



AKADEMIN FÖR TEKNIK OCH MILJÖ
Avdelningen för industriell utveckling, IT och samhällsbyggnad

Discerning Emotion Through Movement

A study of body language in portraying emotion in animation

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May 2014

Examensarbete, C-Nivå, 15hp
Datavetenskap
Examensarbete I Datavetenskap
Creative Computer Graphics

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by

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Abstract

Animators are so often taught more about how to perfect their animations than to consider what it is that makes the animation come alive. They work away with principles and physics, sometimes completely overlooking a characters communication tools. The following thesis is a study of emotive expressive body language and its purpose in animation. The project studies various angles of body language, in an attempt at summarizing key features that could work as guidelines for animators in the future. It deals with the role of body language in animation and why it is necessary for a more realistic feel in the animation. As well as the briefly mentioning the 12 animation principles, on their necessity and faults in the matter. The thesis is divided into a theoretical investigation and a practical experiment. The intention was to create a set of key features for the use of as tools and guides for fresh animators to understand and translate emotion into their animations. The results indicate the power of body language and its versatility as a tool, putting emphasis on why it ought not to be neglected.

Keywords: Animation, Body Language, Emotional Body Expression, Emotional Recognition.

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1 Introduction

Words are the key to successful communication. This is true, however they might not be as important as you believe. According to researchers up to 93% of human communication is made up of body language[1]. Subconsciously, while the more active part of our brain will process words and tone of voice, we also look at the way people move. Facial expressions take up a big part of course. Yet it is important to remember that the face is not alone. Subtle changes in their posture, the placement of the head and shoulders, and what someone's hands are doing, are further examples of the more expressive bodily cues.

This is not something many think of, rather the opposite, it is as mentioned a subconscious action. It is secondary to the conversation. Even so the basic knowledge is there in most people, even if they have never personally put it in words. For example if you asked someone to show you what a frightened person would look like, many would adopt a position of cower with their arms raised protectively.

The basic knowledge is a starting point for animators everywhere. Whether it be drawing, stop motion or computer generated images they work with. One of the issues with learning animation however, is the endless supply of documented realistic movement. How to create weight, to include physics, and what the twelve principles of animation are. A great deal of this is purely technical. In the course of learning, it all might confuse the animators to overlook body language as a tool. So that although their animations might in the end be flawlessly realistic, they lack that spark of life. The animations will lack character and become very repetitive as every appearance of anger will look the same, every character shoulder their sorrow identically.

This paper will test the expressive non-verbal language of a faceless animated character. Broad studies already show an emphasis of facial expressions and their use in communication. Often to the point where the expression of the body is lacking. A study of the creation of expressive bodily movements without the distraction of a face is in many ways an interesting challenge. It may also be of use to show fresh new animators how much can be said with very little.

1.1 Focus and Purpose

Working and watching new animators come into the field and see their progress caused an issue to rise to attention. As mentioned previously, the animators focus always seemed to be in the perfection of each movement. Too focused on their work looking stunning, they often neglected the characters themselves. This formed the question why their animations, while technically rather good, seemed to lack spark and life. Why were they not convincing?

A brief initial study surrounding this question lead to the forming of this research paper. The focus of which is the purpose of body language in communications. Also the further use of it in animation and why it ought not to be overlooked.

The purpose of this paper is to explore the creation of emotional body language. To prove both theoretically and practically that very little is necessary to create a believable expression. Simply put, to lend a helping hand to fresh animators.

1.2 Aims of Research

The aim of the research is to gain a deeper understanding of the role of body language in animation. The goal is to create an animation, of a visually blank character, that successfully expresses emotions. The study will require some understanding of both the sender and receivers viewpoints in non-verbal communication. As well as a deeper than surface understanding of expression. What gestures presented in what manner will convey the chosen emotion? And how do you present this to an audience in a believable manner.

The questions this research will be following have been formed so that research and experiments can be parted into stages, to ease the documentation.

- What is the importance of body language in animation?
- How do you, theoretically, express body language?
- Can an audience relate the desired emotion to a blank figure
- Create recommendations for further use and/or study based on results.

2 Theoretical Background

There is value in learning body language as an animator, for the pure purpose of a more believable animation. Characters talking or interacting with the world around them quickly become stale and boring if body language is not considered. Body language can be such a strong tool for output of emotion. Even characters who are visually blank, can express greatly. Animated characters that are not even human can still convey what they think and feel to us. We know for a fact that posture and gestures can aid a great deal, as actors in theatre often exaggerate the portrayal of emotions to an audience who at times are so far away from the stage the actors seem obscure or tiny.

Previous experiments push further on how expressive emotional body language can be.

2.1 Origin of Body Language

Body language is a subject of interest to behaviourists and researchers of many kinds. Though it is uncertain, as a species who can talk and communicate with words how we feel in exact detail, why humanity has such a strong body language.

Miles Patterson[2] suggests that it is evolutionary. That individuals with more emotive capabilities were favoured. Patterson calls it a system, and that the evolutionary aspect serves a very important role in creating a functional system. The articles used to build up the argument strongly suggest that the beginnings of human body language sits in the ability to emote for survival. Survival in the wild as well as among one another.

2.2 The Psychology of Emotion

Animations are only as lifelike as an animator can make them. If an animator does not have an understanding of what they are attempting to create, then it will not often turn out as intended. Therefore it is a requirement that animators understand feelings, and expressions of feelings. So that they can easily simulate what a character is feeling.

There is a study by Paul Ekman, which suggest that the face have a number of universal expressions[3]. The study which turned out the evidence suggest six

emotions that exist across culture. These being Anger, Surprise, Joy, Sorrow, Disgust and Fear. The seventh, neutral, often considered a detail of reference. However as stated it is only the evidence of universality. The study was conducted over numerous western and eastern literate cultures.

In a very basic format, the study was conducted through means of pictures and labels. Each subject was asked to put a label onto a picture of an emotion. The options for labels were limited, so that the subject had to choose one of the existing. There was some critique thrown at this study because of the choices available. The argument was that if the choices were limited the subject might have agreed because the proper emotion was not available. However, Ekman retorted to the critique; "If a proper choice cannot be found the closest related will do". This was explained further in that a test with a picture of the colour orange, where subjects were asked to pick the appropriate colour, orange not being among the choices. Then more often than not the choice will be yellow or red, the closest related colour. [3]

Later an inclusive study added in some cultures referred to as preliterate, such as the Fore Tribesmen found on Papua New Guinea. This proved, at least, that some emotions were not in fact learned from media.

It is worth mentioning that at the end of the 1990's, Ekman proposed to extend the list of basic universal expressions with an additional eleven. Including, but not limited to, Amusement, Embarrassment, Guilt and Shame.[4]

When attempting to learn more about body language, a great deal of what comes up is about facial expressions. Studies show that common people believe the face to be our main source of expression. That most of it is read from the face and with little consideration of the body. Which had Hilliel Aviezer et al.[5] pose the question. What happens in cases of extremely intense emotions?

Their study is in support of body language having a greater part in reading emotions. In their study they proposed that in cases of intense emotions the face might become overloaded. That there is a kind of biological static in these cases and that it would make it difficult to tell what the person is expressing. Contradicting the common belief that the face is the greatest expressive device.

Aviezer's study was based in pictures depicting intense emotions, such as the win or loss at a tennis game, and the intense pain of getting a piercing. Then separating these emotions into three categories. One where the subject only saw the face, another where the subject only saw the body, and one in which the subjects saw the full unedited photo. In the two later agreement was made that it was not very difficult to tell what the person was feeling. However in the group with only face there was some deal of confusion.

Following this they made another study in which they took the winning and losing faces and switched around which body they were posed on. So that for example a winning face was imposed on a losing body posture, and vice versa. This study gave more supporting evidence, as the subjects once again were mostly in agreement with the bodies. A negatively intense face on a positive body posture was considered positive.

