

**An Assessment of Motion Capture in Animated Film through an
Analysis of Aesthetics**

Christie Edwards

Master of Arts in Digital Animation

The University of the Witwatersrand

Supervisor: Bronwyn Horne

31 October 2016

Declaration

I declare that this research report and abstract are my own unaided work. Proper accreditation has been given to all outside sources.

This report has not been submitted to another university or institution of higher learning. No part of this report has been published in any journals or social media.

Christie Edwards

on this 31 October 2016.

Acknowledgements

A very big thank you to my supervisor, Bronwyn Horne, for guiding me through the process of conceptualizing, writing and editing this paper.

A very big thank you to my editor, Janet Whelan, for figuring out exactly what I meant to say and making this paper legible.

Another big thank you to André Van Der Merwe, Mathew Lottering and Daniel Buckland of The Flying Circus here in Johannesburg, for taking the time to answer all my questions and for a very informative interview.

An extension of gratitude goes out to Andrea Hayes for all her love and support, and my family for all their support and patience while I discussed this work with them.

Christie Edwards

Supervisor: Bronwyn Horne

WSOA 7036 Research Report - MA Digital Animation

31 October 2016

An Assessment of Motion Capture in Animated Film through an Analysis of Aesthetics

Abstract

This study aims to determine whether motion-captured animation is better suited for hyper-realistic or caricatured film aesthetics and whether it creates or breaks the aesthetic engagement for the viewer. This will be done by analysing how each aesthetic maintains or breaks 'suspension of disbelief' in viewers towards character engagement and identification.

This paper specifically aims to report on a study of body motion capture, via attaching trackers only on the body and not on the face and fingers. Films used to critically analyse these ideas will be *The Adventures of Tintin: The Secret of the Unicorn* (year) directed by Steven Spielberg to illustrate motion capture, which pertains to caricatured animated feature film aesthetics with caricatured designs. In comparison *Beowulf* (year) directed by Robert Zemeckis will be studied to demonstrate motion capture with hyper-realistic aesthetics.

Motion capture has often been critiqued negatively for its depiction of human characters and their movement as having a disturbing appearance; which is mostly criticised as effects of the Uncanny Valley - a phenomenon first introduced by Professor Masahiro Mori. There are currently 13 major motion capture animation feature films, such as *Final Fantasy: Spirits Within*, *Final Fantasy: Advent Children*, *The Polar Express*, *Last Order Final Fantasy VII*, *Monster House*, *Happy Feet*, *Beowulf*, *A Christmas Carol*, *The Adventures of Tintin: The Secret of the Unicorn*, *Mars Needs Moms*, *Happy Feet 2*, *Kochadaiiyaan*, *Space Captain Haddock*. With the amount of motion capture being used in current animation features, especially with a local South African studio such as The Flying Circus using it as a means of saving costs on animation production, there needs to be an understanding of where motion capture is best suited depending on the aesthetic design of the film. This becomes especially imperative to animated films, because it has its own codes of depicting 'realism' that are separate to that of live action films that are discussed in detail in the paper.

To conclude, this study will aid in determining which aesthetic style provides better engagement through a critique of aesthetics the films chose to pursue and which keeps viewers succumbed to 'suspension of disbelief'. This will aid in determining whether motion capture is an appropriate method to creating animated movement for a particular aesthetic.

Contents

Introduction	1
Chapter 1:.....	8
The Development of the Cartoon Style and Creating the Illusion of Movement in Animation.....	8
1.1. The Development of the Principles of Animation	8
1.2. Development of the Cartoon Style	10
1.2.1. Influence of the Principles of Animation.....	10
1.2.2. Squash and stretch	15
1.2.3. Anticipation	19
1.2.4. Follow through and Overlapping action.....	21
1.3. Movement and the Cartoon Style	24
1.4. Stylization of Designs	26
1.4.1. Simplification and Engagement	26
1.4.2. Appeal of Simplified Designs	30
1.4.3. Audience Identification and Involvement	31
1.5. Objectification or Engagement.....	34
1.6. Acting for Film and Adapting to Animation	36
1.7. Conclusion: Cartoon Style and Engagement	41
Chapter 2.....	43
Brief History on Motion Capture in Film and an Engagement with Realism.....	43
2.1. Introduction to Motion Capture	43
2.2. History of Motion Capture.....	44
2.3. Realism Theories: Realist Theory and Formative Theory.....	49
2.1.1. Formative Theory	50
2.1.2. Realist Theory.....	51

2.4.	Hyper-realism Theory	54
2.5.	Naturalism Theory in Animation	55
2.6.	The ‘uncanny valley’	56
2.7.	Suspension of Disbelief.....	62
2.1.	Aesthetic Engagement with Realism.....	64
2.2.	Conclusion: Motion Capture and Issues of Realism	65
Chapter 3.....		68
Motion Capture in 3D Animated Films and Their Stylistic Considerations		68
3.1.	Introduction	68
3.2.	Beowulf Case Study.....	69
3.2.1.	Hyper-realism Filmmaking in Beowulf.....	69
3.2.2.	Hyper-realism and Engagement.....	73
3.2.3.	Clean-up and Keyframe Animation	77
3.2.4.	Budget and Box Office Recordings	79
3.3.	The Adventures of Tintin Case Study.....	80
3.2.1.	Creating Designs of The Adventures of Tintin.....	80
3.2.2.	Clean-up and Keyframe Animation	86
3.2.3.	The Adventures of Tintin and the ‘uncanny valley’	88
3.4.	Caricature and Engagement	91
3.5.	Conclusion	97
Conclusion		100
Works Cited.....		105
Appendices.....		117
Appendix 1.....		117

Introduction

This research report critiques the movement that motion capture in 3D animation provides in two different aesthetic styles, those being hyper-realism and caricature; in order to determine which aesthetic motion capture movement provides better audience engagement. This will be measured by using forms of engagement derived from traditional 2D animation such as techniques of appeal and simplification combined with live-action filmic techniques of engagement, most important being ‘suspension of disbelief’. This will be discussed using two motion captured animation films as case studies, *The Adventures of Tintin* and *Beowulf* as to assess these findings.

Traditional 2D, or cel animation was developed in the early 20th century and came to dominate animation techniques for almost a whole century because the process lends itself to large scale production techniques. In 2D animation, animators typically drew characters by hand frame by frame in order to create movement; this continued to be the main technique for creating 2D animation until 1990 when computers and three-dimensional (3D) animation was developed. In early 3D animation, initially there was a singular technique of making characters move - keyframing. Keyframing is a technique that uses “three dimensional models in the computer [and] motion is achieved by setting key poses¹ and having the computer generate the inbetween movements”. Keyframing was properly

¹ A key pose is a key moment or position of the characters body during a movement. Key poses are essential to creating movement in animation as animators can create key poses and then fill in the appropriate movement between the poses.

developed during Toy Story in 1994 (Lasseter 36). However, since the early 2000's, another prominent technique began to emerge and gain popularity - that of motion capture animation with the release of films such as *Final Fantasy: Spirits Within* (2001) and *Polar Express* (2004).

Motion capture records an actor's bodily motion through trackers attached to certain points on their body. These trackers function to translate the recorded real-world placement of the actor's body and movements into digital animation that is then mapped onto a Computer Graphic (CG) character to make it perform the same motions (Sturman 1). This technology has had a significant impact on the film industry and is mostly being used to create realistic CG characters integrated into live action film that has never before been possible to create in such a convincing way. Thus this technology has resulted in motion capture becoming one of the foremost techniques in creating convincing CG character integration seen in such films as *The Lord of The Rings*, *The Rise of the Planet of the Apes* and *Avatar* by prestigious studios like Twentieth Century Fox Film Corporation and New Line Cinema. Of keen interest in this research is its use in fully animated 3D films such as *Beowulf*, *The Polar Express* and *A Christmas Carol* directed by Robert Zemeckis and *The Adventures of Tintin* directed by Steven Spielberg. Motion capture for these films was used as the primary method for the performance creation of the characters.

Animated films using motion capture as its primary performance tool like these listed above, have often been critiqued negatively for its depiction of human characters as being too realistic because they result in the characters having a disturbing appearance (Butler & Joschko). This type of motion capture works the same way as CG-live action integration, but when this technique is used in isolation (without added keyframing) the result is movement

that is naturally hyper-realistic (Butler & Joschko 55). Paul Wells describes hyper-realism in accordance to animated films as “the design, context and action within the hyper-realist animated film approximates with, and corresponds to the design, context and action within live-action films representation of reality” (25). Wells also states that hyper-realism tries to represent “the conventional physical laws of the ‘real’ world’ through its aesthetic style, characters, objects, and environments” (25). Motion capture in animated films that use hyper-realistic aesthetics such as *Final Fantasy: Spirits Within*, *Beowulf* and *The Polar Express* have delved into ‘real world’ or photo-realistic aesthetics are described as hyper-realistic.

Live-action film relies upon the viewers’ ‘suspension of disbelief’ in order to engage the audience. This term, refers to the effectiveness of audiences’ willingness to believe in what they are seeing (Sarfo-Boansi 25). It also refers to the level of engagement between the viewer and the film; if the viewer can see production methods in a film the audience ‘suspension of disbelief’ is then broken and their engagement with the film is lost. An example of this is a phenomenon known as the ‘uncanny valley’ which is an effect originally identified in robotics by Professor Masahiro Mori which suggests that our emotional response is connected to our levels of familiarity. This familiarity can reach a point where it becomes disturbing because the “likeness is so close to human, yet has enough variation, that the difference suddenly becomes prominent” (Butler & Joschko 60). When the ‘uncanny valley’ is present in a film, the audience no longer succumb to ‘suspension of disbelief’ because they are constantly aware of the construction of the characters. Therefore, criticisms of how the uncanny valley can break the audiences ‘suspension of disbelief’ is a main focus of this research paper.

However, most animated films such as those produced by Disney, Pixar and most 2D studios use 'caricature' stylization which refers to animation design and movement that adheres to the Principles of Animation, a set of design and movement techniques which animators use to help create more believable and engaging characters (Bishko 24). Leslie Bishko describes the cartoon aesthetic as mimicking the stylized movement that emulates the "cartooniness" of 2D animation as it developed and changed over the course of the 20th century (26). Cartoon animators prioritise stylization in movements and design for the audience to identify with the characters rather than making it seem as if it is 'real life' (Sarfo-Boansi 32). Scott McCloud, an American Cartoonist and Theorist, describes how simplified designs helps the viewer identify with the character by relying on universal features which every person can relate to (29). Feither Kaba argues that the success of the film depends on the extent the audience is willing to identify themselves in the film (188). The question becomes: how could animation be done using motion capture without characters that fall into the 'uncanny valley'?

In chapter one, I will unpack the caricature aesthetic in animation and what exactly it pertains to and how it has developed throughout the course of the 20th century. This chapter will consider relevant animation history and the development of traditional animation techniques that became prominent in the industry. It is important to understand prominent techniques of character animation as a starting point to understand what animation requires in order for the audience to engage with. This chapter will also discuss concepts of simplification and engagement as many of the elements that make up the caricature aesthetic deals with concepts of engaging character designs and motions. This will show the importance of how simplification of character designs can help to create engagement for the audience. This

chapter includes a brief overview of acting techniques and how performances are constructed for animation versus live-action. It is necessary to understand that acting for motion capture is different from acting for live-action due to the animation aesthetic, especially the caricature aesthetic.

In chapter two I will provide a brief history on the development of motion capture in film and animation. This chapter will focus primarily on realist theories that motion capture and live-action film pertains to. An important point of this chapter will discuss how engagement is created in live-action film and how that applies to animation films. The ‘uncanny valley’ will be discussed in order to provide a clear understanding of what it entails and how it breaks ‘suspension of disbelief’ which will also be discussed in order to provide an understanding of its importance and impact upon the viewer. ‘Suspension of disbelief’, the ‘uncanny valley’ and ideas of how engagement is created in film are theories that are important to this study as it defines how audiences evaluates the merits of motion capture films and the overall success of a film.

In the final chapter, I engage the theories from previous chapters and apply them to case studies, these being *The Adventures of Tintin* and *Beowulf*, discussing others along the way. Each of the two case studies will present the reasons why the filmmakers chose to undergo motion capture animation and the reasons as to why they made certain decisions for the films aesthetic appearance. Because audience response is difficult to assess and I am unable to conduct the quantitative research required because of the scope and nature of this report, in this chapter I will weigh up expenses (as motion capture films have been costly to produce) against their box office recordings in an attempt to demonstrate some sort of quantifiable

result to the audience response to the films in question. I will also present critiques from reviewers of the films animation and aesthetics to demonstrate the public and professional reaction to each film. I will discuss problems with realism for each film and if they entered the ‘uncanny valley’ and broke ‘suspension of disbelief’ or not by using reviews and critiques on each film as well as assessing the design elements of the film. Kunz argues that the ‘uncanny valley’ can be sidestepped if characterization and character design is carefully considered and avoids replicating hyper-realistic traits (4). Part of this chapter will discuss this argument to determine if motion capture is suitable for hyper-realistic character designs over caricature character designs.

This paper also uses primary data derived from interviews conducted at The Flying Circus, a South African animation studio, which uses motion capture as their primary means of creating movement for their children’s series and films that maintain a caricatured style of animation. The interviews will provide information on how the creators at The Flying Circus have found ways of avoiding the ‘uncanny valley’. The findings from these interviews will be used to support arguments made within the paper and provide a practical real-world example to the use of motion capture in caricature animation aesthetics.

This study aims to aid in understanding whether motion captured movement is more beneficial to use for either or both hyper-realistic or caricatured aesthetics in animation films and whether or not it creates aesthetic engagement with the audience. This paper investigates the aesthetics of caricature and hyper-realism animation development and the impact each style has on the viewer’s engagement with the characters designs. This will be done by analysing how each aesthetic maintains or breaks ‘suspension of disbelief’ in viewers through

character engagement which will be analysed through a filmic analysis of *The Adventures of Tintin* and *Beowulf*.

Chapter 1:

The Development of the Cartoon Style and Creating the Illusion of Movement in Animation

1.1. The Development of the Principles of Animation

We've always been trying to make pictures move, the idea of animation is aeons older than the movies or television. (Richard Williams 11)

2D and 3D animation in film is a form that is completely constructed; it is created frame by frame by an animator using different media, this is at least the understanding of traditional 2D animation practice. The animators who draw the characters onscreen craft their performances; they create the movement and emotion of the characters and ultimately bring them to life. Even in CG animation such as in Pixar films, there is an animator behind the computer, albeit not animating the 'drawings' by hand, but still animating the character's 3D model², getting the model to perform and express emotion. 3D animators are doing very much the same thing as 2D animators would by creating key pose and using the computer to control how the inbetween frames are calculated just as the inbetween³ would by drawing in the inbetween drawings the 2D animator would require.

² A 3D model is a mathematical representation using data points in a computer programme, which can produce graphics that appear to have three-dimensions.

³ Inbetweeners create the drawings between previously completed key poses that a lead animator or character animator has produced. Inbetween drawings fill up the space and time needed to complete the illusion of movement and action.

“The old knowledge applies to any style or approach to the medium no matter what the advances in technology.” (Richard Williams 20). When early research transitioned into computer animation, animator and (now) chief creative officer at Pixar Animation Studios, John Lasseter, showed that 3D animation was more successful when traditional 2D techniques were applied; he was referring to the Principles of Animation (Lasseter 35). The Principles of Animation are a set of guidelines initially crafted by animators at the Disney studios during the 1930s for 2D animators to follow for creating believable and appealing motion for animated characters (Bishko 24). As computer animation developed, research focussed on rendering⁴ animation rather than creating convincing character animation; this resulted in ridged and improbable character motion (Lasseter 35). Before this discovery, animators thought that because 3D computer animation did not use 2D drawings that the techniques of 2D animation did not apply, which resulted in only a few 2D animators finding their way into early 3D animation (Lasseter 35). Poorly animated work in 3D is considered by Lasseter due to the unfamiliarity with the Principles of Animation (35).

With his strong grounding in 2D animation, Lasseter pushed for the development of 3D technology and found support from Edwin Catmull and Steve Jobs, who allowed Lasseter the opportunity to create and experiment with creating 3D animation. This empowered Lasseter to develop methods of transforming the 2D Principles of Animation into the 3D environment. Of course not all of the Animation Principles could be applied perfectly from 2D to 3D, and some of them needed a little modification in order to represent the same technique when moving over to 3D, such a Squash and stretch. Regardless, every Principle of

⁴ Rendering is a process that generates an image of a 3D model or scene that has been made in a computer programme.

Animation from 2D is applied to 3D computer animation. Lasseter lead the transition from 2D to 3D through several films, the most successful being *Tin Toy* (1988), which received the first 1988 Academy Award for Best Animated Short Film and made 3D Animation a legitimate artistic medium, and lead the way for *Toy Story* in 1995.

As Richard Williams (a long time animator and author of *The Animators Survival Kit*) suggests in the quotation on the previous page, no matter what the change in technology is, the knowledge of how to animate still applies to any style or approach, this can be assumed to include motion capture animation.

1.2. Development of the Cartoon Style

1.2.1. Influence of the Principles of Animation

For now, I will discuss the cartoon style and how it developed and what exactly it refers to through a brief discussion on the history and development of animation. Leslie Bishko is an experimental animator who researches movement styles in animation and the use of animated imagery for Laban Movement Analysis studies (34). Bishko discusses the cartoon style broadly in her essay titled 'The Uses and Abuses of Cartoon Style in Animation' and defined the cartoon style as such: "Cartoon style' in animation broadly refers to animation design and movement that adheres to the Principles of Animation, defined and developed at the Disney Studios" (Bishko 24).

An early pioneer of non-digital development of animation (and later motion capture) would be the most important development of rotoscoping. Rotoscoping in animation is a technique in which the animator would trace live-action footage frame by frame as a method by which to mimic realistic movement for animation (Christophers 2). Rotoscoping was pioneered by the Fleischer brothers, Max and Dave, in order to create animated characters that moved more realistically and was used for their animated series *Out of the Inkwell* in 1919 (Solomon 30 -31). Even Disney Studios used similar methods during the production of *Snow White and the Seven Dwarfs* and continued to do so thereafter. Disney studios used rotoscoping as a method for studying human and animal motions (Kitagawa & Windsor 6). Walt Disney pushed for more believable movements and in doing so he intended movements to largely mimic live-action 'classic cinematic' commonly seen in Hollywood cinema (Sarfo-Boansi 26). Disney animators used the live-action references by using stand in models and live-action footage that also helped cut costs by reusing footage as reference for other scenes. They would study frame by frame to reveal the details of the living body motion; essentially they were using rotoscope as one of their methods for discovering details in motion (Thomas & Johnson 321). This happened in conjunction with the development of the Animation Principles in the making of *Snow White and the Seven Dwarfs* and shows the Principles of Animation were developed over studies of live-action footage. But more importantly, this shows that rotoscoping was the basis for motion capture technology, as it involves a very similar idea: the copying of actors' choreographed movements into animation. For now however, this chapter will focus on the Principles of Animation and the development of the cartoon style.

The Principles of Animation were pioneered by animators from Disney Studios during the 1930s as a set of techniques that animators followed to animate believable and appealing motion for animation (Bishko 24). Walt Disney required his team of animators, before they started animation on *Snow White and the Seven Dwarfs* in 1937, to further develop their skills to create more physically believable animated characters and worlds in order to create more believable and appealing characters. What they found out in doing so evolved into set rules that became known as the Principles of Animation still practiced by animators today. These were techniques animators found benefited their methods of relating drawings to each other and ways that produced better results; these became the rules of the trade (Thomas and Johnston 47). I will list them here and apply them through the context of this paper:

The Principles of Animation

1. Squash and stretch
2. Anticipation
3. Staging
4. Straight Ahead Action and Pose to Pose
5. Follow through and Overlapping action
6. Slow In and Slow Out
7. Arcs
8. Secondary Action
9. Timing
10. Exaggeration

11. Solid Drawing

12. Appeal

The Principles were developed by animators continually observing on-screen and realistic motion and noting what aspects of animated movement best created believability for the characters. Through trial and error, scrutinizing frame by frame, they slowly evolved into the set of Principles that animators using the cartoon style use today. The Principles of Animation were so effective because they help reflect and over-emphasised the physical properties of objects and characters in motion and achieved believability (Bishko 24, 26). The Principles of Animation were evolved along with the full animation style Disney became known for, which involved making 24 frames of drawings per second of footage and depending on the scene also animated making 12 frames of drawings per second. Over the course of history, especially after the 1950s and during the rise of Hanna-Barbera, a studio which made cartoon shows by using as little animation as possible to cut costs, many animation companies did not use the full animation style as it is very costly to produce this amount of detail but also because many companies wanted to pursue different approaches and styles in animation. Nevertheless, Disney's full animation style and the development of the Principles of Animation became the main basis for how the cartoon style developed and how the caricature styles in animation have been influenced. It is important to clarify, before we continue, that 'cartoon movement' or 'cartoony movements' do not refer to cheaply produced or badly animated characters, nor do they describe animated movement created using puppets. By 'cartoony movement' is meant that they emulate the "cartooniness" of hand-

drawn animation, which adheres to the Principles of Animation and depicts characters in dramatic or comedic contexts and actions (Bishko 26).

Walt Disney himself was the driving force behind the Principles of Animation; however Disney does not take sole credit for the cartoon style, as other studios that produced work afterwards did not always use the Principles of Animation to the fullest extent possible like Disney and decided rather to change production methods to suit themselves (Bishko 31). Warner Brothers were legendary for pushing the stylistic features of the cartoon style that emulated from the Principles of Animation. They wanted to move away from Disney Studio's content to target more adult audiences and based their comedy on extreme physical violence only possible in animated worlds (Bishko 31). Warner Brothers became known for their rubbery style of animation that reflected the 'squash and stretch' movement (Schneider 78). Universal Productions of America (UPA) rebelled against the full form emphasis Disney relied upon for believability, for a more graphically stylistic economy comprising of design elements of line, colour and composition, so that Principles such as 'anticipation', 'squash and stretch', 'follow through and overlapping' were hardly used at all such as with Gerald McBoing-Boing (Bishko 31). Another important influence would be the Hanna-Barbera studio which used "limited animation" to keep animation alive in a time of struggle after the 1950s when the demand for animation decreased due to the harshities of the World Wars and the rise of television and thus ended the Golden age of American animation. The shows that came from Hanna-Barbera were called 'illustrated radio' by Chuck Jones (who worked at Warner Brothers) due to the large amount of voice acting and minimal movements which helped to save costs in production by restricting the number of drawings needed. Some

Hanna-Barbera shows avoided particular Animation Principles such as the Flintstones which has no ‘exaggeration’ and only subtle hints of ‘anticipation’, ‘squash and stretch’ and ‘follow through’ (Bishko 32). Through these changes the cartoon style has evolved and taken shape.

From the beginning of the Principles of Animation created by Disney in the 1930s, they have been implemented in Disney’s full animation films in extreme detail, they have been used to the extreme in Warner Brothers films, they have been used minimally in UPA’s films that have graphic emphasis and lack of volumetric form⁵ of characters and objects and adopted a more ‘modernist style’, and they have been used in Hanna-Barbera’s films which made use of limited animation. Throughout all these studios there have been three enduring Principles that remained, those being ‘anticipation’, ‘squash and stretch’, and ‘follow through and overlapping’ which make up the cartoon style (Bishko 32). This is because these Principles function is to support the illusion of life, believability and characterization, and “as such they have formed the building blocks of style and expression” (Bishko 32). It is important to note how these principles were developed and used throughout history because they became the standard techniques in creating the cartoon aesthetic. I will give a brief description of what these really entail and why they support aliveness, believability and characterization so well.

1.2.2. Squash and stretch

Most shapes in animation are either fixed, like an object such as a chair, or organic such as a character, and if they can move, they are able to be subjected to ‘squash and stretch’ (Thomas

⁵ Animators didn’t join lines to make a complete figure and that was not realistic towards a characters physical mass such as Disney studios did with their characters when creating the Principles of Animation.

and Johnston 47). The movement from one pose to the next is essential in animation (Thomas and Johnston 48), and 'squash and stretch' represents the movement between a squashed pose and a stretched pose. 'Squash' will happen when the figure is contracted into itself and literally is squishing its volumetric form, and when it is 'Stretched' it extends its form to the most extreme position that literally stretches itself out. Both these poses modify the same form in both extremes but it is of utmost importance that the volume still retains the same mass regardless of what pose it is making (Lasseter 36). 'Squash and stretch' is the second most important Principles according to Bishko, because "it represents the modulating flow of feelings" and the effect of these feelings it has on the character's body as well as represent physical forces of the body (32). This technique is often used just to create breathing which can represent aliveness (Bishko 32). It can be used to help the flow of movement through the body, and help portray the physical properties of the body with the transfer of weight through the joints or different parts of the body (Bishko 32).



