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Creating Believable Acting in Animation

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Abstract

Creating a believable acting experience with character animation is essential for animators that want to work in the animation industry. This research focus on developing guidelines for planning the animation, with the goal to ensure that every animation feel as believable and emotionally true as possible. The two animation software that are being used in this research are Autodesk Maya 2012 and Digicel Flipbook. Two animation shots are created and compared in order to analyze if a common set of guidelines can be used for every animation the animator may encounter.

Keywords: Animation, believable acting, body language, facial expression, cinematography, emotions, gestures, 3D character animation.

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1 Introduction

Being able to convey a story or emotions with animation is an essential task for the animation industry of today. With animation, we try to tell stories. The more believable the stories are being told, the greater the experience will be for the audiences. This also leads to more money towards the animation industry and also the possibility to develop the craft even further, as well as the ability to pass it on to the next generations. This dissertation focuses on the idea of creating believable acting in animation.

1.1 Background

The animation industry has been growing with a fast pace since Walt Disney and his "nine old men" carved out the Principles of Animation. They brought animation to the masses and they loved it [1 pp.3-4] [2]. Since then, there has been an enormous development as how to approach character animation. Today, you have to be able to communicate the story through animated characters which are supposed to feel as alive as you and me. This can be a hard task at hand if you do not know how to communicate it through the animation language.

1.1.1 The principles of animation

Walt Stanchfield was an old time animator and mentor at the Walt Disney Studio. He listed The Principles of Animation in his book "Drawn to life" as 28 different principles. However, these also took into consideration principles for drawing, design and pacing of the scene, which has been removed from the actual animation principles that we use today. These "hidden" principles are however still being used by animators in order to create great animations [3]. They are just not on the "public list" anymore.

The principles from Walt Stanchfield's book "Drawn to life" [4 p.4]:

-Pose and mood
-Anatomy
-Weight
-Action and reaction
-Direction
-Planes
-Arcs
-Beat and rhythm
-Overlap and followthru [sic]
-Working from extreme to extreme
-Primary and secondary action
-Anticipation
-Details
-Simplification
-Shape and form
-Model or character
-Line and silhouette
-Perspective
-Tension
-Solidity
-Squash and stretch
-Depth and volume
-Timing
-Straights and Curves
-Staging and composition
-Caricature
-Texture
-Positive and negative shapes

The principles above have then been reduced down to what is now known as the Twelve Principles of Animation which are the building blocks used in today's 3D animation, and mentioned in "The Illusion of Life" by Frank Thomas and Ollie Johnston, two of Disneys "nine old men" [5 Ch.3]. These are:

- Squash and stretch

"This action gives the illusion of weight and volume to a character as it moves. Also squash and stretch is useful in animating dialogue and doing facial expressions. How extreme the use of squash and stretch is, depends on what is required in animating the scene. Usually it's broader in a short style of picture and subtler in a feature. It is used in all forms of character animation from a bouncing ball to the body weight of a person walking. This is the most important element you will be required to master and will be used often." [10]

- Anticipation

"*This movement prepares the audience for a major action the character is about to perform, such as, starting to run, jump or change expression. A dancer does not just leap off the floor. A backwards motion occurs before the forward action is executed. The backward motion is the anticipation. A comic effect can be done by not using anticipation after a series of gags that used anticipation. Almost all real action has major or minor anticipation such as a pitcher's wind-up or a golfers' back swing. Feature animation is often less broad than short animation unless a scene requires it to develop a characters personality." [10]*

- Staging

"A pose or action should clearly communicate to the audience the attitude, mood, reaction or idea of the character as it relates to the story and continuity of the story line. The effective use of long, medium, or close up shots, as well as camera angles also helps in telling the story. There is a limited amount of time in a film, so each sequence, scene and frame of film must relate to the overall story. Do not confuse the audience with too many actions at once. Use one action clearly stated to get the idea across, unless you are animating a scene that is to depict clutter and confusion. Staging directs the audience's attention to the story or idea being told. Care must be taken in background design so it isn't obscuring the animation or competing with it due to excess detail behind the animation. Background and animation should work together as a pictorial unit in a scene." [10]

- Straight ahead action and pose to pose

"*Straight ahead animation starts at the first drawing and works drawing to drawing to the end of a scene. You can lose size, volume, and proportions with this method, but it does have spontaneity and freshness. Fast, wild action scenes are done this way. Pose to Pose is more planned out and charted with key drawings done at intervals throughout the scene. Size, volumes, and proportions are controlled better this way, as is the action. The lead animator will turn charting and keys over to his assistant. An assistant can be better used with this method so that the animator doesn't have to draw every drawing in a scene. An animator can do more scenes this way and concentrate on the planning of the animation. Many scenes use a bit of both methods of animation." [10]*

- Follow through and overlapping action

"*When the main body of the character stops all other parts continue to catch up to the main mass of the character, such as arms, long hair, clothing, coat tails or a dress, floppy ears or a long tail (these follow the path of action). Nothing stops all at once. This is follow through. Overlapping action is when the character changes direction while his clothes or hair continues forward. The character is going in a new direction, to be*

followed, a number of frames later, by his clothes in the new direction. 'DRAG,' in animation, for example, would be when Goofy starts to run, but his head, ears, upper body, and clothes do not keep up with his legs. In features, this type of action is done more subtly. Example: When Snow White starts to dance, her dress does not begin to move with her immediately but catches up a few frames later. Long hair and animal tail will also be handled in the same manner. Timing becomes critical to the effectiveness of drag and the overlapping action." [10]

- Slow in and slow out

"*As action starts, we have more drawings near the starting pose, one or two in the middle, and more drawings near the next pose. Fewer drawings make the action faster and more drawings make the action slower. Slow-ins and slow-outs soften the action, making it more life-like. For a gag action, we may omit some slow-out or slow-ins for shock appeal or the surprise element. This will give more snap to the scene." [10]*

- Arcs

"*All actions, with few exceptions (such as the animation of a mechanical device), follow an arc or slightly circular path. This is especially true of the human figure and the action of animals. Arcs give animation a more natural action and better flow. Think of natural movements in the terms of a pendulum swinging. All arm movement, head turns and even eye movements are executed on an arc." [10]*

