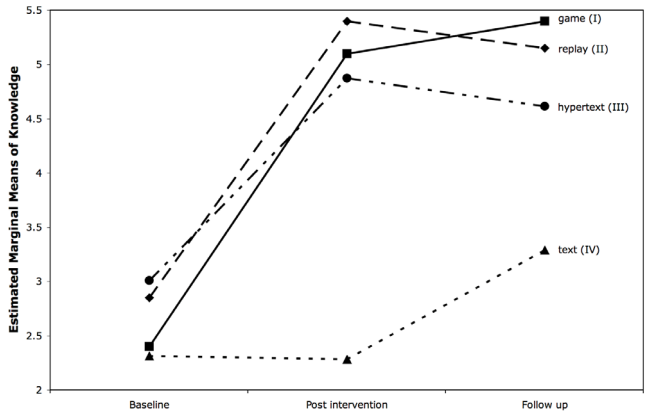

Figure 17: Effects of media format on knowledge. *Source: Wong et al., 2007*

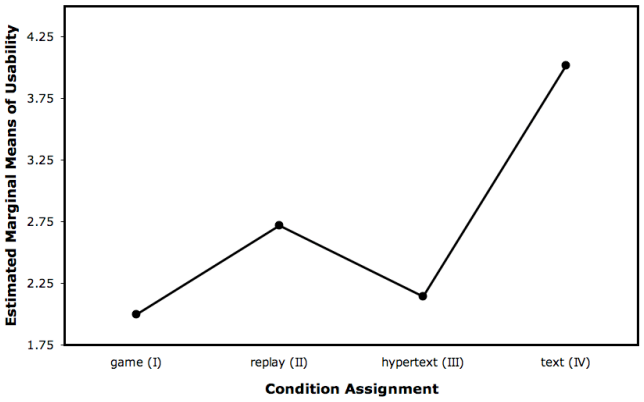

Figure 18: Perceived usability of media format. *Source: Wong et al., 2007*

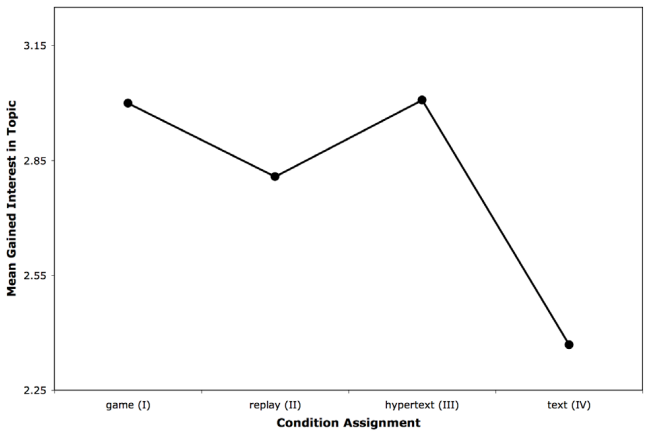

Figure 19: Effects of media format on gained interest in topic. *Source: Wong et al., 2007*

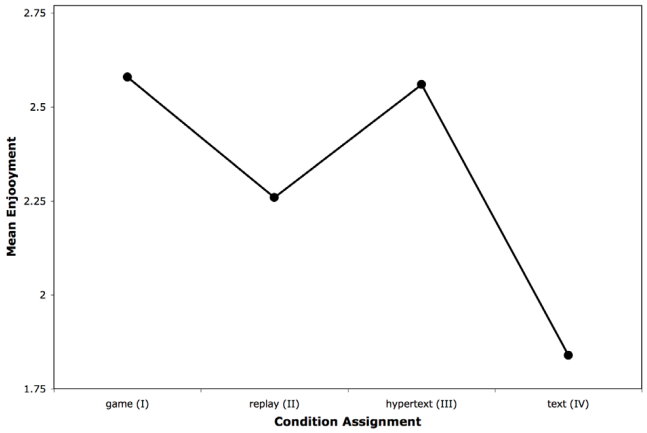

Figure 20: Effects of media format on enjoyment of the learning process. *Source: Wong et al., 2007*