Figure 1: "Squash and stretch". 2016. Digital drawing by the author.

In 3D animation, ‘squash and stretch’ has to be used a little differently due to the medium changes. For example, if the 3D model is stretched by pulling it in the Y axis⁶ (upwards or downwards) to try achieve a similar effect as in 2D, more often than not the model’s rig⁷ will break which can result in a deformed shape, unless the rig has been specifically designed to be able to ‘squash and stretch’. Instead, ‘squash and stretch’ can be achieved by scaling the model in 3D: if it is scaled up in the Y axis then the Z and X axis must be scaled down in order to keep its volume (Lasseter 37). Lasseter demonstrates another way of achieving this in 3D by using the character’s form (or pose) to represent ‘squash and stretch’ (36). For example, the character could fold in on itself by bending its knees down and lowering itself without any distortion of form, and then jumping and stretching out all its limbs and body to perform the stretch motion (Lasseter 36). I am mentioning the conversions of these Principles from 2D into 3D because motion capture animation is most commonly applied to 3D animation; therefore it is important to show the conversion of 2D Principles into 3D before we can talk about them in motion capture. Similarly to 3D, motion capture relies on human actors’ bodies to perform; therefore we cannot have an actor squashing and stretching like characters do in 2D where their form distorts. In this case they could represent the principle in similar ways to how 3D animators create Squash and stretch without distorting the form, but by using their bodies to fold themselves up and extend themselves out.

⁶ A axis serves as a 3D parameter to represent space inside the computer. It is made of Y Axis- upwards or downwards, X axis- left or right, and the Z axis- forwards or backwards.

⁷ A rig in 3D animation is a basic skeleton that represents the moveable joints of a character’s skeleton that is used to animate the 3D model’s mesh and give the illusion of realistic biological movement.



TC: 00:10:13

Figure 2: Toy Story.

Daniel Buckland, motion capture actor and director at The Flying Circus, says that some of the Principles of Animation cannot be applied during the acting stage because they rely on being created by animators. However 'squash and stretch' can be applied directly through the actor's body. 'Squash and stretch' can be very subtle but there is a limitation on what the actor's physical body can do. Daniel Buckland states that The Flying Circus is constantly trying to push that limit in order to get the style more caricatured. Buckland notes that 'squash and stretch' is an important Principle of Animation when convincingly portraying the style of caricature in animated film. Buckland states that The Flying Circus' actors try to deliver a specific performance to the animators, so they can interpret what the actor was trying to achieve (such as 'squash and stretch' in their performance) and be able to push that performance more by exaggerating the movements beyond what the human body can achieve during the animating stage of production.

1.2.3. Anticipation

Anticipation is another Principle of Animation that Bishko believes is also an enduring Principle (32). In other words, it helps the audience understand the events on screen by giving pre-sight into what is about to happen, it reflects a planned sequence of actions that moves from one action to the next (Thomas and Johnston 51). This makes ‘anticipation’ the clearest signifier of intent (Bishko 32). It represents the body’s automatic provision for an action; this refers to bodily muscle movement, where the muscles must first be extended before they can contract: a foot must be pulled back before it can be swung forward to kick (Lasseter 38). In simpler terms, a character might need to jump in the air, but in order for the audience to register that movement it will need to incorporate ‘anticipation’, the character will do so by lowering itself more towards the ground in preparation of the jump. Without ‘anticipation’, actions are unnatural as they become stiff and abrupt, reflecting more robotic movements than organic (Lasseter 28). It has been one of the oldest theatre devices as it helps the audience understand what the character is doing is without question because they are informed by the characters additional actions ahead of time of what they intend to do (see Figure 3). Without ‘anticipation’ audiences can be confused as to what is happening on screen (Thomas and Johnston 52).

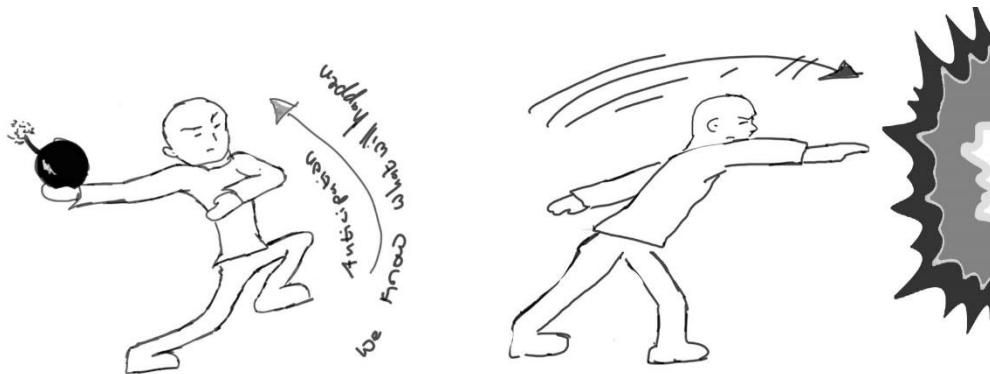


Figure 3: “Anticipation”. 2016. Digital drawing by the author.

Bishko deems ‘anticipation’ important for achieving the Cartoon style as it embodies character intent and therefore builds authentic and realistic performances (32). It includes preparation for the action, the action and recuperation of the action. ‘Anticipation’ is the preparation of an action (Lasseter 38). Luckily, ‘anticipation’ is an Animation Principle that moves over to 3D animation seamlessly, as it does not distort the form like ‘squash and stretch’ does, rather it reflects a pose or position the body moves into and can therefore be done in motion capture without much divergence. There are of course some movements that *Loony Toons* are famous for, such as the anticipated run hold when the characters legs are running but his upper body remains still that a human body cannot achieve.

‘Anticipation’ is also closely linked to ‘exaggeration’. The anticipated movement is exaggerated so that the movement is bolder and easier to read. As it is, anticipated movement is already an exaggeration to what a similar movement would have been in reality.

‘Exaggeration’ is another Principle of Animation that physically exaggerates the action or performance of a character. When Walt Disney looked at a sad character from his animators, he wanted them sadder, when he looked at a happy character, he wanted them happier (Thomas & Johnson 65). ‘Exaggeration’ makes an action, emotion or pose more convincing and clear by making the physical proportions or action larger than life (Thomas & Johnson 66). ‘Exaggeration’ is often used in combination with ‘squash and stretch’ and ‘anticipation’ in order to help create clarity and engagement by aiding the movement becomes bolder and better defined. The actors at Flying Circus consider that their actions need to have a purpose for every single movement, which is different for every character, because each character has a specific physicality (Van Der Merwe). Buckland notes how important ‘exaggeration’ is in

acting for motion capture animation because subtle details of movements do not work as well as they do in live-action acting as they are subtle and therefore harder to read when the same movements are applied to animation. Instead ‘exaggeration’, simplification and heightened poses helps the movements become clearer for the audience to read. Matthew Lottering, lead animator at The Flying Circus, believes that the Principles of Animation help to create realistic and convincing motion for the animators to work with. Lottering suggests that the actors’ performance allows for the actors’ body to naturally create ‘anticipation’ as well as ‘squash and stretch’. Lottering says that the team of animators at The Flying Circus help to create Anticipation by exaggerating the actors’ performances during acting phase in order to emphasize the ‘anticipation’. Lottering says animators also help to create appealing silhouettes⁸ which actors might not consider that results in better *Staging*. This shows that even using motion capture, animated films can use the cartoon aesthetic techniques to create movement that is engaging and clear to watch and reflects the cartoon aesthetic.

1.2.4. Follow through and Overlapping action

The last Animation Principle Bishko claims is important is ‘follow through and overlapping action’. ‘Follow through’ involves certain parts of the body, or appendages attached to the body, not all moving at the same time as the main bodily movement but continue to move behind and after the body stops. ‘Overlapping action’ is the offset of when other parts of the body or appendages start to move, as they usually do not start at the same time as the main

⁸ In animation, the silhouette involves creating a clear and appealing pose for the character so that the viewer can easily see who the character is and what they are doing. Animators often black out the character’s pose to see if the silhouette is clear enough.

bodily action but will catch up by typically dragging after the main body part. Bodies do not move all at once, appendages like ears or hair usually follow after the body, and loose flesh such as cheeks or flaps will move at an offset time from the main parts of the body (Thomas and Johnston 59-60). This is what 'follow through and overlapping action' is really about, delaying movements in order to represent physical properties of the real world. This stops the figure looking stiff and unnatural and gives looseness and wholeness to the figure, and overall gives a more successful illusion of life because it represents physics of the real world that audiences expect to see when watching characters (Thomas and Johnston 60). When combined with 'squash and stretch', 'follow through and overlapping action' support the physical mass and materials of the figure's form while in motion (Bishko 32).

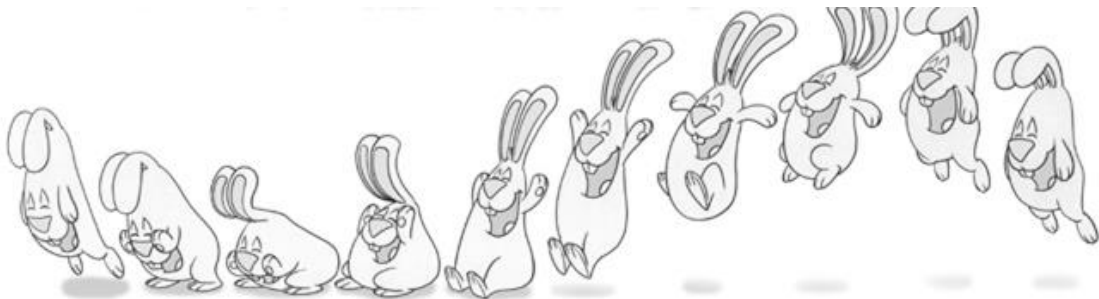


Figure 4: 'overlapping action' by Lemay. Digital image. PRINCIPLES OF ANIMATION.

The Animated Cartoon Factory, 2011. Web. 18 Jan. 2016. Lemay, Brian.

When moving into 3D, 'follow through and overlapping action' tries to reflect realistic properties of the material or object; this makes it possible to convert the Animation Principle from 2D into 3D. However, in some 2D films there is an amount of distortion when the

image drags to achieve this effect, such as the turning of a head, floppy cheeks will drag behind and distort as it stretches out and catches back up to the face. Obviously elements like this cannot be achieved in most motion capture productions when using the raw data from the actor's performance, unless the system allows for that amount of detail. 'Follow through and overlapping action' are generally put in during the animating phase of most productions (Lottering).

Lottering believes that the actors might not need to be conscious of the Principles of Animation because the body can naturally perform these motions which can be translated into the Principles of Animation. If the animators feel it is necessary to exaggerate the body's natural performance, they will (Lottering). Lottering gave an example that if the character needs to jump on a table 'the actor in the mo-cap room just jumps up and down. The animator goes in and really gets the character on his haunches to give him that *Squash* boost that he needs; we are really giving him the 'squash and stretch' and the arc to get it to the point where it needs to be. If someone's punching and the timing and spacing is off, we've got the freedom to go in and change it.' This allows for animation to be extended further in post-production, the actors will provide the idea of the performance but might find himself limited to the restrictions of the human body in his performance. The animator then has the ability to go and exaggerate what the actor was trying to achieve and connect the performance to the Principles of Animation in order to create cartoon movement that is more engaging to the viewer and clearly defines what the character is doing.

1.3. Movement and the Cartoon Style

Bishko states that ‘squash and stretch’, ‘anticipation’, and ‘follow through and overlapping action’ are the building blocks to creating authentic character performances and also the frontiers in creating a stylistic set of features that make up the cartoon style (32). However, these Animation Principles cannot just be thrown into the animation without specifically crafting movements, developing characterization and style for characters, and overall stylistic elements of the film (Bishko 33). One cannot just use these three Animation Principles on characters as if they are but a simple formula in hopes of achieving stylistic features of the cartoon style and functional movement. Without carefully designing each character’s movement there will be a lack of authenticity as the characters movement would most likely all move the same and use the Animation Principles in the same way. This is where animators can use tools from acting to help them clarify the character’s intent in the movement and integrate the movement with expression, which will express the inner expressive drive that influences the character’s actions (Bishko 30 & 33). Clarity of expression is of utmost importance for animators and directors to implement so that movement, voice acting and dramatic context all match the characterization of the characters so they do not appear hyper-active, over-the-top or shallow (Bishko 33).

According to Bishko, to create authenticity of animated movement, there are two things that need to be apparent:

- Firstly, create ‘Suspension of Disbelief’⁹ in order to engage with a character and make sure the character is convincing and
- Secondly, through characterization the character is seemingly authentic in their intentions and unmistakably clear through their movements and expressions (Bishko 24).

Movements need to match dialogue and dramatic context; this does not mean characters’ movement are over exaggerated just because they try to follow the Principles of Animation, because this makes characters appear ‘over the top’ and the movements end up not matching their personalities. In this case, the characters will be considered not authentic in their movements. Authentic movements are important in animation as it aids in achieving believability and engagement for the character (Bishko 25). Bishko explains this with an example from *Robots* with the character of Ratchet the antagonist of the film, who has a broad range of gestures that transition suddenly from one extreme to the next yet has a dark controlling character and whose voice actor does not match the gestures making Ratchet seem out of control (Bishko 25). Ratchet’s movement inconsistencies to his character idea and his voice actor make him say one thing but say something else with his movements which become inappropriate for his character (Bishko 25). To achieve authentic characters, Bishko notes that the audience must believe in the characters “because all elements of the animated illusion are unified”, but also this is what animation viewers have come to expect when watching animation films (Bishko 25). Audiences engage with the characters due to emotional empathy because the audience can understand the dramatic context the characters

⁹ This topic will be discussed fully in chapter 2.

find themselves in from their own personal emotions (Bishko 25). As audiences, we can experience the authenticity of a character through his movement by expressing his emotion with his whole body, making the emotion readable so that the viewer can engage.

Authenticity also includes design; this means the design of a character should match its characterization and personality. This entails line, shape, form, colour, composition, voice acting and movement which must all align themselves to form a meaningful whole; a character is then believable because all its parts seem appropriate to each other (Bishko25).

1.4. Stylization of Designs

1.4.1. Simplification and Engagement

The cartoon style has become a default aesthetic style for most animation films because it gives authentic movement, which is vitally important as through movement the audience can read what is happening in the film (Bishko 34). However, movement is not the only thing that reflects the cartoon style, but also the aesthetic design of the characters, by this I mean what they look like, how simple or realistic they were designed to look and the stylistic bracket they would fall into. Cartoon style is reliant partly on the design of characters, which needs to have appealing characters and communicate an idea about what the personality of the character is. Designing characters for animation or drawings normally involves simplifying and abstracting the forms until the character represents that idea with just their design. Scott McCloud speaks about simplifying character designs and how simplification is important for the viewer to be engaged and identify. In drawn pictures the level of abstraction varies, some pictures are more abstract or simplified than others (McCloud 28). The photograph is the most realistic picture that can resemble real-life counterparts; this is best

demonstrated with the example of a human face. The photographed face, although it does not move because it is one image, is the closest image that resembles the face in real life.

When the image of the face becomes more abstract, it can still resemble a face, even when it becomes just outlines (McCloud 29). It is now no longer a photograph, but it becomes a drawing. The more the image becomes abstracted or simplified, the less it represents the realistic photograph of the face. The more abstract the face becomes the more acceptable to our eyes it becomes and it “seems just as real as the others” faces that came before it and were more detailed (McCloud 29). As we simplify the photograph, it turns into a drawing, then a cartoon image and as we simplify it further it turns into nothing more than a circle, two dots and a line, but still we see it as a face. The image by McCloud from his book *Understanding Comics* demonstrates this progression.

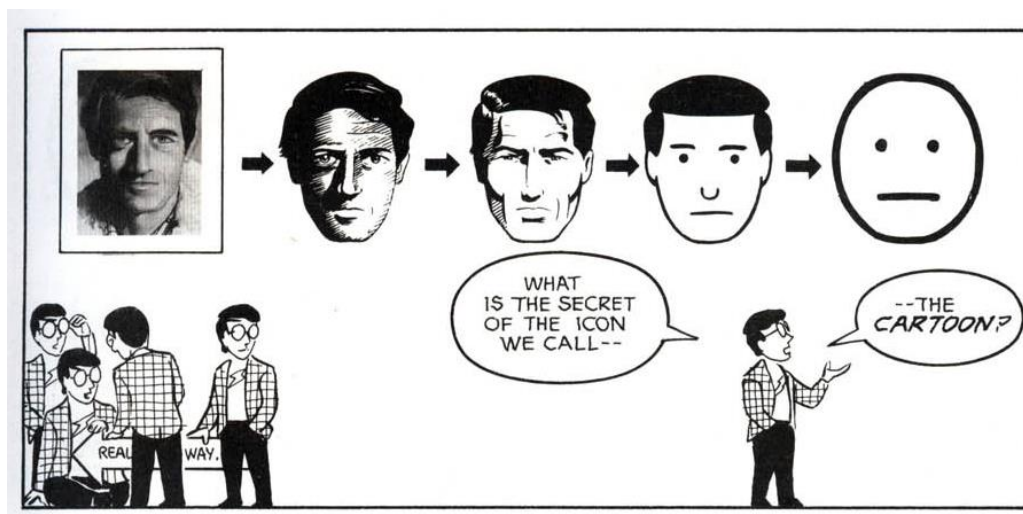


Figure 5: *Simplification of a face*. McCloud, Scott. 1993.

Through this simplification process, the focus is more on the specific or defining details of that face (McCloud 30). This is why animated cartoon characters can sport overly large noses for example, because the nose was the dominant feature of that face and was exaggerated to

put more emphasis to it and create more of a caricature style. Typically the cartoon image or animated characters are generally a little more detailed than a smiley face, such as the third or fourth image in the above sequence, the question now becomes *why* do viewers respond so well to them if they are so simple? I said that they are ‘generally more detailed’, but audiences can even respond to the simplest form like the smiley face, such as *The Powerpuff Girls*, who are only a little more detailed than the smiley face itself with additions of hair and different coloured eyes.



Figure 6: *The Powerpuff Girls*. Michelle, Kara.

So why do audiences respond so well or better to cartoon images as opposed to a realistic photograph? Why do audiences young and old respond so well to *The Powerpuff Girls* to warrant six seasons, a movie, an anime spinoff, and a upcoming re-boot? Would a live-action version or a hyper-realistic version of *The Power Puff Girls* do as well? Probably not at all because undoubtedly the *Powerpuff Girls* look much better as cartoons. When the character is stripped down to the essential features the meaning or essence behind that character is amplified in such a way that could never be achieved in realistic images (McCloud 30). This will also make their meaning an essence simplified along with the design. Simplification of

allows the audience's attention to focus on an idea that is important in animation as it helps the legibility of the character. Legibility in character ideas is similar to when I previously spoke about 'anticipation', which was to help the audience foresee the action before it actually happened so that the audience did not question what was happening when the action did happen. In designing a character, simplification helps to create the idea about who that character is. Simplification helps in creating 'appeal' which it is one of the 12 Principles of Animation. Not all appealing characters are simplified, but simplification helps to create 'appeal'. *The Powerpuff Girls* are 'appealing' to children because they can represent a majority of young girls due to the three characters vastly different personalities that individualises them. Such as Blossom who is an intellectual and loves school and is the 'leader', Bubbles represents an archetypal cute girlish child who likes fluffy animals, is afraid of the dark and 'is the joy and the laughter', and Buttercup who is a tomboy character and 'is the toughest fighter' as the end theme song states. These distinctions are portrayed through their personality but amplified by their designs, such as with Bubbles girlish pigtails compared to Buttercup's more streakline short hairstyle. *The Powerpuff Girls* superhero abilities are also amplified through their designs through their matching striped costumes, they are also more simplified compared to the other children in the show, not even supporting fingers or ears, and they have much larger eyes which makes them stand out from the other children in their school. They also can be appealing to children by the themed colours of each character, red/pink, blue and green which children can pick a favourite powerpuff based on their favourite colour. They are designed to be essentially little girls with super powers that girl viewers can relate to and their designs amplify these two traits undeniably.

1.4.2. Appeal of Simplified Designs

‘Appeal’ is considered one of the most important Principles of Animation as it represents the secret ‘ingredient’ of engaging animation. However, it does not focus on movement as previously spoken about, but rather it entails the design of a character and how ‘appealing’ it is to the viewer. This does not mean the addition of cute attributes to a character, for even evil villains can have ‘appeal’. ‘Appeal’ basically means that the design of the character is pleasing to the eye and allows the audience to engage with that character. That can entail a quality of charm, simplicity, communication, and magnetism that the character’s design displays (Thomas and Johnston 68). Once the viewer appreciates the design, not necessarily because it is highly realistic or skilfully drawn, then the character’s design has ‘appeal’. ‘Appealing’ characters compel the audience to watch; regardless if the character is striking or repulsive, if they do not have ‘appeal’ then the audience will not want to watch what the character is doing (Thomas and Johnston 68). This is known as charisma in live-action film. The most important question is how to make characters ‘appealing’ which is somewhat subjective by nature. A design that is hard to read lacks ‘appeal’. This harks back to the concept of the *idea* of a character that helps legibility of who the character is and what he/she is all about. The design of the character should communicate the idea of the character and show the audience who the character is as a person. For example, the design of Maleficent from *Sleeping Beauty* depicts her as an evil character with black and red colours, long cloak, lean white face, dark coloured cosmetics, long thin fingers, and horns on her head and when she spreads her arms out it appears as if she has wings, foreshadowing her later transformation into a dragon.

These designs are not to make her appear scary but rather to give the idea that her character's essence *is evil* and she is the antagonist of the film.

An unappealing character would be The Great Gazoo from *The Flintstone viva Rock Vegas*, which is a live-action take on The Flintstones. Although live-action, the interpretation of a cartoon character that once had 'appeal' replaces his charm with horror. The most unappealing part of this design is Alan Cumming's large face attached to a small misshapen body results in a badly proportioned design. Other unappealing factors are the sickly colour of his skin, his small flat hands, a ball shape body and the unauthentic chrome of his headgear, making what was once the cute Great Gazoo into a bizarre, hard on the eyes, unidentifiable, creepy character (Stuff). Compared to his cartoon version of a tiny green floating alien exiled to earth for creating a doomsday machine, his character is a troublemaker for Fred Flintstone who he calls 'Dumb-dumb'. The live-action version did not in any way capture the essence of his character through the design.



Figure 7: *The Great Gazoo* live-action.

IMDb. IMDb.com, 7 Jan. 2001. Web. 4



Figure 8: *The Great Gazoo* Animation.

Digital image. YouTube. YouTube, 4

When characters are stripped down to their essential features, they communicate the idea of what the character is all about better than if they were detailed realistic impressions.

Audiences respond better to characters with less detail than with more detail because more detailed and realistic creates more objectification than engagement with the character, but there is also another reason why simplified characters are more ‘appealing’ to the audience.

McCloud believes there is more at work that goes on in the audience’s mind when they view a cartoon that is simplified (31). He calls this ‘Universal Identification’ which is applied to cartoon characters that have been simplified. The more ‘cartoony’ the image of a face is, the more people it can describe or represent.