- Secondary action

"*This action adds to and enriches the main action and adds more dimension to the character animation, supplementing and/or re-enforcing the main action. Example: A character is angrily walking toward another character. The walk is forceful, aggressive, and forward leaning. The leg action is just short of a stomping walk. The secondary action is a few strong gestures of the arms working with the walk. Also, the possibility of dialogue being delivered at the same time with tilts and turns of the head to accentuate the walk and dialogue, but not so much as to distract from the walk action. All of these actions should work together in support of one another. Think of the walk as the primary action and arm swings, head bounce and all other actions of the body as secondary or supporting action." [10]*

- Timing (and Spacing)

"*Expertise in timing comes best with experience and personal experimentation, using the trial and error method in refining technique. The basics are: more drawings between poses slow and smooth the action. Fewer drawings make the action faster and crisper. A variety of slow and fast timing within a scene adds texture and interest to the movement. Most animation is done on twos (one drawing photographed on two frames of film) or on ones (one drawing photographed on each frame of film). Twos are used most of the time, and ones are used during camera moves such as trucks, pans and occasionally for subtle and quick dialogue animation. Also, there is timing in the acting of a character to establish mood, emotion, and reaction to another character or to a situation. Studying movement of actors and performers on stage and in films is useful when animating human or animal characters. This frame by frame examination of film footage will aid you in understanding timing for animation. This is a great way to learn from the others." [10]*

- Exaggeration

"Exaggeration is not extreme distortion of a drawing or extremely broad, violent action all the time. It's like a caricature of facial features, expressions, poses, attitudes and actions. Action traced from live action film can be accurate, but stiff and mechanical. In feature animation, a character must move more broadly to look natural. The same is true of facial expressions, but the action should not be as broad as in a short cartoon style.

Exaggeration in a walk or an eye movement or even a head turn will give your film more appeal. Use good taste and common sense to keep from becoming too theatrical and excessively animated" [10]

- Solid drawing (same or different as weight)

"*The basic principles of drawing form, weight, volume solidity and the illusion of three dimension apply to animation as it does to academic drawing. The way you draw cartoons, you draw in the classical sense, using pencil sketches and drawings for reproduction of life. You transform these into color and movement giving the characters the illusion of three-and four-dimensional life. Three dimensional is movement in space. The fourth dimension is movement in time." [10]*

- Appeal

"A live performer has charisma. An animated character has appeal. Appealing animation does not mean just being cute and cuddly. All characters have to have appeal whether they are heroic, villainous, comic or cute. Appeal, as you will use it, includes an easy to read design, clear drawing, and personality development that will capture and involve the audience's interest. Early cartoons were basically a series of gags strung together on a main theme. Over the years, the artists have learned that to produce a feature there was a need for story continuity, character development and a higher quality of artwork throughout the entire production. Like all forms of storytelling, the feature has to appeal to the mind as well as to the eye." [10]

The twelve principles of animation mainly describe how to achieve good movements. In order to create great animation, additional thought has to go into acting, storytelling, pacing and cinematography as well.

1.1.2 Background of acting in animation

In average 65 percent of our language is non verbal [6 p.9]. These are hints in our body language and facial expressions that as humans we pick up on a subconscious level and interpret. These are what we can call acting in animation. Animators provide hints with body gestures and expressions to the audience. This in turn allows the audience to feel what an inanimate object feels even though that object clearly has no feelings in reality. In real life, these expressions can be very subtle [7 p.105] and if done so in an animation, they can be missed. In order to convey the emotion, the animator often removes all the misleading nuances and tries to make an expression or gesture which can only be interpret in the approach that the story demands. This is of course different for every production. Some animations have to be more realistic looking and then it is time to put in all those small nuances instead in order to achieve that proper feeling.

Thought can be a difficult thing to express in animations since it is an internal process of the character. In order to convey thought of an animated character, extroverted versus introverted posing can be used, as Kieth Lango mentions in his VTS video series [8]. What this means in reality is, when a character is thinking for himself poses should reflect this. In a sense, it can be said that the character is talking to himself when thinking. Therefore, the poses should be small and compact around the characters center. When the character is then ready to express his thoughts, extroverted poses should be applied. These poses should reflect that the character now focuses outside of himself and that he is trying to communicate with his surroundings.

It is important when creating character animation to remember that the character is "alive" and that he or she is a real person in him/herself. Acting is reacting, and in order to make a believable performance, the character at hand needs to react to the surrounding world. Every action must have a reason behind it. As mentioned before, thought process is an important thing to portray within the animation if the animation shot is to have depth, complexity and believability. Look for opportunities to show thoughts, these thoughts will then force the character to make decisions. Ultimately this will lead to actions.

1.1.3 The psychology of emotions

In order to create natural emotions that the audience can relate to in animation, animators need to understand how the human psychology functions. Both how humans express emotions by facial expression and by body gestures, since both these methods are prominent in how humans interpret the message sent out from the animation character.

There are seven universal emotional facial expressions in the world that does not differ between different cultures. Henrik Fexeus, mentalist and author in the subject practical psychology, names them "the seven samurais" in his book "Konsten att läsa tankar – Hur du förstår och påverkar andra utan att de märker något" and these are: surprise, sorrow, anger, fear, joy, repulsion and disdain [7 p.110].

By using these emotions, staying away from cultural emotional differences, we can increase the number of viewers that will interpret the message in the manner intended. However, this should only be used as a starting point. Other emotions will have to be added as well, in order to make the strongest performance possible.

Surprise has the shortest expression time of the emotions that humans show. It usually lasts between one to a few seconds, and always leads towards another emotion as a reaction towards the action which caused the surprise. The full expression is shown by eyebrows rising while creases are created on the forehead and the upper parts of the eyes opens up. Depending on how big the surprise is the mouth will open up. The more it opens, the grander the surprise has been for the person [7 pp.114-120] (see Figure 6).

Figure 6. Expression of surprise.

Sorrow is one of the longest lasting emotions that humans express. This expression is shown by the middle part of the eyebrows rises. The upper eyelids will close partially, and the lower eyelids will rise with deeper sorrow. The upper eyelids will also create a triangle shape, which is one of the methods to see if the emotion is real or faked. This triangle will always show through if the person tries to hide sorrow. The corners of the mouth will be lowered creating a "sad" mouth [7 pp.120-126] (see Figure 7).

