

# **Stylistic Versus Photorealistic Aesthetics in Computer Games**

**By**

**Jenny Anne Peers**

*“How do stylistic games offer a greater depth aesthetically while providing a deeper play experience than games which boast photorealistic visuals?”*

## **Introduction**

Brilliant graphics are not essential for a successful game, but they do have a certain amount of importance when creating an overall game experience for the player. The game industry started with games that had no choice but to be highly stylised due to the technology available at the time. However, today’s technology has advanced to a point where photorealistic and hyper realistic visuals are possible, giving the game industry new windows of opportunity. Despite these stunning hi-res scenes and insanely high polygon models there are some elements which are yet to be achieved successfully. Stylised games have been using certain techniques to their advantage and have been doing so for years, this has played a huge part in the successfulness of video games.

I have always been naturally attracted to games with fantastical worlds, emphasised characteristics and highly stylised visual appearances. I find that games with highly stylised visuals offer a unique and far more rewarding experience allowing you to immerse yourself as a player in a new world. I will be investigating which elements work well together to achieve this and why many photorealistic games struggle to achieve the same experience. To illustrate my arguments I will be analysing and closely referring to the Sony PlayStation 2 game called *Okami (Clover Studio, Capcom, 2006)* due to its captivating game play and unique Japanese Sumi-e art visuals. For the photorealistic side of the argument I will be referring to a number of different games include *Heavy Rain (Quantic Dream, Sony Computer Entertainment, 2010)*, *Bayonetta (Platinum Games, Sega, 2010)* and *Vanquish (Platinum Games, Sega, 2010)*, which *Okami* creator Atsushi Inaba is currently producing.

## **The Visual Styles**

Firstly to establish a strong base level, I want to define what I mean when I say ‘stylistic’ and ‘photorealistic’. With the term stylistic, I am referring to visuals that have a distinctive appearance which is unlike how we see things in real life. With the term photorealistic I am referring to visuals which have been designed to mimic how we see things in real life, as photographs do but within a virtual 3D game environment. These two styles achieve two very different aesthetics and often can have a large part in whether the game will be successful or not. *Okami (Clover Studio, Capcom, 2006)* was originally planned to be a 3D photorealistic game but during the development process it was decided that the Japanese Sumi-e art style suited it better due to its depictions and restoration of nature.

“The painter... put upon the paper the fewest possible lines and tones; just enough to cause form, texture and effect to be felt. Every brush stroke must be full-

charged with meaning and useless detail eliminated.” (Wesley Dow, A, Composition: A Series of Exercises in Art Structure for the Use of Students and Teachers, Page 156).

“The goal is not simple to reproduce the appearance of the subject, but to capture its soul. To paint a horse, the sumi-e artist must understand its temperament better than its muscles and bones.” (Wikipedia, available online at [http://en.wikipedia.org/wiki/Ink\\_and\\_wash\\_painting](http://en.wikipedia.org/wiki/Ink_and_wash_painting)).

The photorealistic style would have detracted from the strong messages and meanings destroying the large amount of symbolism that is essential to the narrative and purpose of the game. The game’s visuals link closely to the Japanese art style called Ukiyo-e as well as Sumi-e. Many of the in game environments have a close resemblance to images such as ‘Amida Waterfall on the Kisokaido Road (Kisoji no oku Amidagataki)’ and ‘Women Returning Home at Sunset (Sarumaru Dayu)’ by the famous Japanese artist Katsushika Hokusai (1760 - 1849). His work consists of visually strong images made up of flowing line, shapes and a pastel yet varied colour palette. *Okami* (Clover Studio, Capcom, 2006) clearly draws from this and uses these simplified forms and gestural brush marks to illustrate the world and its characters effectively as well as providing a unique game play mechanic called the Celestial Brush.