2.3 Reading Body Language

Body Language is a common term for various non-verbal communications. Contrary to popular belief these non-verbal cues make up the majority of a conversation. Janine Driver[1], a body language expert, claims it to be a whole 93%. She goes on to say that there are a great deal of factors, i.e. the tone and pitch of voice, posture, micro

expressions on the face as well as different gestures. Most commonly Body Language is sectioned into three bodily attributes, the face, the body and the tone of voice. Sources are divided on how much of our silent communications are focused. There is no real evidence that the face is a stronger communicator than the body. It is a fact that has been assumed, probably over centuries.

The documentary[1] put emphasis to the fact that there are two methods for reading body language. The first of which is standard expressions, the second is personal expression.

Standard is a type of standardized guideline to what expressions generally look like. These standards range from the very basic expressions, to some rather complex. However it is always as important to remember that if there are standards, there are aversions. There is also the personal expression. Which is normally specific to an individual. It might require some time of studying to understand their personal expressions.

The first indicator is the way the body moves. When reading body language it is important to remember to look at the whole picture. No one part of the body speaks alone. All of it speaks as one, and it is part of each communication.

”Body language can't be considered in isolation. It's usually an amplifier to what you are already saying.” - Harry Witchel, PhD [1]

Looking at the full body expression one start by looking at the alignment. All gestures and expressions naturally follow a certain rhythm. When there is a disconnection between what someone is saying and their gestures, it points toward something being amiss.

“To show that you are an integrity, your face, your head, your gestures, and your body need to be in alignment. In this case [Bill Clinton] is gesturing in one direction and looking in another direction.” - Patti Wood [1]

Gesture inconsistency is another form of disconnect, which explains that a person is attempting to control their bodily expression. There could be a huge array of reasons for these imbalances. The speaker could be worried, stressed, or even lying. However concealing true emotions or intent is most often the reason.

Broken down into parts the experts and body language coaches [1] speak most often of certain areas of the body which they examine at every moment. Among these areas are posture, head and eyes, gestures and hands. There are constant questions that they ask repeatedly. Where are the eyes looking, what are the hands doing, how is their posture, open or closed body language?

Finally there is need for consideration that certain gestures or expressions do not always travel over culture. As explained during a lecture by the former marine-core intelligence officer Frank Marsh.[1] With the example of getting up in another person's face, in the United States and most of the western world, this is a sign of aggression, it is a challenge. While in the Middle East, the same gesture means that they are about to talk. Pushing the example further, Frank Marsh explained how marines were getting in trouble because people in the middle east would get up in their faces to talk or argue, and the soldiers would respond by smacking them in the face.

2.4 Body Language in Animation

In the earliest of animation, the very earliest of Mickey Mouse animations, expressions were exaggerated and crude. The characters had very basic sets of

emotion, the characters were either happy or sad, angry or frightened. Though often, according to Thomas and Johnston [6], the expressions were hard to read even so and could be confused. Unless these emotions were added to in the form of tears or shaking knees.

Animation has come a long way since then, and it might all be thanks to Walt himself. For a long period of time animators worked on the principle of picture to picture, one moment until the next. Which was one of the reason for the stiffness. As it is phrased in the book[6.p442]:

“A picture can be made to express an emotion to perfection. However it will only be able to display that one emotion. In animation a character is alive, animators can make the character change expression, they can show a thought process.”

Thus they discovered how much better a character could express if the emotions and thoughts were allowed to resonate throughout the body. Thomas and Johnston[6] claim that it was Walt's acting that pushed the animators to draw bodily attitudes.

Acting and body language now go hand in hand in animation. To act successfully is to fool an audience into believing the emotions are genuine. When an audience is watching, the biggest canvas to paint emotions with, is the body. How actors pose their body, what poise they have, the expanse of their movements, and the speed with which it is done, are important features.

Thomas and Johnston mentions the correlation between body language and acting several times. Chapter eleven is dedicated to expression in dialogue, it is in part the chapter where the authors describe the process of how dialogue became more than just words. It became feeling and emotion and tools to drive a story that the audience engaged in.

The twelfth chapter, Acting and Emotion, includes displaying personality, and fitting the expressions of emotions to their characters personality. A direct example from the book is Grumpy, one of the seven dwarves. [6 p.476]

“... He[Grumpy] could not have put his head on someone's shoulder like Dopey. True to his personality, he must turn away to cry alone.”

This quote is part of the explanation of the scene in Snow White. The scene is of the dwarves holding a wake for Snow, after she ate the poisoned apple. Most of the dwarves are standing around the bed and crying. In this scene Grumpy attempts to stay true to his name, trying not to cry. Yet it is clear that emotions still overcome and he turns away, because he cannot let the others see. Because a small part of him that will always be Grumpy, says he cannot cry or bawl like a baby in front of others. So he must hide. We see him on the screen turn away covering his face and hunch up, making himself small, shaking as he sobs. A clear expression of his sorrow.

“When someone is lifting a heavy weight, what do you feel? Do you feel that something is liable to crack at any minute and drop down? Do you feel that because of the pressure he's got, he's going to blow up, that his face is going to turn purple, that his eyes are going to bulge out of their sockets, that the tension in the arms is so terrific that he's going to snap?”

- Walt Disney, 1935 [6, p.490]

This quote from Walt Disney himself brings up the subject of recognizing emotion on screen. On being engaged and feeling for the animations as well. In one quote Disney managed to encompass the importance of a well done expression. It is important that the character expresses their emotion in such a way that is believable and engaging.

The audience must feel the struggle of someone carrying a great weight. Feel that pain in the heart when Simba walks up to his lifeless father. Disney challenged his animators to think not only of how a character portrays their emotion, but also how it will be received.

According to Thomas and Johnston the questions were answered only fifteen years after Walt had posed them. In 1950's Cinderella there is a sequence of two mice struggling to get a very heavy key all the way up the tower to where Cinderella was locked away. The two mice had been characterized throughout the film, so the audience already knew and related to their personalities. They were lovable, good natured though a little daft, and always that endearing squabbling.

What made this scene such a success was the warmth the audience felt at these two little mice. The characters emotions spoke to the audience.

The chapter ends with the stating of "points to remember when animating emotions".

1. Make sure the emotional state of the character is clearly defined.
2. The thought process reveals the feeling. Sometimes it can be shown in a single, held drawing or a simple move. Other times there should be gestures, body moves, or full action. Determine which is best in each case.

3. Be alert to use cutting and camera in helping to accentuate the emotion.

4. Ask yourself constantly:

- what am I trying to do here?

- What do I really want to show?

- How do I want the audience to react?

5. Use the element of time wisely:

to establish the emotion of the character,

to convey it to the viewers,

to let them savor the situation.

Don't be ponderous, but don't take it away from them just as they start enjoying it."

- [6, p.507]

2.5 Principles of Animation

An important moment in animation history was the development of the animation principles. Disney took great part in the creation of these as they were the leading figure in the field. They made quite a few of them to begin with. Many of these were subject to drawing alone however, and it was soon shortened into the very basic ones. There are now 12 basic principles of animation.

These include Squash and Stretch, Anticipation, Staging, Arcs, Appeal, etc. The principles are meant to create a more realistic and believable animation, to create the illusion of the laws of physics as well as dealing with the abstract issues such as timing or emotion.

Squash and Stretch

The first and considered the most important principle. The purpose of this animation is to create a weight and flexibility in the animation. It upholds the sense of material. It is

a matter of stretching or compressing the object in a manner to replicate the real life thing.

“When a fixed shape is moved about on the paper from one drawing to the next, there is a marked rigidity that is emphasized by the movement. In real life, this occurs only with the most rigid of shapes, such as chairs and dishes and pans. Anything composed of living flesh, no matter how bony, will show considerable movement within its shape in progressing through an action.” - [6, p48]

Anticipation

This principle deals with the audience. It is the preparation before an action. So that the Audience can keep up with what is happening. Much like in real life where a person takes a few bouncing starts before they jump off the edge of the pool and into the water.