Figure 7. Expression of sorrow.

Anger is shown by lowered and contracted eyebrows. The eyelids are tense with the eyes staring. There can be either an open mouth or closed with lips pressed together [7 pp.126-132] (see Figure 8).

Figure 8. Expression of anger.

Fear is expressed by the eyebrows raising, mostly in the middle, the eyes tense up and eye white is shown above the iris. The lower eyelids rise and cover a part of the iris with the mouth open or almost sealed with tense lips. Only showing the eyebrows in this expression is enough to make it a genuine expression of fear. The only time the eyebrows are absent in this expression is in paralyzing fear. At this stage, the expression is only shown in the eyes and mouth region [7 pp.132-136] (see Figure 9).

Figure 9. Expression of fear.

The full expression of joy is shown by the corners of the mouth translating upwards, creating a smiling mouth. The muscles around the eyes will contract and create creases at the outer corners of the eyes. The contracting of the eyes muscles are mostly created unconsciously, only ten percent of the human population can control these muscles on a conscious level. Because of this, a faked smile is easy to spot since the eyes will not participate in the faked expression of joy [7 pp.144-146] (see Figure 10).

Figure 10. Expression of joy.

Repulsion and disdain are two similar emotions that humans express. The main differences between these two are repulsion which can be both towards other people and material things, whilst disdain only is expressed towards other peoples. If you feel repulsion, you also have the urge to distance yourself from the object or person immediately. Disdain instead often leads to a feeling of superiority towards the other person. The nose bridge creases while the upper lip rise either followed by the lower lip or not. The cheeks rise as well pressing on the lower eyelids creating narrower looking eyes [7 pp.136-143] (see Figure 11).

Figure 11. Expression of repulsion and disdain.

In animation each movement must come from within the characters mind. Each movement must be influenced by the emotional state that the character is in, and the acting is the means for the character to respond to this internal emotion. Thus, the emotions drive the motion, not only in the facial area but in the whole body language.

The characters pose and body center has to match the overall emotional state in the same way facial expressions match this state. The body center is not the same as center of gravity but instead where the characters emotional state protrudes from. A high body center around the chest might provoke a feeling of pride and strength while a low body center around the knees will make the character feel much more relaxed, non-caring, lazy or sad [9].

1.1.4 Cinematography to enhance acting choices

Depending on how you choose to film your shot, what angle, depth of field, wide or narrow, high or low angle, to name a few, the shot's character can drastically change. In order to enhance the experience, cinematography must be taken into account.

Will a wide shot or a close up shot be used? It all depends on what the scene itself demands. There are many different methods to film the same shot.

- extreme wide shot
- wide shot
- medium shot
- medium close up shot
- close up shot
- extreme close up shot

These can also be filmed from a high or a low angle, as well as with different tilts on the camera. By experimenting with camera angles and reading up on cinematography, the animator can aim towards making the best decision possible to enhance the performance of the animated character. This is crucial in order to make the most coherent experience for the audience.

One of the most basic rules in cinematography is the rule of thirds [15]. The cameras image is divided into thirds by drawing vertical and horizontal lines. The intersecting of these lines is the basic focal points of the image. At these intersections, the shots point of interest should be placed. This "rule" however should only be considered as a guideline since there are times when other compositions are to be preferred. As said before, it all depends on what the story demands and what communicates the idea in the clearest way.

When addressing cuts between different shots, it is a good idea to take into consideration where the last shot's point of interest was and where the new shot's point of interest will be. In order to make the cut coherent while keeping the flow, it is a good idea to match these two points of interests on the images. An example would be if the last shot ends up in the right corner, then the following shot should begin from the right corner.

1.2 Aims of research

This research searched for guidelines and rules for creating a believable acting experience with animated characters. In order to propel the story forward, focus was towards communicating the mood and emotions the animated characters were going through. This was accomplished with the help of studying human psychology to make sure the expressions and reactions were as believable as possible. This would hopefully lead to a stronger and more entertaining performance and experience.

1.3 Research questions

Whilst creating two different animation shots this dissertation aimed to find conclusions and explanations for four protruding questions when talking about character animation.

- How can believable acting be created in animation?
- What characteristics make the acting choices believable?
- How can the animator choose the correct acting for every animation shot?
- What psychological factors deal with the perceived emotions?

2 Method

In order to research and draw conclusions for the four above stated questions, two different animation shots were created. One pantomime acting shot and one dialogue based shot. Since these two animations were so different towards one another this would lead to well-rounded conclusions for what was needed in order to achieve believable acting, as well as to see if a common foundation could be used for both shots to obtain emotionally true acting choices.

The computer software that were used for the animations were Autodesk Maya 2012 [11] and Digicel Flipbook [12]. These are two prominent applications used in the animation industry today.

Both shots followed the same workflow of planning and layout, blocking, blocking plus and polish.

2.1 First animation shot

The first animation shot that was created was a pantomime acting shot. It required a great amount of body mechanics since the character was running, jumping and crouching. The rig that was used for this shot was the Malcom rig, created by Animschool [13] (see Figure 5). A rig is basically a puppet created in a 3D environment that the animator can move around in the 3D space in order to create animation.