The Celestial Brush is a mechanic based on gestures through use of the controller’s thumb stick enabling the player the chance to create their own sumi-e style paintings within the game. Different techniques are unlocked as you progress releasing each God in turn; the Gods are based on the Chinese Zodiac. Each God gives you a certain power which has its own brush stroke that you must copy to perform that move. For example, the God of Explosions (a Wild Boar) requires you to draw a circle with a short line emerging from the top to symbolise a cherry bomb. The sumi-e drawings required are simple and easy to remember, for example a straight horizontal line cuts objects in half. This generates strong cognitive semiotics between each God and its technique that it teaches you, making the player link the brush gesture with the game characters and its action. To emphasise the fact that the game looks like an animated Japanese painting, there is a canvas texture overlay throughout the whole game. It is a very clever way of reinforcing the sumi-e art style and making sure everything looks consistent throughout the game.

It is not only *Okami* (Clover Studio, Capcom, 2006) which has been influenced by this art style, one of Atsushi Inaba’s earlier games called *Viewtiful Joe* (Capcom Production Studio 4, Capcom, 2003) uses a similar visual aesthetic of chunky lines and cel-shaded graphics. A music game called *Mojib-Ribbon* (NanaOn-Sha, Ltd, SCEI, 2003) boasts a similar gestural brush mechanic with the objective to write out lyrics written in the katakana format to the beat of the music. It is no doubt that *Okami* (Clover Studio, Capcom, 2006) was influenced by these two titles as well as the famous *The Legend Of Zelda* (Nintendo, Nintendo, Capcom, *Flagship, 1989 – present*) series created by Shigeru

Miyamoto. It has been reported that Atsushi Inaba is a huge fan of the Zelda series and has drawn upon its successful design using a similar linear game play structure in *Okami* (*Clover Studio, Capcom, 2006*).

### **Why Is This Style Successful?**

It is not only the use of stylised visuals that can make a game successful, it relies on the balance of three categories; style, rules and ludology, and narrative. If one area is weaker than the other then the game as a whole can suffer as a consequence. From these three categories we can also branch out to look at coherence, plausibility and believability. *Okami* (*Clover Studio, Capcom, 2006*) is based on the Japanese folklore about how Susanoo defeated the great serpent, Yamata no Orochi. We are explained this from the introduction cinematic at the start of the game and realise that we are continuing from this tale. Your character of the white wolf is often referred to as Amaterasu, the Sun Goddess, during game play which then links to further folklores which also include appearances by Susanoo.

“Amaterasu is usually understood as a goddess. In an "alternate writing" quoted in *Nihongi* she calls herself a "woman" (*taoyame*), and her brother Susanoo also calls her his "elder sister" (*ane*).” (*Mori Mizue, 2006, Encyclopaedia Of Shinto*, available online at <http://eos.kokugakuin.ac.jp/modules/xwords/entry.php?entryID=27>).

Due to the story line and characters being heavily based on folklore we immediately accept and consider the game as coherent and plausible despite the use of magical healing powers. The visual style is consistent throughout the entirety of the game and close consideration to the ecology of assets has been made. Every object, character and environment in *Okami* (*Clover Studio, Capcom, 2006*) has a good level of distribution, abundance, and works well with other game objects. They have all been designed with the same level of detail and care which has created a high quality stylised outcome using simplified forms and gestural outcomes.

“Since the beginning of representation, from cave paintings to political satire, we have stylised and caricatured in order to accentuate. Exaggeration of characteristics is a rich shorthand which, when used well, allows for large ideas to be communicated through smaller actions.” (*I Am The Manta, 2010, The Uncanny Valley: Is the other side any greener?*, *Edge Online*, available online at <http://www.edge-online.com/blogs/the-uncanny-valley-is-other-side-any-greener>)

We as human beings read the stylised forms more easily and can pick out greater meaning from them than with photorealistic imagery. However due to this battle of stylistic versus photorealistic we automatically assume that the more ‘cartoony’ something is, the more childish it is. Japanese Anime is a good example of turning this assumption upside down.