“They [the audience] must be prepared for the next movements and expect it before it actually occurs. This is achieved by preceding each major action with a specific move that anticipated for the audience what is about to happen. This anticipation can be as small as a change of expression or as big as the broadest physical action.” - [6, p51]

Staging

While it has a very precise definition, due to its broad area of influence this is one of the most general principles. It has its roots in theatre and films. The purpose of staging is to guide the audience to what is important in the shot. To make the idea of the shot unmistakably clear. So that if you are staging an action then only that one action would be seen, clear ass glass. Unmistakable for anything else in the scene.

“Its meaning, however, is very precise: it is the presentation of any idea so that it is completely and unmistakably clear. An action is staged so that it is understood, a personality so that it is recognizable, and expression so that it can be seen, a mood so that it will affect the audience. Each is communicating to the fullest extent with the viewers when it is properly staged.” - [6, p.53]

Straight Ahead Action and Pose to Pose

This principle is about the approach of the animation. Straight ahead action is when the animator creates the animation one frame at the time. Which gives a more fluid animation though there is often an issue with proportion.

“The first is known as Straight Ahead Action because the animator literally works straight ahead from his first drawing in the scene. He simply takes of, doing one drawing after the other, getting new ideas as he goes along, until he reaches the end of the scene.” - [6. P56]

While the Pose to Pose is where the animator first stages out a set of key frames and then animates the frames between, with the drawback of sometimes feeling less fluid in motion.

“Here, the animator plans his action, figured out just which drawings will be needed to animate the business, makes the drawings, relating them to each other in size and action, and gives the scene to his assistant to draw the inbetweens.” - [6, p.56]

Often a mix or an in-between is used. This principle as a whole is mostly applicable to 2D or Stop Motion. In 3D most of the issues with straight ahead are removed as the animated object is constant, however pose to pose is the more common due to versatility. The programs will calculate the frames between each pose automatically.

Follow Through and Overlapping Action

The terms are nearly identical and refer to actions that help make the animation feel more realistic, as if they follow the laws of physics. Follow Through can be explained as the actions of objects or parts belonging to a moving figure. In other words, when a character with a big floppy hat comes to a halt, their hat will keep moving along with the last bounce of the walk. It is about an object following through with a motion in their pace compared to the main motion.

“If the character has any appendages, such as long ears or a tail or a big coat, these parts continue to move after the rest of the figure has stopped. This is easy to see in real life. The movement of each must be timed carefully so it will have the correct feeling of weight, and it must continue to follow through in the pattern of action in a believable way, no matter how broadly it is cartooned” - [6, p.59]

Overlapping Action in comparison is best described as the tendency for bodily appendages to move at different pace. How an arm will not move with the head, or the slight off beat of the feet and arms while walking.

Slow In and Slow Out

Actions of movement take time to accelerate or slow down. In animation it is the part where extra frames are used near the beginning and the end. In the bounce of a rubber ball, the extreme poses is the fall and the bounce. Near the beginning, where the ball falls from its height, it lingers somewhat in the air before accelerating down toward the ground. In the moment of bounce, it slows down a fraction again as it squashes against the ground. In the return stretch it once again accelerates, and flies into the air. Slowing down as it reaches the peak of the flight.

Arcs

To enhance the feeling of life animators must consider the arc of a motion. Very few things in life, organic or not, move or are moved without an arc. Very few things move in straight lines. The principles of arch means that animators should consider the arc of trajectory of a motion. They might be wide swept, as most gestures with the human body are. Or in the case of a rubber ball bouncing, the arc might be wide though in the middle tapering out as the ball is slowing down.

“The actions of a woodpecker might be an exception, and, because of the restrictions of an external skeleton, there are undoubtedly some examples in the insect world, but the movements of most living creatures will follow a slightly circular path.” - [6, p.62]

Secondary Action

A secondary action is a smaller gesture made to enhance the main action. It is secondary to the main, and while relevant would never steal the attention from the main action.

“A sad figure wipes a tear as he turns away. Someone stunned shakes their head as he gets to his feet. A flustered person puts on his glasses as he regains his

composure. When extra business supports the main action, it is called Secondary Action and is always kept subordinate to the primary action.” - [6, p.63]

Timing

This principle relates to the number of frames an action spans. This will relate to the speed of which the action has in the film later. Timing is important when working with animation, as it can make or break the believability of the action. Timing is also vital when conveying character mood, emotion or reactions.

“...But the personalities that were developing were defined more by their movements than their appearance, and the varying speed of those movements determined whether the character was lethargic, excited, nervous, relaxed. Neither acting nor attitude could be portrayed without paying very close attention to Timing.” - [6, p.64]

Exaggeration

At times it is difficult to tell what this principle means. Exaggeration as a word explains it all. How much or what kind of exaggeration tends to depend on the kind of feeling an animation is supposed to have. In most of the shots it is about exaggerating feeling, or actions, so that they are still life like, but much clearer to the audience. If a character is sad, it should be really sad. If a character is worried, exaggerate the worry. If the character is drawing up to swing a bat, make the swing wider than 'realistically', to show that it is a really hard swing. There is an element of restraint necessary however, too much exaggeration crowding the shot might confuse the intent rather than help it.

Solid Drawing

As it sounds, it is about finding solidity in the character. To put weight and volume on a character and understanding the three dimensional aspects of their character. Mostly this principle effects drawn animation. In 3D the shape is created as a solid and the camera can twist and turn wherever, the shape will remain the same size. However the principle is still necessary, if slightly altered for 3D. Instead it is about creating and maintaining solidity and weight and volume in the way the character is shaped and rigged. Every shape must remain solid and full of volume through every bend and twist.

Appeal

Appeal is the 12th principle of animation. Appeal is important though often overlooked. Many learn about appeal as; the principle of a good looking character. Leaving it down to the way a character looks, the colours and shapes. There is more to it than that.

As Disney, and several other sources write, Appeal is what makes a character likeable. It is difficult to pin into one word. Every character needs appeal, even villains and minor characters. Another word would be Charisma. It is what makes us interested in a character, it makes us invest in their problems, even if it is with dislike toward their evil goal.

“The word [Appeal] is often misinterpreted to suggest cuddly bunnies and soft kittens. To us, it meant anything that a person likes to see, a quality of charm, pleasing design, simplicity, communication, and magnetism.” - [6, p.68]

Charm and communication and magnetism are all part of the characters personality as well as visual design. A character has to be as interesting as it looks. Imagine for a moment if the evil sorceress Maleficent from 1995's Sleeping Beauty, had not been appealing. If her character looked like the evil sorceress, except she would go about life with exasperation, rather than vicious pride. The film would have been dull. Perhaps even tedious to watch. This is why Appeal is so important. Personality and expressions of emotion are just as valuable as an impressive look.

2.6 Previous Work

The literature review provided some previous researches on the subject. All of these researches were based on Ekman's theory of universal faces for their foundation of experiment. The studies were not easy to find in the hundreds or experiment and researches related to emotive facial expressions and replications of Ekman's experiments.

These prior work showed promise for the experiment and acted as a guide to finding information relevant to the text. Each took part in creating a framework for the experiment, and expectations of the outcome.

One study made by Konrad Schindler et al.[7] focuses on the neural aspect of recognizing. Many features in their study stood as a basis for the experiment in this study. Two additional studies of the human gait or walking pattern, and its display of emotion, added additional information both on the forming of the test animations as well as the survey. C.Roether et al.[8] wrote an experiment where the emotions were first captured on film from live actors, then moved onto an animated avatar, and viewing the response. While the experiment made by M.Felis et al.[9] was created directly in 3D using a set code of movement, calculating the expressions of the character directly.

The last, grand study, preformed in several stages, was the one created by Aryl Beck et al.[10] This study intended to pinpoint the nature of human emotional bodily expressions, created an experiment for testing various emotional expressions via actors and animations. To test the difference in perceived emotion. So that it could later be translated into an artificial intelligence with body.