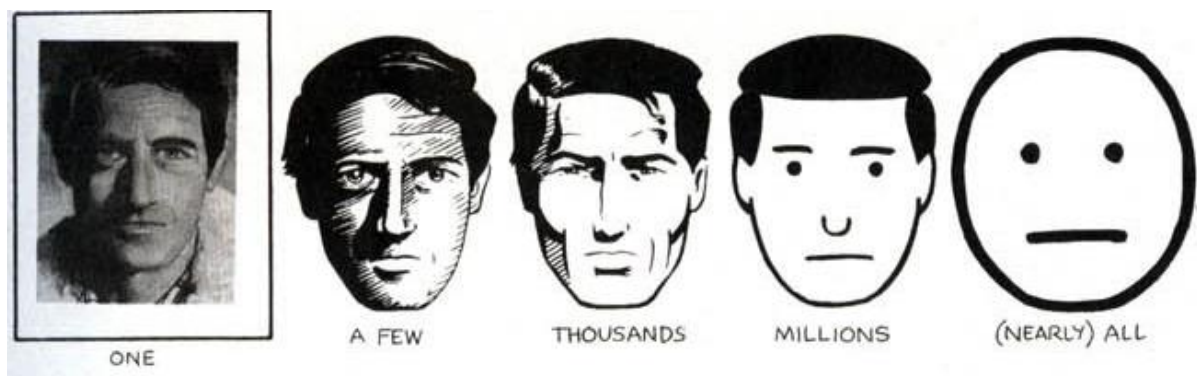


Figure 9: *The Cartoon face*. McCloud, Scott.

The smiley face on the far right in Figure 9 is nothing more than a circle, two dots and a line, but your mind cannot avoid letting you see it as a face even though it does not look anything like a real face. Humans can see themselves in almost everything, and we assign identities and emotions to images that look like faces because we make the world in our image (McCloud 33). The *Blue Umbrella*, a Pixar short made in 2013 is a fantastic example of this, as characters are created out of mundane city objects on which faces are implied. The audience

can see the suggested face implied in each character because we can see ourselves in the world around us.

Going back to Figure 9, the realistic image can only represent one person, the person whose photograph was taken, but as the image begins to simplify it can start representing more and more people. People can start identifying with the face as themselves as the image simplifies until we see the face on the far right, which can represent everybody in the world, it has no gender, no specific facial features; all the image has is a mouth and two eyes, with which every person can identify. This enables viewers to see themselves in that image. This happens because we cannot remember ourselves as vividly as we can see other people in front of our own eyes; we retain a sense of a shape of the general placement of our own features in our minds, a concept of ourselves, something similar to a simplified sketch... or a cartoon (McCloud 35-36). Therefore when we look at a simplified face, we can see ourselves in that image, and when we look at a realistic drawing or image of a face, we see it as another face, not our own, we are objectifying it because it is realistic and describes someone else, therefore we cannot identify with it (McCloud 36). However, not all cartoon faces are simplified enough for everyone to identify with them, but the simpler the design the more people will be able to identify with it. This shows the importance for the cartoon aesthetics being implemented into design aspects, because they help create audience engagement better than realistic character who become objectified by the audience.

This is why children and even adults have a primary fascination with cartoons, because of Universal Identification and simplicity that can allow for the viewer's own identity and awareness to be inserted into the cartoon character that enables the viewer not to just observe

the character but become that character (McCloud 36). With realistic characters, the audience objectifies and becomes too aware of the person to fully receive the character's idea or message about who they are and what they are doing (McCloud 37). Simplified characters are blank slates, the audience does not wonder who the person is, so that what they say and do and what the idea behind them is matters more (McCloud 37). The cartoon is a concept as is does not emphasise the appearance of the physical world, but favours an idea of the form of the physical world placing itself in the world of concepts (McCloud 41). McCloud's argument that abstract designs are better suited to characters because the audience can identify with them is central to my argument when comparing hyper-realistic and caricatured characters, as to which provides better engagement for the viewers. One of his main concepts I will draw from will be simplification of designs when looking at characters from *The Adventures of Tintin*.

1.5. Objectification or Engagement

“Aesthetic engagement in animation can focus fundamentally on the appearance of the characters [...] and overall contributes to the level of immersion and depth of [the audience's] cinematic experience”

(Butler & Joshko 59).

Audience involvement comes from the degree to which the audience identifies with the characters (McCloud 42). Conventional character types are easily recognisable, such as a girl, boy, dog, or cat character types. These increase chances for success as they depict ‘types’ of

characters that are easily recognisable and can represent types for the audience themselves to identify with (Furniss 67). Cartoons have a speciality of creating viewer identification as mentioned previously, but backgrounds and environments can be seen to be slightly more realistic, even in Disney films and some comics such as *Tintin* (McCloud 42). *Tintin* comics feature characters that are greatly caricatured, Tintin himself is a step up from a smiley face just like *The Powerpuff Girls*, but he is featured in unusually realistic backgrounds. This allows the viewer to identify with simplified characters such as Tintin and immerse themselves into a visually stimulating world that is more detailed and vastly more realistic than the character (see image below); this is called Masking (McCloud 43).

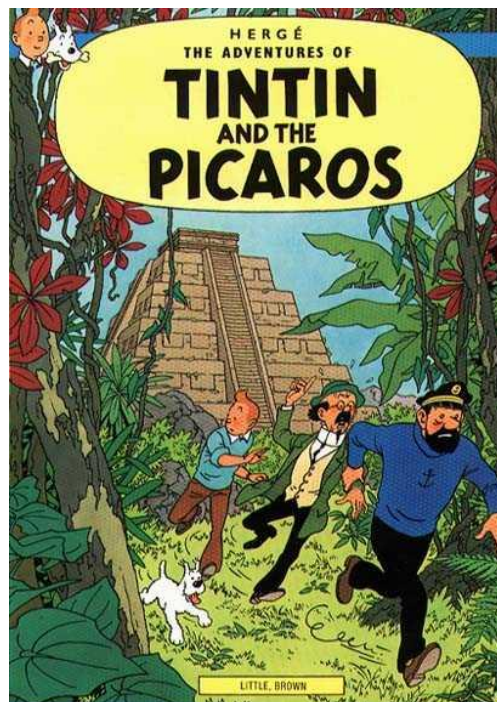


Figure 10: *The Adventures of Tintin* #23. Hergé.

Some characters are drawn simply to assist with viewer identification, but others are drawn realistically to objectify them for a specific purpose, this is most commonly seen in manga and anime films (McCloud 44). They become “othered” from the person viewing them, as

mentioned before; they represent one or a few people who can identify with them because they are more detailed. A choice in style can have consequences far beyond the mere look and feel of an animation; a simple style does not necessarily mean a simple story (McCloud 45-46). The Tintin comics demonstrates what many caricature animation films do, especially those of Disney, Pixar and DreamWorks, they use simplified characters to engage the audience situated into a realistic environment, allowing the audience to identify with the characters and visualise themselves into the visually stimulating world. This is important to note for engagement and is very important in ‘appeal’ and how this will be used with motion capture caricature films.

1.6. Acting for Film and Adapting to Animation

Animated films would require the animator to not only move the character but provide the performance; this means that the animator’s job is not only to draw the action but to articulate the acting basis for the performances (Sarfo-Boansi 14). Animators need to think deeply about their characters to understand what it is that makes a character’s performance authentic, many early animators from Disney enrolled in acting classes to seek greater understanding and many animators today still do so as well (Thomas & Johnston 473-478). Animating characters who are able to incite ‘pathos’ in the audience, a term used to describe how on-screen characters create empathy and connection with the audience, is key to creating emotional connections (Thomas & Johnston 475).

Konstantin Stanislavsky's theory plays a fundamental part of acting that requires performances which are compelling and believable (Sarfo-Boansi 15). Much of the westernized forms of acting use Stanislavsky's theory, as it forms the basis of Method Acting which emphasises studying and living the role of a character incarnated by the actor, and tries to achieve better characterizations of the characters (Sarfo-Boansi 16). The actor needs to *become* the character (Sarfo-Boansi 16). Although not physically on-screen, animators still embody the characters through their performances (Crafton 45). The process of embodiment through incarnation gives animators artistic ownership over the animation that can reflect their personal techniques, and is what Stanislavsky referred to as the creation of the 'inner life' of a character that legitimizes and authenticates the character's external actions from a deep internal source within the actor (Sarfo-Boansi 16). The 'inner life' concept uses an actor's personal memories "to inform moments of narration action" (Wells 105). The animator essentially becomes a Stanislavskian actor because they construct and develop their character with experiences by means of the animator's 'inner life' (Sarfo-Boansi 16). Due to animation being a graphic medium where characters are drawn, performances in animation can often be very exterior based with focus on actions and movements, with little display of internal feelings and emotions of a character's performance (Sarfo-Boansi 16). Influences from Stanislavskian acting allows internal motivation to give performances emotional depth to animated characters so they are not mere moving drawings but believable characters with emotions and desires (Sarfo-Boansi 16-17).

Animated film has never strived to mimic live-action film exactly because animation was always meant to be a fully constructed medium and could never truly convince the audience

that it was a recording of the real world (Sarfo-Boansi 19). Due to this idea, Disney always meant to take advantage of animation stylization without trying to make what was happening onscreen plausible and insisted there remained some gap between animation and cinematography (Sarfo-Boansi 19). The animated aesthetic still governs these performances in terms of naturalism that resulted in the animator controlling the way poses and actions were staged, which remained grounded in animated stylization and resulted in ideals of clarity of expression and readability of poses and actions over and above naturalistic acting (Sarfo-Boansi 19).

Audiences understand that in live-action film, there is a real physical living person portraying the character (Sarfo-Boansi 28). However, animated characters do not have a separate identity out of the film and have no life other than when they are onscreen, and the audience knows they are not real due to their stylized or graphic representation, but at the same time accept them as real persons just as they would an actor in live-action film (Sarfo-Boansi 26). Crafton believes that the animated character comes close to real, but the audience's belief in the characters living status is always consciously or unconsciously aware that they are manifested beings because the audience (52). Disney's push towards naturalistic animated performances was to try and reduce the gap between the real world and animated realism so the viewers would experience engaging characters (Crafton 82-83).

In animation, Milt Kahl said that "the hardest thing to do is nothing" in animation, because animation is filled with gestures and dynamic movement as well as being such a constructive form (Sarfo-Boansi 34). Animators who study techniques of acting found that Stanislavskian acting often made acting more subtle. Animators realised certain techniques were not

necessary or suitable for animation's graphic representations and animation demanded that movements were better when they were displayed to the audience purposefully so that the action and emotions of the character was clear and readable (Sarfo-Boansi 34-35).

In contemporary animation trends, however, such as with DreamWorks Animation, there has been a move to a more naturalistic kind especially in CG animation where the animators emulate "low-key ostensiveness" that corresponds to dramatic live-action film meant to increase believability, and show case characters that perform in very subtle ways during emotionally driven moments (Sarfo-Boansi 35). Modern day animators often try to create subtle performances that can have as much range as live-action performance (Sarfo-Boansi 36). This relates to 'secondary action' in animation, which is used to support the main action by creating 'extra business' that creates movement or gestures that supports the primary action and adds more dimension to the animation (Thomas & Johnston 64). However, animators always stylize it in some way, because without stylization the performance would appear far too realistic for a medium where characters and backgrounds are generally stylized (Sarfo-Boansi 36).

Daniel Buckland states that when he performs for motion capture animation at The Flying Circus, there are a lot of similarities to acting for live-action or theatre, such as the motion capture performance space, which is similar to the performance space of a sitcom, where the actor performs in one direction. Unlike acting for live-action, acting for motion capture animation needs to contain actions that are heightened, simplified and amplified in order to be clear and easily read (Buckland). Buckland believes that animated motion captured

characters that are stylized demand that gestures, thoughts, and motions have a ‘sharpness’ and ‘tightness’ to them that naturalistic acting or method acting does not have.

Buckland says after much experimentation with acting techniques, he ended up acting ‘between pedestrian¹⁰ and robotic’. Buckland states that acting methods for animation are routed more in the body and physical acting rather than relying on emotion to fuel acting, such as in method acting. Buckland explains that it is more important to play the character, to find the characters body, weight, breath, movement style, bodily rhythm, stride length, and rhythm of speech that the character has an affinity to. An essential technique Buckland uses is improvisation to come up with new and creative material that the writers had not thought about, and that other animation studios (that use keyframe animation) might lack such as add in in unscripted performances or an interpretation by the actor.

Buckland explains that ‘exaggeration’ is important in order for actors to play stylistic characters because their movements need to stylize their performances; this helps actors amplify the physical comedy in animation. Buckland explains how minor movements in certain actions, such as a mime, might work in live-action but in animation, they can often look unrealistic because of the subtle movements that are captured which he calls ‘white noise’. Acting for animation does not need the subtle bodily movements of naturalistic acting; therefore they try to take out the ‘white noise’ of body movement such the subtle subtextual motions that are meaningless, because they do not resonate with the audience in the caricature style (Buckland). Rather the actors have to clean and simplify the physical actions

¹⁰ A style of acting that takes general everyday movements that are adopted into performative expression. For example: an actor walking across the stage that is turned into a performance that makes it stylized by the fact that it is a form of gesture has been transformed into a performative gesture.

to represent ‘one specific contradiction or one specific inner conflict and then amplify that up’. ‘Squash and stretch’ is also used during acting phase to try and amplify their acting.

Buckland says that, similar to pose-to-pose in animation, actors try to hit the actions fast and remove subtle movements from the performance to provide movement that is clear and easy to read.

The audience’s eyes are a lot more forgiving to acting for live-action than acting for animation (Buckland). Buckland states that audiences who watch animations are a lot more demanding when it comes to matching the style of the animation to the style of the acting. He also states that animated characters have more potential in acting and style which the audience has come to expect in animated films because they have previously seen what animation is capable of elsewhere in other animated films. Therefore, it is important that the performance of the motion capture actor fits the aesthetic style of the animated film.

1.7. Conclusion: Cartoon Style and Engagement

When looking at the development of motion capture animation, many studios can spend millions of dollars producing a film that uses motion capture (including facial motion capture), because of the amount of technology, equipment and time employed and developed during the production of the film. I will speak more about two films and how they used motion capture later in my case studies in Chapter 3. However motion capture does not always have to be an expensive means of creating motion capture film, Andre Van Der Merwe, CEO of Flying Circus, uses motion capture as a primary means of animation for the

content they produce in both series and movies. Andre Van Der Merwe states that The Flying Circus uses motion capture as a means of creating animation more quickly than using keyframe animation. The Flying Circus produced their Silly Seasons series, which consisted of 26 episodes (each 24 minutes long) - this made up eleven hours of screen time, in eleven months, using only 20 animators (Van Der Merwe). Mathew Lottering said that using motion capture to create characters' initial movements helped to reduce the time that keyframe animators would require when starting from scratch at T-Pose¹¹. Lottering explained that it positioned the animators halfway through the animating stage of the pipeline¹², which normal keyframe animators would have to work towards. This helps to speed up their pipeline production time and reduce the cost of producing animated content. The Flying Circus also shows how motion captured animation can be used successfully in creating engaging content by using the caricature aesthetic.

The cartoon style is not a style that defines all animation entirely; it is a style that can be chosen to be used in animation. Other styles can be employed such as hyper-realism, which I will cover in the next chapter. From here on I will refer to the cartoon style as caricature, but I am also encompassing the cartoon style with McCloud's theories on simplification and all that has been discussed in this chapter which borders on abstraction, simplification and 'exaggeration' of style and design. In the next chapter I will discuss motion capture and realism in animation and how audiences react to hyper-realistic animations.

¹¹ T-Pose is the default unanimated pose of a 3D model that has all the models limbs straightened out. This result in the legs straightened out and the arms straitened sideways in the shape of a T.

¹² The pipeline in animation refers to the step-by-step process of development of creating an animated film.

Chapter 2

Brief History on Motion Capture in Film and an Engagement with Realism

2.1. Introduction to Motion Capture

In the last chapter the caricature aesthetic was discussed in detail, but now there needs to be investigation into what the hyper-realism aesthetic entails and how it is used in motion capture animated films. During this chapter I will give a history of motion capture, and I will speak about realism in film and what hyper-realism in animation means. In order to critique which aesthetic provides better engagement to the viewers, there needs to be an understanding of what 'realism' encompasses and how it moves across into hyper-realism in animated film, before *Beowulf* as a hyper-realistic animated film can be critiqued and a decision can be made on which aesthetic style is better for motion capture animated film. I will also give explain the relevant realistic filmic techniques of 'suspension of disbelief' from film studies as a basis for measuring engagement in film. As a starting point, the history of motion capture will be discussed in order to show how the technology came about and why it was developed further.

2.2. History of Motion Capture

The development of motion capture technology has been led by innovations in many varying fields, such as the medical sciences, army, robotics and more pertinent to this research, the CG industries; however today it is most commonly seen in film, television and video games (Kitagawa & Windsor 2). Motion capture is relatively new, having begun in the late 1970s (Sturman 1). Only in the last 15 years has it become widespread and used in large scale production films, especially in live-action fantasy films such as *The Lord of the Rings* trilogy (Peter Jackson), *Avatar* (James Cameron) and *Dawn of the Planet of the Apes* (Matt Reeves) to name a few but there are many more big production Hollywood feature films¹³.

The concept of motion capture as we know it today had not developed until the digital era of filmmaking began. In the late 1970s when it became possible to animate characters using the computer, animators adapted traditional techniques like rotoscoping to create methods of motion capture (Sturman 1). At the New York Institute of Technology Computer Graphics Lab where Rebecca Allen, an artist who created a variety of work from 3D computer graphics, animation, music videos and video games, performance pieces and virtual reality, used a mirror to super impose footage of live-action dancers onto the computer screen so she could pose a CG dancer for Twyla Tharp's project called *The Catherine Wheel*. The computer used the poses to automatically generate smooth animation between the key poses, although this meant setting a keyframe every few frames (Sturman 1).

¹³ *Final Fantasy: Spirits Within, Final Fantasy: Advent Children, The Polar Express, Last Order Final Fantasy VII, Monster House, Happy Feet, Beowulf, A Christmas Carol, The Adventures of Tintin: The Secret of the Unicorn, Mars Needs Moms, Happy Feet 2, Kochadaiyaan, Space Captain Haddock, Dawn of the Planet of the Apes, The Hobbit, Pirates of the Caribbean, The Avengers Reel Steel, Tarzan (2013), Star Wars: The Force Awakens.*

During the 1980s, biometric labs were beginning to use computers to analyse human motion; the techniques used in these studies began to make their way into the CG industry (Sturman 1-2). In the early 1980s Tom Calvert, a professor of kinesiology and computer science, attached potentiometers configured to be a form of exoskeleton to a body and used the output to drive a CG figure (Sturman 1-2). Using this method he used these potentiometers¹⁴ to produce output animation to computer figures for choreographic studies and clinical assessment of movement abnormalities (Sturman 2). Soon after, systems such as Op-Eye and SelSpot that used optical tracking systems became prominent in the graphics community (Sturman 2). Optical trackers are small markers attached to the body; they can be either flashing or LED or reflecting markers that a series of cameras use to capture the performance (Sturman 2). A combination of hardware and software picks out the markers in each camera's visual field and by using a comparison of the different images provided by the cameras, the software calculates the 3D position of each marker in a 3D programme (Sturman 2). Motion capture is limited by the speed at which the number of positions can be captured per second, as well as the resolution of the cameras especially when there needs to be differentiation of markers which are close to each other. It is also limited by a marker's occlusion¹⁵ which can limit the software if the cameras cannot pick up where the marker is (Sturman 2). Early systems could track only a dozen or so markers at a time; modern systems can do many more but still require manual post-processing to recover trajectories when a marker is lost from camera view (Sturman 2).

¹⁴ A potentiometer (commonly known as a pot) is a simple electro-mechanical transducer. Adjusting the potentiometer changes the resistance that can be used to control and determine the output current to a circuit.

¹⁵ Occlusion is the hiding of a marker that prevents it from the sight of one or several cameras and results in the system unable to pick up its placement (Kitagawa & Windsor 203).

In the 1980s, only a handful of CG animation companies existed, most produced flying logos for TV commercials or programmes' opening sequences (Kitagawa & Windsor 7).

“Brilliance” (also known as “Sexy Robot”) was an advert of a shiny robot moving like a real human being; it was produced by Robert Abel and Associates for the National Canned Food Information Council and was aired during the 1985 Super Bowl (Kitagawa & Windsor 7).

They painted 18 dots on the joints of a female model and photographed her action from different angles; using the data they imported the photographs into a number of applications to animate a CGI¹⁶ robot (Kitagawa & Windsor 7). The final product was ground breaking because it was the first successful use of motion capture and a milestone in the history of CG animation.

In 1988, ‘Mike the Talking Head’ was developed for Silicon Graphics to show off real-time capabilities of their new 4D machines (Sturman 3). ‘Mike’ was built so a single puppeteer could control his face including his mouth eyes and expression, which by using the Silicon Graphics hardware provided real-time interpolation between the puppeteer and ‘Mike’s’ geometry (Sturman 3). ‘Mike’ was performed at SIGGRAPH film and video show in 1988, a prestigious conference on and for the publication of computer graphics research held annually. At SIGGRAPH ‘Mike’ demonstrated that the possibility for motion capture technology was ripe for exploitation in the production environment (Sturman 3). Jim Henson Productions had previously been trying to create computer graphic versions for their characters but had had little success due to the limitations of the technology at the time. With the availability of a Silicon Graphics 4D series workstation they had found a solution

¹⁶ Computer Graphic Imagery.

(Sturman 3). This resulted in 'Waldo C. Graphic' creation, a computer generated puppet that could be controlled in real-time in concert with real puppets, the video feed and the computer generated image of 'Waldo C. Graphic' mixed (Sturman 3).

After seeing the possibilities of animating characters such as 'Waldo C. Graphic', Videosystem, a French video and computer graphics company created a daily production character called 'Mat the Ghost' in 1991 (Sturman 4). 'Mat' interacted with live actors and puppets on a daily children's show called *Canaille Peluche* produced by Canal+ that ran for three and a half years (Sturman 4). 'Mat the Ghost' had no post-rendering; this resulted in animation sequences generated in the time it took to achieve a good take (Sturman 4).

Generally a seven minute film would require about a week's worth of shooting time, however *Canaille Peluche* only required a day and a half of shooting for seven minutes of animation.

This resulted in a very successful enterprise as Videosystem created several hours of production animation for more than a dozen characters (Sturman 4). Typically the system required two puppeteers or actors working to control facial expressions, lip-synch and shape transformations for 'Mat the Ghost': the facial expressions were controlled by finger and joystick movements that the puppeteer performed, while the motion of the actor was directly mapped onto the characters body (Sturman 4-5).

SimGraphics developed a system in 1992 for facial tracking that they called 'face waldo', which used mechanical sensors attached to the chin, lips, cheeks and eyebrows that allowed them to track important motions of the face and map them in real-time onto computer characters (Sturman 5). This was a very important development for facial motion capture, because unlike 'Mat the Ghost' whose facial expressions were created using finger motion and

a joystick, the actor could now use his own face to manipulate the facial expressions of the character which resulted in better realistic movements and expressions. The first success of this technology was with ‘face waldo’ using the VActor animation system and driven by an actor behind the scene wearing the ‘face waldo’. This was a real-time performance of Mario from Nintendo’s popular videogame for Nintendo product announcements and trade shows to interact with the audience by conversing and responding to their questions (Sturman 5).



Figure 11. 1992. *SimGraphics VActor™*. Web. 19 Jan. 2016.

At SIGGRAPH in 1993, the company/studio Acclaim amazed audiences with a realistic two character animation done entirely out of motion capture created from a high-performance optical motion tracking system that was able to track up to a 100 points simultaneously in real-time (Sturman 5-6). The system is mainly used to generate character motion sequences for video games such as *The Amazing Spiderman*, *Resistance: Burning Skies*, *The Order 1886* and *Call of Duty*, which all featured motion capture animation.

In the past twenty years, many companies have released commercial motion tracking systems for computer animation, allowing motion capture to move into the realm of a large number of production houses and making it as wide spread as it is today. Many 3D products integrate

motion capture into their software as it is used far and wide in the current industry, such as 3D animation software Autodesk Maya, and add-ons that make it possible in existing programmes such as open source 3D animation software, Blender. When ideas of tracing over footage for animation started (which in essence is the core concept of motion capture), it was to benefit the realism of animated characters and in some productions it benefitted in cutting costs by taking out the expense of animator's keyframing the movement from scratch. As the digital era came, that objective stayed very similar but the need to produce more real-time (in live performance shows) animations was added. We can see that the development of digital motion capture was mainly in the pursuit of real-time animation of characters for purposes such as real-time television shows like 'Mat the Ghost' or marketing campaigns such as 'face Waldo'. As previously mentioned, motion capture was used for purposes other than animation; however the research will focus on motion capture for animation and computer graphics for feature films.