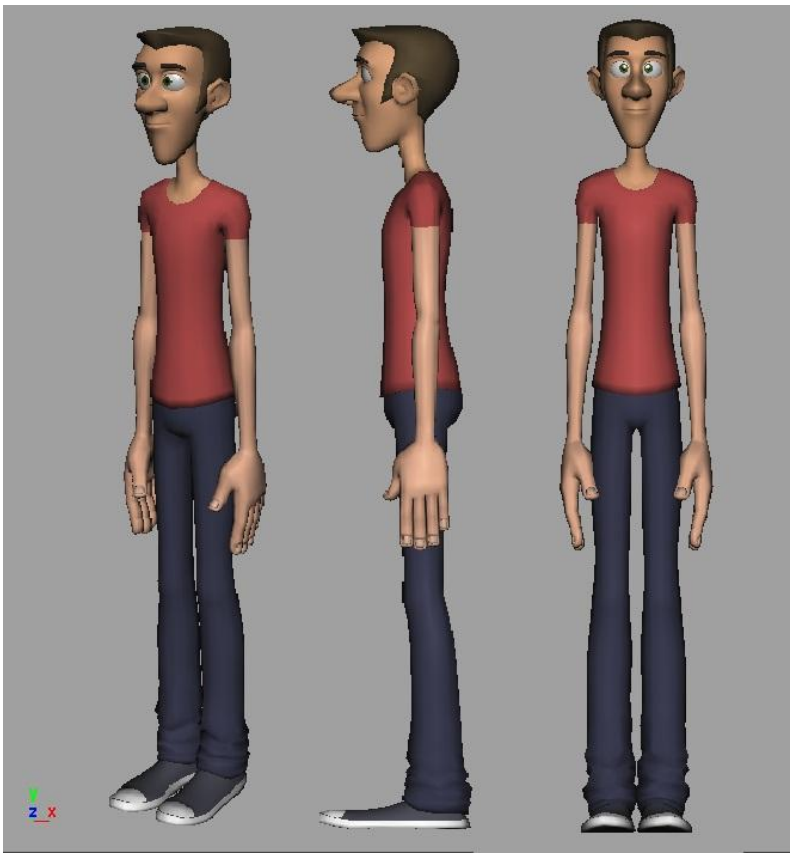

Figure 5. The Malcom rig, created by AnimSchool.

2.1.1 Planning and layout

The story that was imagined for this animation was, Malcom is running through a dark cave beside a deep chasm. Behind him footsteps can be heard and screams from the Tawatawa tribe. His arms are clenched around the most beautiful treasure that can possibly be imagined. The footsteps are coming closer and closer. Malcom looks behind him and in the turn he loses his grip on the treasure. It bounces towards the deep chasm. He panics and throws himself towards the chasm in order to catch it, however it is too late. The treasure plummets toward the deep, never to be seen again. The screams and footsteps are gaining on him and his only means of escape is to hide as best as he can. His heart is rushing as he finds a rock formation to hide behind.

A scene was modeled in Autodesk Maya 2012, creating the basic environment of the cave the character was placed in. A low camera placement was chosen in order to tell the story in the clearest method, showing the chasm, as well as the cave path besides it (see Figure 1). The rule of thirds was used, having the character enter at the focus point in the upper left and ending with him in the upper right.

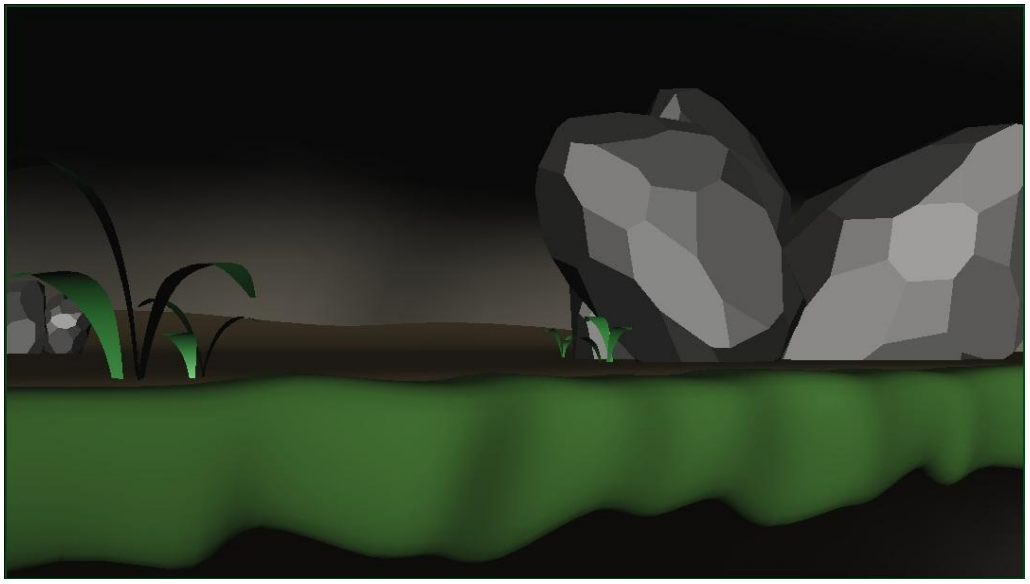

Figure 1. The layout that was created.

The Malcom rig was referenced into the scene and a Malcom Picker script was imported in order to speed up the selection process of the animation controls. The rig was then placed inside the shot-cam's view in order to provide a size reference for the rough 2D animation that was created in Digicel Flipbook. An image was rendered out of the shots layout. This was then imported into Digicel Flipbook as a background image.

References was collected, created and acted out in order to figure out how a run is affecting the body, as well as to figure out different body mechanics that the shot demanded.

Inside Digicel Flipbook the rough 2D animation was figured out (see Figure 13). The main focus was on creating a timing and tempo for the shot that was coherent with the feeling of fear, stress and surprise that Malcom was feeling, as well as showing the main acting beats of the shot. This was all built upon a strong foundation of the Twelve Principles of Animation.