3 Method

To begin with a literature review was extended to encompass some more highly relevant sources. This in order to get a fuller answer to the initial two research questions; the importance of body language in animation and theoretically how to express it.

After which a layout over the coming experimental research was made. From the information gathered in the literature review it was concluded that four animations would be created, to fill the role on a later survey. To answer the question of how well an audience reacts to the attempted emotion.

Each four of these animations would portray one emotion. Following Ekman's[3] set of basic emotion, the four emotions were part of the universal seven. Neutral, for a reference to the other three. Anger, Joy and Sorrow were the other three, as these were the most intense and agreeably most unique in body language of the six options. Due to considerations of time the limit was four. More, preferably all six, would have given a more definite answer, however four was seen to get the point across.

The animations were created with Autodesk Maya 2014 specifically for this project. Adobe Premier was used to put the rendered animations together. No sound or music, as it is commonly known to change the mood of a picture entirely. The stage and lighting were constant.

3.1 Figure

Some time and planning was put down into creating a neutral figure. The model had to follow a set of rules. No specific body stereotype should be discerned, it ought to be emotional neutral, and preferably gender neutral as well. Studies have shown that certain emotions are easier to connect to gender, and thereby, others are more difficult. It is understood that true neutrality is very difficult to recreate, but the attempt was made. The character lastly had to be about large picture body language, the set of posture and angle of limbs. As such the face was removed, it was considered a distraction based on the human instinct to always confirm an emotion by looking at the face.

A test was preformed with roughly ten participants. 80% of which agreed that the final figure was neutral.



Fig1: Model "Fig" v3.0, with head

To begin with it would also have been headless. This was to remove the idea of facial features completely from the viewers mind. However due to later material received, among these being the study of Aviezer et al., the head was put back on the figure. As it would contribute more to the full posture of the figure, which had already been established to be a key feature.

3.2 The Survey

The survey was constructed according to several of the previous works. It was decided that subject taking the survey would be asked to watch the aforementioned animations one at the time, and answer questions about them before moving on to the next page. The two questions were:

Vilken känsla tycker du att modellen uttrycker?

Motivera svaret i föregående fråga:

Written in Swedish as the majority of the possible participants were more comfortable with their native tongue. They translate to:

“What feeling do you think the model is expressing?”

“Motivate your answer to the previous question”

The first question is a multiple choice question. Through a combination of [10] and the argumentative rapport Ekman posed against Russell, it was decided that the subject would be asked to choose between a number of emotions. This is because it narrows down the possibility of interpretation from a massive range to merely a large one.

One of the researches [10] with a larger amount of animation used a number of 20 emotion choices for their participants, to lessen the chance that participants might use the exclusion method to try and pinpoint the “correct” emotion displayed. Because of the surveys construction of taking one question at the time it was decided that 8 emotions, displayed in a random order every question, would appear to the subject with enough of a range.

The second question was meant to have participants engage more in why they think the model is feeling that way. To see what parts of the body, or body work, they look at when they determine the emotional state of the character.

Lastly the videos were uploaded onto the survey without a name to remove any influence from the creator. The participants were meant to conclude the emotion themselves. While a specific emotion might be considered the correct choice, the question was open to interpretation. The point of the animations were to test how well they simulated an emotion based on key features.

4 Results

4.1 Results of the Theoretical Background

From the sources gathered in the literature review the information could be distilled into a set of basic guidelines when approaching the task of animating emotion. These key features were identified as a basic set of expressive tools when portraying and receiving body language.

Shoulders

The placing of the shoulders is vital to the posture. They are a critical centre of tension in the body. Tension is very important to reading a person. High amounts of tension might mean pain, anger, stress or irritation. Often tension in the body is indicative of negative feelings. Low tension is at about middle, low tension means relaxed shoulders. Though it is important to remember that tension is on a scale. There is a

difference between very low tension and no tension. The body has a natural level of tension, a state we consider relaxed. This is when the body is just tensed to stand upright. In cases of no tension, the shoulders are slack and low hanging. Most often indicating tire or feelings of sadness, distraught or depression.

”So [Hillary Clinton] comes in, and she's a little hunched over, because that's what you do when you feel slightly threatened. Because when you don't feel threatened, when you feel very confident, you stand up very straight.” - Mark Jeffries [1]

Head

Many things can be said by the orientation of the head. The angle of the head is important, as well as the steepness of the angle. While in a conversation the gestures done with the head can mean the world. If the head is turned toward the speaker shows interest, a slight lean to the side might emphasis your interest. Looking anywhere but the speaker indicates a lack of interest. By not looking at a person while with them could also be a sign of distancing. Showing that the individual does not in fact want to talk to the other.

A slightly bowed head might indicate submissiveness, that the person is trying to indicate that you are more important than them. A strong bow forward might instead indicate pain or sorrow in the person. A head held high might on the contrary be a sign of confidence, or superiority.

Hand placement

The placement of hands indicate quite clearly how a person feels. Hands are difficult as they can gesture as expressively and wide as the rest of the body. While at other times have just as fine micro expressions as the face. They are also another point of tension in the body.

The scale of tension go between relaxed, where they are often relaxed hanging down the sides, or if sitting down, placed in the lap. Tension can build and create twitchy fingers under stress or if the person is worried. Or a more controlled and deliberate tension which balls the hands into fists, most often during anger. Hands can display tension with how they are used as well. If a person is hiding their hands they are often trying to hide their feelings.

Arms

Another critical feature of the body is how the arms are positioned and moved. What the arms are doing can be very indicative of a persons feelings. Relaxed arms are usually slack, they move in a controlled manner. While if a person is angry they tend to want to puff out, and appear large, their elbows stick out more. Movements when feeling aggression are stiff but wild. They flail about more.

A wide posture can also mean that the person is confident, in themselves or a situation. Just like folding the arms is a protective gesture. Depending on the situation it could be protection from others, a protection from the situation, or a protection from a conversation. I.e., a conversation where a person fold their arms, might indicate that this individual does not approve of the direction the conversation is going. Folding of the arms close off the body posture and give off a feeling of rejection. Whereas a positive body language with your arms might be to open up. To welcome people in. Arms raised wide is often a sign of acceptance. Light and less controlled movements.

Feet

Feet are a rather simple tell on how a person is feeling. There are three stages of angle. There is the outward, which shows confidence and openness. There is the straight forward which is an indicator of purpose. As well as the inward, which closes off the expression and indicated lack of confidence, or worry and wanting to be small. Pace is also important. How quick a persons feet are moving are indicative of their emotions.

Posture

Posture includes all the above and more. Posture is how the person holds themselves when walking. First sign of the posture is the spine. Though it also includes shoulder movements backward and forward and hip tilt.

A positive body posture is straight backed with the shoulders in a neutral or pushed back state. It is open and welcoming to the world. A straight back is a sign of confidence. A negative body posture is either tensed or slumped. There are many ways of displaying either. A sorrowful posture would be slumped, and closed in an attempt to appear smaller. There is a weight to each movement and a weight to the body as if the individual does not have the energy to lift themselves. The shoulders are often pushed forward to put emphasis on the closed off expression.

At the same time an aggressive body posture might strive to be taller, leaning forward slightly to appear looming. Depending on the intensity of the anger the posture might push the shoulders forward, a sign of indignant anger. The shoulders might be push backward if the person feels more intensely aggressive and ready to fight.

Open or Closed

The words open and closed are used frequently when describing body language. This is the broadest term of indicative body language. It includes all of the body, tip to toe. It is the first glance of a person. Their body language is open, or closed, and then you move on.

An open body language is where the person displays their open mind. They are open to suggestions, to ideas, to be talked to, they are opening themselves up to the world saying bring all. It is a way of saying trust me, talk to me, be honest with me as I will be honest to you, I have nothing to hide. Most of all open body language says I am confident.

It is typically distinguished by an open chest, no arms in the way, shoulders are neutral or pushed back, and the feet are angled outward.