2.3. Realism Theories: Realist Theory and Formative Theory

Motion capture is closely linked to realism in that much of the content created with motion capture has used the technology to try to emulate realism or hyper-realism (in animated film). Live-action films such as *The Lord of the Rings* and *Rise of the Planet of the Apes* for example, use motion capture to create characters that could not be created normally without the use of CG and in both these instances the CG characters are made to look as close to the real world representations as possible. This is important for this study as animated films which try to

mimic realism are commonly described as hyper-realistic (which will be discussed a little after this section on realism). I will describe realism within traditional film theory, but not delve into the complexities of the subject as this is not the focus of this research. My aim is to focus on what realism means in live-action film so that it can be applied to the concept of hyper-realism in animation.

2.1.1. Formative Theory

There are two main theories for realism in film theory that Clare Louis defines in her research report *“A Study of How the Technological Advancements in Capturing Believable Facial Emotion in Computer Generated (CG) Characters in Film has Facilitated Crossing the Uncanny Valley”*. For this purpose, I am going to discuss these theories through the works of two pioneering filmmakers of the late nineteenth Century. The first theory can be illustrated through the work of George Méliès, a famous French filmmaker and illusionist who produced films that featured magic and illusions from the 1890s to the 1920s and made over 500 short films. George Méliès is said to fall into the **formative theory** (Louis 15). George Méliès is considered to be the pioneer of cinematic fantasy films because his films always incorporated lavish sets, magic tricks, special effects often done by stopping the camera, changing the elements around and then starting the camera again to create the illusion of magic, and he was the first to use such techniques in film. The impact his development made on cinematic film was enormous, as he was one of the first successful filmmakers (at least up until World War One) to tell a fictional story and invented most of the post-production

processes that involved editing footage, compositing layers, colour correcting, etc. to create a successful entertaining film (Louis 16).

Formalist theory states that film is art and not a reproduction of reality (Louis 16). It is based on the technical varieties of film such as camera, lighting, editing etc. elements that allow the filmmaker artistic control over the cinematic aspects of making a film (Andrew 76). Formalist theory believes that the real world needs to be altered and heightened for the audiences, making cinema a set of “correct choices” that classifies formative theory as providing the audiences with a catalogue of film effects (Louis 17). Formalist theory relies heavily on establishing the design of the aesthetic style of the film, the ‘mise-en-scène’ - the look and feel of the film and is about escaping the real world (Louis 17-18). It is very important when discussing the ‘uncanny valley’, as it relies on the *production technology* that makes a film look realistic; if the production quality does not match that of real life it challenges the perceptions of the viewer’s idea of a realistic looking human being (Sweeney 117). This creates uncanny characters which breaks the audiences ‘suspension of disbelief’. Concepts of the ‘uncanny valley’ will be covered later in this chapter.

2.1.2. Realist Theory

The second theory can be discussed through the work of Auguste and Louis Lumière (or the Lumière Brothers as they are more commonly known), who captured shots that were called ‘Slice-of-life’ films because they usually used the camera to record reality as it was happening

in an observational mode¹⁷. The Lumière Brothers form part of the **realist theory** (Louis 15).

Realist theory theorises the idea that the photograph is a recorded trace of reality captured onto celluloid by the camera (Louis 17). The metaphysical term for realist theory is called 'indexicality', which in film is used to embody the link between the photograph and the image preserved by the camera (Louis 17). Therefore cinema is best understood as an indexical medium because it records reality by capturing what is in front of it, unlike paintings or drawings (which have a subjective input from the artist) because the photograph or film captures exactly what is in front of it and therefore reproduces reality more accurately than other forms of image reproduction (Louis 17 & 18). Editing film, however, can result in trickery of true realism as real life is not cut. Editing film allows the director to change events and perspective by cutting the film and repositioning scenes, producing a false reality; this is called pseudo-realism (Brazin 12).

Traditional film reproduces a reality rather than just representing reality due to the element of the camera being involved. The camera is a mechanical device that reproduces what goes through the lens onto a piece of celluloid or digital film data without being touched by human hands (Louis 18). Roland Barthes, a literary theorist and philosopher, who influenced the development of many schools of theory, believed that photographs are inseparable from the references they were taken from (Louis 18). This is essential as the belief of the viewers' traditional relationship with the film is based on the idea that what they are seeing is happening in real life because its link is so close to their familiarity with the real world; this is

¹⁷ Observational mode is a term from Bill Nichols used in documentary filmmaking that suggests the camera is used to observe aspects of the world as they happen. The filmmaker typically makes no intervention in the events happening with the subjects in order to capture the truest possible representation of that scene or moment. It is meant to be used as 'a window on the world'.

similar to the concept of the ‘suspension of disbelief’ as I have spoken about briefly before and will go into in more detail later.

‘Motion picture realism’ a term defined by Andrew Kania, a Professor in Philosophy, involves two important categories for realism film: Cognitive Illusion and Perceptual Realism (Currie 237). “Cognitive Illusion refers to how film creates a false belief in the audience, the viewer wills their conscious mind to accept what they imagine rather than believe what is fictionally represented on the screen” (Louis 19). The viewer is fully aware that he or she is watching a film, but it is perceived as ‘documentary footage’ as if it were a representation of reality, even when watching fantastical creatures that are impossible in the real world (Louis 19).

Perceptual Realism theory suggests the closer the film creates an experience of the real world, the closer the experience of watching it approximates to the viewers’ experience of the real world and more effectively engages the viewers’ belief that what they are watching is real (Louis 19). Perceptual Realism and Cognitive Illusion are theories that are better fitting for live-action film than animation because it is folly to try and convince the audience that the animated film they are watching comes from the real world, unless the characters are meant to be hyper-realistic.

I have discussed a few theories for realism in live-action film, but indeed there are many different theories for cinematic realism available. I will focus mainly on the idea that realism is a recorded trace of captured reality, as suggested by realist theory based on the work of the Lumière Brothers. However, we can also suggest that realist theory is not pure reality captured as accurately as possible by the camera, but as a “medium that communicates certain represented realities to the viewer regardless of its photographic or digitally-rendered status”

(Louis 20). This would mean that realism is inbuilt into motion capture technology because the human body's motions are grounded in reality and the audience is able to experience these motions as those of a photographically recorded actor (Louis 22). Motion capture in animation is commonly referred to as hyper-realistic in style.

2.4. Hyper-realism Theory

Hyper-realist¹⁸ theory is the illusion of photorealism that attempts to represent “the conventional physical laws of the ‘real world’ through its aesthetic style, characters, objects, and environments” (Kunz 3). Paul Wells describes hyper-realism according to animated films as “the design, context and action within the hyper-realist animated film approximates with, and corresponds to the design, context and action within live-action films representation of reality” and tries to represent “the conventional physical laws of the ‘real’ world’ through its aesthetic style, characters, objects, and environments” (Wells 25). This means that hyper-realistic animation films try to mimic reality, so that we are faced with characters who try to look as close to the real-world versions of live-action actors as possible. Their faces and bodies do not sport caricature designs similar to those of the cartoon style, but mimic features similar to real-world living beings – audiences are able to see fine hairs on their faces, the pores in their skin, ‘realistic’ eyes, and faces that represent features of a real world living being. Motion capture animation resides partly in reality because it comes from the actor’s

¹⁸ There are many definitions as to what ‘hyper-realism’ entails depending on the subject. I use ‘hyper-realism’ in a filmic sense that is a recorded trace of a captured image and a representation of certain realities (Louis 20).

real world body, supporting what we have found out so far about animation history constantly trying to create more realistic movement. In animated films using motion capture, there will be a certain amount of clean up and re-animation, but it will be situated in a completely CG environment, that means the environment, the lighting, the effects are all rendered in CG. With this in mind, we should ask how 2D or 3D caricature animation films create realism.

2.5. Naturalism Theory in Animation

Realism in animation is a slightly different concept because there is no live-action footage presented to the viewer. However, realism still applies as we cannot deny that there is realism in animation otherwise audiences would not recognise or connect with anything in the film. Naturalism in animation is a term used to describe more realistic in Disney animation designs and movement when the term ‘hyper-realism’ seems inappropriate as it does not entirely mimic photorealism (Sarfo-Boansi 13). Animators prioritise stylization of character and environment designs for the audience to identify with the characters rather than making it seem as if it is ‘real life’ (Sarfo-Boansi 32). Animation is always distinguishable from live-action by some form of caricature and this definition takes into account that realism in animation is different from live-action realism because animation is constructed by hand in some way, making it a representation of reality in the form of lines and colour (Sarfo-Boansi 13). The practice of the Principles of Animation aims to represent ‘realism’ through the caricatured style by trying to create more realistic movement to help engagement and bring life to characters (Kunz 2). With naturalism in mind, we can find realism in animation

creation, although it is not a photograph of the real world reproduced through the camera, is it a reproduction of the real world through the animator's subjective input. However, we are looking at *motion capture animation*, which is partly grounded in reality as a photographically recorded actor, which is why realism in live-action was covered in detail.

2.6. The 'uncanny valley'

When it comes to realism in live-action or hyper-realism in animated films, the digital tools that enable sensory details help the viewers to be sensually persuaded into believing the fictional world is real because it invokes a sense of cognitive illusion (Louis 20). However, when the 'uncanny valley' strikes within hyper-realism films the illusion fails. Of course it is impossible to speak about motion capture especially in animated films without a discussion of the 'uncanny valley'. The concept of the 'Uncanny' was first used in an article by Ernst Jentsch, a German psychologist in 1906, called *On The Psychology of The Uncanny* (Kaba 188). It spoke about the uncanny rising from the case of uncertainty, which came when a person was having difficulty in making a decision (Kaba 188). Jentsch asked whether or not the objects we visually perceive are really *alive* (Kaba 188). Sigmund Freud further discussed the concept in an article entitled *Uncanny* in 1919, where he suggests the reason for its existence is the effort of mankind to reach immortality by overcoming the sense of death which is seen by the fact that man has created wax sculptures and artificial dolls and automations to look like the living, which is a denial of death (Freud 5 & Kaba 188-189). The feeling of the

uncanny is a realization that we cannot create a double of our own bodies or reach immortality (Kaba 189). The uncanny arises from the boundary between fantasy and reality, when we are faced with the reality of something that we realize is imaginary (Kaba 189).

The uncanny concept was first a psychological one, but has since been prolific with the production of robotics as technology advanced and the means of creating robots became more accessible. The ‘uncanny valley’ is a term that was initially used by Masahiro Mori a Japanese roboticist in 1970 to describe the phenomenon whereby the more lifelike a robot becomes to a real world human being, the more likeable they are, however only to a point (Butler & Joschko 56). When the human likeness of an entity increases, so too does the audience’s familiarity with the entity. Familiarity can also be interpreted as how the audience identifies with the character it views. However, this likeness can reach a point where it becomes disturbing because the “likeness is so close to human, yet has enough variation, that the difference suddenly becomes prominent” (Butler & Joschko 60), see figure 12 on next page. This point is dubbed the ‘uncanny valley’ and represents a literal valley on the graph (Kaba 189). The ‘uncanny valley’ has become the subject of much discussion and criticism among hyper-realistic films in animation due to hyper-realism animated films failing to produce believable characters. It is because of this reason that the ‘uncanny valley’ becomes important in this study of animated motion captured films as it suggests that if hyper-realistic characters fall into the ‘uncanny valley, they are breaking the audiences ‘suspension of disbelief’ and therefore failed to create engagement. It is not the intention of filmmakers to make the characters appear peculiar; the technology had just not reached the stage (at the time of their

making) where perfected hyper-realism was possible in fully CG animated films. The more the detail and realism of human likeness increases the closer it gets to the 'uncanny valley'.

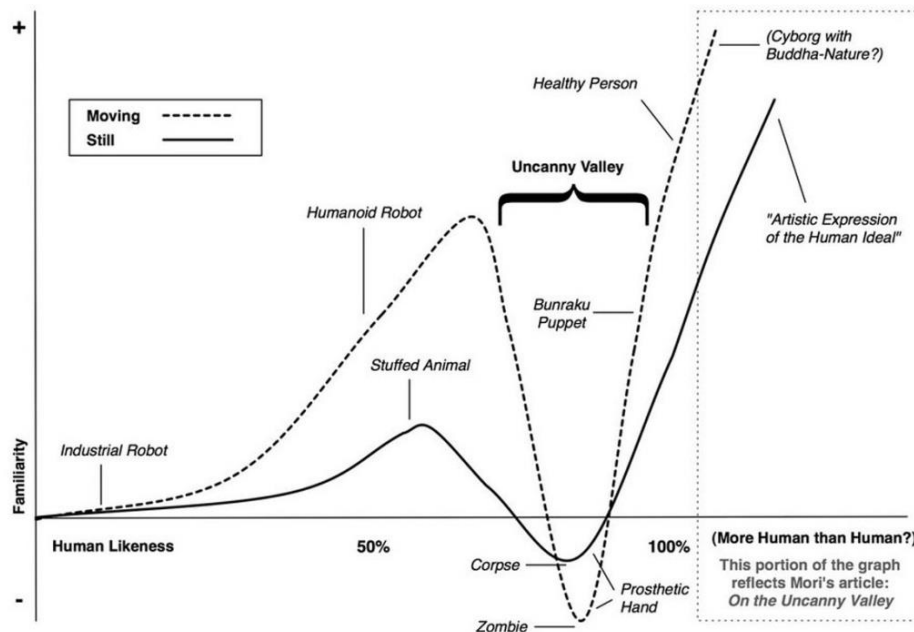


Figure 12. *The Curiosities of the Uncanny Valley*. Mori, Masahiro. Digital image. The Uncanny Valley. N.p., 26 Feb. 2013. Web. 19 Jan. 2016.

Motion can contribute to this feeling of the uncanny; motion that does not match the form or idea of the character can destroy the expectations set up by the viewer and result in the character seeming uncanny (Kaba 190). Movement in animated films is an important element in creating a synthetic reality which is essential to convincing an audience's sense of realism (De Beer 45). Movement in animation is made up of gestures that create the performance; however the movement is not limited to the physical body, but also encompasses emotion that is needed to interpret how the audience reads the gesture through expression and behaviours (De Beer 45). For convincing movement in animated characters from one extreme position to the next, the character's movement must demonstrate a realistic relationship between the flow of the character's body weight through time and space as a body would in

the real world (Wells 106). An animator's job is to re-create the process of making the body execute mechanical acts (De Beer 46). However, for animators it can be difficult to re-create even the slightest gestures and the appropriate movements to express the desired action and emotion due to the lack of details in the design and the sheer amount of movement that can happen in an expression or action cannot always be replicated and included into the animation (De Beer 46).

Andre Van Der Merwe stated that 'you cannot motion capture everything, it's not the answer for every piece of animation. It's a solution; it's a tool for very a specific kind of animation'.

Van Der Merwe states that, at *The Flying Circus*, movements that are incredibly stylized or exaggerated, or make use of 'squash and stretch' (similar to its use in Warner Brothers shows), are not the right style to be achieved in motion capture because motion capture is designed for a specific style of movement that is more realistic. Van Der Merwe believes that *The Flying Circus* situates its aesthetic style between stylized and realistic humanoid animation. Matthew Lottering believes that their characters are 'saved from the Uncanny Valley' due to the design of their characters and their world, which are situated in the caricature aesthetic. Lottering says their characters can look cartoony and move more realistically than characters that resonate with the cartoon style, without falling into the 'uncanny valley' because having a cartoon style that keeps the characters away from the 'uncanny valley' when motion capture provides so much detail in the animation. Lottering also says that 'when the two [stylization and realism] start merging and it's not quite real and it's not quite stylized either, and then it starts feeling creepy'. Lottering notes that *Avatar*, *The Rise of the Planet of the Apes*, or Gollum from *The Lord of The Rings* do not fall into the

‘uncanny valley’ because they aimed at making the characters look realistic, but he suggests that if all the human characters in those films were animated they would fall into the ‘uncanny valley’ because replicating exact human features and movements in motion capture has proven difficult to achieve perfection and the audience is very adept at spotting inconsistencies. This means that creating hyper-realistic human characters is a far more difficult task to achieve without falling into the ‘uncanny valley’. The humanoid characters that have similar features to humans but are not quite human, such as Gollum or Caesar and therefore are easier to create, but I will discuss this concept later in Chapter 3.

Adam De Beer whose research focuses on animation and movement in animation and the history of animation in South Africa, speaks about movement as a semiotic system that entails Salience and Framing in the context of creating movement for animated characters on screen that create meaning and impact in the interpretation of their movements (47).

‘Framing’ constitutes devices which connect or disconnect parts of the picture to show the image but also specifically the movement in that image (De Beer 47). ‘Salience’ creates a hierarchy of importance amongst the compositional elements of the images present in the film (De Beer 47). De Beer connects ‘Salience’ to technology and programmes that are used to re-create the process of animating (48). One such example De Beer presents is software that creates hair flow (48). This software becomes a technological gimmick in motion capture films such as *Final Fantasy: Spirits Within*, where such gimmicks are used only on certain characters for hair movement, but it is out of place due to lack of wind or body movement (48-49). Such devices disconnect the viewer from engaging with the film because the movement detracts from the realism by drawing too much attention to it and therefore results

in the movement becoming uncanny (48-49). The audience's mind can easily pick up incorrectness and if movement mismatches the audience's idea of realistic movement based on the physical properties of real world movement, then the illusion of reality is destroyed (De Beer 47). When the movement fails to create a scene of reality for the audience due to incorrectness, the film has failed to engage with the audience and to suspend their disbelief (De Beer 47). The success of realistic movement in hyper-realistic animated films is the fact that movement is convincing when it is unobtrusive (De Beer 49). De Beer noted in his analysis of *Final Fantasy: Spirits Within* in his paper 'Kinesic Constructions', that in certain shots there was less emphasis on performance created from motion capture and more emphasis on movement made with software such as the hair gimmick mentioned earlier (49). This is the result of less animator intervention with movement and more reliance on the software and the inclusion of gimmicks, which breaks the illusion of reality in shots where there is less noticeable movement detail because the audience's eye is drawn to these gimmicks which do not represent realistic movement (De Beer 49).

In the years following the success of *Toy Story*, and as technology began improving, filmmakers tried their hand at creating hyper-realistic human characters in both live-action and animated films. Live-action films with characters created by motion capture have in most part prospered and been praised for their realism and success, such as Gollum from *The Lord of the Rings*, Caesar from *Rise of the Planet of the Apes*, the Na'vi from *Avatar*, and Smaug from *The Hobbit: Desolation of Smaug*, to name a few. However, when *Final Fantasy: The Spirits Within* was made in 2001, the world saw one of the first fully animated films that used motion capture to create movement for its characters and with it came the concept of the

‘uncanny valley’ that was brought into discussion for animated film. Animated film characters such as those in *Final Fantasy: Spirits Within*, *Christmas Carol*, *The Polar Express*, etc., were described as having a mechanical quality to their movements, a coldness in their eyes and it was apparent the characters had fallen into the ‘uncanny valley’ that Mori described (Kaba 190). Some critics even went so far as to say that the film’s failure was due to the ‘uncanny valley’ (Kaba 190). *Final Fantasy: the Spirits Within* cost \$137 000 000 on production, but the total box office profit was \$85 131 830, a large loss of \$51 868 170 (Butler & Joschko 58). The failure of the film is often said to be due to the ‘uncanny valley’ which trumps other elements such as poor story creation, unbelievable character motives, etc., that could also have degraded the film’s success. The ‘uncanny valley’ is the foremost target of critics when reviewing films such as *Beowulf*, *The Polar Express*, and *Final Fantasy: Spirits Within* and other hyper-realistic motion capture films, as it results in the viewer’s failure to engage with the characters. When their senses are betrayed by something they find uncanny, ‘suspension of disbelief’ fails to retain in the viewer and their engagement is lost.

2.7. Suspension of Disbelief

It can, therefore, be deduced that the success of a film relies heavily on the audience’s engagement, which is why the ‘uncanny valley’ is so devastating to animated films as it breaks the ‘suspension of disbelief’ and the audience suddenly becomes aware of the creation of the characters on screen. ‘Suspension of disbelief’ allows for the audience’s willingness to be absorbed in what they are seeing (Bonasi-Sarfo 25). This can include every aspect of the film.

The continuation of a film's 'suspension of disbelief' is acquired by many things, to name a few: continuity editing, convincing naturalistic acting, not breaking the fourth wall, clear and seamless story development, and most importantly to this case study the continuation of the *mise-en-scène* and believable looking characters. Visually, when a filmmaker presents realistic characters and movements that do not match the expectations of the viewer, it results in their rejection of the 'suspension of disbelief' because their willingness to be absorbed by the film has been broken (Kaba 190). There are many ways a film can retain 'suspension of disbelief', but the minute the audience starts to question what they are seeing on screen as being nonsensical or become aware they are watching a film, 'suspension of disbelief' has failed. For the purpose of this paper, the discussion on 'suspension of disbelief' will primarily concentrate on *mise-en-scène* and the look/design of a character because this paper aims to assess the visual aesthetics that broke the audiences 'suspension of disbelief' and not the plot or character development that the filmmakers developed during pre-production. When we narrow 'suspension of disbelief' down we realise why viewers and critics can find motion capture animated films disturbing to watch. The audience may be disturbed by the appearance of the character due to the 'uncanny valley' and they are *noticing* that they are disturbed. The audience is able to *notice* that something is not quite right with the look of the character because there is a variation in the realism of the character that separates it from reality. In essence they are noticing all of this because their 'suspension of disbelief' which helps them enjoy and engage with the film has been broken, and therefore they will walk out of the theatre dissatisfied with their filmic experience because the entire time they were watching, they were aware they were watching a film with characters that didn't look 'quite right' due to the hyper-realistic aesthetic design of the films characters. This is important for

the study of motion capture because motion captured animated characters often fall into the ‘uncanny valley’ and break ‘suspension of disbelief’.

2.1. Aesthetic Engagement with Realism

Kunz defines engagement as focusing mainly on the appearance of characters and contextualized within their environments (4). The character design must suit their backgrounds somewhat in style in order to make the film appear as a seamless whole. We already know from McCloud that realistic representation of characters results in the viewer objectifying the character rather than identifying with them. Kunz notes that in order to create engaging character designs the designer must be aware of not making the character too realistic so that it stands a chance of falling into the ‘uncanny valley’, and design movements that are somewhat similar to how humans move in the real world but instead use a syntax of animation such as the Principles of Animation (4). So far, in the motion capture animation films that exist today, it would appear that not much demonstration of the Principles of Animation can be seen, as movements focus more on the motion capture data and using this to its fullest extent rather than using the movement as a basis to begin plotting the movement. Lottering notes how important it is that people who work in motion capture, such as the animators, need to understand the concepts of how to animate and the Principles of Animation in order to animate for motion-capture. Lottering notes that in most cases while working on a show at The Flying Circus, animators are required to animate faces, expressions and hands (as their system does not capture these motions and only captures

bodily motion), in addition animators will often have to tweak the performance captured.

Depending on the situation the character is in, these tweaks can be small or big, such as stunt shots which their system cannot capture (Lottering). Lottering notes that if their team has the time and resources available to them, they could re-animate over most of the performance captured in order to create animation that was much better. This shows how important animators are to the motion capture process as their job goes beyond cleaning up the motion captured data. It also includes the addition of elements from traditional animation that are not captured; or involves over-animation of the data in order to better the performance readability. It is important for motion capture to include additional animation over the motion captured data and not to be used straight without any alteration from the animators.

2.2. Conclusion: Motion Capture and Issues of Realism

Motion capture in animated films has long pursued realism, often being called hyper-realistic in style. Films such as *Final Fantasy: the Spirits Within*, *Beowulf*, *A Christmas Carol*, and *The Polar Express*, are all films that tried to take on hyper-realistic qualities. The majority of these films were made over eight years from 2001 with *Final Fantasy: The Spirits Within* to 2009 with *A Christmas Carol*, and have received poor critiques due to the effects of the ‘uncanny valley’ that breaks the ‘suspension of disbelief’ in the viewers. The majority of motion capture films are made in hyper-realistic aesthetics and only a handful have stylized characters, such as *The Adventures of Tintin* and *Monster House*. *Monster House* had a production budget of \$73 million and the film grossed \$140 million worldwide at the box office, not just paying off its

production expense but also making a profit (Monster House (2006) - Box Office Mojo).