contents, than traditional text book teaching. Interactivity though, the main feature distinguishing video games from other media rich formats, doesn't seem to affect learning outcomes in a positive way. Wong et al. even argue that it might have a slightly negative effect. In that learners have to simultaneously handle gameplay, they claim, they are likely to be distracted from the actual content. It has been shown, that participants in groups, provided with interactive media, did in fact report comparably more usability issues. Of course people in the study were confronted with the game for the very first time, so it is only natural that they weren't immediately able to master all aspects of the gameplay without any problems. A player's skills though usually improve over time and eventually controlling the game happens almost completely automated in the background. At this point the interaction with the medium should no longer influence the attention to the content. Thus Wong et al.'s argument probably holds true for a "first-play" situation, as observed in the study, but in the long run the distracting effects of interactivity might become insignificant. Still, granted the correctness of Wong et al's assumption in the context of the study, it is surprising that the knowledge gain in the game group didn't suffer, compared to the replay group. The explanation given states that the participants of group II weren't completely focused either. Since they were watching somebody else's game, they automatically tried to figure out the intentions behind the player's actions, thus being distracted in a similar way the players themselves were distracted by dealing with gameplay.

With the ability of video games to facilitate and increase knowledge gain in doubt, the question arises, whether they even *are* useful for other purposes than entertainment. The answer here might lie in the question. Games usually *are* entertaining and this is why people like to play them. So the most important influence that video games might have on learning is the fact that they motivate people to actually do it. The study partially proves this assumption, as it shows that the game was enjoyed most amongst the different media provided. It is moreover thoroughly possible, that it would have been even more enjoyed, once the initial usability issues were overcome. Thus it can by all means be stated, that video games are *at the least* an attractive and appealing mode of presentation for educational content.

Finally it shall be noted, that the results of the presented study do almost certainly not apply to all kinds of serious games. "Metalloman" touches upon rather complicated biological processes and therefore often provides the player with adequate information in classical written form. This again positions the game *relatively* close to traditional learning tools and possibly diminishes the game character and entertainment effects. Other forms of serious games though, like Ian Bogost's persuasive games for example, work in

entirely different ways and pursue different goals. Wong et al's study shall therefore *not* be regarded as an overall evaluation of serious games.

5 Conclusion

In this time, where home entertainment is becoming more and more dominated by video games a new genre of *serious games* attempts to benefit from their popularity. With the emerging movement being rather new, there's not even yet an agreement on what is to be classified as a serious game. While the ones consider games as tools, whose technology export to other industries qualifies as serious games, the others stick to the traditional definition of games. Serious games are thus video games that serve a primary purpose other than entertainment. Bogost again even separates *serious games* from *persuasive games*.

Not only are the definitions diversified, but also the areas of application. Advertisers have found them to be useful in promoting their products. Humanitarian organizations use them to raise public awareness on important social topics and activist groups try to enforce criticism through them. Games and game technology are used in educational institutions, in military training and even in medicine, visualizing anatomic data, simulating surgeries or treating phobias. The list could be extended largely, as games are slowly pervading every single aspect of modern life.

Considering the current hype around serious games, it is surprising that hardly anyone asks, whether all the enthusiasm is actually justified. This paper presented one case study on the effectiveness of serious games but simultaneously suggested not to consider the results as representative for the whole genre. The study is a first step and a lot of work has to be done, in order to be able to make valid statements on the influence of these games on humans. As game development tools are becoming easier to use and available to everyone, new possibilities and opportunities arise, but also new problems occur. One of the problems is the possible misuse of the medium. Every coin has two sides and if games can be used for the promotion of humanitarian ideas, what disqualifies them for the use as means of ethically questionable propaganda? The future thus holds a variety of needs for further research in the new and flourishing field of *serious games*.

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