A closed body language is where the person displays a more negative attitude. They are not open for suggestions and do not agree with you. A person displaying closed body language might not want to be disturbed, they would prefer to left alone. It could also mean they are hiding something, or should they close off mid conversation it could mean they are not uncomfortable with the conversation. There are a great many things more a closed body language can describe. Most of all it says I do not want to talk.

It is typically distinguished in the opposite of open body language. The shoulders are neutral of pushed forward, they close of their chest with the use of arms, folded or otherwise protectively placed. Their feet might be in a neutral angle or inward.

4.2 Results of Creating the Animations

Part of this study was to explore how to create emotion in animation. Through the information found in the literature review and the more in-depth theoretical background, the steps of animation and the key points of emotion were integrated.

The process of creating these four can be summed up in the following list:

- Planning the movement/Emotion
- Animating the character step by step
- Putting Emphasis on the key areas of interest
- Changing the timing to fit the emotion

It is important to note that this list has been circumstantially simplified. Due to the nature of the experiment and the model, the method of work is much simpler than it would be with a character meant for production. For production these steps are incorporated in the making of a scene. This experiment did not require a scene.

Planning the movements and emotion is an important first step. Because this is where the emotion is decided and the expression of character carved into life. Since the character does not have a specific personality to extend the expression to, the expression is rather basic in all four animations. However each emotion proved a different type of challenge. It was proved, as later will be discussed in the following chapter, the positive emotion demanded much more thought.

Animating the character step by step is a classic animation principle. The animation is created from one pose to the other. At this step only the very large differences were put in place. The size of steps, the arms swing and the positioning of the posture and spine. This gave a quick overview of the coming emotion while still being unobtrusive while trying to pose the character.

The following step was to put emphasis on the key aspects of emotion. This step was arguably the easiest and most difficult to do at the same time. There was a clear set of things that needed to be done. Control the shoulders, fix the arm and leg movements, key the movement of the head and feet and hands. This proved simple and easy to one of the expressions. However, as easy as one of them was, another was deviously difficult to achieve. And it is debatable whether it actually succeeded. The reason for this will be discussed in the next chapter.

4.2.1 Neutral

The neutral animation was depicted as the model walking calmly forward. The intended expression was relaxed. It had to be slack movements, paced in a slow rhythmical manner. It had to look intentional, as if the model while totally relaxed, still aims for something. So that it would not become jittery or out of sync. Which could indicate emotional problems instead.

The shoulders were slack, and relaxed, at a level with the torso. The head was in a slow manner peering around at its surroundings. The arms swung in time with the feet in a casual flow, dropped at the sides. The legs and feet were moving sedately, with a certain swing to them. Feet turned outward to propose an open expression, and lifting not too high off the ground, keeping the knees rather low and softened, suggesting that they are in no hurry.

The neutral one has a softer spine to further indicate an attitude of not caring, while maintaining a rather open body posture. No arms folding or covering them up,

shoulders set neutrally and feet spread, head looking around to show attentiveness but without purpose.



Fig2: Model "Fig" in a neutral pose

4.2.2 Angry

The angry posture was focused on stiff action. They were posted to walk aggressively, a fixed intent on moving forward. The steps were more determined. The arm movements wider, rougher. The model was tensed up.

It was very important for this animation that each movement was determined. Everything had to be sharp and focused. To show aggression typical signs are to make yourself look larger, taller, scarier. The shoulders were raised, to indicated tension. Though pushed back to include a more open expression. The open expression, combined with the lean forward becomes a threat. It leans forward, into your territory, opening up the posture with shoulders and feet to show that it means business. A challenge that would say come on then, if you think you can.

Along with the raised shoulders, the arms were raised level with the hips, kept and moved rather stiffly back and forth with a pace to match the temperament. Shoulders out, making the model look bigger, like it's flexing. Clenched hands to complete that look of the arms being loaded to strike.

The feet are deliberately angled outward, to comply with the rest of the open challenge. However they are also put down on the ground much more severely. The heel barely touches the ground before the rest of the foot slaps down after it, and the gait propels the character forward at a bit more speed.

For that feeling of tension along the spine was straightened out in comparison to the Neutral stance. It was hunched forward mostly at the top in a manner to replicate a tensed kind of hovering. This gave the model just that bit of height that compared to the Neutral would put it at a more crowding level.

Lastly the head was focused on the camera, or as the camera shifted, straight ahead. It was probably one of the more crucial elements to making the model appear as though

it was aiming for the audience. This tensed body. challenging you and ready to strike was coming for you. It gives an extra sense of deliberation, in comparison to neutral that was aloof and looking around.



Fig3: Model "Fig" in an angry pose

4.2.3 Sorrowful

Sadness is a slow and often small emotion. It is an emotion that makes a person want to withdraw, stay out of the way of what has hurt them and what could further hurt them. Therefore it was important to get a slow pace to the model. Neutral was slow but amiably so, more because they didn't have a reason to stress. This emotion is slow because it is weighted with sorrow.

The weight is seen all through the body, everything droops. The feet are almost dragged along the ground. The posture had to sag to begin with, so the spine was bent at every joint. Creating this weight that was dragging the torso down onto the hips, and the hips had angled slightly as well to emphasise the slump. The model, from the side, was made to form a wide C. Such a move was suggested to be strong, because it would work doubly. While it put the weight of pain on the character, it also closed their body posture a little. A closed body posture was the second very important feature of this emotion. A person who withdraws from the world can do so in many ways, while being watched however they will do so into themselves. Hide behind themselves in various fashions.

Which is why the model was given sunken shoulders that were pushed forward. Closing off the body posture to indicate that this character did not want to make contact, they would prefer if you left them alone. This could have been enhanced by a folding of the arms, however just like an open body posture can mean many things, so can a closed off. The argument was that folded arms seems more guarded. The elbows pointing out could be seen as a spike in the behaviour. Since the emotion was the kind

of sorrow where they give up it was therefore put aside. The arms were made slack instead, barely moving from side to side, in a demure fashion.

To extend the closed body posture throughout the character the feet were turned inward slightly, compared to the previously outward. Making the character appear a bit less confident and insecure. Lastly the head was turned away and down. The model did not want to face you or anyone, or even the world. They were much more content in watching their feet.



Fig4: Model "Fig" in a sorrowful pose

4.2.4 Happy

A joyful expression is open to the world. There is energy in their movements. Most often described as having a song in their heart. They would almost look like they are dancing.

Because of this the model was made with as much open body posture as possible. The spine was straightened, with only a slight relaxation to it. The shoulders were at about average with the torso again, as less tension was wanted. They were pushed back to reveal an open body language, along with spread feet for confidence. The initial pose was leaning on one foot, one hand on the hip and the other relaxed to the side. As this seemed a more natural starting point, rather than hands already flailing in the air and jumping on the spot.

Once the character started moving the first idea was to have them nearly bounce in their steps. To simulate this feeling of bouncing to the rhythm of a song. This was exchanged for actual bouncing. The character walks, however being unable to contain their joy they start skipping. Arms spreading out in a sort of welcome of the world. The feet were paced to take a small skip, followed by an almost relaxed placing of the previously hovering foot on the ground. The foot is placed quite firmly on the ground quickly however, as skipping and joy has a rhythm to follow. It had to be paced and determined, so that the body showed that the next skip is already being planned.

The head was aimed at the feet as if the model was making sure to keep the beat, sometimes rolling just slightly upward to indicate that the model was keeping track of where they were going. The overall rhythm of animation was speeded up once it had been put together as a video.



Fig5: Model "Fig" in a happy pose

4.3 Results of the Experiment

The survey was handed out electronically to two groups of people. One group which had definite prior experience with 3D animation, and the second group which at most could define their experiences to films and/or games. This was not a required question in the survey, it felt to bring a more rounded framework to include both an educated and a casual audience.

The survey was done anonymously with only a reference to their gender. Sixteen people participated in the survey, with a majority of 10 to 6 being female.

The answers to the survey will be analysed more in-depth in the discussion. Where it will be further discussed the positive and negative, and how to improve upon the emotional output. Because even though the emotions mostly came across, there was some disagreements both to the emotion displayed and why it felt that way. Meaning there is room for improvement in the experiment.