“We realise that not all Anime is violent. Nevertheless, the artistic style emphasizes childlike super-sensuality while dealing with adult-oriented topics.” (Rollings, A and Adams, E, *Andrew Rollings and Ernest Adams on Game Design*, Page 125).

Highly stylised cartoon characters dealing with, as Rollings and Adams state above, adult-oriented topics is a twist that western audiences are not used to. It boils down to the super-sensuality stimulation that is communicated to the player; examples include cuteness and sexual desire. *Okami* (Clover Studio, Capcom, 2006) appeals to us through cuteness and use of humour through the dialogue and appearance of the characters in the world. Due to its abstraction it relies on this to entice and immerse us in to the game. We accept that the visuals are stylised, so we also assume that the way things function will be stylised and vary from our real world experiences. For example, if I jump into a pool of water, will I emerge soaking wet? Do I even know how to swim? New rules are employed that we discover as we play the game, exploring our abilities and ‘what if...’ factors. It is because of the Sumi-e visuals, folklore narrative that things become plausible and we lose our pre-conceived expectations of the real world. If we were looking at a photorealistic environment we would expect everything to act the same as real life because this is what we are used to and will be subconsciously comparing the game against.

## Photorealism

One of the earliest uses of photorealistic imagery in games was the loading screen of the Commodore 64 game called *Rambo: First Blood Part II* (Ocean Software Ltd, 1985). Based on the movie poster, it was a photorealistic representation made up of pixels and a very limited colour palette. However this was deceiving as the in-game graphics differed heavily destroying the realism that the loading screen had previously created.

“On earlier systems, computer animation technology had been used to produce complex visualisations for games. The hardware was not capable of producing, either in real-time or as FMV, those graphics used in promotion of the game.” (Surman, D, *Gaming, Uncanny Realism and Technical Demonstration* essay, *SwanQuake: The User Manual* by Martelli, B and Gibson, R, Liquid Press / i-DAT, 2007, essay Page 5)

It is only recently that we are seeing a similar appearance between promotional art and in-game graphics. An early example of this was *Lara Croft* from the *Tomb Raider* series (*Core Design/Eidos, 1996 – present*).

“... the software technology used to create the in-game graphics and model the promotional images was in principal the same. Stark differences still remained regarding the level of resolution between these two images, but the shift to a common production base had been made.” (Surman, D, *Gaming, Uncanny Realism*

and Technical Demonstration essay, *SwanQuake: The User Manual* by Martelli, B and Gibson, R, Liquid Press / i-DAT, 2007, Essay Page 6)

Lara was promoted as a character rather than a game as a whole, making her a virtual celebrity. One of the tactics used was to make her appeal to the super-sensuality of primarily male video game players. Despite having real world human representation as the target aim, she still had some stylisation such as her top-heavy physique that in the real world, would not allow her to be as limber as she is in game. But it is these traits which has added to her success and really started the goal of reaching lifelike visuals in games with human characters.

As with the stylistic approach, there is a balance that needs to be achieved which Scott McCloud illustrates in his book called *Understanding Comics* (HarperCollins, 1994). He states that any visuals can be contained within a triangular diagram, The Picture Plane, showing the relationship between abstraction, visual language and icons, and reality. A realistic image can always be simplified which when reached its abstracted stage often contains a meaning; icons, logos, simplified shapes/signs that our brain links signifiers to. For example, we look at a photograph of someone; we see it as a face of another person. If we look at a circle with two dots and a line within it, we see our own image in it, a face.

“When two people interact, they usually look directly at one another, seeing their partner’s features in vivid detail. Each one also sustains a constant awareness of his or her own face, but this mind-picture is not nearly so vivid; just a sketchy arrangement. A sense of shape. A sense of general placement. Something as simple and as basic as a cartoon.” (McCloud, S, 1994, *Understanding Comics*, HarperCollins, Pages 35-36).

