In Matthias Rauterberg (Ed.): Entertainment Computing – ICEC 2004: Third International Conference, Eindhoven, The Netherlands, September 1 – 3, 2004. Proceedings. Lecture Notes in Computer Science, Vol. 3166 / 2004, Springer-Verlag, Heidelberg, pp. 216 – 225

How Realistic is Realism? Considerations on the Aesthetics of Computer Games

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Abstract. One of the major goals in the development of virtual environments in recent years has been to create more and more realistic scenery, characters and natural human forms of interaction with the environment. We question this approach especially for the domain of computer games for two main reasons. Firstly we argue the following: When the absolute difference between reality and virtual environments decreases one would expect the latter to become increasingly believable for a spectator. Paradoxically often the opposite is true since the attention of the spectator gets drawn to the remaining differences to a greater extent. Secondly we ask ourselves why of all things computer games which are created for entertainment should be limited with real world constraints and are not used to experience features that are only possible in virtual environments. We conclude with a 'manifesto' for the renovation of computer games.

1 Introduction

An examination of earlier and current developments in the domain of computer games suggests that a great deal of all effort is concerned with creating ever higher degrees of 'realism' and photorealism in particular. The straightforward reason behind this tendency is the strong and seemingly natural belief within the industry and among many artists that the resulting productions will consequently be more believable and immersive for the user. While doing so the term realism itself is taken as self-evident as well as the conviction of the causality that somehow 'more realism equals higher believability'.

In this paper we will at first have a quick closer look at this often misconceived term with regard to computer games in particular. We will then give several reasons for our strong belief that the approach to 'reproduce realism' in computer games will fail and is the wrong track in the attempt to create better or the best possible games. Beside own considerations these reasons are based on findings in biology, ethology, robotics and character animation. The results even suggest that realism works counterproductive for immersion of the user. We will then proceed with stating our core matter of concern: The need for a formulation of new and specific *aesthetics for computer games*. Hence we list examples from inside and outside the domain of computer games and propose some first principles, knowing that this task has to be challenged

by a broad community involved in the development of virtual environments in general and computer games in particular. In order to initiate a future and hopefully passionate debate on this issue we conclude by putting together a first *Manifesto for the Renovation of Computer Games* as a starting place.

2 Realism

What have players and marketing departments in mind when they are speaking of computer games being realistic? Surely they do think of the quality of the audio and visual presentation, the simulation of physical properties but also of the behavior of non player characters which should act naturally or like 'being real'. But can a fire-breathing dragon really be 'realistic' when there is of course no counterpart in nature?

The notion of reality often refers to the 'world itself' containing everything, the nature as well as the culture. But when talking of computer games the term 'realism' is often interpreted in a comparable or a partial sense. The notion of realism is used here to relate to a reference point. For example: If the reference point is a fantasy world equipped with trolls, dragons and magic, the appearance of a tax man from a fiscal authority like in our real world would be regarded as extremely unlikely and unrealistic. On the other hand if we speak of realistic graphics the point of reference will be the sense-impressions we receive with our eyes from the real world and the graphics on the screen will be compared with those.

Hence the question comes up how to measure the degree of realism of a computer game. To this question we do not expect an overall answer because there are finally different measures for various aspects of computer game worlds and their representation. In addition the notion of realism can always be regarded relative to a chosen point of reference. But if we took for an example the audio visual representation of the game world as well as the behavior of a non player character as a measure of realism, two different points of reference – belonging to perceptual realism or social realism respectively – are brought together, which have nothing to do with each other in the first place. Moreover there are some aspects which are barely measurable because the representation of the game world finally creates a representation of the game world inside the player's head, which is not comparable in an inter-subjective way.

Beside the term realism also other terms, which are closely related to the notion of realism, can be used to judge the quality of computer games and to classify them or particular aspects of them. *Presence* as 'illusion of nonmediation' [5] describes the experience that a medium is not perceived by a person while this person is dealing with it. As Lombard figures out the 'illusion of nonmediation' can be found in two different ways. Firstly the medium can appear invisible and transparent and the user as well as the content of the medium share the same physical environment. Secondly the medium can be transformed into something like a social entity. It is interesting to see that the expression of reality is not used in this examination (and is actually regarded in opposition to social and perceptual realism) and the focus is put only on the medium itself.

3 Drawbacks of Producing Realism

There is a desire to attain more and more realistic virtual worlds, characters and forms of interaction in computer games. This desire is driven by several reasons (one of them might be the competition in the game industry forcing companies to search for unique selling points for their products which are very often assumed in the graphical domain). One reason which is pointed out very often is the believe that the reduction of the absolute difference between real and virtual environments leads to a increase of presence and makes the virtual worlds more believable. We disagree with this point of view and do present in this paper some examples to support this opposition.