This section will handle the results of the experiment, stating what people agreed on and what they did not.

One of the first reactions that is not specific to the animations was that one participant thought the options inadequate. They would have preferred to also have an option to say they don't know, or other with a chance to write in their own emotion.

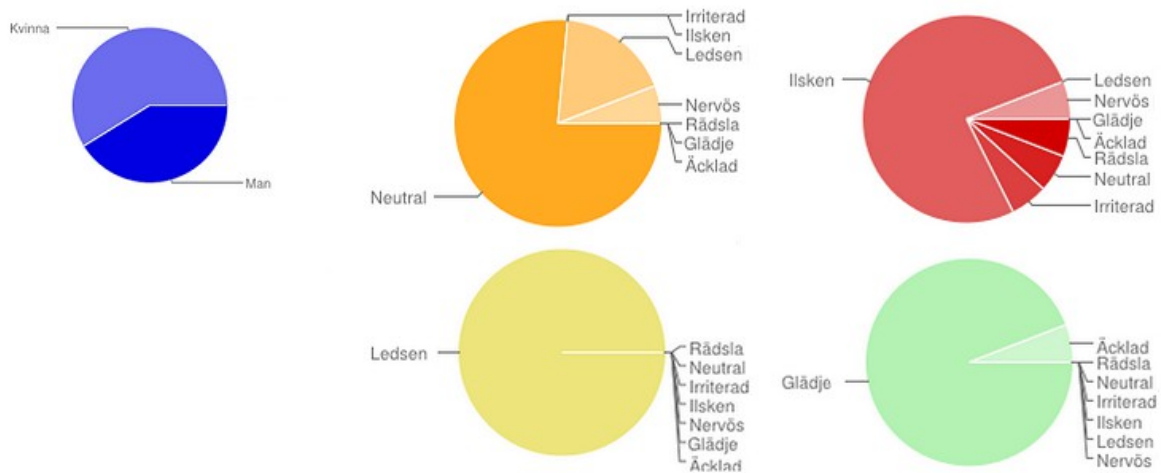


Fig6: Pie Diagrams of Survey Results
Blue: Sex of participant -Orange: Neutral - Red: Anger - Yellow Sorrow - Green: Joy

4.3.1 The Neutral Expression

The first animation the audience was tasked to watch was the Neutral. Their responses to the first question indicate a majority of agreement that this model was neutral. 13 of the participants agreed that the character showed little signs of any significant emotion. As the following question asks them to motivate why they chose to call it neutral, most of the participants wrote that the character seem to be walking along at its own pace, relaxed and equal to its surroundings. One of them likened it to being out on town and stopping to wait for a signal.

However another 2 thought it looked sad. The first of which said that the sigh at the end is what made the model look upset or lost. The other however, suggested that it appeared bored, which they related to sad. One person said it looked nervous, they felt that the walking was slow and uncertain.

4.3.2 The Angry Expression

Next the participants viewed the Angry animation. The response was again majority focused, while some participants still opted for different answers. On this animation 12 participants agreed that the model seemed angry. These twelve all intone their first answer with saying that the heavy breathing was part of being worked up and angry, and the firm, faster paced steps forward. They noted how the model was spreading out, attempting to look bigger and threatening. The tension in the body, hands, and shoulders were the most common agreement among them all. One person who chose irritated for the first question, still described the model to be very angry and upset. In their words: “Determined steps and a forward hunch with clenched fists appears a little frightening, I suppose.”

Another two voted that the model looked nervous or even scared. They thought it looked like the model was scared and running away from something. Very nervous with a sunken body posture and heavy breathing due to stress. Lastly one vote lay on Neutral, as they perceived the character to be old and tired, and in poor condition to be walking around as it was panting so hard.

4.3.3 The Sorrowful Expression

Following the spread of the other two, the responses to the sorrowful animations were comparatively unanimous. All 16 experienced the model to be sad this time. They all agree, in more or less words, that the model appears weighted and troubled. There is a slowness to the steps, a weight in its movements, and that the eyes are fixed on the ground.

One of the participants noted that the model appeared to be around other people, that it was attempting to mask their emotions from the others, not wanting to show that they were sad in front of these hypothetical other people.

4.3.4 The Joyful Expression

Lastly the participants watched the model meant to be happy. Responses from the first question make it seem like almost everyone were unanimous in their interpretation of the emotion. 15 say that the character appears happy and joyful. The following motivations are filled with the words playful and silly, childish attributes. The model has a light-hearted attitude. They are bouncing and flailing their arms wide. A very happy and open body posture, most agree.

Some of the motivations also mention the first standing pose, though they disagree on whether it was part of the emotion or not. I.e one claims that the pose is very cocky and bad attitude indicating that it does not fit with the overall emotion of the animation. While another says that it shows determination and confidence and contributes to the feeling.

The last participants answer was that the model was disgusted. The comment however is difficult to handle as it appears to be dishonest.

4.3.5 Animations

The animations can be viewed in the following links. On that note, they were uploaded without names to remove the chance of influence. Instead they were numbered according to appearance in the experiment:

01 Neutral: <https://www.youtube.com/watch?v=2TRfcI0H9sI>

02 Anger: <https://www.youtube.com/watch?v=8Anlqr9yO1A>

03 Sorrowful: <https://www.youtube.com/watch?v=GHIIVmWH0kU>

04 Joyful: <https://www.youtube.com/watch?v=QD46KahPryk>

5 Discussions and Conclusion

5.1 Discussing the Overall Picture

To animators who focus solely on the face and conversation, claiming that the words are more important, than what of the expressions when characters are not talking, I ask:

What about those moments in communications, where there is a hush in the conversation?

That is to say, when all the words have been spoken, and the characters pause to react. How do characters portray their thoughts and feelings in these pauses? If they turn away from a conversation, or gesture wildly at a ridiculous proposition, then that is not the face nor words, creating the illusion of a feeling.

What about silent films, or films where the characters speak in the form of simple noises?

These characters who are mute still manages to relate to the audience, they create a feeling in the story that still conveys perfectly what is happening. I.e. Silent films with the likes of Charlie Chaplin in, or more modern films such as Wall-E. These characters express and show that they are thinking through their body and facial expressions.

Here one might say, “but that is what acting is for”. The assumption is quite right. However it once again misses the point. Acting is to make believe that emotions are genuine. A big part of acting is body language. So while it true to say that animators ought to study acting as it encompasses staging and the arts. It does entail for animators to look at body language. Otherwise, without considering the actors body language, they would be staring themselves blind. It is such an easy transition too. The student watches the actor as they move about the scene. Every time they see an expression, all they need to think is: “what made that expression seem true?”

Body language in the form of the face alone, is so versatile that through Ekman's studies, over several thousands of individual expressions have been defined. There are also evidence for Ca. twenty universal expressions across the world. Normally what is called the six basic is what people refer to when they talk about these universals. Mostly due to the eleven or so other expressions much later additions to the theory.

These six have been tested on numerous accounts in both facial and body expression experiments. There is strong evidence of mutual universals between the face and body, at least in the basic model.

This might be called common knowledge to body language experts. While they might not have chosen to use the phrasing of universal expressions. They do agree that there are standards to how one reads and expresses with the body. Most of the information attained from James Millars documentary is about how to read the more subtle body language. To tell whether a person is feeling guilty or if they are lying.

Throughout the documentary, in a pace that spans the whole one and a half hour, they repeatedly talk about features they use to reading body language. Often mentioning the posture a person takes standing or walking. Whether their body language is open or closed.

Though as might be expected each segment only describes briefly what is normally indicative of positive or negative emotions. Where tension lies and what it means for the posture. I.e. the shoulders sag or rise with the amount of tension. So that while high tension might indicate aggression, it could also mean stress or fear. As they say in the documentary, you cannot look at the body individually. An examination of the full body picture is how you tell an emotion from another.