It is because of our natural ability to create, read and use these abstractions that photorealism can ruin experiences created and make us feel uneasy about things. Everything has to be 100% correct or we will pick out its faults instantly which will derive from the experience intended.

“The simplest caricatures reveal how primed we are to find out likeness in abstractions, as does the childhood fascination with finding primal faces in the patterning of wallpaper... Here (Photorealism), our drive to read the ‘correctness’ of humanlike representation is evoked. We do not forgive these images any imperfection. We scrutinise them with the same voracious eye, hungry for beauty and symmetry, that we engage in our social lives.” (Surman, D, (2007), *Gaming, Uncanny Realism and Technical Demonstration, SwanQuake: The User Manual* by Martelli, B and Gibson, R, Liquid Press / i-DAT, essay page 8)

There has been a large amount of research created looking directly at this topic; the theory created is called 'The Uncanny Valley'. The research primarily looks at human representation in Japanese robotics, however it is also relevant to photorealistic human representations in computer games.

## The Uncanny Valley

The robotic creator and researcher named Masahiro Mori published an article back in 1970 looking at how robots with close human resemblance seemed familiar to a human observer until it reached a certain point. At this point the human observer would act negatively towards the robot and have a sense of discomfort about the robot's appearance. He named this occurrence 'the uncanny valley' due to the sudden and drastic dip in the chart just before perfect realism was achieved. There are many factors that can add up and create this undesired, uncanny response, particularly in video games. Due to the character on screen being designed to appear photorealistic, we expect it to fully behave as if in real life. A common problem seems to be the reaction times and fluidity of interaction.

"The characters must not only look realistic and animate accurately, but they must also react to control with perfect timing." (Gouskos, C, 2006, The Depths of the Uncanny Valley, available online at <http://uk.gamespot.com/features/6153667/index.html>)

The technical demonstration of *Heavy Rain: The Casting* (Quantic Dream, Sony Computer Entertainment, 2010) that was first shown in 2006 shows off its attempt at photorealism. It is a motion captured sequence that is rendered using real-time 3D processing on the Sony PlayStation 3, following the actress, Aurelie Bancilhon, reading a script. The performance captures you, it creates drama yet there is still a degree of an unnatural feeling present. While watching this clip I noticed slight imperfections with her lip syncing not fully matching up with the words that she was saying; this is the huge giveaway that tells the viewer something isn't right. The depth of field has been exaggerated making sure her face is in focus but her hair and neck are not, this channels our vision to the facial expressions as if she was talking to us directly just as conversations in real life work; we look directly at the other person and make eye contact because people communicate with their eyes as well as their ears to generate the full intended meaning.

"We know the proportions of the face and body so completely through the experience of everyday life that a highly realistic image of human form must comply with these conventions, or else be felt on a deep cognitive level to be unsettling or unacceptable." (Surman, D, *Gaming, Uncanny Realism and Technical Demonstration essay, SwanQuake: The User Manual by Martelli, B and Gibson, R, Liquid Press / i-DAT, 2007, Essay Page 8*)

“A character that’s realistic will seem to have ticked off a checklist of human characteristics, but a believable one will display nuances and subtleties that make them seem unique and alive.” (*Elsbeth Tory, Gouskos, C, 2006, The Depths of the Uncanny Valley, available online at <http://uk.gamespot.com/features/6153667/index.html>*)

Human behaviour is such a complicated thing and to mimic it perfectly in a photorealistic environment is a very tough task. All it takes is for one feature to be slightly off and it raises our suspicion making us feel uneasy about what we are seeing. The same rules apply to the game environments as well as characters.

“I do not expect a blocky, pixelated tree to sway in the wind or splinter realistically when I blow it to bits with a rocket launcher. But if that tree looks nearly identical to the one in my front yard, then it will be a noticeable distraction if it does not act like the real thing.” (*Chandler, R, Looks Aren't Everything: Making Games Act Real, available online at [http://www.gamasutra.com/view/feature/3721/sponsored\\_feature\\_looks\\_arent\\_.php](http://www.gamasutra.com/view/feature/3721/sponsored_feature_looks_arent_.php)*)

It is this barrier that is preventing the photorealistic game from being believable at this moment in time. If objects look as they do in the real world while in-game then we automatically make assumptions that they must function following the same real world rules.