3.1 Essential and Non-Essential Information

The attempt to 'simply copy nature' neglects the fact that the information contained in different stimuli for human senses divides into *essential* and *non-essential* information. It is safe to say that the vast majority – definitely more than 90 percent, maybe even more than 99 percent – of this information is non-essential insofar that it is filtered out physiologically and mentally. Hence it will not be used at all by our senses and mind to create an inner image of the 'real world'. Findings from research on behavior control rather suggest that in fact animals' attention predominantly is confined to relatively few certain specific features and stimuli. A famous example for this are the studies on stimuli releasers by Niko Tinbergen and Konrad Lorenz. Among other Tinbergen [7] studied the herring gull chickens' pecking on their parents' beaks which hold a noticeable red spot. The chickens perform this to beg for food. The pecking behavior towards the real head of a parent (Fig.1) was set to be the normal rate. For our considerations the results then were twofold:

Fig. 1-2. Different degrees of abstraction of a Herring Gull's head and beak: 1. Original. 2. Stuffed animal.

Firstly increasingly realistic models (e.g. stuffed gull head, Fig. 2) were no more effective at eliciting pecking than a simple painted strip of cardboard (Fig.3). Secondly

exaggerated sign stimuli sometimes lead to exaggerated responses (Fig.4, supernormal releaser), i.e. work better than the original although they are far from being realistic.

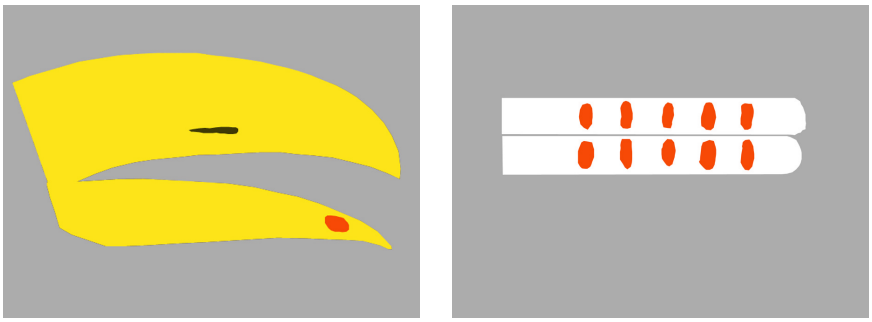

Fig. 3-4. Different degrees of abstraction of a Herring Gull's head and beak: 3. Painted cardboard with similar shape and colors. 4. Painted cardboard with exaggerated length and numerous red spots

We do not want to suggest here that complex human behavior can be explained by or should be reduced to a small set of easily measurable actions. Rather we would suggest that creators of computer games should keep in mind two things: Firstly copying nature is costly out of proportion since one has to produce all information including

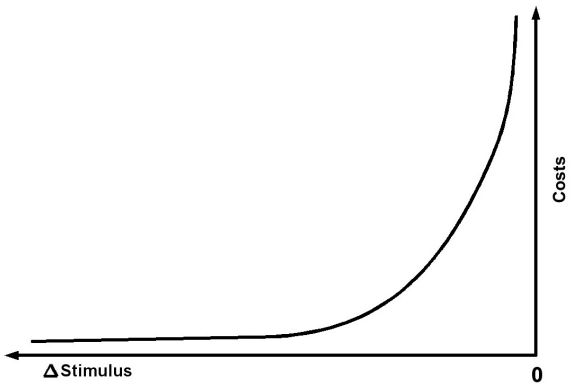

Fig. 5. The *costs* of a production in dependence of the size of *Δ Stimulus* given through the deviation of the stimuli from the virtual world related to those of the real world

the non-essential parts. While decreasing *Δ stimulus*, which here stands for the difference between artificial and real, (i.e. moving from left to right in the above diagram)

the costs to do so simply explode. But even if one does so it is secondly not at all guaranteed that the results are the best ones possible. The use of certain specific aesthetics for computer games will most likely lead to stronger responses and emotional involvement of users. We will give further existing examples for this instance in chapter 4.

3.2 A First Paradox – Single Stimuli

Mimicking real stimuli gives rise to an additional drawback. Humans undoubtedly are optimized for the perception of certain details (e.g. faces, movements). The discrepancies compared to stimuli from reality often are increasingly weighted by our cognition the closer (but not identical) the artificial stimuli are to reality. Metaphorically speaking the 'recognition of reality' awakes our 'wardens of reality' too who instantly detect the incongruities and for example judge facial movements as spastic. Hence an increase in realism might paradoxically lead to a *decrease* in believability.