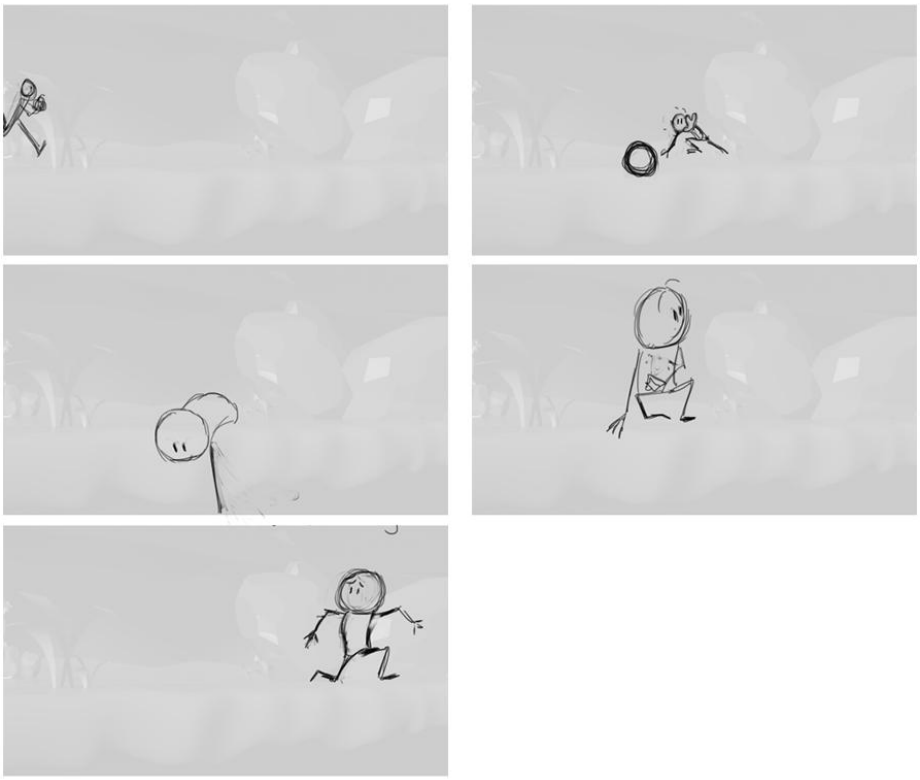

Figure 13. The five storytelling poses that were used in this animation.

2.1.2 Blocking

The first pass of animation with no inbetweens (Appendix 1: Word definitions) created by the computer is called Blocking, or Blocking Pass. For this particular shot, the blocking in Maya was accomplished by importing the rough 2D animation that was previously created in Flipbook. These images were then placed in a camera as an animated image-plane, which allows real-time playback with both the 3D animation and the 2D animation simultaneously in the viewport.

Each of the 2D poses was then recreated with the 3D animation rig. In some cases, the pose had to be changed in order to translate smoother into the 3D rig. The main idea was to make sure that the energy in the 2D animation was felt in the 3D animation and that the poses were the same or stronger ones. The blocking was created by going Straight Ahead and Pose to Pose, depending on which worked the best for the particular motion at hand. Poses were recreated on average every 5th frame by following the rough 2D animation, ending up with 35 poses to tell the story in blocking (see Figure 2).

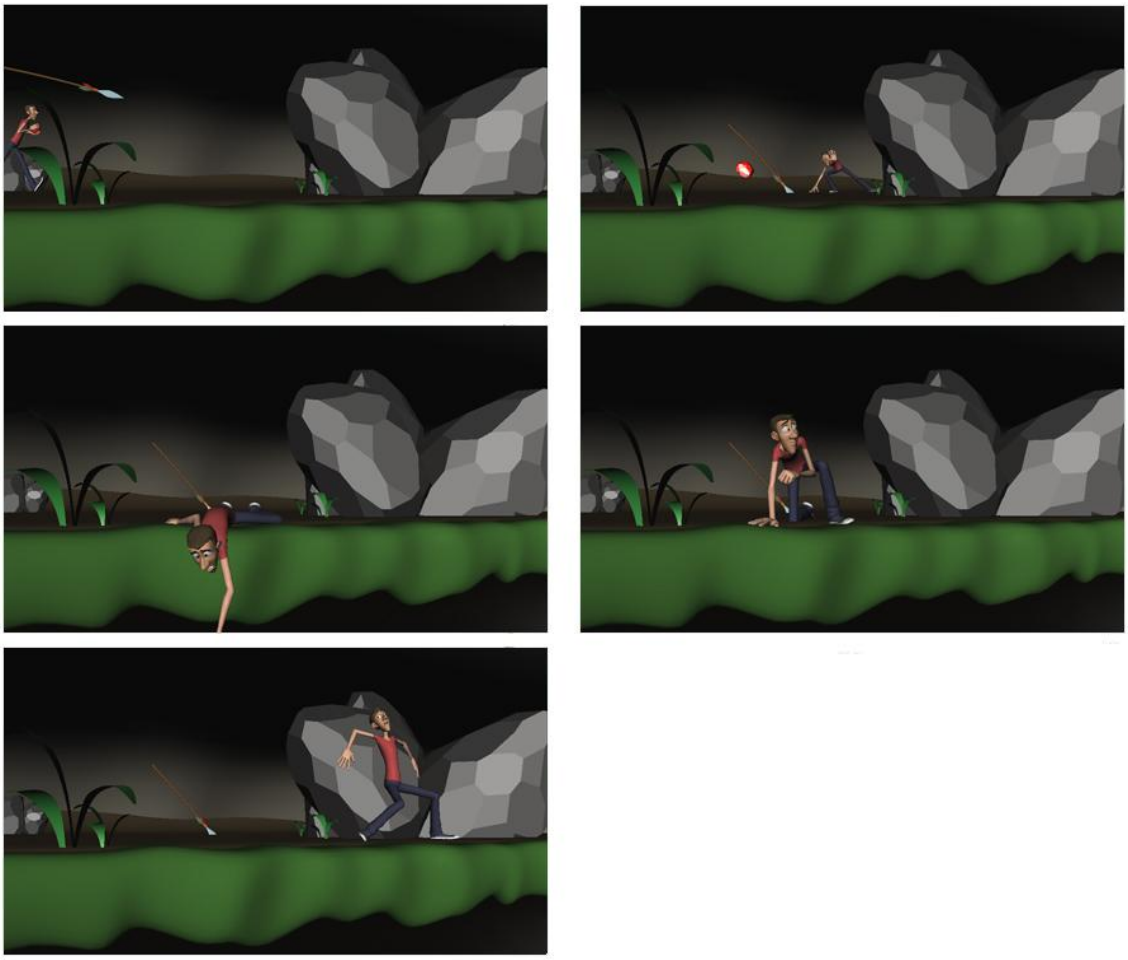

Figure 2. How the five storytelling poses translated to the 3D rig.

In order to keep the poses organized and easy to handle changes, keyframes were placed on every control curve for each pose, making it easy to slide them across the time-line for timing changes.

2.1.3 Blocking Plus

After the blocking had been completed, all the characters control curves was then set to interpolate between the different poses. The interpolation used was Maya's built in Auto Tagent (Appendix 1: Word definitions) as the base. Changes was then made for each individual action (control curve) if it demanded a different interpolation.

These inbetweens that the computer created were not always what was needed in order to create the desired motion. At this stage, it was a matter of adjusting or changing the inbetweens in order to follow the Principles of Animation. It was also important to make sure that the acting choices were communicating well with enough timing and good spacing, as well as providing the entire shot a good rhythm.