To get around some of these problems, photorealism is being mixed with stylisation, as mentioned earlier, an example being Lara Croft. A more recent example of this technique can be found in Bayonetta (*Platinum Games, Sega, 2010*). The environments have realistic appearances as do the characters; bricks look like bricks, skin looks like skin, cloth looks like cloth. However subtle hints of stylistic qualities have been riddled throughout, for example the characters talk and make slightly exaggerated expressions as if from a graphic novel. This notion is further emphasised by the semi-still, only certain assets move such as grass in the wind where characters stay motionless, cinematics with a strong narration overlay. Due to the stylisation aspects anything uncanny is less obvious and we are more inclined to forgive the imperfections that we may find.

An interesting upcoming project which is being produced by Okami (*Clover Studio, Capcom, 2006*) creator Atsushi Inaba is entitled Vanquish (*Platinum Games, Sega, Q4 2010 – not yet released at time of writing*). At the time of writing there has only been a teaser trailer released but it creates an interesting mix of visuals. It uses a mix of photorealistic 3D animation and real life visuals of actors captured by video camera. The mix has been merged together successfully creating strong realistic imagery which is difficult to tell apart the 3D animation to the real life actor. This creates a lot of

questions about how the in-game graphics are going to be and how games are exploring Hollywood quality FMV's (Full Motion Video).

## **Conclusion**

We as human beings have a natural ability to be able to read abstractions quickly and effectively compared with images of photorealistic quality. A good example of this in today's world is the use of corporate logos; some successful logotypes include the apple sign of Apple Inc, the Panda of WWF-UK, and the tick shape of Nike. Photorealism tends to detract from any messages and meanings making it difficult for us to have a long lasting visual impression in our mind. This same notion is relevant to the experience created for the player from within the virtual world of a game. We accept the stylised visuals of Okami with its links to folklore, and render it acceptable in our minds. However with a photorealistic game such as Heavy Rain, we automatically make assumptions that if objects look the same as in the real world, then we expect it to function following the same real world rules. If the object doesn't behave as expected we begin to feel uneasy about it. Absolutely everything must look and behave with 100% accuracy to the real world otherwise its faults and differences will become obvious to the player and kill the experience that was intended. This is where the uncanny valley comes in, most evidently with character interaction and performance within game.

The uncanny valley is a tricky thing to escape; human behaviour is such a complicated thing to mimic as there are so many factors to be considered. Many game studios are battling this problem by throwing in some stylisation into the mix. By using exaggerated visuals but still maintaining an aspect of reality, these games have the advantage of using the best bits of both visual types. Everything must merge well together creating coherence and plausibility as well as consideration of the ecology of assets used, but enough room is left aside for some stylisation. This can give a game a unique experience for the player, especially if a high level of production quality is maintained throughout. Animation is a key role and often requires exaggeration for it to become believable. A great reference point for this is in the animations created by Pixar Animation Studios, even though its movies are not game orientated, they possess a huge amount of knowledge that game designers can certainly learn from.

We are all aware that video games started with highly stylised visuals due to the technology available at the time. As the years have progressed, technology has advanced meaning we have constantly strived to achieve better graphics, animations, and narratives, making the assumption that this will create a more believable experience within video games. This statement is true up to a point, game visuals have increased in quality drastically and continue to do so, but photorealistic game experiences are proving to still be too ambitious for our current technology. Until we can conquer this recurring problem, stylisation in games will always prevail when it comes to creating a unique and effective play experience.

## References

Wesley Dow, A (1998), *Composition: A Series of Exercises in Art Structure for the Use of Students and Teachers*, University of California Press.