A similar effect has earlier been recognized and described within the realm of robotics by the Japanese roboticist Masahiro Mori while he did psychological experiments on human responses towards humanlike robots. A good formulation of this observation into a principle in English language is given by Dave Bryant [1]. Roughly the principle states that humans respond the more emphatically towards robots the more anthropomorphic the robots are – but only until a certain degree. Now a surprising thing happens: For robots (and all other characters) which are designed even more humanlike the formerly positive reaction of the users declines and becomes strongly repulsive. Only when the robots become (nearly) indistinguishable from real humans the user reaction reaches highest positive (human-human-like) levels again. The described dip of the empathy curve is called the 'Uncanny Valley'.

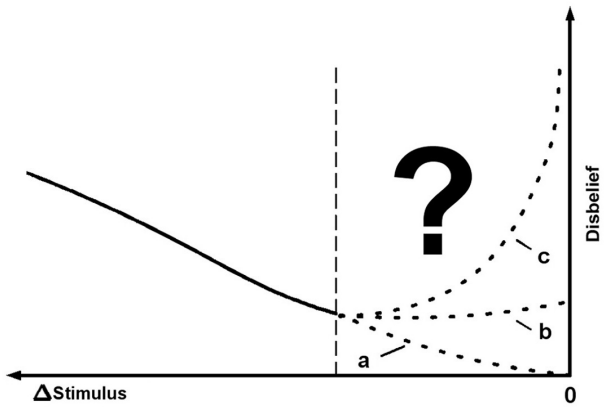

Fig. 6. The degree of *Disbelief* of a spectator in dependence of the measure of *Δ Stimulus* given through the deviation of the stimuli from the virtual world related to those of the real world

Obviously in the above principle the claim that the empathy for the robot or character will reach the highest possible rates can be regarded as an optimistic prediction since neither in robotics nor in any other field completely humanlike beings have been created to date. In the above figure we list the three possible scenarios. The most optimistic one (a) is that indeed from a certain point on the decreasing difference between the real and the artificial stimuli (Δ stimulus) leads to a continuous suspension of disbelieve of the user, finally reaching 0 and hence leads to full believability and immersion. The most pessimistic scenario (c) is that whenever humans detect even the smallest difference to reality they will refuse the artificial creation – the closer to reality the more – since an increasing number of 'wardens of reality' are awoken.

Of course any other outcome in between the two extremes (b) is possible too. We too have to leave this question open although we strongly fear that for the future (c) will be the most likely scenario. In addition to the concerns already stated in this chapter we want to list yet another observation.

3.3 A Second Paradox – Stimuli Interdependencies

The created total stimulus of a virtual environment is a composition of a number of different stimuli. Advances or even perfection of a single stimulus (e.g. photorealism) or a certain category of stimuli increasingly reveal the shortcomings in other categories of stimuli (e.g. social interaction, movements). This again leads to a paradoxical growth in the spectator's disbelieve.

The results presented by Hodgins et. al. in [4] demonstrate that an improvement of a virtual character's visual presentation must not automatically go along with an increase of it's realism. In an experiment three different figures of one character were presented to different subjects. The presented figures varied in the richness of detail of their visual presentation. The simplest figure was consisting only of simple sticks representing the character's skeleton, another figure had a body based on a polygon model and the third figure featured the highest degree of detail and showed the movement of muscles too. All characters where moved by the same sequence of animation. The resonance of the different subjects demonstrated the following: Shown the simplest figures (stick and polygon) the subjects did not recognize the subtleties of the animations. Consequently manipulated and unrealistic animations were recognized only with the most detailed figure. This means, that the increase of one aspect of realism (visual presentation) can rapidly lead to much more weight of another aspect (animations). Therefore flaws in one aspect might not appear until another aspect gets optimized to some extent.

4 Principles for Computer Games Aesthetics

In the before chapter we gave several reasons for our conviction that on the long run the approach 'reproducing realism' will not be successful at all in enhancing immersion in computer games. But what are the alternatives? We believe that for the still young art form computer games the goal must be to develop own aesthetics. We too believe now is the time to start postulating principles. Methods used in other (visually driven) media like movies or comic books for example may serve as a valuable source for insights.

4.1 Principle: (Mis)use well-known elements even if they seem foreign to the subject

Numerous examples for the method of creating instant understanding and a high degree of believability with the help of – on first look – inadequate elements can be found within the movie industry. The makers of Shrek used this method deliberately and very successfully throughout the entire movie. When for example Shrek and Donkey enter the arena of Lord Farquaad's castle within a short sequence one can observe the following:

The bright sun creates a lens flare, an effect not known to humans from a natural environment but the better known from nearly any movie one has seen (and hence build into some computer games already). But the makers came up with more than pure technical tricks. For the story's progress Shrek has to be named the winner of a competition. But who knows (or cares) what an original knight tournament looked like. So they finally decided to make the fight a nowadays well-known one, namely a mixture of ice hockey and wrestling. A further and very subtle solution was found for a sound problem. Just about nobody knows how it sounds when a battery of crossbows is drawn. But this very noise is needed to create an atmosphere of threat within a fraction of a second after Shrek's victory. Hence for the scene it was decided to simply use the well-known sound of cocking rifle shutters.