Monster House also received nominations for Academy Awards and Golden Globe Awards and Saturn Award for Best Animated Feature, Annie Awards for several categories, although it did not win any of its nominations (IMDb- Monster House- Awards). *The Adventures of Tintin* was also another successful film, having a large budget of \$135 million, and grossing \$374 million at the box office (The Adventures of Tintin (2011) - Financial Information).

Although *The Adventures of Tintin* was discredited from being able to win an Oscar Best Animated Feature due to the use of motion capture, the film still won Golden Globe Best Animated Feature (The Adventures of Tintin-Awards). The pursuit of hyper-realism was motion capture's primary goal beginning with *Final Fantasy: Sprits Within* which spent \$137 million on production costs (almost double what would be spent on a normal animation film from Pixar for example) on trying to achieve hyper-realism (Butler & Joschko 58).

Unfortunately the critic's reaction to such animated hyper-realistic films has all been the same, saying that the hyper-realism is the greatest downfall in these types of films (Butler & Joschko 58). This is due to motion capture's well known and disliked 'uncanny valley' effect. This is somewhat problematic as the success of a film depends on the extent to which the audience is willing to identify itself with the film (Kaba 188).

Problems that occur due to the 'uncanny valley' in animated films break the film's success by presenting almost realistic characters and movement that do not match the expectations of the viewers and this results in their rejection of 'suspension of disbelief' because their willingness to be absorbed by the film has been broken (Kaba 190). When realism is needed, is more logical and practical to make a film in live-action (Sarfo-Boansi 36). This does not

mean that motion capture should not be used for animated films; however the way in which motion capture is being used should change to help the success of a film and avoid the ‘uncanny valley’. The next chapter will look at animated examples of the hyper-realistic aesthetic and the caricature aesthetic to determine which style creates more convincing characters.

Chapter 3

Motion Capture in 3D Animated Films and Their Stylistic Considerations

3.1. Introduction

In order to critique how motion captured movement creates engagement in animated feature films and analyse whether or not the aesthetic style convincingly matches the hyper-realistic movement the technology enables, there needs to be a comparison between the aesthetic styles the previous two chapters discussed: hyper-realism and caricature. This research aims to determine which aesthetic motion capture provides better engagement based on which aesthetic style is more convincing by sustaining the viewers' 'suspension of disbelief'. In order for a film to be successful in suspending the audience's belief in the film, the audience will have had to engage with the characters or believe fully that what they are seeing on screen is a recorded trace of reality and does not show evidence of construction. The audience will need to be able to mask themselves or identify in some way with the characters on screen if the film is of a caricature aesthetic, or believe that they are watching fully alive characters if in a hyper-realistic aesthetic. Therefore, if the film has characters that have crossed the 'uncanny valley' and revealed their construction (if in a hyper-realistic aesthetic) or appear disturbing, then the audience would have lost suspension of disbelief and their immersion of the film.

Films I will use to critically analyse these ideas are *Beowulf* directed by Robert Zemeckis to demonstrate motion captured movement in hyper-realistic aesthetics as the aesthetic style aims to pertain to the real world. In comparison I will discuss *The Adventures of Tintin: The Secret of the Unicorn* directed by Steven Spielberg to illustrate motion capture, which, I will argue, pertains to caricatured animated feature film aesthetics with simple designs rather than trying to replicate real world aesthetics. There will be an investigation into how much of the movement created by motion capture has been animated or refined using keyframe in both hyper-realism and caricature aesthetics in order to assess how much adjustment the style needs in order to be convincing. There will also be investigation to find out whether motion captured movement is better to use for caricature or hyper-realistic aesthetic and whether it creates stylistic uniformity or if the animator plays a significant role in creating movement that matches the aesthetic style.

3.2. Beowulf Case Study

3.2.1. Hyper-realism Filmmaking in Beowulf

Beowulf is a masterful film that was produced with much dedication towards the hyper-realism aesthetic. The characters were designed to be as realistic as human beings in the real world; such can be seen with characters like Grendel's Mother (see figure 13). The textures and the environment also try to represent real world versions of themselves. At the beginning of production of the film, *Beowulf* was meant to be more stylistically designed than the final film turned out to be (Duncan 49). Jerome Chen who worked as the visual effects supervisor

on *Beowulf* (and also acted as co-supervisor with Ken Ralstone on *The Polar Express* directed by Robert Zemeckis in 2004) commented on the decision saying:

When we started building the characters and looking at the motion on them. [...] We realized that the performance wasn't reading very well in those stylized characters. So we started adding things to make the performances read better. We added wrinkles and folds in the skin. We added moisture to the eyes. We added all this stuff to the characters, which made them look more realistic and less stylized. We didn't start off intending to make these characters look photoreal or hyper-real. We just took them in that direction because that's what created compelling performances (Duncan 49).

Of course this fine detail resulted in characters that hovered dangerously close to the 'uncanny valley', and Chen was quoted saying "But I don't believe in the uncanny valley...despite the negative reaction by the critics to *Polar Express*. Now, with *Beowulf*, we hope to cross over that 'valley' by creating characters that connect emotionally with the audiences." (Duncan 49).

Regardless, *Beowulf* still fell straight into the 'uncanny valley' due to the hyper-realistic aesthetic for reasons discussed previously, such as problems with realism of the eyes, movements and facial features. The emotional connection with the characters Chen hoped to achieve is not satisfactory when the audience 'suspension of disbelief' is broken due to visual aesthetics.

Many critics and film goers asked the question when questioning their response to the aesthetics of motion captured films 'why use motion capture?' If CG characters are going to closely replicate live actors as if in the real world, why not create the film in live-action instead of animation? (Duncan 46). Chen answered the question by saying that they wanted

to have complete control over every production aspect of the film: “If the director has an exact vision of what he wants his film to look like, this technique is the only way to accomplish that.” (Duncan 46). This is especially true when it comes to picking the best shot, as due to technical issues the best performance can often be lost and the director has to go with another, with his vision consequently being lost due to the realities of live-action filmmaking. Motion capture allows the director to pick his most desired performance without the ‘distractions and misfires’ of camera, lighting, set and costumes, and then begin to create the film cinematically by determining camera work and the look of the entire movie all digitally (Duncan 46).

Zemeckis and the ImageWorks crew set up 72 motion capture cameras, a system that far exceeded the system ImageWorks used on *The Polar Express* when motion capture was fairly new to them and they had to spend 75 percent of the time just figuring out how to do it (Duncan 46). The system was further refined for *Monster House*, but the technology reached its peak with *Beowulf* (Duncan 46). By the time *Beowulf* got to production, the technical problems that the previous films had encountered had been ironed out and only creative challenges were left (Duncan 46). *Beowulf* used a state-of-the-art motion capture system: 16 digital video cameras and 228 motion capture cameras that were 4 megapixels each, which resulted in much better motion capture data (Duncan 46). The system of *Beowulf* allowed for 21 characters and 76 props all together at the same time on a space of 25 feet squared to be recorded all at once (Duncan 47). Numerous rigs¹⁹ were built for simulating actions, such as

¹⁹ In film, this refers to a device used on a film set to simulate movement or represent an object that will be added in later via 3D or special effects.

Beowulf on top of the dragon, rigs for horses' manoeuvres by special effects crew, and rigs to capture swimming actions (Duncan 47-49).

Due to the negative critiques about the lifeless eyes in *The Polar Express*, ImageWorks had to find a way to make the eyes in *Beowulf* come alive: they studied the actors' eyes, then re-created them exactly, they put in subtle shapes like sunken eye corneas and refraction through the lens of the eye in order to create realism (Duncan 50). Unlike *The Polar Express* where keyframe animated the eye movements, *Beowulf* used electrooculography (EOG), a system of four electrodes around the eye sockets used to capture realistic eye movement of eye orientation and eyelid movements from an actor ranging from large movements to the tiniest of movements in the eyes, which resulted in every character having photorealistic and lifelike features and movements (Desowitz 3 & Duncan 47).

Chen says that after they decided the characters needed more details they needed to go "all the way" in terms of detailing and realism, in order to convincingly portray the hyper-realist style (Duncan 49). The movements and behaviour of synthetic characters were grounded firmly in the real world, but some performances required keyframe animation adjustments to make them read on screen (Duncan 49). The environments also needed the same level of detail as the characters so they would not stand out when placed together; textures were photographed from real world textures. One scene, the scene on the beach where Beowulf confronts an invading army, went as far as including live-action footage for a background (Duncan 57).

Luckily in *Beowulf*, the 'uncanny valley' is not quite as uncanny as previous hyper-realistic films. Due to the advancements in performance capture techniques and 3D animation at

ImageWorks, the characters are incredibly detailed even down to the fine hair on their faces, their eyes are more authentic, their movements more convincing (Desowitz 1). The fine detailing in the characters' faces resulted in synthetic human characters that hovered dangerously near the 'uncanny valley' (Duncan 49). The team found that the hardest part of crossing over the 'uncanny valley' was the eyes (Duncan 49). However, the team was not entirely successful in keeping the renowned 'dead eye' and 'creepiness' which were spoken about in critiques of the film, even though the creators tried so hard by implementing state-of-the-art technology; they were still unable to reach that extra mile that kept the characters out of the 'uncanny valley'. This resulted in the audience noticing the inaccuracy of the eyes compare to human eyes in real-life and broke their 'suspension of disbelief'. This is one of the reasons why many reviews of the films using this technology have complained of the disturbing nature of the characters eyes.

3.2.2. Hyper-realism and Engagement

The extent of hyper-realism in the film can be seen with Grendel's Mother. In *Beowulf*, there are references to the real actors in the final film, such as Angelina Jolie who plays the role of Grendel's Mother (a Succubus). The uncanny effect is invoked by watching their digital equivalents on screen due to the audience seeing the differences between a CG character and being familiar with the actor (Brown 165). The virtual avatar²⁰ of Grendel's Mother is meant to represent the actor who portrays her, Angelina Jolie, so much so that it could almost be a

²⁰ In reincarnation, avatar is a word for the embodiment of a person in a new form (especially the reappearance or a person in another form).

live-action recording of her (Kunz 7). When the audience sees Grendel's Mother, they cannot escape from the recognition of Jolie, so that it becomes less about who the character of Grendel's Mother is (a Succubus) and more about how recognisable Jolie's digital CG character represents the real-world actor. Jolie's character is more of an avatar of the actor than the character of Grendel's Mother. Her character shows the extent of hyper-realism, as her character has the exact facial features of Jolie. Even in the way she speaks, such as the movement of her lips is conveyed over into the avatar and can be recognised as if watching a live-action recording of her.

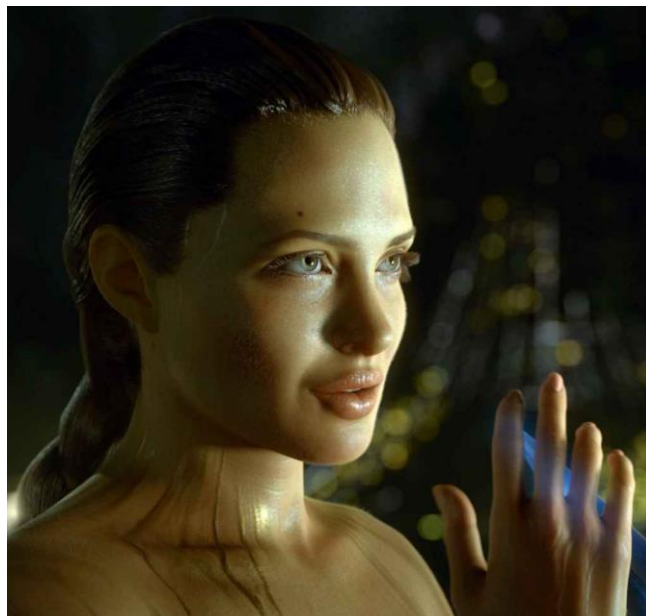


Figure 13. "*Beowulf Grendel's Mother*." *Review*. Union Films, 9 Mar. 2009. Web. 23 Jan. 2016.

Angelina Jolie's avatar is more of a gimmick, which was spoken about in the previous chapter in the context of the term 'Salience'. While her likeness is impressive, the filmmakers' intention was to recreate a digital Jolie as a form of showpiece to demonstrate their digital

skills. This is somewhat ironic because even though she looks very close to the real life Jolie, she still falls into the 'uncanny valley' due to the discrepancies of her eyes and movement.

A common feature of Zemeckis' films is a mismatch between the characters' physical appearance and movement owing to the misuse of motion capture technology. [...] For example, in 'A Christmas Carol,' we see an old man thrust into the heavens, and yet his movements are that of a young acrobat. This mismatch between appearance and behaviour breaks the illusion of being transported into another world. Audiences lose their identification with and empathy for the characters. (Wolchover)

This quotation is true in *Beowulf* as well, as the lead character's movements became uncanny during the process of aging. The film sees him as a young man and then the story progresses 40 years and Beowulf is seen as an older man. However, Beowulf is still able to move and perform stunts as if he were his younger self due to the muscle movements being those of the younger actor of Ray Winstone, even though in the epic poem he would be 70-80 years old when he fights his final battle with the dragon. Scenes of an older version of Beowulf where he flies through the air holding onto a dragon and fighting start to make his character appear uncanny. Movement among all characters is very smooth, creating a 'gliding' sensation over surfaces or between key poses (Kunz 7). Although the advancement of realism in the characters eyes, they have a lack of involuntary or spontaneous eye movements which can be seen very easily in close-up shots and this lack contributes to the lack of a range of emotion also plaguing the characters (Kunz 7.)

“I was generally unable to ‘suspend disbelief’ and forget that I wasn’t viewing real-life human actors on-screen.” Editor-in-Chief of the Embedded Vision Alliance Brain Dipert said when doing a review on *Beowulf* in the EDN Magazine (Dipert).

Due to the effects of the ‘uncanny valley’, the above statement is exactly what many viewers were burdened with when watching the film; the minute the audience is able to recognise the filmmaking elements, in this case, the creation of hyper-real CG characters, the minute their ‘suspension of disbelief’ has been broken and their engagement with the characters has been lost. Although motion capture provides increased reality when it comes to movement, especially when done in a hyper-realistic style, hyper-realism does not necessarily help the audience identify with them (Kaba 188).

[Beowulf’s] animation is otherwise so sophisticated that it is hard to pin down just what is missing. Perhaps we have spent so much time looking at our fellow humans that we can detect a problem with something as subtle as the physics of a muscle contracting [...] It seems like the last few steps to creating convincing hyper-realism is going to be tricky as no animated feature film has accomplished it yet. (Gallagher)

When viewers watch a CG character that attempts to imitate real world characters, it becomes incredibly easy to pick up variations between a real human and a hyper-realistic human. This is when the ‘uncanny valley’ happens and the audience notices the variations that break the ‘suspension of disbelief’ (Butler & Joschko 60). Zemeckis might have thought that having absolute control over every aspect of the film would have benefited the film, but due to the effects of the ‘uncanny valley’, it was a huge toll to pay and possibly was more

hurtful to the film's reception than not having complete control over every shot in the film would have been.

3.2.3. Clean-up and Keyframe Animation

Compared to *The Polar Express*, the animation team on *Beowulf* used considerably less keyframe animation, mainly because the motion capture data and rigs were so much better than in *The Polar Express* (Duncan 49). Although a significant amount of time was still spent on fine-tuning to reflect what the actor did, such as eye, mouth and cheek movements, as motion capture does not allow for the recording of inner bodily movements such as the insides of the mouth, tongues and lip volume (Duncan 49). The production had a large array of body and facial toolset rigs created to enable animators to move quickly and easily between motion capture and keyframe animation. They would use the toolsets to look for keyframes the performer provided and animate within those frames to maintain the original performance (Duncan 49). The toolsets improved animation both for body and facial animation and lead to remarkably detailed and specific animated performances, despite there being 100 different performances for the film that was often created by a set of actors whose performances were duplicated and altered so they did not all seem the same (Duncan 49).

Although *Beowulf* used motion capture to create movement for the characters, keyframe animation is still paramount in the production of the film (Desowitz 3). Mouths, tongues, cheeks, eyebrows, cloth, hair, lighting, vfx²¹, and even some characters, still had to be

²¹ In filmmaking vfx stands for 'special effects', the process of creating imagery.

keyframe animated to attain greater subtlety (Desowitz 3). Toolsets were developed so the animators could go back to animation and fix performances (Desowitz 3). Animators also had to fix eyeline changes to make sure they matched (Desowitz 3). However, in total the production team used far less keyframe animation compared to *The Polar Express* because the motion capture data and the rigs were a big improvement (Duncan 49). The toolsets spoke about a previously developed system that took a generic facial rig and deployed it across dozens of characters which became the basis for all human characters in *Beowulf* (Duncan 49). However this system resulted in noticeable yet small movements that were specific to each other and resulted in the same movement between characters so the team had to build a custom control for that facial feature on that character where it was noticeable (Duncan 49). Custom motion capture rigs were built for the main characters, but were individualised to suit each actor that allowed for the capture of the exact performance the actor gave (Duncan 49-50).

Zemeckis described Grendel as a “deformed creature wracked with pain and suffering from every deformity and skin disease known to man”, who is 12 foot tall, which was especially tricky to create because he was performed by a normal size actor, Crispin Glover (Duncan 55, 56). Animators had to scale Glover’s motion capture data up in 3D animation and slow his movements down because he was so much bigger (Duncan 56). Keyframe animation was needed to help Grendel’s deformities read on screen by playing up his limp and giving him a hunch to his back. They also customised the motion capture data to mimic paralysis on one side of his face and play it up even further (Duncan 56). One character had to be entirely animated, that of the dragon in the fight scenes, which they tried to make as detailed as

possible to fit in with the rest of the movement in the film. ImageWorks built a complex rig for the dragon; there were individual controls for each joint in his wings and controls for the leathery membrane of the wing to simulate a sense of turbulence when he was flying (Duncan 56). This is an example that shows just how much animation and clean-up was involved in a hyper-realistic film such as *Beowulf*. Not everything can be motion captured correctly and some characters, like the dragon, cannot be motion captured at all and then relies on animators to create them by keyframe animation.

3.2.4. Budget and Box Office Recordings

Beowulf production budget was a high \$150 million, and it managed to make a total of \$196 million from a combination of domestic and foreign box office (*Beowulf* (2007) - Box Office Mojo). Although Sahra Kunz still calls *Beowulf* a box office failure (3) and to be fair the overall profits were not exactly as high as a feature animated film's producers could hope for, making a profit of little over \$46 million compared to other animated films such as *The Incredibles* which cost \$92 million to produce and made a total box office success of \$631 million, equalling a net profit of \$539 million (*The Incredibles* (2004) - Box Office Mojo). Despite the large investment in cutting edge technology and the hyper-realistic representations, motion capture films gross less than half of that of *Shrek* or *The Incredibles* or most other animated films produced by Disney, Pixar, DreamWorks and other studios that create caricature animated films (Kunz 3-4).

Natalie Wolchover, a writer at Quanta Magazine who writes about physical science and has written for LiveScience, Make magazine, Seed, Popular Science, among other publications (Wolchover), states that “[Zemeckis must be aware] that you can't make much money on a film whose uncanny protagonist doesn't garner empathy from the audience.” It is very important to note the production cost, because even if a film makes over \$200 million, the film has made a loss if it does not cover the production cost. Some of the most profitable films have smaller production costs such as *Paranormal Activity* which earned \$193.2 million worldwide and had a production budget of only \$15,000, making the return on investment an astounding 1,288,360 percent (Avila).

3.3. The Adventures of Tintin Case Study

3.2.1. Creating Designs of The Adventures of Tintin

The Adventures of Tintin: The Secret of the Unicorn, is based on the creation of Georges Remi comics who is better known by fans as ‘Hergé’ author of Tintin’s 24 adventure comics published between 1929 and 1983 (Fordham 73-74). Steven Spielberg director of *The Adventures of Tintin* and Peter Jackson whose visual effect’s companies, Weta Workshop and Weta Digital, made a live-action test with a performer wearing prosthetics to make up for look-a-like characters in the comics and an animated Snowy (Tintin’s canine friend) as a mock up for how the film would look (Fordham 74). Weta Digital animation supervisor Jamie Beard recalled: “As soon as Steven and Peter saw the test, they knew they didn't want the film to be live-action. [...] Steven was adamant about wanting to honour Hergé’s

artwork, rather than present a prosthetic wannabe” (Fordham 74). This meant that the film needed to be animated in order to capture the aesthetic stylizations of Hergé original designs of the characters. It is clear that *The Adventures of Tintin* does not represent the commonly understood cartoon style exactly, as it contains elements of hyper-realism in it. But the fact that Spielberg aimed to try and represent Hergé’s comic designs as much as possible in the CG characters show that a form of stylization helped make *The Adventures of Tintin* a successful motion capture animated film because the characters became engaging, allowed for identification and ‘masking’.

Spielberg approached the film as if he were shooting live-action, working through the scene and moving around the performance with a virtual-camera which gave him real-time camera position and orientation of live-action photography, and approached the coverage like live-action, directing performers while he covered a shot from a certain angle (Fordham 75, 76). This is unlike what Zemeckis did on *Beowulf*, instead Spielberg chose to map out his camera angles and movement while shooting the scene, in order to better direct the performance (Fordham 75). This shows the different approach Spielberg took to Zemeckis in making a motion captured animation feature film, which is important to understand why the film had more success than the other.

The most challenging tasks of the film was creating the designs of the characters and translating Hergé’s 2D designs of Tintin who had an oval shape face, black dots for eyes, and a ‘quiff’ for hair, into a 3D character (Fordham 76). The team at Weta did early tests, and found that an exact replication of Hergé’s designs did not extract the required performance out of the character, because facial expressions and subtle emotions were difficult to achieve

with the oval shaped design of his face (Fordham 47). When designing characters, there will always be a struggle and compromise between how much to stylize and how much to make realistic, even in films by Disney, Pixar, DreamWorks and other animation studios there is a level of realism in characters' hair, skin tones, textures, realistic lighting, and backgrounds.

The Good Dinosaur for example has caricatured characters inside a photo-realistic world.

Animation supervisor, Jamie Beard, commented that the hardest part of making the film was “Getting the performances to read as the actors intended and how to make them look best against the world of Tintin. [...] matching Jamie Bell and Andy Serkis' performances with the models and then matching the models in the world of Hergé.” (Lamar). The point of motion capture is to translate the recorded movement onto a control that moves the CG character in the same way, but without the existence of that detail recorded from the actor on the character in 3D there was a lack in the expressions of the characters (Fordham 76).

Therefore a degree of detail was needed in the characters to get them to perform and evoke emotion and detailed expressions, so the designs could not be as simple as Hergé's designs because the medium of expression in animation needed more detail in order to be read. The team went through many iterations of the characters' designs copying the panels of the comics, adding detailing to the designs, then copying the actor's features so the rig would work according to their features (Lamar). The team finally found a solution using motion capture animation and state-of-the-art rendering techniques that created subtly stylized animated characters that were able to stay true to and express the charm and unique designs of Hergé's comics (Fordham 75). Tintin was designed to enable use of all of the data captured from Jamie Bell's performance and translate it onto Tintin, but then it no longer

looked like Tintin, so the realistic design and the stylistic designs were blended; when Jamie smiled in performance, the CG Tintin smiled a half-moon smile; copying Hergé's designs exactly resulted in ugly looking characters (Fordham 76).

Every aspect of the panel we pored over, and we always went back to the comic's panels. Steven was very clear that we had to honour Hergé's world. [...] When Tintin smiled, we'd have all the smiles that Hergé ever drew for reference. [...] But we're not presenting a simplistic graphic version of Tintin. We're presenting something that can really perform - like Jamie Bell or any actor could perform - and that's not something we could've done if we slavishly exactly copied Hergé artwork - Jamie Beard. (Lamar).

In the first scene, Tintin is getting his portrait done by an artist in a market (see next page), the artist says 'There, I believe I have captured something of your likeness' and reveals the painted design that is Hergé's design of Tintin, Tintin picks the painting up, turns round to the camera and asks Snowy what he thinks. This moment in the film is the first time the audience sees Tintin, and they get to compare the original Hergé design with the newly crafted 3D version. Spielberg is asking the audience to compare, and he is also showing off how impressive Tintin looks compared to Hergé design, he is asking the audience to be impressed by the translation of Hergé's Tintin into his 3D Tintin.



Figure 15. *The Adventures of Tintin: The Secret of the Unicorn*. Dir. Steven Spielberg. Perf. Jamie Bell, Andy Serkis, Daniel Craig. Columbia Pictures, Paramount Pictures, 2011. Film.