“The painter... put upon the paper the fewest possible lines and tones; just enough to cause form, texture and effect to be felt. Every brush stroke must be full-charged with meaning and useless detail eliminated.” (*Page 156*).

Wikipedia - <http://en.wikipedia.org>, article found online at [http://en.wikipedia.org/wiki/Ink\\_and\\_wash\\_painting](http://en.wikipedia.org/wiki/Ink_and_wash_painting)

“The goal is not simple to reproduce the appearance of the subject, but to capture its soul. To paint a horse, the sumi-e artist must understand its temperament better than its muscles and bones.”

*Mori Mizue, 2006, Encyclopaedia Of Shinto, found online at <http://eos.kokugakuin.ac.jp/modules/xwords/entry.php?entryID=27>*

“Amaterasu is usually understood as a goddess. In an "alternate writing" quoted in *Nihongi* she calls herself a "woman" (*taoyame*), and her brother Susanoo also calls her his "elder sister" (*ane*).”

I Am The Manta, 2010, *The Uncanny Valley: Is the other side any greener?*, Edge Online, available online at <http://www.edge-online.com/blogs/the-uncanny-valley-is-other-side-any-greener>

“Since the beginning of representation, from cave paintings to political satire, we have stylised and caricatured in order to accentuate. Exaggeration of characteristics is a rich shorthand which, when used well, allows for large ideas to be communicated through smaller actions.”

Rollings, A and Adams, E, (2003), *Andrew Rollings and Ernest Adams on Game Design*, New Riders Publishing.

“We realise that not all Anime is violent. Nevertheless, the artistic style emphasizes childlike super-sensuality while dealing with adult-oriented topics.” (*Page 125*)

Surman, D, (2007), *Gaming, Uncanny Realism and Technical Demonstration*, *SwanQuake: The User Manual* by Martelli, B and Gibson, R, Liquid Press / i-DAT.

“On earlier systems, computer animation technology had been used to produce complex visualisations for games. The hardware was not capable of producing, either in real-time or as FMV, those graphics used in promotion of the game.” (*Essay Page 5*)

Surman, D, (2007), *Gaming, Uncanny Realism and Technical Demonstration*, *SwanQuake: The User Manual* by Martelli, B and Gibson, R, Liquid Press / i-DAT.

“... the software technology used to create the in-game graphics and model the promotional images was in principal the same. Stark differences still remained

regarding the level of resolution between these two images, but the shift to a common production base had been made.” (*Essay Page 6*)

McCloud, S, (1994), *Understanding Comics*, HarperCollins.

“When two people interact, they usually look directly at one another, seeing their partner’s features in vivid detail. Each one also sustains a constant awareness of his or her own face, but this mind-picture is not nearly so vivid; just a sketchy arrangement. A sense of shape. A sense of general placement. Something as simple and as basic as a cartoon.” (*Pages 35-36*).

Surman, D, (2007), *Gaming, Uncanny Realism and Technical Demonstration*, SwanQuake: The User Manual by Martelli, B and Gibson, R, Liquid Press / i-DAT.

“The simplest caricatures reveal how primed we are to find out likeness in abstractions, as does the childhood fascination with finding primal faces in the patterning of wallpaper... Here (Photorealism), our drive to read the ‘correctness’ of humanlike representation is evoked. We do not forgive these images any imperfection. We scrutinise them with the same voracious eye, hungry for beauty and symmetry, that we engage in our social lives.” (*Essay Page 8*)

Gouskos, C, 2006, *The Depths of the Uncanny Valley*, available online at <http://uk.gamespot.com/features/6153667/index.html>

“The characters must not only look realistic and animate accurately, but they must also react to control with perfect timing.”

Surman, D, (2007), *Gaming, Uncanny Realism and Technical Demonstration*, SwanQuake: The User Manual by Martelli, B and Gibson, R, Liquid Press / i-DAT.