4.2 Principle: Use principles found within biology and ethology

In the previous chapter we argued that acquainted or inborn reaction towards certain biological features or stimuli might for different reasons work unhelpful regarding the believability of a character or setting. On the other hand it was shown that reducing the number of features while exaggerating certain ones can have a stronger effect than a genuine stimulus. Hence we suggest that these very behavioral tendencies and principles should be exploited for the creation of believability, empathy and immersion. Keeping this in mind it is very comprehensible why for example the characters created by Walt Disney work so well in representing human behavior although not even being humans in the first place. Steven J. Gould [3] points out Lorenz' findings that humans

have the ability to react biologically adequate towards animals as well as inanimate objects by projecting human characteristics onto them. The examination of the appearance of the character Mickey Mouse over a fifty years period leads him to the following conclusion: Knowingly or unknowingly the artists at the Disney Studios eventually have equipped their character along the exactly same principles as 'nature would have done' if the intention had been to create empathy and fondness. Only, the 'evolution of Mickey Mouse' went backwards resulting in an ever more youthful, nearly childish character (e.g. size of head and eyes, volume of arms and legs, behavior, relative positions of eyes and ears).

4.3 Principle: Amplification through simplification

In his examination of comics [6] Scott McCloud explains why realistically drawn pictures are not used in comics by the concept of amplification through simplification. An image of a face can be stripped down to its essential meaning through simplifying and cartooning. This allows artists to amplify the meaning of the image (e.g. the expression of a face) in a way that would not be possible with a realistic presentation. Another aspect is the universality of a simplification. In contrast to a realistic picture which represents only one individual person an abstract cartoon image might represents millions of people and is therefore more suitable for identification.

Within the domain of computer games Shigeru Miyamoto is not only the creator for the all time game classics Donkey Kong, Super Mario Bros. and The Legend of Zelda but also the one who has created the game industry's only instantly recognizable aesthetic – with a very colorful, cartoonish and whimsical look. Instead of using a particle system in the game Zelda the clouds of explosions are of a simplified flowery and spiral look.

4.4 Principle: Get rid of real world constraints

In parallel to the issues whether or not it will at some point be possible to perfectly copy nature and whether this will at all lead to the intended breakthrough in terms of believability and immersion we question this approach for yet another reason: Our possibility to build highly sophisticated computer games – or more general, virtual environments – is an option to create *fantastic* worlds, the very worlds we can never visit in reality. Hence it was already argued for the formulation of 'qualitative physics' which are consistent but not necessarily an adaptation of real physics (e.g. by Marc Cavazza et. al. [2]) to create non-realistic or surreal behavior. Art and in particular VR art should not routinely and self-evidently be restricted with real world constraints.

4.5 Manifesto for the Renovation of Computer Games

Of course the above short list of principles cannot at all be more than a first start. To provoke further impetus to some of the topics to be scrutinized we end our first list of principles with further demands on future computer games.

Manifesto:

Contra:	Personalization by Figures, Humans, Aliens,...
Pro:	Representation as Protoplasm
Contra:	Nonverbal Communication by Gestures, Grimaces,...
Pro:	Communication by Colors, Emotions, Time, Sound,...
Contra:	Solid Body Stature
Pro:	Novel Organs and new Sense Organs, Developed by oneself
Contra:	Long Range Weapons
Pro:	Inner Fight
Contra:	Gravity and Thermodynamics
Pro:	New Forms of Viscosity
Contra:	Ethnical Debates and Transfiguration
Pro:	Multiple Egos
Contra:	Walking, Flying, Driving
Pro:	Crawling Wriggling, Flowing, Sliming, Dripping, Floating, Evaporation, Osmotic Motion…
Pro:	Reproduction, Sprouting and Vegetative Growth
Contra:	Hemispheric Visual Field
Pro:	More Arms, Legs, Eyes, Organs
Contra:	Walls and Dungeons
Contra:	Edges and 90° Angle
Contra:	Euclidian Space
Contra:	Surface with Characteristic 0
Pro:	Möbius Strip and Klein Bottle

5 Conclusion

The claim 'more realism equals higher believability' was proven wrong with the help of several examples and findings from different realms of media and science. An 'increase of realism' often leads to an at first paradoxical increase of disbelieve for the user. On the other hand several successful examples and approaches exist which deliberately turn down realism. This article does not want to condemn efforts to create realism but rather wants to emphasize the fact that other approaches lead to very good or even better results for computer games. Production can and should be freed from the 'corset of realism'. We hope that this text helps to incite a continuative discussion about the aesthetics of computer games and an extension of this discussion to other media and sciences.

Acknowledgements

The authors would like to thank Otto E. Rössler, Michael Mateas and Andrew Stern for valuable comments on the topic during personal conversations.

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