Tintin however has been critiqued as falling into the ‘uncanny valley’ due to the lack of prominent features common in caricature animations, as his face is strangely unhuman and foetal and his eyes glassy (Kaba 192). This is due to the lack of ‘exaggeration’ in his face, but the Hergé’s design of Tintin did not allow for exaggerated features to make Tintin more likeable in a moving medium. However, all other characters are stylized according to Hergé’s designs and feature the ‘exaggerations’ Hergé designed in Tintin. Hergé drew more stylized characters around Tintin; other characters such as Thomson and Thompson, have more exaggerated features and are similar in appearance making them comical (Fordham 77-78). In fact, every other male character in the film has a distinct large nose and simplified designs, such as Captain Haddock and Thomson and Thompson. Tintin himself is more realistic than every other character in the film.



Figure 16. *The Adventures of Tintin other characters designs compilation*. Dir. Steven Spielberg. Perf. Jamie Bell, Andy Serkis, Daniel Craig. Columbia Pictures, Paramount Pictures, 2011.

The colour palette was meant also to match Hergé's original comics, and emulate Hergé's economy of line and shape, and attention to detail, known as *ligne claire* or 'clear line' (Fordham 81). The team analysed Hergé's use of colours and found that it was composed of warm and desaturated pastels with very little texture, using blocks of colour. This level of abstraction (similar to the issues with abstracting Tintin's features according to Hergé) did not quite work and looked unconvincing as flat skin tones, so they decided to make the backgrounds as photorealistic as possible making sure the details were there otherwise it would look like a cartoon world, but still keeping Hergé's colour palette (Fordham 82). The backgrounds were somewhat fitting as Hergé comics always featured Tintin in a detailed and visually stimulating world that is more detailed and vastly more realistic than the characters (McCloud 43). Another issue was using the flat tones Hergé used for the characters' skin which became a bit disconnecting; Spielberg wanted him to be recognisably human so the

team added a fair complexion and skin textures (Fordham 76). Tintin had fine traces of hair on his face and they added in the rest of his hair; originally Hergé's Tintin design only had the quiff for hair and shading to represent the rest (Fordham 76- 77).

The world of *The Adventures of Tintin* might have realistic textures and subtle details like hair on skin and clothing, but the world itself has a stylization to it that clearly puts it in the world of animation, so that no audience member would question that *The Adventures of Tintin* is an animated film, unlike in *Beowulf*, where the world and characters are meant to look like the real-world, and only careful inspection will reveal that it is fully animated.

3.2.2. Clean-up and Keyframe Animation

Although human performances were recorded as a basis for character movement, much was left to the animators using traditional keyframe animation (Doyle). The most noticeable character animation is that of Snowy, Tintin's faithful canine, who was a dynamic character in the film, but could not be motion captured because he had to perform and do stunts and motion capturing animals is difficult, so he had to be keyframe animated (Lamar). The motion capture actors had a wireframe rig of Snowy to work with and make sure their eyelines matched up, but Snowy was brought to life by the animators (Lamar). He was created entirely using standard keyframe animation techniques, including the Principles of Animation and may have more illusion of life and characterisation about him than the human characters (Doyle).

During the film, there is a motorcycle chase sequence of extraordinary brilliance where Tintin is chasing after an falcon and rides, flies, falls, through the scene, his vehicle goes through buildings and he ziplines down a cable using the handlebars, all in one shot of two and a half minutes (Lamar). It was the most complex scene Weta Digital had ever done up until then, motion capture was used to help shape the action where appropriate, and then split into seventeen sub-shots closer to a typical shot length to help manage the scene (Frei). During this intense action scene, a lot of the motion capture performances had to be interspersed with animation and many other elements that needed to move apart from the characters, such as the hotel with the tank inside that skids after them, Snowy, the falcon, vehicles, camels and more all had to be keyframe animated in order to create a complete shot.

Other scenes needed keyframe animation for various reasons, for example: the sequences where Tintin is captured and Snowy chases after him also needed to be keyframe animated interspersed with performance capture of passers-by and truck occupants (Fordham 88). In a scene where Tintin and Snowy steal a key from the Karaboudjan's unconscious shipmate and cause an avalanche of inebriated bodies, the stunt team rigged layers of bunk beds from which stunt persons could fall (Fordham 91). It gave useful data on a sense of weight and timing once motion captured but the scene was so complicated that most of the action had to be keyframed to emphasize the comedic nature of the scene (Fordham 91). In the scene where the plane crashes into the desert, the plane and Captain Haddock were animated in order to create the motion of Haddock parachuting down and getting his parachute caught in the plane's propeller and spinning round (Fordham 93).

“There is not a single live-action element in the whole movie,” Spielberg says “[...] every inch, every frame of the movie is animated. For me, motion capture is [...] certainly co-existent with the kind of animation that DreamWorks and Pixar do. It’s just a different form of animation.” (Zahed). Weta’s animation team worked on the process of refining and sculpting and adding detail to each of the film’s 1,240 shots for a year and a half after the motion capture was recorded (Zahed). At the Flying Circus, Andre Van Der Merwe explains how the data cleaner’s task is quite labour intensive, stating that for ‘one minute of screen time per character, equals out to one man day for a data cleaner to clean the raw motion captured data, to get it to the point where the animators can start altering the animation’. This shows that when creating motion capture films, there is a lot of animation done by hand that goes into the process on top of the motion captured movement. This is especially apparent in films with caricature aesthetics because of all the added characters or movements that could not be done by the actors such as the implementation of some Principles of Animation. In hyper-realistic aesthetic animation films there will be a lot of clean-up for animators to perform, but they will not change the actor’s movements in order to accommodate the animation principles because it would not match the hyper-realistic style.

3.2.3. The Adventures of Tintin and the ‘uncanny valley’

The characters in *The Adventures of Tintin* are neither stylized human beings nor hyper-realistic human beings, but regardless critics found the characters falling into the ‘uncanny valley’ (Kaba 193). Tintin fans and nostalgic viewers were unsatisfied by the rendering of 3D

Tintin as it did not capture their imagination of the characters and the world and the characters became uncanny in their eyes due to the amount of unimagined realism “outfitted with an alien and unfamiliar visage” (Snyder). However for those viewers who were not so familiar with Tintin, the film was able to engage them and emerge them in the world and character of the film. Although some critics found the characters having ‘dead eyes’ which seemed blank and sometimes they looked ‘disturbingly plastic’, a trait very common with the ‘uncanny valley’ (Snyder).

Early publicity shots [...] looked strange and stilted; the trailers weren’t much better.

Once the figures move, they live; and whilst not being exactly how I see them in my mind’s eye, they offer a consistent interpretation of the drawings, so that you very quickly accept this world of caricatures. (Doyle).

Up close Tintin seems weirdly slack-skinned and plastic (Kaba 193). The Weta team strove to create an emotional connection with Tintin’s eyes, as a point of reference the audience could connect to, but realistic CG eyes fall into the ‘uncanny valley’ very easily; however the team at Weta found that if they created believable eyes the effect fell away (Fordham 77). Regardless of their attempts, the eyes of Tintin do seem lifeless (Kaba 193). Unfortunately *The Adventures of Tintin* has not been exempt from falling into the ‘uncanny valley’; it has however kept from it most of the time due to its stylistic character designs. Haddock was designed more successfully than Tintin, as he stands on the line of caricature and a real man. This could also be attributable to Andy Serkis who played Haddock and who was well versed in performance capture and easily able to create a believable character performance and establish total control and overpower Jamie Bell’s performance over the entire film (Kaba

193). When the characters are seen at a distance, the motion capture works in favour of the film and the ‘uncanny valley’ cannot be recognised, closer shots however can be more problematic, especially on Tintin (Kaba 193). Matthew Lottering from Flying Circus believes that if the creators of *The Adventures of Tintin* designed their characters (such as Tintin), with more of the cartoon style in mind and gave the characters bigger eyes (similar to Disney character designs), and then the characters would not have fallen into the ‘uncanny valley’ as they would have leaned more towards caricature style of designs more than realistic shaped eyes.

The question from *Beowulf* remains ‘why use motion capture and create hyper-realistic characters when you can shoot it in live-action?’ Spielberg comments on that: “Had I made it live action, here's what people would be saying right now: 'I hated all that makeup on those actors' faces!' Why'd he have to give him big, fake noses and big, fake ears and fake chins?' You know, I would've been criticized for stylizing the movie beyond recognition and that's why I chose this medium” (Desowitz). Making a live-action version of Tintin with prosthetics would have possibly resulted in a more negative effect than the use of motion capture, so was using motion capture the best way to create a Tintin film? As discussed, the use of motion capture required a certain amount of detail in the characters that was far beyond Hergé’s initial designs of Tintin, but if we look at contemporary 3D animated films from Disney, Pixar, DreamWorks and the rest, there is defiantly a growth in detail and realism that surpasses the designs of 2D animated films. This has been because of technological progress and rendering packages becoming more powerful, but the majority of animated films nowadays feature photo-realism in some aspect such as *The Blue Umbrella*,

The Good Dinosaur, the fantastically created hair in most contemporary animated films such as *Brave* and *Frozen*, vfx elements such as snow, dust, fire, water and rain also take a very photorealistic role in most animated contemporary films.

The Adventures of Tintin, has been the one motion capture animated film to have done the best in terms of critic scores and gross incomes, it had a budget of \$135 million and reached a worldwide total of \$374 million gross (*The Adventures of Tintin* (2011) - Box Office Mojo). *The Adventures of Tintin* has an IMDb rating of 7.4, which is much higher than other motion capture films, such as *Beowulf* which had 6.3, *A Christmas Carol* which had 6.8, and *Final Fantasy: Spirits Within* had 6.4 (IMDb). This shows that *The Adventures of Tintin* has been the most successful in terms of motion capture animated films and also the most critically successful. This can be said because of the direction it took with creating caricature characters rather than creating hyper-realistic ones which resulted in more believable and engaging characters.

3.4. Caricature and Engagement

In animation, it takes a bit of 'exaggeration' of character designs to make character designs seem convincing and engaging (Kaba 191). Even when the characters are human beings, exaggerating their features provides a better sense of engagement. The Principles of Animation tries to represent 'realism' through the caricatured style by aiming to create more engaging movement that bring life to characters (Kunz 2). Caricature designs can highlight the characters' individual personalities, their conflicts and physical characteristics (Kunz 7). In

order to create engaging character designs the designer must be aware not to make the character too realistic so that it falls into the ‘uncanny valley’, and design movements that are not too realistic as to how humans move in the real world, but instead use syntax of animation such as the Principles of Animation (Kunz 4). Animated films that use motion capture as a primary means to create movement lead to an abandonment of animation practices such as cartooning which as Bucklance suggested in chapter 1 acting for animation needs to have heightened and simplified acting in order to make the movement legible (Kunz 5).

However, even caricatured characters can veer dangerously close to the ‘uncanny valley’, such as Sid from *Toy Story*, whom it can be argued teeters precariously close (Film Facts: The Uncanny Valley). Although Sid was the result of an underdeveloped 3D animation industry and Pixar did keep human faces out of the film as much as possible because it was incredibly difficult to create human faces at that stage in the history of 3D development.



Figure 17. *Sid Toy Story*. Digital image. *Film Facts: The Uncanny Valley*. FlashbackBackslide, 25 July 2014. Web. 24 Jan. 2016. Film.

The team at DreamWorks managed to avoid the ‘uncanny valley’ with Princess Fiona from *Shrek*, a human character whose design borders closer to human realism than cartoon stylization. DreamWorks Lucia Modesto noted that her team had to pull back a little on her, saying that she was beginning to look too real, and the effect was getting distinctly unpleasant, which could mean she was falling into the ‘uncanny valley’ (Butler & Joschko 60-61).

Manohla Dargis, a writer for the New York Times, states that,

‘The 3-D is necessary to the film only in so far as it keeps your eyes engaged when your mind starts to wander. Stripped of much of the original poem’s language, its cadences, deep history and context, this film version of “Beowulf” doesn’t offer much beyond 3-D oohs and ahs, sword clanging and a nicely conceived dragon, which probably explains why Mr. Zemeckis and his collaborators have tried to sex it up with Ms. Jolie, among other comic-book flourishes.’

Dargis is suggesting that the film lacks engaging storytelling and character development to engage the audiences. Most characters were superficial in their appearance and were flat in their character development. They filled archetypal roles such as the femme fatal, the hero or the minion. These are a few reasons as to why the film could lose the audiences ‘suspension of disbelief’, but it is not the main cause as to the most prominent reason: the uncanny valley breaks the audiences ‘suspension of disbelief’ almost immediately from when characters appear on screen.

This does not mean that there is no hope for the more realistic realm of animated film. There has been some positive feedback in terms of *Harlock: Space Pirate* released in 2013 which mixes caricature and realism (admittedly there has not much feedback from the film), which has been said to cleverly bypass the ‘uncanny valley’ with stylistic design of characters that look as though they have come out of a high quality cut scene from a recent Final Fantasy video game (Review for Harlock Space Pirate). Although these designs are quite similar to *Final Fantasy: Spirit Within* characters, there had been a twelve year advancement in technology and more anime-like stylization to the characters. Although in truth, some characters verge dangerously close to the ‘uncanny valley’, such as Ezra (Figure 14) who is less stylistically designed compared to the other characters and would be considered more hyper-realistic. The stylization of anime-like women and other characters in the film is enough to keep the viewer (for the majority of the time) from breaking ‘Suspension of Disbelief’.



Figure 14. *Harlock Space Pirate*. Dir. Shinji Aramaki. Perf. Yû Aoi, Jessica Boone, Ayano Fukuda. Toei Animation, 2013. Film.

Van Der Merwe says that the caricatured state of their characters is what keeps them out of the 'uncanny valley'. Van Der Merwe and Lottering both admit that motion capture is ultimately just a tool that can be used to create animation, but it comes with its own limitations as to what it can achieve. Van Der Merwe states that 'we use the mo-cap just as a tool to get that result. 'In some cases we use very little of it and in some cases we use a lot of it, but it is just one of the tools that we use.' Van Der Merwe and Lottering both agree that if they used motion capture for their characters' faces, their characters would start to fall into the 'uncanny valley'. In conjunction with the caricatured aesthetic, allowing animators to keyframe the face, eyes and expressions help to avoid the 'uncanny valley' altogether (Van Der Merwe). Lottering states that he does not believe that any 'tool' used to create an animation is better or worse than the other, saying that it depends on how the creators plan to use it and how many resources they have available, justifying that motion capture is just as good at creating movement for animations as keyframe animation, especially in the caricature aesthetic.

Matthew Lottering from The Flying Circus believes that (with their budget constraints in mind) they produce content whereby the characters designs and movements are just as engaging and appealing in comparison to other characters that are produced using keyframe animation. Van Der Merwe explains that earlier designs of their characters were not as engaging and appealing, but as soon as the designs were simplified, the characters became engaging to their audiences. Van Der Merwe says that feedback from the industry, such as

from broadcasters, distributors and Disney, show that their content, character design and the way they are animated is above average.

Increasing reality for hyper-realistic animated films does not necessarily create better audience recognition and engagement with the characters (Kaba 188). Delicate refinements in animation are not possible, drawings that are too fine and complex can hinder communication of the idea, resulting in animated characters that are restrained and cannot communicate (Thomas and Johnston 69). “Only simple and direct attitudes make good drawings, and without good drawings we have little ‘appeal’” (Thomas and Johnston 69). CG characters that have been created with ‘appeal’ and the Principles of Animation in mind had the ability to engage audiences and appear convincing in design and characterization (Kaba 191). This does not mean that CG animation must be devoid of all detail as that often results in plastic looking characters, but the characters must retain a careful balance between detail and the amount of realism used (hyper-realistic characters need to be incredibly realistic to match to movements of real humans face and body) in order to avoid characters that fall into the ‘uncanny valley’ (Kaba 191).

History has proven audiences to be rather skittish around digital representations of themselves. Non-human entities like Andy Serkis’ Golum or Caesar from *Rise of the Planet of the Apes* have had no problem wooing viewers. It’s only when they attempt to mimic reality, instead of warp and play with it like the friendly caricatures of the Pixar universe do, that they fail’ (Snyder).

Avatar and *Rise of the Planet of the Apes* have characters that are not distinctly human, and due to that fact they are able to avoid the ‘uncanny valley’ (Kaba 192). The Na’vi in *Avatar* do not trigger the audiences ‘uncanny reflexes’ because they are distinctly alien (Kaba 192).

Therefore the audience does not recognise the discrepancies in the facial features and movements with as much ease as with human characters. In *Mars Needs Moms*, the audience’s uncanny reflexes are triggered with the human characters, but the motion captured aliens of the film are just as engaging as characters made in keyframe animated films that are caricature. This is because the aliens do not resemble human faces. Even Gollum from *The Lord of the Rings*, who has some human features does not try mimic movements from real life and that is why he does not fall into the ‘uncanny valley’ (Kaba 192).

3.5. Conclusion

“...there is much to be gained from bridging the gap between the cartoon and the real world.

Clearly, many topics demand a high degree of realism, of authenticity...” (Wolchover)

This is true when it comes to telling the tale of *Beowulf*, it is quite clear that having a cartoon stylized version of *Beowulf* would not have invoked the sort of response the filmmakers would want from the audience, because *Beowulf* is not a film for children, it deals with topics of loyalty, reputation, envy, violence, and revenge in such a harsh manner (Critical Essays Major Themes in *Beowulf*). These are clearly themes that do not match a cartoon stylization of characters and environments as in the example of *Harlock: Space Pirate* character stylization that does not invoke the Japanese anime style rather than the cartoon style which is also not

a film meant for children, as it includes a brief scene of a nude woman, violence and gore, the main character drinks wine in many scenes and there are some intense dramatic scenes (Parents Guide). *Harlock: Space Pirate* is able to avoid the ‘uncanny valley’ due to other ways of stylizing that are not restricted to the cartoon style. The problem lies with creating hyper-realistic human characters, as viewers are incredibly vigilant at spotting mistakes in CG human features and movements that making a hyper-realistic human character that is meant to look as close to the real world as possible is an extremely difficult feat to achieve and the viewers see mistakes as uncanny. Therefore making characters with motion capture or with CG animation that are humanoid or alien or caricatured helps to avoid the ‘uncanny valley’.

The Adventures of Tintin is more successful than other attempts to make an animated film using motion capture, primarily because of the use of caricaturing the features as well as the advancement in motion capture technology (Kaba 192). Tintin himself had an uncanny face that was strangely unhuman and foetal and his eyes glassy however the other characters which more closely emulated the cartoon style were much more successful (Kaba 192). Chuck Jones once said that animation means to invoke life, not imitate it. This does not discredit motion capture from being a variable means to create animation, just that it cannot be used successfully to create animation if the filmmakers use the raw motion capture data to move the 3D characters, it must go through a process of animating over the movement. Richard Williams believed that animators need to use live-action footage to know how the body moves and works, that there needs to be enough realism to be convincing, but not to wonder why the filmmakers did not use live-action instead, that is not how the animated medium works (372, 376). Therefore motion capture in animation makes more sense if it is used with

a caricatured aesthetic than the hyper-realistic aesthetic because it can help the movement in caricature films seem more authentic and realistic when combined with the principles of animation. Whereas in hyper-realism animated films viewers might wonder why the filmmaker would chose 3D to create a film that mimics reality when they could have made it in live-action and produced more authentic results.

Conclusion

In conclusion, the aim of this research paper was to critique how the movement motion capture in 3D animation influenced audience engagement looking at two different aesthetic styles, those being hyper-realism and caricature. Audience engagement was measured by analysing traditional animation's forms of engagement combined with live-action filmic techniques of engagement, most important being 'suspension of disbelief'. Throughout this paper, motion capture in animated film has often been critiqued negatively for its depiction of human characters and movement which resulted in characters having a disturbing appearance as they fall into the 'uncanny valley' (Butler & Joschko). It was presented that this occurs when the film adopts the hyper-realism aesthetic or tried to include hyper-realistic features of the characters such as realistic eyes or facial features which can be seen in *Beowulf*, *Final Fantasy: Spirits Within*, and *The Polar Express*.

According to Wells, when trying to achieve hyper-realism in animation films by representing "the conventional physical laws of the 'real world'", films can often fall into the 'uncanny valley' due to minor or large discrepancies in the reproduction of realism (25). When the 'uncanny valley' is present, audiences can no longer succumb to 'suspension of disbelief' because they are constantly aware of the construction of the characters in the film. This has been one of many criticisms as to why numerous motion capture animation films have been received poorly by audiences and critics, because their aesthetic look breaks the 'suspension of disbelief' in the film and keeps them from believing in the world of the film. There however, can be other reasons as to why the audiences 'suspension of disbelief' has been broken in a film which need to be taken into consideration in this discussion. These have been

highlighted in the research as poor plot and characterisation, editing or sound design and other filmic production techniques. However with the case studies provided in this paper, there are not many faults that can cause audience disengagement as strongly as the CGI elements. Therefore disapproving reviews of these films are based on the reaction to their hyper-realistic aesthetics, over and above other more minor issues such as characterisation and plot that might break the audience 'suspension of disbelief'. When using motion capture for animation, the main disillusionment in these films for the audience is becoming aware of construction of the characters, the gliding movements, plastic facial features, uncanny lack of movements can all lead to their disengagement with the film moreover than minor issues like plot. This is due to motion capture movement not being altered enough by animators to be natural in the scene or the textures of the characters not being completely accurate to similar objects in the real world.

However, caricature animation emulates the 'cartoon' characteristics of traditional 2D animation and stylizes characters, environments and movement. Motion capture films that adopt the caricature aesthetic will alter the motion capture movement by inputting some of the Animation Principles in order to emulate the caricature aesthetic such as 'squash and stretch', 'exaggeration' and 'anticipation', among others. As seen with interviews from the Flying Circus, the actor assumes the role of crafting the characters performance, but has to change their acting style from more subtle techniques used in live-action to a more exaggerated technique so that their performance reads properly in the animated medium (Buckland). As seen with animators from Flying Circus, they need to over-animate the movement that comes from the motion captured data, by inputting the animation principles

and push what the actor was trying to achieve but could not due to the limitations of their physical bodies (Lottering).

Caricature animation films that use motion capture will attempt to adapt a more 'cartoon' look in their character designs by simplifying and exaggerating features such as noses, eyes or chins to create more aesthetically 'appealing' characters (in terms of the animation principles) that do not fall into the 'uncanny valley'. Successful examples of this technique can be seen in *The Adventures of Tintin* with characters such as Captain Haddock and Thomson and Thompson. These characters were much more appealing and engaging than the characters in *Beowulf* because of their adaption of the cartoon style that mimicked the drawn comic (for example their disproportionately large noses). Although still extremely realistic in nature, characters such as Tintin himself were also more successful than the characters of *Beowulf* because of Tintin's likeness and visual relationship to the original drawn character. This allowed for the viewer to 'mask' themselves into Tintin's 3D character that was so reminiscent of his original drawn design which was so simplified (McCloud 29). This allowed for Tintin to become a much more engaging character when watching.

Caricature characters that sometimes fall into the 'uncanny valley' such as Tintin are not as problematic with breaking the audience's engagement because of his ability to allow for the audience to 'mask' themselves into the character. Whereas with *Beowulf*, the mother became an avatar of Angelina Jolie rather than representing the character. The same can be said for Beowulf himself, as both characters became objectified due to the level of detail that came from the hyper-realistic aesthetic, allowing for little identification with the audience. This is a clear example of how the caricature aesthetic produces more engaging characters than hyper-

realistic aesthetics on the level of character design. In order to overstep the ‘uncanny valley’ filmmakers need to create completely accurate characters to ‘real world’ humans, which has been a long dream for many CG filmmakers and one of the many challenges hyper-realism animation has sought after. But so far in high budget animation film such as these discussed in the paper, even when animation does not stylize its design as seen in hyper-realistic films, the audience can still see a level of construction as reality is extremely difficult to reproduce exactly in completely CG created productions.