Some significant timing changes had to be made in order to provide the shot more time up front, having the character enter from off-screen instead of starting in the camera view as it had originally been planned. The final action that the character performed was also timed again since the motion went by too fast from the method that had been blocked out previously. Beside these two major timing changes, small changes was made, providing each move an adequate time to read, as well as to settle. The spacing of the entire character throughout the shot was refined and pushed into arcs.

All nuances of the characters acting was added in, such as the nervous fast breathing, the facial expression changes and eye-darts. At this stage, key-frames were only created on individual control curves where they were needed and not on the entire body. Control curves was offset in order to make sure that the entire character did not start or stop moving at the same time, most of this was created previously in blocking, however some areas needed tweaking after that as well.

2.1.4 Polish

When the acting choices were nailed down and the timing was figured out the Polish Pass started. At this pass, all small textural animation parts were added, such as weight on fingers as they were being pressed and released on from the upper torso. Every part of Malcom's body was observed and analyzed frame by frame, trying to spot any weird glitches or out of place movement and pushing every movement into an arc. The shot would not require any major, if any, timing changes during this pass. The story, movement and acting should all be working already and the focus was instead aimed towards obtaining the desired spacing on each frame.

2.2 Second animation shot

The second shot that was animated was a dialogue acting shot. The twelve second audio was borrowed from the movie Dumb & Dumber and was of Jim Carrey saying the line “I'm sick and tired to having to eke my way through life.....breathing in..... Sick and tired of being a nobody [14].” The rig that was used for this shot was the same Malcom rig utilized in the previous shot, created by Animschool [13].

2.2.1 Planning and layout

The audio was analyzed with the goal to imagine the context and subtext of the dialogue. The idea for this particular shot was to have Malcom come home from a hard day of work. He had sat himself down in his couch in the corner of his living room. His wife sits beside him, out of frame, while he explains and feels pity about his job. He does not get any credit or recognition for the work he performs and is treated like air from his coworkers and superiors. He does not understand why he cannot get a break in this world.

In order to stay true to the emotional state Malcom was in, the poses that were chosen had to evoke the feelings of despondent, suppressed anger and sorrow. He would also have to stay in a defensive state since he would want to keep out the surroundings and protect himself in this vulnerable state he was in. His overall movement had to stay in a slower pace to help evoke the feeling of sorrow and despondent. One major item to add to the animation was to animate the breathing between the spoken lines in order to connect the animation with the audio throughout the shot since it was so prominent in the audio file.

References were collected by the means of acting out the shot and analyzing what movements and poses that could work best in the given situation.

After the underlying planning was completed, the set was modeled and a layout was chosen to help portray that Malcom was lonely and sad. The camera was placed above Malcom, having it look down on him with a medium close up shot in order to help portray that Malcom is small, helpless and lonely in the audience's eyes (see Figure 3). An image was then exported to be used as a background for the 2D animation in Flipbook.

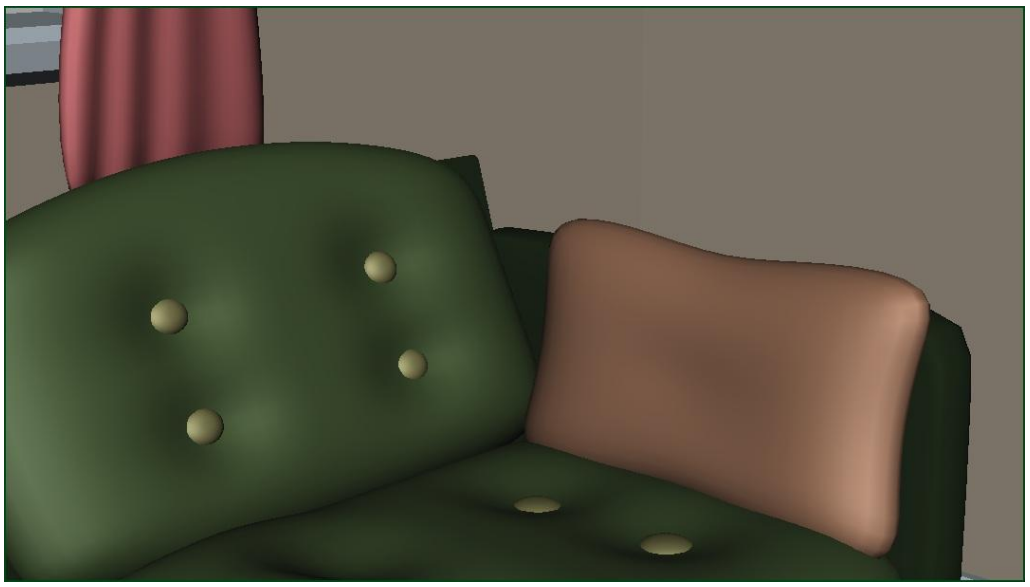

Figure 3. The final layout.

Inside Flipbook, the background was imported, as well as the audio file. The poses were drawn out in order to hit the beats of the audio four frames early in order for the animation to match better to the actual audio file. Seventeen poses was created, starting with the key poses (see Figure 12), then poses where body accents had to match the audio and finally one primary breakdown between each larger movement. This animation was then exported as a series of still images ready to be imported into Maya.

Figure 12. The four Key Poses that were used in the animation. Camera setup came to change to a closer shot after the initial drawings.

2.2.2 Blocking

The Blocking in Maya started by importing the still images which were created in Flipbok and then placing them as an animated image-plane, as well as importing the audio file.

The previous seventeen poses that had been planned out in Flipbook were then recreated with the 3D rig (see Figure 4). At this stage, mouth shapes were also created in order to match up to the dialogue. Except the seventeen original planning poses, a great amount of additional poses were created as extremes for head accents, as well as primary and secondary breakdowns between most of the different moves. These were made in order to figure out all accents to the dialogue and adding the correct mouth shapes to them as well. This was accomplished with Maya in order to reduce the drawings that had to be created in Flipbook and speed up the rough 2D pass, since it was only going to be used as a guide and poses might change slightly well inside Maya.