All this works back toward the importance learning to read body language. In turn emphasising the importance of knowledge when animating.

5.2 Discussing the Experiment

The experiment went well. With Autodesk Maya, the creation of the animations went past with very few technical hiccups. The method for creating the emotions one by one worked without much trouble. The form used for the survey proved excellent and easy to use and the participants had little trouble using it. Setting up the experiment took some time, while the gathering and compilation of data was done partly already in the platform for the form.

In previous studies some chose to use photographs and animated avatars, displaying facial features on an otherwise relatively neutral base. Other studies removed as many indicators as possible, hands and feet and face on an otherwise solid figure. There were issues with both these kinds of studies. Or at least in comparison to what the experiment in this research was intended to strive toward. This study wanted to explore the potential power of body language. And therefore, by extracting valuable information from all studies, the figure was made neutral. It was a full body, even though it was debated back and forth whether the head would be useful or distracting.

The animations were meant to be very simple. Their emotions were basic, the character as visually plain as possible to invoke less distractions from the movement. While creating the model, rigging and skinning it the process was stunted several times by technical issues, however when that was done the animations worked smoothly. There were little to no technical hiccups, and the creation of each animation served no difficulties. Once the expressions were put down on paper, each key features planned and positioned. It was easier to translate the pictures into animations. The neutral surroundings and light in the clips were chosen against evidence that it might decrease the bodily expression. It was important to contain the animations to equal grounds. So a plain background with a normal white light appeared to be the best choice. It went well with the simplicity of the figure. The cameras position, as also mentioned by Disney, was important to nail down fast. The angle of camera contributes to the feel of an expression. Again opting for the most neutral, a straight forward starting point, with a slow pan to the side appeared to be neutral enough. It would show the model from two directions which was necessary to give a feel for the 3D element of the movements. To show off as much of the body posture and angles as possible.

To create the neutral expression a simple walk animation would suffice. It was paced and the movements quite controlled. Beside the initial stress of trying to figure out a walk cycle and actions for the character to make, the following animation stood the ground for all the others, easing the workload quite generously.

Anger posed a problem due to a mistake in the rigging, at the point of discovery there was no time to turn back and reconstruct the skeleton. Therefore the hands in the expression are less than quality. However they appeared to suffice for most of the audience.

The sorrowful expression seemed easier yet than the other two. As it was a full body slump, what had to be controlled was mostly the pace. Slowing the entire animation down and restricting the amount of gesture the character portrayed was no problem at all.

Issues arose once again around the happy expression. Because no matter how it was argued, the happy expression would be the grandest of the four to animate. The theory made it sound easy. It was a bounce in the step, high spirits and a good confident posture. Again and again however came the argument that it was not expressive enough. How do you truly show that a person is happy or feeling something positive. Searching for additional poses that could guide the animation back on track, the bounce changed into a skip. The character would instead of bouncing ridiculously up and down while walking, skip their way forward with their arms out and welcoming the joy.

Judging by the results of the survey the majority could relate to the feeling. Their comments on the second question seemed to miss the point in most cases. A rethinking of the question or a more detailed description of what the answers should concern is

required. It was a flaw, but an amendable such. Further comments on the survey itself were on the lack of options. It was initially intended to be a range of twelve options. Both to give the audience the feeling of an option, and to eliminate possible cheating or choosing by exclusion. The twelve emotions would have been three from each second of expression. Three neutral, three joyful, etc. However the amounts were shortened to eight due to a lack of time. Bad planning lead it there, highlighting the importance of timing.

There was no choice for “I don't know” or “other”, and the reasoning behind this is the same that Ekman used against Russell. There were enough emotions ranging in positive, neutral and negative to choose a closest relation. It shows in the results too that the participant whom raised the question showed no difficulty in choosing an adequate label.

As for the participants themselves, the survey recorded 17, though there were only 16, one of the 17 were a test and the platform for the survey did not support a separate form meant for testing. The test was removed from recording the sum of the survey.

The reactions to each expression varied slightly, though evidence dictates that most of them could successfully relate to the feeling. Sometimes more so through the comments than the choices.

Like that of the Neutral. The majority agreed that the character was neutral when placing a label on to the animation. In their comments the participants lay divided in considering the emotion truly neutral, and that of being bored. In the planned twelve emotions, bored would have taken place as one of the three “neutral” expressions. Though it would seem at least one participant thought boredom to be a negative feeling.

All of the four emotions do have a majority of agreement on the emotion received being the intended expressed by the animation. However while the predictions said that happiness would be the most difficult to relate to due to the troubles with creating the expression. And contrary the results of previous studies. It would seem it was one of the strongest. Anger was one of the more difficult. The participants seemed somewhat confused of this animation.

Much of this probably lies in the work of the camera however. The lesson has been taught several times by reading the theory. Emotion depends very much on context. And while the context of the animations were as neutral as possible, it seemed the composition was simply not adequate for portraying this emotion properly. Improvements include a lower set camera, for the aggressive hunch to be threatening the model had to look tall. The camera in the current version is slightly looking down on the model, meaning the expression instead of looking tall, becomes hunched over. As one of the comments say, it looks more like an old man. And an improved rig for the hands so that they may clench fully. The issue in this animation could have been helped in the hands had been angled slightly inward, to express a tension as well as “close up” the palms a bit more.

A 100% majority on the sorrowful expression speaks for itself, the portrayal of emotion was a success. It is the comments no participant asked for a different alternative, and every one describes the character as weight with one form or another of sorrow. They seemed also to have grasped the idea of motivation better by this question, as most of them suggested one key feature or another as to why the character appeared so sad.

This goes for the troubled Happy expression as well. There was a 15 participant agreement that this character appeared happy. While the expression felt difficult to portray, and the timing is certainly off, there is strength in the posture, in the skipping

and the spread of the arms. Clearly the emotion was much better received and interpreted, than it felt portraying it. Though there was comment back and forth on whether the initial posture removed or added to the full feature. Personally the favour leans on the comment that it does not. The pose is a typical contra-pose, which in this neutral figure with the open body language and raised head probably leaned more toward the over confident and cocky, than simply the confident. It is also out of place, compared to the other emotions this animations start feels a bit of a fumble. It falls over itself attempting to show what the rest of the animation should have too. The confidence is there, though it is not particularly joyful. A better move might have been to have the model giggle in some way, or possibly seeing something out of frame, waving and start skipping toward it. This might have indicated a more light-hearted confidence than as it is now.

Rounding the section off the last bit of improvement that would have served this animation well, even though it was a clear expression to the participants and very well received, there is an improvement to be made. The model could have looked at the camera or up further. There is an argument that the way it looks down at its feet keeping track of the feet could be seen as juvenile or childish. However a greater emphasis of childish innocence, which so often relates to happy expressions, would be to turn the head up. Have the face turn toward the sky, in a kind of manner that the model means it cannot believe how happy it is.

5.3 Research Questions and Conclusions

This paper was from the start meant to be divided into theoretical and practical sections. As can be understood from the research questions half the papers intent is to theoretically learn more about body language. The second half was a shorter experiment in utilizing the information gathered. Pre-emptively testing the guidelines derived from the theory. The following section will answer the research questions one at the time.

- What is the importance of body language in animation?

The question essentially asks why animators ought to learn about body language. Why would it be important? The short answer is that body language is a large part of emotional expression, and it is hard to avoid even if the animator knows very little about it. Learning more about it would benefit them, as body language is part of what makes a character feel real, alive and gives the audience a chance to relate to the character. Thus the animations get a whole different flow.

To understand the importance of body language in animation, one must understand the importance of it daily communications. As it has been established body language in all forms weigh in for a very large majority of these non-verbal communications. What you are saying in a conversation only accounts for a mere fraction of the communicative output.

It is made clear by the accounts of Thomas and Johnston that in the annals of Disney animation, that acting and emotion are very closely linked. Acting is the gateway to learning more about emotional body language. Including face and body expressions.

- How do you, theoretically, express body language?