“Aesthetic engagement in animation can focus fundamentally on the appearance of the characters” (Butler & Joshko 59) and this research argues that this is exacerbated by the realistic movement as a result of motion capture techniques. This means that the appearance of characters in conjunction with their movement is of utmost importance to create aesthetic engagement and that characters that appear uncanny or have movements that the viewer finds uncanny will result in the loss of the viewer’s engagement and belief in the character. It is therefore suggested that in order to create engaging character designs, the filmmakers must consider not making the characters too realistic so that they do not stand a chance of falling into the ‘uncanny valley’, especially if motion capture is to be used for the movement of the character. Instead, they should rather design the characters and their movements so that they are less exact to how humans move in the real world, and rather use the syntax of animation such as the Principles of Animation (Kunz 4). A recent success in motion capture animation has been the character of Maz Kanata from *Starwars: The Force Awakens*. Maz Katana is a completely CGI character created from motion capture of an actress’s face using a system to translate those facial features onto that of a differently proportional alien character

(Seymour). Maz Katana is incredibly realistic in her facial features and because she is an alien she does not conform all the time to human facial movements, allowing room for the audience to accept nonhuman expressions.

In conclusion, this study aimed to determine if motion captured movement is more beneficial to use for either or both hyper-realistic or caricatured aesthetics in animation films and whether or not it creates aesthetic engagement. This paper looked into the aesthetics of caricature and hyper-realism animation in certain films and the impact each style has on the viewer's engagement with the characters designs. This paper analysed how each aesthetic maintains or breaks 'suspension of disbelief' in viewers. The research suggests that through a filmic analysis of *The Adventures of Tintin* and *Beowulf* and other films, engagement with characters is better when the style is caricatured. However, this study also found that if hyper-realistic aesthetics in motion capture are to succeed, they need to replicate human characters with one-hundred percent accuracy or create humanoid or alien characters because the audience is not familiar with how bodily muscles of such beings would perform and therefore would not feel uneasy about incorrect human movement while watching.

Works Cited

- Andrew, Dudley. *The Major Film Theorists*. Oxford University Press, 1976. Print.
- Avila, Michael. "What's the Most Profitable Film Ever Made?" *LiveScience*. TechMedia Network, 07 July 2010. Web. 24 Jan. 2016.
- Bazin, Andre. *What is Cinema?* trans, and ed. Hugh Gray. Berkeley: University of California Press, 1967. Print.
- "Beowulf (2007) - Box Office Mojo." *Beowulf (2007) - Box Office Mojo*. IMDb, n.d. Web. 23 Jan. 2016.
- Brown, William. "Beowulf: The Digital Monster Movie." *Animation: an Interdisciplinary Journal* 4.2 (2009): 153-68. *Sagepub*. Web. 27 Nov. 2013.
- Bishko, Leslie. "The Uses and Abuses of Cartoon Style in Animation." *Animation Studies* 2 (2007): 24-35. Print.
- Buckland, Daniel. Personal Interview. 1 March 2016.
- Butler, Matthew and Joschko, Lucie. 'Final Fantasy or The Incredibles: Ultra-realistic animation, aesthetic engagement and the uncanny valley'. *Animation Studies- Animation Dialogues* (2007): 55-63: Print.
- "Critical Essays Major Themes in Beowulf." *Beowulf*. CliffNotes, n.d. Web. 24 Jan. 2016.
- Crafton, Donald. *Shadow of a Mouse: Performance, Belief, and World-Making in Animation*. Berkeley: University of California Press, 2013. Print.

Christophers, Kelly. *Realism in CGI Character Facial Performance: A Comparative Study of the Evolution of Key-Framed Animation and Motion Capture at WETA Digital Studios*. MA

Research Report. University of the Witwatersrand, Johannesburg, 2011. Print.

Currie, Gregory. "Film, Reality and Illusion". Bordwell, David and Noel Carroll. *Post Theory: Reconstructing Film Studies*. Madison, Wisconsin: University of Wisconsin Press, (1996) : 325 - 344. Print.

Dargis, Manohla. "Confronting the Fabled Monster, Not to Mention His Naked Mom." *The New York Times*, 16 Nov. 2007. Web. 04 Sept. 2016.

De Beer, Adam. "*Kinesic Constructions: An Aesthetic Analysis of Movement and Character Performance in 3D Animation*." *Animation Studies* 4 (2009): 44-52. Print.

Desowitz, Bill. "'Beowulf: A New Hybrid for an Old Tale.'" *Animation World Network*. AWN.com, 21 Nov. 2007. Web. 24 Jan. 2016.

Desowitz, Bill. "Spielberg Talks 'Tintin'" *AWN.com*. Animation World Network, 19 Dec. 2011. Web. 28 Jan. 2016.

Dipert, Brian. "The Uncanny Valley: Beowulf's Dead-End Alley." *EDN*. UBM Communities, 05 Dec. 2007. Web. 24 Jan. 2016.

Doyle, Simon. "The Adventures of Tintin: The Secret of the Unicorn (2011) - A Review." *Tintinologist.org The Tintins Fans Resource*. Tintinologist.org, n.d. Web. 28 Jan. 2016.

Duncan, Jody "*All the Way*." *Cinefex* 112 (2008): 45-59. Print.

Dunlop, Renee. "TINTIN." *CGSFeatures*. The CGSociety, 19 Jan. 2012. Web. 27 Jan. 2016.

"Film Facts: The Uncanny Valley." *Film Facts: The Uncanny Valley*. FlashbackBackslide, 25 July 2014. Web. 24 Jan. 2016.

Freud, Sigmund. "The Uncanny." *The Standard Edition of the Complete Physiological Works of Sigmund Freud* 17 (1917-1919): 219-252. *Welles Shakespeare Media*. University of Florida. Web. 8 Feb. 2016.

Fordham, Joe. "*A Thirst for Adventure*." *Cinefex* 129 (2012): 73-98. Print.

Frei, Vincent. "THE ADVENTURES OF TINTIN: Matt Aitken - VFX Supervisor - Weta Digital - The Art of VFX." *The Art of VFX*. The Art of VFX, 21 Dec. 2011. Web. 03 Feb. 2016.

"From Beowulf, How Old Was Beowulf When He Fought the Dragon?" *Enotes.com*. Enotes.com, 24 Sept. 2012. Web. 25 Jan. 2016.

Furniss, Maureen. *Art in Motion: Animation Aesthetics*. Revised ed. UK: John Libbey Publishing, 2007. Print.

Gallagher, David F. "Digital Actors in 'Beowulf' Are Just Uncanny." *Bits Digital Actors in Beowulf Are Just Uncanny Comments*. The New York Times, 14 Nov. 2007. Web. 23 Jan. 2016.

Hergé. "The Adventures of Tintin." *Tintin Magazine*. France: Casterman, Le Lombard, 1929 – 1976. Print.

Hergé. *The Adventures of Tintin #23*. Digital image. *The Adventures of Tintin #23*. Comicvine, 06 Mar. 2013. Web. 17 Jan. 2016.

Kaba, Fethi. "Hyper-Realistic Character and the Existence of the Uncanny Valley in Animation." *Hyper-Realistic Characters and the Existence of the Uncanny Valley in Animation Films* 4.2 (2013): 188-95. *International Review of Social Sciences and Humanities – Home*. Web. 5 Jan. 2016.

Kitagawa, Midori and Windsor, Brian. *MoCap for Artists: Workflow and Techniques for Motion Capture*. Amsterdam; Boston: Elsevier/Focal Press, 2008. Print.

Kunz, Sahra. "The Problem of Realism in Animated Characters- Has the Uncanny Valley Been Crossed." (n.d.): n. pag. *Academia*. Web. 3 Oct. 2015.

Lamar, Cyriaque. "Why Tintin Won't Transform into a Giant Whiskey Bottle in His New Steven Spielberg Movie." *Io9*. Io9, 14 Dec. 11. Web. 27 Jan. 2016.

Lemay, Brian. 'Overlapping action'. Digital image. *PRINCIPLES OF ANIMATION*. The Animated Cartoon Factory, 2011. Web. 18 Jan. 2016.

Lottering, Mathew. Personal Interview. 1 March 2016.

Louis, Clare. "*A Study of How the Technological Advancements in Capturing Believable Facial Emotion in Computer Generated (CG) Characters in Film has Facilitated Crossing the Uncanny Valley*". MA Research Report. University of the Witwatersrand, 2014. Print.

Lasseter, John. "Principles of Traditional Animation Applied to 3D Computer Animation." ACM SIGGRAPH Computer Graphics SIGGRAPH Comput. Graph. 21.4 (1987): 35-44.

McCloud, Scott. *Understanding Comics: The Invisible Art*. 1993. USA: Harper Perennisal. Print.

"Monster House (2006) - Box Office Mojo." *Monster House (2006) - Box Office Mojo*. N.p., n.d. Web. 21 Jan. 2016.

"Monster House -Awards." *IMDb*. IMDb.com, n.d. Web. 21 Jan. 2016.

Mori, Masahiro. *The Curiosities of the Uncanny Valley*. Digital image. *The Uncanny Valley*. N.p., 26 Feb. 2013. Web. 19 Jan. 2016.

"Parents Guide." *Harlock: Space Pirate*. IMDb.com, 2013. Web. 24 Jan. 2016.

Pilling, J. (Ed.) 1997. *A reader in animation studies*. Sydney: John Libbet and Company.

"Review for Harlock Space Pirate Collectors Edition Steelbook 3D/2D." *MyReviewer.com*. N.p., n.d. Web. 24 Jan. 2016.

Williams, Richard. *The Animators Survival Kit*. Expanded ed. London: Faber and Faber, 2009. Print.

Sarfo-Boansi, Emmanuel. 'A critical Assessment of the Animators Artistic Ownership over Motion Captured Performances'. MA Research Report. University of the Witwatersrand, 2014. Print.

Schneider, S. 1988. *That's all Folks! The Art of Warner Bros. Animation*. New York: Henry Holt and Company.

Seymour, By Mike. "FMX Day 1: Sure It's Cool (it Is 4C)." *Fxguide*. N.p., 05 May 2016. Web. 28 Oct. 2016.

SimGraphics VActor™. 1992. *SimGraphics VActor™*. Web. 19 Jan. 2016.

Solomon, Charles. *The History of Animation: Enchanted Drawings*. Revised ed. New York: Wings Books. 1994. Print.

Snyder, Daniel D. "'Tintin' and the Curious Case of the Dead Eyes ." *The Atlantic*. Atlantic Media Company, 26 Dec. 2011. Web. 29 Jan. 2016.

"Stuff, John K.: Appealing or Unappealing?" John K Stuff: Appealing or Unappealing? Blogger, 16 Dec. 2008. Web. 25 Jan. 2016.

Sturman, David, J. "*A Brief History of Motion Capture for Computer Character Animation*". Character Motion Systems. SIGGRAPH 94: Course 9, 1997. Print.

"The Great Gazoo." *IMDb*. IMDb.com, 7 Jan. 2001. Web. 25 Jan. 2016.

Sweeney, Kevin. "Medium". Livingston, Paisley and Plantinga, Carl. *The Routledge Companion to Philosophy and Film*. Oxon, UK: Routledge, 2009: 173 - 183. Print.

"The Adventures of Tintin (2011) - Box Office Mojo " *Box Office Mojo*. IMDb, n.d. Web. 28 Jan. 2016.

"The Adventures of Tintin (2011) - Financial Information." *The Numbers*. Nash Information Services, n.d. Web. 21 Jan. 2016.

"The Adventures of Tintin - Awards." *IMDb*. IMDb.com, n.d. Web. 21 Jan. 2016.

"The Flintstones in Viva Rock Vegas (2000)." *IMDb*. N.p., n.d. Web. 25 Jan. 2016.

"The Incredibles (2004) - Box Office Mojo." *Box Office Mojo*. IMDb, n.d. Web. 02 Feb. 2016.

Thomas, Frank and Johnston, Ollie. *The Illusion of Life: Disney Animation*. 1981. Michigan: Hyperion, 1995. Print.

Van Der Merwe, André. Personal Interview. 1 March 2016.

Wells, Paul. *Understanding Animation*. London: Routledge, 1998. Print.

Wolchover, Natalie. "Why CGI Humans Are Creepy, and What Scientists Are Doing about It." *LiveScience*. TechMedia Network, 18 Oct. 2011. Web. 24 Jan. 2016.

Wylie, Brooke. "Mars Needs Moms." *Trend Tracking: Is The Uncanny Valley Expanding?* Faction Media, 29 Sept. 2015. Web. 24 Jan. 2016.

Zahed, Ramin. "A Grand Adventure." *Animation Magazine*. Animation Magazine, 20 Dec. 2011. Web. 03 Feb. 2016.

Digital Images

Figure 13 "Beowulf Grendel's Mother." Digital image. *Review*. Union Films, 9 Mar. 2009. Web. 23 Jan. 2016.

Figure 6 Michelle, Kara. *The Powerpuff Girls Are Back!* Digital image. *'The Powerpuff Girls' Will Return on TV in 2016*. Celebeat, 22 Feb. 2015. Web. 16 Jan. 2016.

SidToyStory. Digital image. *Film Facts: The Uncanny Valley*. FlashbackBackslide, 25 July 2014. Web. 24 Jan. 2016.

Review for Harlock Space Pirate Collectors Edition Steelbook 3D/2D. Digital image. *MyReviewer.com*. N.p., n.d. Web. 24 Jan. 2016.

YankeeClippa. *The Great Gazoo*. Digital image. *YouTube*. YouTube, 4 Sept. 2007. Web. 25 Jan. 2016.

Wylie, Brooke. *Mars Needs Moms*. Digital image. *Trend Tracking: Is The Uncanny Valley Expanding?* Faction Media, 29 Sept. 2015. Web. 24 Jan. 2016.

Films

A Christmas Carol. Dir. Robert Zemeckis. Perf. Jim Carrey, Gary Oldman, Colin Firth. Walt Disney Pictures, ImageMovers, 2009. Film.

Avatar. Dir. James Cameron. Perf. Sam Worthington, Zoe Saldana, Sigourney Weaver. Twentieth Century Fox Film Corporation, Dune Entertainment, Ingenious Film Partners, 2009. Film.

Beowulf. Dir. Robert Zemeckis. Perf. Ray Winstone, Crispin Glover, Angelina Jolie. Paramount Pictures, Warner Bros. Pictures, 2007. Film.

Brave. Dir. Mark Andrews and Brenda Chapma. Perf. Kelly Macdonald, Billy Connolly, Emma Thompson. Walt Disney Pictures, Pixar Animation Studios, 2012. Film.

Brilliance. Dir. Robert Abel. Robert Abel & Associates, 1985. Advert.

Canaille Peluche. Perf. Valérie Payet. Canal+, 1991-1995. TV Series.

Dawn of the Planet of the Apes. Dir. Matt Reeves. Perf. Gary Oldman, Keri Russell, Andy Serkis. Chernin Entertainment, Ingenious Media, Soho VFX, 2014. Film.

Final Fantasy: Spirits Within. Dir. Hironobu Sakaguchi and Motonori Sakakibara. Perf. Alec Baldwin, Steve Buscemi, Ming-Na Wen. Columbia Pictures, 2001. Film.

Frozen. Dir. Chris Buck and Jennifer Lee. Perf. Kristen Bell, Idina Menzel, Jonathan Groff. Walt Disney Animation Studios, Walt Disney Pictures, 2013. Film.

Harlock Space Pirate. Dir. Shinji Aramaki. Perf. Yû Aoi, Jessica Boone, Ayano Fukuda. Toei Animation, 2013. DVD.

Kochadaiiyaan. Dir. Soundarya R. Ashwin. Perf. Rajinikanth, Deepika Padukone, Sarath Kumar. Media One Global Entertainment, Eros International, Cinemorphic, 2014. Film.

Loony Toons. Dir. Chuck Jones and Tex Avery. Perf. Mel Blanc, June Foray, Arthur Q. Bryan, Bea Benaderet, Stan Freberg. Warner Bros. Animation, 1930-1969. TV Series.

Mars Needs Moms. Dir. Simon Wells. Perf. Seth Green, Joan Cusack, Dan Fogler. Walt Disney Pictures, ImageMovers Digital, 2011. Film. Christmas carol

Monster House. Dir. Gil Kenan. Perf. Mitchel Musso, Sam Lerner, Spencer Locke. Columbia Pictures, 2006. Film.

Out of the Inkwell. Dir. Dave Fleischer. J.R. Bray Studios, 1919. Film.

Paranormal Activity. Dir. Oren Peli. Perf. Katie Featherston, Micah Sloat, Mark Fredrichs. Solana Films, Blumhouse Productions, 2007. Film.

Rise of the Planet of the Apes. Dir. Rupert Wyatt. Perf. James Franco, Andy Serkis, Freida Pinto. Twentieth Century Fox Film Corporation, Dune Entertainment, Chernin Entertainment, 2011. Film.

Robots. Dir. Chris Wedge and Carlos Saldanha. Perf. Ewan McGregor, Halle Berry, Mel Brooks. Twentieth Century Fox Animation, Blue Sky Studios, 2005. Film.

Shrek. Dir. Andrew Adamson and Vicky Jenson. Perf. Mike Myers, Eddie Murphy, Cameron Diaz. DreamWorks Animation, DreamWorks SKG, Pacific Data Images, 2001. Film.

Sleeping Beauty. Prod. Walt Disney. Dir. Clyde Geronimi. Perf. Mary Costa, Bill Shirley, Eleanor Audley. Walt Disney Productions, 1959. Film.

Snow White. Prod. Walt Disney. Dir. William Cottrell, Harry Stockwell. Perf. Adriana Caselotti, Harry Stockwell. Walt Disney Productions, 1937. Film.

Star Wars: The Force Awakens. Dir. J.J. Abrams. Daisy Ridley, John Boyega, Oscar Isaac. Lucasfilm, Bad Robot, Truenorth Productions, 2015. Film.

Tin Toy. Dir. John Lasseter. Pixar Animation Studios, 1988. Film.

Toy Story. By John. Lasseter. Perf. Tom Hanks, Tim Allen, Wallace Shawn. Pixar Animation Studios, Walt Disney Pictures, 1995. Film.

The Adventures of Tintin: The Secret of the Unicorn. Dir. Steven Spielberg. Perf. Jamie Bell, Andy Serkis, Daniel Craig. Paramount Pictures, Columbia Pictures, 2011. Film.

The Blue Umbrella. Dir. Saschka Unseld. Perf. Sarah Jaffe. Pixar Animation Studios, 2013. Film.

The Catherine Wheel. Dir. Twyla Tharp. Perf. Sara Rudner, Jennifer Way, Tom Rawe. British Broadcasting Corporation (BBC), WNET Channel 13 New York, 1982. Film.

The Flintstone Viva Rock Vegas. Dir. Brian Levant. Perf. Mark Addy, Stephen Baldwin. Universal Pictures, Amblin Entertainment, Hanna-Barbera Productions, 2000. Film. *Tron* 1982

The Good Dinosaur. Dir. Peter Sohn. Perf. Jeffrey Wright, Frances McDormand, Maleah Nipay-Padilla. Pixar Animation Studios, Walt Disney Pictures, 2015. Film.

The Incredibles. Dir. Brad Bird. Perf. Craig T. Nelson, Samuel L. Jackson, Holly Hunter. Walt Disney Pictures, Pixar Animation Studios, 2004. Film.

The Hobbit: An Unexpected Journey. Dir. Peter Jackson. Perf. Martin Freeman, Ian McKellen, Richard Armitage. Warner Bros, Metro-Goldwyn-Mayer, New Line Cinema, 2012. Film.

The Hobbit: Desolation of Smaug. Dir. Peter Jackson. Perf. Ian McKellen, Martin Freeman, Richard Armitage. Metro-Goldwyn-Mayer, New Line Cinema, WingNut Films, 2013. Film.

The Lord of the Rings the Fellowship of the Ring. Dir. Peter Jackson. Perf. Elijah Wood, Ian McKellen, Orlando Bloom. New Line Cinema, WingNut Films, The Saul Zaentz Company, 2001. Film.

The Polar Express. Dir. Robert Zemeckis. Perf. Tom Hanks, Chris Coppola, Michael Jeter. Warner Bros. Pictures, 2004. Film.

The Powerpuff Girls. Created Craig McCracken. Perf. Cathy Cavadini, Elizabeth Daily, Tara Strong. Hanna-Barbera Productions, Cartoon Network Studios, 1998-2005. DVD.

Video Games

Call of Duty: 1. Activision. 2003. Video game.

Resistance: Burning Skies. Sony Computer Entertainment. 2012. Video game.

The Amazing Spiderman. Activision. 2012. Video game.

The Order: 1886. Sony Computer Entertainment. 2015. Video game.

Appendices

Appendix 1

Interview with **André Van Der Merwe (AM)**, animation producer at The Flying Circus; **Matthew Lottering (ML)**, lead animator at The Flying Circus and **Daniel Buckland (DB)**, actor and director at The Flying Circus.

Date: 1 March 2016

Place: The Flying Circus Studio (Kyalami Business Park, Indianapolis St, Johannesburg)

Breakdown: Part 1: 33minutes (Primarily with Andre Van Der Merwe about the system used at the Flying Circus)

Part 2: 23 minutes (Primarily with Daniel Buckland on acting for motion capture)

Part 3: 35 minutes (Primarily with Matthew Lottering about animation)

(**Note:** This is a faithful transcription of the interview. For the purposes of this research report, only the questions and answers pertaining to the process and research on motion capture. This accounts for the gaps in times and, perhaps, the interrupted flow of the interview as parts of the interview that did not involve the research being carried out in this report are omitted).

PART 1:

CE: Can you give a brief description about your background in acting and how long you have been acting for animation?

AM: My background is in visual and production specifically for visual effects for feature films and commercials. I joined Flying Circus at the end of 2012. The studio turned on the mo-cap system in August 2012 and I joined at the end of that year. I have a degree in theology, not really related to film. I've always had an interest in pictures, but it took

me awhile to find the in-point into the industry, it was really by chance. I introduced to a friend of a friend of a friend uncles friends and got involved in a visual effects Studio and I started off as an assistant to the editor editing visual effects for commercials and feature films. That I did for a few years until I became an editor and being an editor you work closely first-hand with clients so that's where the client facing producing part of my career started. And then I started producing the visual effects for my first feature film in 2003 it's called 'What The Bleep Do We Know'.

CE: How did you decide on using motion capture for Flying Circus? Is motion capture a viable business model? What are the advantages of motion capture?

AM: it allows for a slightly more rapid production model when it comes to the production of animation. So it's a little bit quicker and it's a little bit cheaper depending also on what your animation style is and the aesthetic style of your projects. The short answer is that it's cheaper and faster it's designed for a very specific kind project. It's taking us quite a while to understand exactly what those projects are, what characters are in these projects, how those characters move particularly. If it wasn't a viable business model I don't think we'd be doing this. The one thing that I like about mo-cap is that it very quickly pointed us in the direction where we realised it's actually about the characters and how we tells a story through movement really. So it necessitated us to go back to the beginning of what is actually important. It's something we continuously develop our production model to fit, in order to make it more viable in the business sense. We always trying to do it quicker, do it cheaper, and sort of at the same time still maintain a higher production at the end of the line. So it's almost a model that will always be in flux, we will always try to do things differently and better and faster. I mean the an example is what we recently turn on Nalibali where we are using the mo-cap system to develop a different kind of animation model to produce animation at significantly lower costs within a much tighter production schedule.

CE: What are the specifics of the motion capture system you are using? Amount of cameras? Tracking points?

AM: The systems called Motion Analysis they are the guys that make the system. We have 40 cameras and very specifically an amount of tracking points per character's body and per character's face that are very strategically placed. Each one relates to a very specific point on the rig.

CE: Is motion capture animation faster to produce than to create animation with keyframe?

AM: The short answer is yes it depends on exactly on what you trying to achieve, it's important to know and understand also that you cannot motion capture everything, it's not the answer for every piece of animation. It's a solution; it's a tool for very specific kind of animation.

CE: Can you tell me what this kind of animation is that you're talking about?

AM: It's meant to be for the designs for humanoid kind of performances, if it's not a performance a human character that you want then you need that character preferably as bipedal, so that if it is like what we did for Silly Seasons such as a polar bear character, that that character then walks on his hind legs, he walks and talks like a human. That they are anthropomorphic.

DB: taking a quadruped and forcing them to be bipedal similar to the old Disney movies and Zootopia coming out. A chameleon is not of bipedal animal by nature but we decided to make him one.

CE: Motion Capture is a costly system to use, how is The Flying Circus using it so that it becomes financially beneficial over traditional keyframe animation?