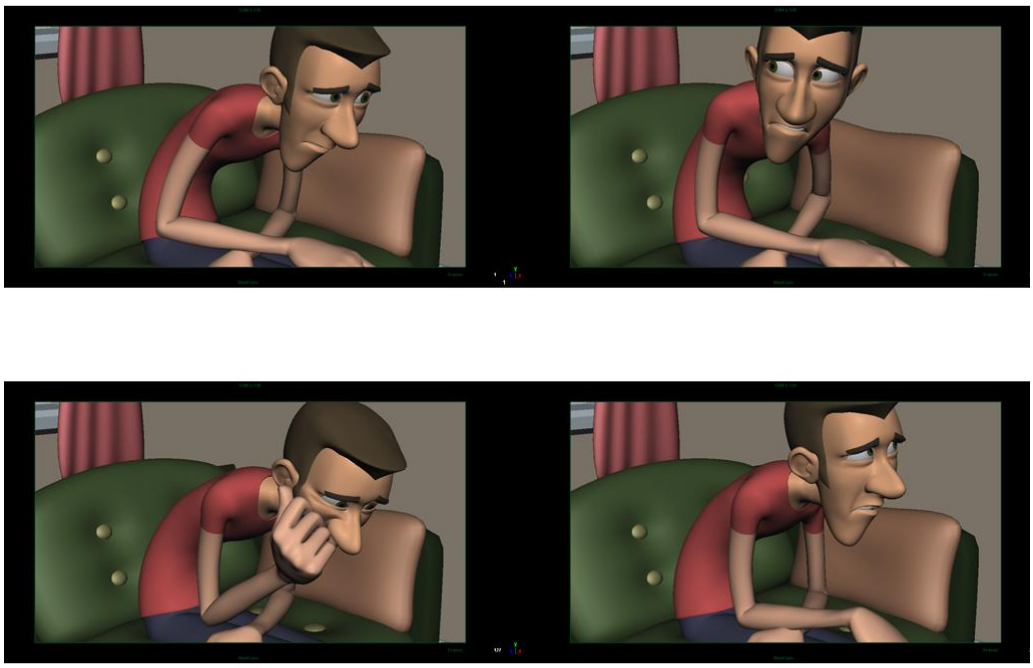

Figure 4. The four Key Poses translated to the 3D model.

Effort was put in order to make sure that the body accentuated the spoken words around four frames before the audio, and that the mouth shapes occurred between one to three frames before. This was in order to make sure that the audience would see the accents before they hear the sound. This is to mimic what happens in real life.

The pacing of the shot had to stay in a relatively slow state throughout since the feeling of sadness affect us humans as to slow down our movement and make us act in a smoother manner. Then small bursts of fast actions were sprinkled on top of this base in order to create an entertaining rhythm to the shot. This was considered for every breakdown and extreme pose that was created in Maya after the first seventeen poses that had already been planned out.

In all, forty-five different poses were created in order to tell the story through the Blocking pass.

2.2.3 Blocking Plus

In Blocking Plus, the whole characters control curves were set to Auto Tangent which allows the computer to "draw" inbetweens between the created poses in order to smooth out the animation. These inbetweens were then modified in order to compliment the original poses and retain the desired spacing and having them move in arcs.

Some minor adjustments with the timing had to be made on different body parts in order to achieve the desired feeling. Some body parts were also offset to avoid having the animation looking to much pose to pose, with every part of the body starting and stopping at the same time.

The lip sync was added and the facial features were reviewed for accuracy and cleaned up. It was important to make sure that the facial expressions translated from one to another in a believable manner without any weird pops, as well as making sure that they accentuated the spoken dialogue and showed emotions.

A breathing pass was added with the intent to show some breathing before each spoken line, where it demonstrated that the character had air in his lungs and therefore could produce the spoken words.

2.2.4 Polish

In order to have the face feel like one big unit instead of several different control curves, cheek pushes were added with the intent to show that different parts of the face affects others and causes them to move as well.

Other changes that were made during polish were on correcting frames that only showed eye white within the eyes. Adding small finger movements and making sure that the pressure was felt when the character rested his head on his clenched fist.

The entire shot was examined frame by frame, taking lists of all the small mistakes that could be found and then correcting them.

3 Results

The two animation shots that were created accomplished to tell a story and evoke emotional interest for the viewer. This is based on the comments that I received when showing them to both people with and without professional animation experience. These comments will be analyzed in more depth under Discussion, both positive and negative, and how to improve on these areas. However, even though the story came across, there is still room for improvement on how to make the characters feel as a real person, what acting choices to choose for each different character and how to add more unique characteristics to each character.

The two shots demanded different emotions and methods these emotions were shown, both with and without spoken words. Still, the same fundamentals of creating a believable acting experience were used in both shots. And since they both managed to tell the story in a believable manner, a common ground of guidelines should work for most animations as a base to build on in order to achieve believable acting in animation. These guidelines will be discussed under Discussion.

The first animation shot can be viewed here: https://vimeo.com/42967007
The second animation shot can be viewed here: https://vimeo.com/42967006

4 Discussion

After the animations were completed, they were shown to both professional animators and people without animation experience, in order to obtain comments on what they thought of the shots. This was achieved by sending out the final animation movie clips to three professional animators, three people without animation experience, as well as posting these two animations on "The 11 Second Club" [16], which is a forum for both professional animators and people studying animation. The responses I received were generally positive. However, I also received some comments on how to improve the animation.

One of the things were that the emotions and story were not unambiguous enough which led to confusion in the audience on what was going on in the scene. It is really important that the audience do not become confused and can follow the story without distractions. Thus, it might be better to have a simple but definite emotion that the character expresses instead of trying to show too much. This can hopefully help guide the audience through the story in a smoother manner.

Another comment were that the first shot lacked a bit of tension from the middle to the end and that the acting choices could have been more stressed and panicked, having the character miss footsteps, almost crawling just to get away from the danger. However, I also received comments from people saying that they liked the acting choices but that the tension were not really there.

I went back in to the animation and tightened up the timing of some moves from the middle to the end of the shot and tried to make everything feel more stressed with tension. This seemed to be the problem. The characters movement was to slow though the acting portrayed the desired emotions. This is another thing to be really mindful of, the entire character, emotions, body language and tempo, must express the desired emotion that the animator is after. If one thing is out of sync, the feeling will not be expressed as strongly as desired and the storytelling might get lost in confusion.