This asks about how we express and respond to emotional body language. It is stated quite clearly that for body language to be defined one first has to determine what part

of the body they are looking at. The language consists of three physical parts. The face, body and tone of voice. Each of these can then further be explained piece by piece. The face can be parted between eyes, mouth, eyebrows, etc. The body can equally be sectioned into upper and lower body, posture and composure, it can be sectioned from the large scale to the very minute detail of the fingers. The tone of voice, though playing no greater part in this research, can be divided between the tone and pitch and pace.

A list of key features was derived from previous theoretical material. It is a very rough and basic list of key features and their relevance to the full body picture. The list explains the different aspects and gives brief examples of what each part might be an indication of.

- Can an audience relate the desired emotion to a blank figure?

This question is partly sectioned between the theoretical and the practical. As part of the answer lies in the previous studies and part of the answer is in the experiment.

The simple answer is that yes, an audience can relate to a character's emotion, even when the character is visually blank. The question was posed to encompass a naked and faceless character with indefinite features and the relation between emotion and bodily expression.

Sliding over into the experimental phase of the project and how well the audience related to the emotion, the majority would label the emotion correctly. With only one or two marginal of reading it completely differently. The use of the defined key features resulted in an over-all recognizable expression. Judging by the results there were little to no difficulties reading the emotion. Despite the fact that the character had neither specific traits, a personality, nor a face.

- Create recommendations for further use and/or study based on results

The use of this research is simple. The key features of creating and reading body language, as listed and described, can serve as rudimentary tools for the beginner animator. It is helpful both in attempting to recreate body language in your animation. As well as what to look for when studying actors or emotional expressions.

A further study might entail a larger experiment. More expressions, breaching into the less unique or obvious. Including the same emotion in more than once but expressed with a more personal touch.

It might also benefit from a further use of the camera. While it is about what the body is expressing, there are ways to put emphasis on that via camera angles. Perhaps there ought to be at least three different kinds of camera for the animation. A further analysis in the survey. Definitely a larger survey ground. More people would give a broader view of the perceived vs. intended emotion. Conducting one group in person, where they have the survey in their hand, ready to answer while watching it, and giving no chance of a repeat and potentially changing the answers because of what they see later.

There are many things this research could be expanded to do. It could test the perceived emotions of animations with faces. The experiment being sectioned into the full body expression, and part body expression for however many emotions that would be necessary. Animations for the control would be expressive in both face and body. The two experimental animations would either be only expressive body and a deadpan face, and vice versa.

In conclusion. Body language makes up for such a great deal of communication in daily life. It is because of the way we view it, how we mostly read it subconsciously, that it can be hard to simulate in animation. It is a highly versatile and powerful tool to bring life and flow to your animations. If you do not know how to use it, such flow and life might show up randomly at best. Recreating a feeling will appear as a difficult task. Gather the knowledge and understanding, and your animations will flow.

Reference

- 1 J. Millar, "Secrets of Body Language," October 2008, 2008.H.
- 2 M. L. Patterson, M. L. Patterson and M. L. Patterson, "Commentary: Evolution and Nonverbal Behavior: Functions and Mediating Processes," *J. Nonverbal Behav.*, vol. 27, pp. 201-207, Sep-1, 2003.
- 3 P. Ekman, "Strong Evidence for Universals in Facial Expression: A Reply to Russell's Mistaken Critique," *Psychological Bulletin*, vol. 115, pp. 268, 1994.
- 4 P. Ekman, "Basic Emotions", *Handbook of Cognition and Emotion*. UK, Sussex: John Wiley & Sons Ltd, 1999.
- 5 Aviezer, Y. Trope and A. Todorov, "Body Cues, Not Facial Expression, Discriminate Between Intense Positive and Negative Emotions." *Science*, vol. 338, pp. 1225, 2012.
- 6 F. Thomas and O. Johnston, *The Illusion of Life, Disney Animation*. USA, New York: Hyperion, 1995.
- 7 K. Schindler, L. Van Gool and B. de Gelder, "Recognizing emotions expressed by body pose: A biologically inspired neural model," *Neural Networks*, vol. 21, pp. 1238, 2008.
- 8 C. L. Roether, L. Omlor, M. A. Giese and A. Christensen, "Critical features for the perception of emotion from gait," *Journal of Vision*, vol. 9, pp. 1, 2009.
- 9 M. L. Felis, K. Mombaur, H. Kadone and A. Berthoz, "Modeling and identification of emotional aspects of locomotion," *Journal of Computational Science*, vol. 4, pp. 255, 2013.
- 10 A. Beck, L. Cañamero, B. Stevens and K. A. Bard, "Emotional Body Language Displayed by Artificial Agents," *ACM Transactions on Interactive Intelligent Systems*, vol. 2, pp. 2:1, 2012.

Appendix A: Survey in form of Pictures

Urskillja känslor i animation

Detta är en kort enkät om hur vi uppfattar känslor i icke-verbal kommunikation. Ni som gör enkäten kommer visas ett videoklipp, och sedan bli ombedda att svara på två frågor om videoklipppet. Det är sammanlagt fyra videoklipp, om ca 10-15 sekunder, och tar inte mer än några minuter att svara på.

*Obligatorisk

Jag är: *

- Man
- Kvinna
- Annat

Fortsätt »

20 % ifyllt

Urskillja känslor i animation

*Obligatorisk



Vilken känsla tycker du att modellen uttrycker? *

Om du inte hittar något du tycker passar, tag närmsta relaterade

- Nervös
- Ledsen
- Neutral
- Äcklad
- Rädsla
- Ilsken
- Glädje
- Irriterad

Motivera svaret i föregående fråga: *

Vi vill nu veta vad du tänkte på när du svarade på föregående fråga, om ordet du söker inte fanns skriv gärna detta också

« Bakåt Fortsätt »

40 % ifyllt

Urskillja känslor i animation

*Obligatorisk



Vilken känsla tycker du att modellen uttrycker? *

Om du inte hittar något du tycker passar, tag närmsta relaterade

- Nervös
- Ledsen
- Neutral
- Äcklad
- Rädsla
- Ilsken
- Glädje
- Irriterad

Motivera svaret i föregående fråga: *

Vi vill nu veta vad du tänkte på när du svarade på föregående fråga, om ordet du söker inte fanns skriv gärna detta också

« Bakåt Fortsätt »

60 % ifyllt

Urskillja känslor i animation

*Obligatorisk



Vilken känsla tycker du att modellen uttrycker? *

Om du inte hittar något du tycker passar, tag närmsta relaterade

- Nervös
- Ledsen
- Neutral
- Äcklad
- Rädsla
- Ilsken
- Glädje
- Irriterad

Motivera svaret i föregående fråga: *

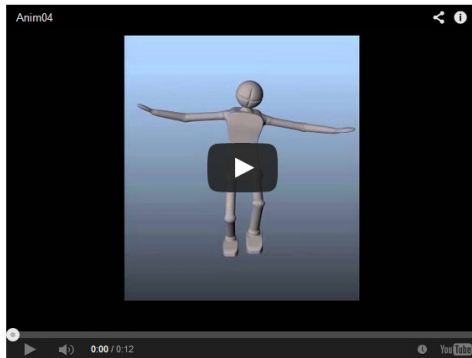
Vi vill nu veta vad du tänkte på när du svarade på föregående fråga, om ordet du söker inte fanns skriv gärna detta också

« Bakåt Fortsätt »

80 % ifyllt

Urskillja känslor i animation

*Obligatorisk



Vilken känsla tycker du att modellen uttrycker? *

Om du inte hittar något du tycker passar, tag närmsta relaterade

- Nervös
- Ledsen
- Neutral
- Äcklad
- Rädsla
- Ilsken
- Glädje
- Irriterad

Motivera svaret i föregående fråga: *

Vi vill nu veta vad du tänkte på när du svarade på föregående fråga, om ordet du söker inte fanns skriv gärna detta också

« Bakåt Fortsätt »

100 % Du är klar.