AM: Yes animation is not cheap so whether you do keyframe animation or where you choose to use mo-cap it' always going to be expensive. Animation is expensive, but I think part of the business thinking behind motion capture is trying to find a method of producing animation that is cheaper. That is not only cheaper but we don't have 400 animators and the money to pay for 400 animators.

CE: What content are you making?

AM: CG animation for kids. It's not exclusively for kids but at this stage the shows we develop and producer are for kids. Some of it this for TV, some for feature film, but it's all for kids. Its action adventure comedy for kids.

DB: Silly Seasons is comedy telenovela with animals. It's content for between 8 to 12 year old girls that is driven by mo-cap that has a non-horizontal arc. So we had to make a kind of genre that accepted that, which would be stylistically consistent with something that was mo-capped that had keyframe bits in it. Originally it was going to be a sitcom that we found that there was a level of expectation when you watch animation as opposed to when you watch a live action film. When you watch live action you are happy with characters walking and talking and discussing their breakfast but with an animated show you wonder why you watching the animated characters talking about their breakfast when they could be zooming out of the window of exploding buildings. We had to do an adjustment while producing Silly Seasons which was a big learning curve to justify the medium animators come into play, where they get to keyframing adjust the data we give them to make it more exciting and visual and what it ended up being was telenovela/sitcom for kids that had lots of comedy in it.

CE: How do you manage using motion capture in the company, what is the workflow you employ?

AM: where an animation studio like every other animation studio, and every animation studio more or less has the same sort of pipeline. We'll start with pen and paper and make drawings of the characters and the environment and at some point those become need to become 3D assets and we model, texture and rig. So that part of the process is exactly the same, it's literally only the animation part of the pipeline that is different. So what the motion capture system enables us to do is get us to the first pass of animation a lot quicker. What comes out of the studio as raw data, is sort of the first or second third pass of what would typically come out of it keyframe studio.

ML: it depends on the shot itself, but for a studio that's doing purely keyframe animation to get what we get out of motion capture will probably take two to three weeks where we get it when we sit down at desks. There is obviously the time it takes to shoot the mo-cap and clean it but that's also time traditional keyframe studios would spend in layout and camera in storyboard as well.

AM: I think it's fair to say we get to the good side of halfway immediately and in some instances it's different.

ML: it depends on the style of the show whereas Silly Seasons is a 50/50 take of mo-cap and keyframe. When Nalibali basically gets us at 99%. With Inside Job where we really want to try stylizing it more we use 25%. So it depends on what you want to do with a mo-cap.

CE: How much motion is animated using keyframe animation over and above the motion capture? How much is the mo-cap edited/cleaned up?

AM: That you can decide as the creator of the show, Matthew explained it well. On Silly Seasons we made the decision to keyframe the faces, we always have to do the blinks and the eyes because that we can't capture, and we made a decision not to capture the hands. So depending on the style of animation that you want to put you how much you want to use keyframe animation. Then Nalibali reference that Matthew made it's a specific design that we made so that so when it comes out of the acting Studio it's sort of done. So it can be anywhere between 55% and 95%.

CE: Do you don't capture blinks eyes and hands in all your shows?

AM: Yeah you can't capture the movement of the eyes, we decided not to do blinks because we tried for a long time and it didn't really work. We are developing a facial mo-cap system which is only working for low-cost rapid animation system, it's not working on Silly Seasons and it's not going to work on Inside Job either. It's also too difficult to motion capture fingers.

DB: Because your hands are often so active. We get the hand and the wrist moment. We tried to capture hands and fingers on the pilot but there was too much

adjusting afterwards it started working against the kind of efficiency and that motion capture offers.

AM: We knew none of this when we started, so we had to try and see what works and what didn't work. When you get to the point when we realized that the motion capture Studio system it's just another tool that we use to tell stories because what ultimately what we do, is we are an animation studio and we are telling stories. Motion capture works with certain things and for certain things it doesn't.

CE: What are the limitations to using motion capture?

DB: very big physical ones like lying down; you obscure a whole bunch of markers. It's all about cameras and knowing where the markers are on the body. Soon as you obscure any amount of them you mess with the skeleton and they have to do a lot of cleaning all the data is unusable. If you working with props, initially we didn't work with any props and played fast and loose with imaginary objects, what we found later was that the objects have weight with volume and movement. Once we bought the real objects in we found that they obscured markers, so we had to make a huge set of wireframe props. Although they don't have the same weight, so we can't use a wire cup the same way we treat a porcelain cup, I suppose that's the actors challenge to get to a place where able to see this wire cup subconsciously with a sense of its weight and content inside the cup. A lot of the time we would just go "oh I'm drinking a wire cup" and put it down and then the animators would have to go over and tweak little bits. Interacting with other characters also, if you have a character you obscure markers and sometimes your markers can come off and stick to the other characters body. Too many fast movements sometimes you can fling off markers. The big limitation to me as a performer and a director is the limiting space, that as soon as you walk out of the specific area the cameras lose you and your rig breaks. If you have a bunch of characters and you move to the side the camera is desperately trying to find your markers and then start messing up with other characters rigs. Limitations of the space we use means we to have to be very creative with how is stage a scene, how you write a scene, how you cheat distance. How many characters we can have in a scene as we can only have with any degree of accuracy 4 or 5 characters in the volume and even then the volume becomes a lot smaller in

terms of the focal points of what the cameras can pick up so often we have to split up these performances.

AM: If we had a bigger space it would be easier to do stunt action. The studio is quite small; if it was bigger we will do more adventurous stunts. What happens now is a lot of the stunts get hand animated because we can't shoot it in a small space.

CE: Is there a maximum amount of characters that each show can have?

AM: No there is no limitation on the amount of characters. We always keep the amount of characters down because we want as few characters as possible to make the show work. The more characters that are there, the more assets we have to develop which means time and money. There are no real limitations to how many characters other than time and money. For Silly Seasons we have 17 characters, for Inside Job there is 37 characters.

ML: When we talk about characters were talking about pivotal characters, not just someone walking around. In the background we have thousands of flowers filling up theatres.

AM: The characters that have speaking parts that is. There are limitations to the amount of characters or performance we can have in a scene at the same time.

DB: You can have a scene with many characters but you can't shoot them all at the same, you have to layer them in.

CE: Do you only use humanoid characters due to the mo-cap system? Could you create a character such as a dog or spider with mo-cap?

AM: We would have to use hand animation. If we had a horse in one of our shows that was a speaking horse that walks like a horse, we would probably hand animate it. The rule of thumb is if you can't get an actor or actress to give you that performance then you going to have to hand animate it. So can you get an actor or actress to give you the performance of a spider? If you can't, you going to hand animate the character. Andy Serkis is a good example if you look at what he did with Planet of the Apes; he gave the animators the performance of an ape as an ape.

CE: So does Flying Circus avoid having to create characters like this because you know you have to hand animate them?

AM: Yes. We do have in Inside Job characters such as a dog and a bird that won't be mocaped. We typically we try to avoid those characters we have to fully hand animate.

CE: What are the maintenance costs to use this system?

AM: There is software maintenance, the little silver balls on suits don't last forever, is wear and tear on gear, we haven't had to yet but at some point the cameras need to be serviced, that's probably it. The system is about 4 years old and it's still working as good.

PART 2:

CE: Can you give a brief description about your background in acting and how long you have been acting for animation?

DB: I also studied philosophy at university, and drama. I did primarily theatre work, film and television and live performance that was geared towards cerebral stuff and natural heightened realism and more of a sense of evocative stuff and physical stuff and stuff that speaks to emotional part of the audience before an intellectual one. A lot of the stuff that I've been seeing was larger than life physical theatre, like physical comedy, big mask work, which was engaging for me because we felt something before we thought it. That's where I draw the relation between animation and the work I was doing before. I came to Flying Circus for the pilot for Silly Seasons 2013. It was my first introduction to motion capture and immediately I took to it because it seems to draw on those qualities I enjoyed about theatre and live performance. We made a lot of mistakes with motion capture for a highly stylized style in that way that we behaved quite pedestrian and the characters had hyperreal action which was a very stylized figure that put us

somewhere in the Uncanny Valley. It was hard to look at, the stylized quality of the animation demands a very specific vision that every gesture has got a thought behind it and that's all of it is very clear to the audience, and that everything has a sharpness and tightness to it that naturalism doesn't have. So when I went into the Silly Seasons we made everything very stilted and had a thought to it, and then everything stilted and robotic, then we found our way back to the middle ground where we can't be pedestrian but we also can't be robotic.

CE: Tell me how you got into directing acting?

DB: I directed quite a bit for theatre and I was used to working with actors because I was an acting coach in a travelling circus show, so that's where the directing part of it came in. The role of being an actor and director is a tough one to juggle at the same time because you are half in one roll and half in the other but I don't enjoy doing it at the same time.

CE: What in your experience are the differences between acting for live-action and acting for animation?

DB: There are lots of similarities that comes from the specific style of acting; that is heightened, that it's simplified, that it amplified. We have treated the space a little bit like a performance space almost like a sitcom where we perform in one direction most of the time and simplify uses of cameras. The difference is that the audiences eyes are more forgiving on performers in live action than they are on animation, they are more demanding on matching the style and people have expectations with regard to style, to how the narrative flows, if you have an animated character they have so much more potential because we seen *The Incredibles* and *Big Hero 6*; we know that animated characters can do that, so we want to see that. So there's a level of expectation with regard to that and stylistic expectations the audience has that they go 'oh we want to see the performance at the style'. With mine, the audience kind of sees a wall there, but you do that in mo-cap and there are tiny little shifts and micro movements in the body, then in animation the audience knows that it's not a wall, it just looks stupid.

CE: What are your main techniques for acting for animation? What do you do to portray animated characters best?

DB: I've never been a big fan of method acting, of fetching a dark memory and bringing it up and sharing it with the universe. Acting for animation is more rooted in the body and more physically based right from the start, but that's not to say that you don't have a complex character, storyline, character arc, backstory, character wants and likes, fears, hates, you have to use all of that stuff and have that as ammunition for the characters. How I like to work is find the characters body, find the weight, find the rhythm, find the animal that the character has an affinity to, and play your character- that's like an age-old acting trick. Lots of physical work, rooting the body, finding the breath of your character, finding the movement style, your strength, your stride length, the way your foot interact with the ground the rhythm of your speech, a lot of that stuff. We use improv as a central method. There are lots of the detracting features of motion capture which gives us a very specific style performance that animators have to go back and tweak. But what it does give out is it gives us a palette to play with that I don't think a lot of other animation studios have; where you have one performer is specifically hired to get inside a characters head because they are that kind of performer which is a unique quality. When you put the actor in improvisation setting they can come up with stuff that the writers could never dream of, adding another creative voice in on the playing field that we wouldn't have if we didn't have mo-cap.

CE: How do you prepare for a shoot?

DB: The script which is the first launch pad, sometimes that strong then it's rickety, we can sometimes play with the script and sometimes the beats are exact. We've got to prepare the blocking, the lines of action, where the cameras are going to be. Sometimes this is vague and you need the actors to bring it to the next level. Sometimes I give actors a problem such as they have to go to someone but also give something to someone else, and not often makes a scene a little bit more interesting. I give actors scenes to go and interpret and play with and comeback, sometimes it comes back in it's a disaster and sometimes it comes back in its amazing and nothing like anyone would have thought of.

CE: Do you know of and/or consider the 12 Principles of Animation in acting for animation?

DB: Some of the principles just can't be applied because they are specific to how the animation gets done but some of the stuff applies directly like squash and stretch, anticipation, follow through, all those things speak to how the body must behave in that environment and you have to sell that style. We are still trying to find the sweet how to sell that with the mo-cap. And again its style, squash and stretch can be very subtle but you really have to boost it for a style like Tom and Jerry animation. There's a limit on with the physical body can do but we're trying to push that limit as much as possible to deliver to the animators a product where they can go: 'oh okay cool, we just need to do that', or 'I see what the performers were doing here' and use that as inspiration to push the performance more. So hopefully animators can use the raw data as a stepping stone to push the animation further and to keyframe it in the right places to make it look awesome, or keyframe the whole thing and make it look even more awesome. To answer that question, yes we are using some of the principals of animation, especially 'exaggeration' which we have to use and implement seeing as though we are playing stylized performances.

CE: Tell me a bit more about how you use 'exaggeration'?

DB: What we tend to do in physical performance in physical theatre is the principle of simplify and amplify, to move away from naturalism and white noise your body produces, we call that parasitic movement, all of this sort of secondary animation which is meaningless and is background noise or at best its subtle subtextual stuff. For example, I'm scratching my ear because I think I heard something, and that kind of stuff doesn't really resonate with the audience we're trying to convince with the style. So what we have to do is clean all that stuff and simplify the physicality to express one specific contradiction or one specific conflict, and then amplifier that up. So the simple thing of scratching your ear becomes like contraction in the body and that instead of being subtle and naturalistic acting becomes exaggerated and then we put squash and stretch and similar to pose-to-pose we're hitting the poses quite fast.

CE: How many characters does each actor have on average? Do you find acting two or more different characters retain those certain characterizations across characters?

DB: I've got a light voice so I have to work really hard to try and drop my residence for other characters. Often you can get locked into a similar kind of physical pattern; we have a fantastic production manager who watches for other characters characterization or physical patterns that looks like a different character while we act. Often there is a little bit of an overlap but we try to keep them apart. Generally people have got about 2 characters that they play. There are specific factors we used to playing a multitude of different characters because they used to the idea of physical theatre where we play fast and loose with those rules. Then there's a whole host of flowers that everyone plays so everyone is required to stretch themselves to create different characters that don't sound like other characters.

ML: I can definitely tell who's playing what character because we've been working with the characters for so long.

DB: I can see that too, we've got very distinct body rhythms sometimes things slip out.

CE: Do you have to go and over animate to get those rhythms looking different?

ML: If that does come through to us it's been approved, so we'll have a laugh about it but we're fine.

CE: Do you have a character you act that has very specific stylistic movements? Can you tell me a bit about him/her and those movements?

DB: Cam the chameleon, he is flamboyant and overly dramatic and his movements are quite sharp and quite expensive. I've been trying to link every action or thing he says to a physical representation of that, that's linked to his over dramatic view of his very pedestrian life.

BL: His movements are big but they feel intentional. He's even cocky.

PART 3:

CE: Can you give a brief description about your background and how long you have been at Flying Circus?

ML: I studied directing and writing, I just wanted to tell stories but I found that I can't control actors and became extremely frustrated with the process. While studying, I did VFX and animation as a sub and I found that I enjoyed the control of making things move and come alive and bring them to life by myself without having anyone controlling the impact. I pursued animation full time with animation schools. After graduating, I interned for a few months and got my first job at the circus as a character animator on Silly Season in 2013.

CE: Can you explain your overall workflow once you receive the mo-cap data to when you send it off for lighting and rendering? Include time frames if possible.

ML: When we finish one episode, we watch the next episode and get a sense of the story and what's going on. We will then have a session with the director and animators and producers and while watching the show point out things that might be misunderstood and then shots will be assigned to us. The director and producers choose shots specifically to animators who they feel have the strength to get the shots done well and in a decent amount of time. We then go into the shot and bring in the witness footage so we can get the facial expressions because we have to animate them. We start cleaning up the mo-cap and animating, we start changing certain poses; we put the lip sync on the characters and the expressions. Once that's done we put it in the dailies folder and the next day the animation director will go through all the shots with us and give us notes and we do the same process until the shot is complete.

CE: How many times on average do you go back and forth?

ML: We generally try not to get the same shot looked at more than twice. We want approvals quickly because you already getting approved stuff from the mo-cap. We don't go and do a blocking pass like traditional animators, we generally try to get stuff finalized the first time which never happens but we don't want to get too many notes.

CE: It sounds like you don't really have a lot of time to do that?

ML: There are time budgets, we hitting trying to hit 200 frames a day. So we get what we can get done finished and then move on and then the notes push us the rest of the way.

CE: How many animators are working on this process?

ML: There are currently 20 of us. At our maximum we were 21.

CE: And once that is approved it goes off to lighting?

ML: Once approved we put it into the system that notifies the lighter that the shots ready, they pick it up and put all the lights in and shaders in. Then the lead animated will look at the lit shot and try to spot anything wrong with the animation because you can't see everything in a playblast. Hopefully there isn't anything but sometimes something can creep up. And if there is something, back animation and the process begins again.

CE: Do you generally have to get those out really quickly?

ML: We've been animating an episode at the moment at 8 days an episode but that's animation alone, not lighting and rendering. Speed is something that important which is why we cast certain shot for certain animators because some of us are faster than others. So you give the more complex shots two slightly faster animators and give the reaction shots to someone else so that it's small but they can get it out quickly and then move on to the next reaction.

CE: How much motion capture data is used in the final animation and how much is keyframed?

ML: Depends on the shot in the show. If the character is doing stunts we have to keyframe that. A lot of the time it's 50/50. There are data cleaners to clean the mo-cap, but the animators will alter it.

CE: How much clean-up is done after the mo-cap performance?

AM: 1 minutes of screen time per character takes one man day to clean up, this includes the retargeting. Every minute of screen time per character will take a man day of clean up and preparation so that animation can start. There's another team, the data cleaners, to prepare the data for animators.

CE: Do you find the actors consider the 12 Principles of Animation or do you have to go over the mo-cap data and put those elements in such as squash and stretch, anticipation and follow through and overlapping action?

ML: I think the 12 principles were created to help animators make things seem real and make it believable. But the motion capture actors are real, they don't have to think about it because that's how your body moves; your body naturally squashes and stretches, you naturally anticipate to do an action. Where animation comes in to help that is with 'exaggeration' and its appealing shapes and silhouettes because actors don't think about the way their body stands. I don't think we need to be conscious about that because they are human. The way the body moves the principles are in there already. Because our style doesn't require bouncy characters, we're doing normal people.

CE: So you don't go and emphasize the principles in the motion capture data, you use what's already there?

ML: We exaggerate things, like timing and spacing but it doesn't need to be conscious from the actors.

AM: They very carefully consider the performance they need for that character in that situation. There needs to be purpose in every single movement, which is different for every character because every character has a specific physicality that needs to be considered. And at some point it can be translated into the 12 principles, but I think they consider more the physicality of every single character.

ML: Through considering the character the 12 principles come into play by themselves.

CE: If you feel like character really needs some squash and stretch for instance, do you put that in?

ML: We will if we feel it's necessary. If they need to jump on a table for instance the actor in the mo-cap room just jumps up and down. The animator goes in and really gets the character on his haunches to give him that squash boost that he needs, we are really giving him the squash and stretch and the arc to get it to the point where it needs to be. If someone's punching and the timing and spacing is off, we've got the freedom to go in and change it. But we don't want to waste time if we don't have to. I mean we could go in and change everything but then what's the point of using motion capture?

AM: At this stage the most important thing that animators do is to get it done in 8 days.

CE: So fingers and face are your priority as animators?

ML: Yes, and helping actors get the story through the way they performed it. If we change too much we're also changing an approved performance from a director already. If we change it they ask us what happened to their performance, which I have been a culprit of a few times.

AM: The key advantage of mo-cap as well is, as the director you have the opportunity on the floor on the day to make sure that you get the performance that you want, you don't have to wait for it to get to animation to get animated and rendered and 7 weeks later you see a first draft of what the animation looks like and whether it's the performance that you wanted. You see that on the day, and you direct the performance on the day, and you do take after take until you get the performance that you want. You're not finally locked, but you've approved the animation in studio already. If the director doesn't get it on the day on the floor, the animators are not going to fix it; the director has to block the animation on the day. And that is an advantage for the director because you know on the day already what you can expect in animation.

CE: So are these just little tweaks are they really big changes?

ML: For the most part we try to keep them little but obviously there are times when we need to add big changes. It is very situational as well.

CE: Is motion capture a feasible means to creating animation of a cartoon/caricature aesthetic (that uses the 12 Principles of Animation for stylization)?

ML: As an animator you should shoot reference, so motion capture is like a starting point as reference, so you can say 'I like what actors doing at certain points', clear out the other key frames and then push it. So you getting at least a starting block and the performance of the actor as well, but then you can push the performance by clearing it out and changing the timing. Motion capture gives you a key on every frame, you can keep 5 of those in a 500 frame shot and use these as your blocking for key poses and then animate the rest as you would normally, you just don't have to start in a T-pose basically. You can use this as a tool to get your pose-to-pose down.

AM: What we come to realise that it's just another tool. Ultimately what we want to do is create good animation using particular styles of animation for different shows and we use the mo-cap just a tool to get that result. In some cases we use very little of it and in some cases we use a lot of it. But it is just one of the tools that we use.

CE: Is motion capture good for specifically stylized animation?

ML: I don't anything is better or worse than the other it just depends on how you plan to use it and how much time you have to use it because one of the reasons a lot of Studios use motion capture is because of a time budget. If you want to get Pixar, you can do it with motion capture but you need the same time budget and money budget that Pixar has.

CE: In your opinion, is motion capture more beneficial than traditional keyframe when considering movement creation? Can you explain? Is motion capture a feasible means to creating animation of a cartoon/caricature aesthetic (that uses the 12 Principles of Animation for stylization)?

AM: From a Producer's perspective, there are certain projects that people for instance want to produce with us, and want us to co-produce animation with them and then when we look at the treatment and the references they have for this style of animation that they want to achieve, we say no, motion capture is actually not the right tool if that is what they want to achieve because it is not the most effective way of achieving that result.

CE: What kind of example would you say no to?

AM: Very very stylized animation.

ML: Cloudy with a Chance of Meatballs, Hotel Transylvania.

AM: Very stylized and exaggerated squash and stretchy animation.

CE: So do you feel like you fit somewhere in between very stylized and more photorealistic animation?

AM: I'm not referring specifically to the look, just in terms of the animation then yes, somewhere between realistic and stylized animation.

ML: I think it saves it's from getting to that uncanny valley, is quite a bit of animation touching for the actual look of the characters and the design of the world so it isn't going to the real side, so characters can look cartoony and move realistically and it won't become uncanny valley. It's where to start merging and it's not quite real and it's not quite stylized either and then it start feeling creepy. Like *The Rise of Planet of the Apes* or *Gollum* or *Avatar*, they haven't hit that uncanny valley because they're making it real because they sticking it with real people. If all the humans in the show were also animated then it's going to hit uncanny valley immediately. So that's what saves us, because we going cartoony with real motion.

CE: What do you think about *The Adventures of Tintin*? Because it technically didn't go hyper-realistic and they caricatured their characters to a certain point but at the same time Tintin was very uncanny because he was so simplified?

AM: Technically it was an amazing film and achievement. I can appreciate the tech behind it and how they made and produced an animated feature looking like that is a major achievement.

ML: It started bordering on the uncanny valley a little bit, kind of like *Mars Needs Moms*, but again if they went slightly more toony with them that wouldn't have happened, if they had bigger eyes like Disney characters that would've happened, but that's the directors design choice. It's not really too much to do with the motion capture.

CE: One of the biggest critiques of motion capture in animation is the lack of engagement with the characters due to the uncanny valley. Do you feel that the final rendered characters that are produced by *The Flying Circus* are just as engaging as if they were made with traditional keyframe animation?

ML: I think that they are, looking at the budget you can't compare us with Pixar movies, so if you look at a similar TV show I think that we're on the same level. There are times where you can become disengaged but this could also be story, design, cameras, so many things.

AM: From the producers side, it's something that we struggled with quite a lot and our biggest issue was the design of the characters not the way they were animated, the characters were not engaging and they were not appealing to kids in particular because we didn't get the design right. As soon as we got to the point where the designs were appealing we added the mo-cap and it worked. So the short answer is yes. When I take the projects to market, I get feedback from broadcasters and distributors who tell us where we are, if we are delivering stuff that is on par or below average or above average. We know that all the content that we create including the Inside Job pilot that we don't want to show it to anyone, even that we know we are above average. We know that our characters are appealing in their design and the way they are animated, we know the appeal on the face and expressions are good. This came straight from Disney on a panel that was looking at one of our projects and he said to us that what we are producing now it is good as anything else that is on TV. So we know we are at the point now where we have appealing characters.

CE: Do you think that if you used a facial motion capture system with your system you would end up with unappealing characters?

AM: Yes definitely. Facial mo-cap is a very intricate science that's very complicated.

CE: And that is where a lot of the uncanny valley happens?

AM: Yeah and we tried it quite extensively for a long time and we only been able to design the Face mo-cap part for a very different kind of character.

(End of Interview)