“We know the proportions of the face and body so completely through the experience of everyday life that a highly realistic image of human form must comply with these conventions, or else be felt on a deep cognitive level to be unsettling or unacceptable.” (*Essay Page 8*)

*Elspeth Tory, Gouskos, C, 2006, The Depths of the Uncanny Valley, available online at <http://uk.gamespot.com/features/6153667/index.html>*

“A character that’s realistic will seem to have ticked off a checklist of human characteristics, but a believable one will display nuances and subtleties that make them seem unique and alive.”

*Chandler, R, Looks Aren't Everything: Making Games Act Real, available online at [http://www.gamasutra.com/view/feature/3721/sponsored\\_feature\\_looks\\_arent\\_.php](http://www.gamasutra.com/view/feature/3721/sponsored_feature_looks_arent_.php)*

“I do not expect a blocky, pixelated tree to sway in the wind or splinter realistically when I blow it to bits with a rocket launcher. But if that tree looks nearly identical to the one in my front yard, then it will be a noticeable distraction if it does not act like the real thing.”

## Bibliography

Capcom (2008), Okami Official Complete Works, UDON Entertainment Corp.

Marque Sondergaard (2006), Redefining 'Cartoony' Game Art, available online at [http://www.gamasutra.com/view/feature/2665/redefining\\_cartoony\\_game\\_art.php](http://www.gamasutra.com/view/feature/2665/redefining_cartoony_game_art.php)

Wesley Dow, A (1998), Composition: A Series of Exercises in Art Structure for the Use of Students and Teachers, University of California Press.

Wikipedia - <http://en.wikipedia.org>, articles found online at

1. [http://en.wikipedia.org/wiki/Ink\\_and\\_wash\\_painting](http://en.wikipedia.org/wiki/Ink_and_wash_painting)
2. <http://en.wikipedia.org/wiki/%C5%8Ckami>

Piper, D (2004), The Illustrated History Of Art, Bounty Books.

KatsushikaHokusai.org, The Complete Works, available online at <http://www.katsushikahokusai.org/>

Encyclopaedia of Shinto, available online at <http://eos.kokugakuin.ac.jp>

I Am The Manta, 2010, The Uncanny Valley: Is the other side any greener?, Edge Online, available online at <http://www.edge-online.com/blogs/the-uncanny-valley-is-other-side-any-greener>

Rollings, A and Adams, E, (2003), Andrew Rollings and Ernest Adams on Game Design, New Riders Publishing.

Surman, D, (2007), Gaming, Uncanny Realism and Technical Demonstration, SwanQuake: The User Manual by Martelli, B and Gibson, R, Liquid Press / i-DAT.

McCloud, S, (1994), Understanding Comics, HarperCollins.

Gouskos, C, 2006, The Depths of the Uncanny Valley, available online at <http://uk.gamespot.com/features/6153667/index.html>

Chandler, R, *Looks Aren't Everything: Making Games Act Real*, available online at [http://www.gamasutra.com/view/feature/3721/sponsored\\_feature\\_looks\\_arent\\_.php](http://www.gamasutra.com/view/feature/3721/sponsored_feature_looks_arent_.php)

## Softography

Okami (*Clover Studio, Capcom 2006*)

Heavy Rain (*Quantic Dream, Sony Computer Entertainment, 2010*)

Bayonetta (*Platinum Games, Sega, 2010*)

Vanquish (*Platinum Games, Sega, Q4 2010 – not yet released at time of writing*)

Viewtiful Joe (*Capcom Production Studio 4, Capcom, 2003*)

Mojib-Ribbon (*NanaOn-Sha, Ltd, SCEI, 2003*)

The Legend Of Zelda series (*Nintendo, Nintendo, Capcom, Flagship, 1989 – present*)

Rambo: First Blood Part II (*Ocean Software Ltd, 1985*)

Tomb Raider series (*Core Design/Eidos, 1996 – present*).

*Pixar Animation Studios (1979 – present).*