To answer the research questions previously stated, I will take one topic at the time and try to answer to the fullest extent on how to solve these problems.

- How can believable acting be created in animation?

There are a many aspects that lead to creating believable acting for character animation. A strong fundamental understanding of the Principles of Animation is needed. These are absolutely necessary if any high-quality animation is to be accomplished. The animator also needs to have the adequate experience of cinematography in order to help tell both the story and emotional feeling of the characters and scenes.

Define the character and know who that person really is. What makes this character unique? Has he or she any special characteristic that stands out? Is he or she lazy or full of energy? All these background questions will help to obtain an idea of how that character behaves and portrays him or her in different situations. You should try and obtain as much background information as possible of your characters entire life. These are information that can be use in order to make acting choices that are true to that specific character. This is also a great approach to stay away from cliché acting choices that are overused.

Be observant of real life and try to draw from your own experiences. People will often connect with things that they have experienced themselves and the chances are that if you have experienced it, others have as well. Stay true to the character and make them feel emotions, if the character exhibit no internal emotions, there is a big probability that the audience will feel disconnected from him/her. Allow the emotions to drive the motion. If the character is joyful, everything that character does has to express this emotion until the emotional state is changed. Show thoughts; make sure that the character reflects inside him/her over the things that are actually happening around him/her. This will enforce that the world around the character is real and that it truly affects this characters decisions. Do not forget to animate the character breathing since this will help ground the character in its world, unless of course it is a world without air.

- What characteristics make the acting choices believable?

In order to achieve emotionally true acting performances for the characters, the animator has to consider who the character is. What protruding characteristics each character has and what makes him or her unique? This will help the animator to realize how each different character would act in certain circumstances. On top of this, the animator must also analyze the scene. What is happening and what is the story at this particular point? How does this affect the character and how does this make him or her feel?

When imagining the acting for this character, everything of the above mentioned needs to be boiled down into one strong performance that is true to your character at this time in the story. It can be of great help to act out the performance yourself and find acting choices that feel natural and motions/poses that do not feel forced, as well as subtle nuances of motions that would not have otherwise been thought of.

The main point is to have the character react to the surrounding world and show feelings and emotions that are true for that character at each specific time.

- How can the animator choose the correct acting for every animation shot?

For each individual shot the character is going to have wants or needs that cannot be fulfilled at this particular point in time, unless it is the end of the movie or a side story that comes to a conclusion. This want or need will help determine what emotional state the character is in at any given time. For an example, a guy is in love with a girl, but she does not know it, and the guy's personality is nervous and jumpy. The shot is that the guy wants to tell the girl how much he loves her and he has just gathered the courage to walk up to her and is now in front of her. His want or need is to tell her how much he loves her, but you cannot just do it simply because of his personality, now can you? He will probably stumble on his words, avoid eye contact, and say the wrong things instead of how he really feels because of his personality. This scenario might be a cliché but his reactions and intentions will be emotionally true for that given situation at that given time for this particular character.

Therefore, in order to choose the appropriate acting for every shot, the background and characteristics of the character must be layered on top of the shots current text, context and subtext in which the character has wants or needs to act upon.

- What psychological factors deal with the perceived emotions?

The main factors that animators can use in order to evoke emotional connections with the audience are body language and facial expression. Since humans read and analyze these on subconscious levels, they are really important for communicating the right message with animated characters. However, the scenes layout and the graphical design can also help evoke the desired feelings in the audience. It is important to be consistent with what feelings the animator are portraying in each given shot, this is to stay away from confusion and make the scene as easy to read for the audience as possible.

4.1 Conclusion

From this research, I draw the conclusion that there is a common foundation that can be applied for most acting shots in animation that will help the animator obtain a believable acting experience. This foundation focuses on the planning stages of the animation process since every animator has a different workflow well inside their animation software, may it be drawn 2D animation, 3D animation or stop motion. Still, all these different branches use the same base, to plan out the shot before the animating begins.

This foundation is a combination of questions that needs to be answered and things to keep in mind when dealing with character animation, apart from a deep understanding of the Principles of Animation.

- Define the character:
  - Who is the character?
  - What is his/her story?
  - What makes him/her unique?
  - Has he/she any particular characteristics?

- Define the scene:
  - What are the text, context and subtext of the scene?
  - What are the characters wants or needs for the scene?
  - What are the characters wants or needs for the entire story?
  - What is the character feeling in this scene?
  - If it is a sequel of shots, what has happened before this shot and what will happen after?

- Define the acting:
  - Let the emotion drive the motion.
  - Make sure that the acting is true to the character at this given time.
  - Express the emotion with the whole character, poses, facial expressions and tempo must act together as a whole.
  - Give room to express the thoughts of the character.
  - Add breathing to your characters.
  - Use natural movements, act it out and see if it feels weird to you if in doubt.
  - Stay away from clichés.

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Appendix 1: Word definitions

Thumbnailing – Fast sketches done at the size of your thumb.

2D animation – Hand drawn animation. Done by pen and paper or by tools on the computer like wacom's pens that you can plug into the computer and draw with.

Blocked in or Blocking – Blocking is when you build your poses and do not let the computer interpolate between the different poses you have created.

Key poses – These are the main storytelling poses that your scene depend on. The main poses that express what is happening in the shot and propel the story forward.

Breakdowns – These are the poses that are between key poses and define how the movement will act out. What will lead the movement and what will follow, is there any overlapping action happening, for example.

Frames – In animation time is counted in frames, in theaters there are 24 frames on each second. For television there can be both 25 frames for each second as well as 30 frames per second depending if the television is shown in PAL or NTSC.

Playblast – A quick way of making a movie clip in Autodesk Maya which is used for looking at animation in real time.

Offset – Offset is often mentioned when animators makes sure that different parts of the body starts and stops at different times. The motion looks unbelievable if every movement in the body starts or stops at the same time.

Knee pops – A common problem that is happening in 3D animation is that the knees will twitch over a few frames causing weird looking "pops" in the motion. This has to be manually fixed for each frame sometimes.

Breathing pass – A animation pass done in order to make the character feel like he or she is breathing according to the tempo he or she is currently in mentally.

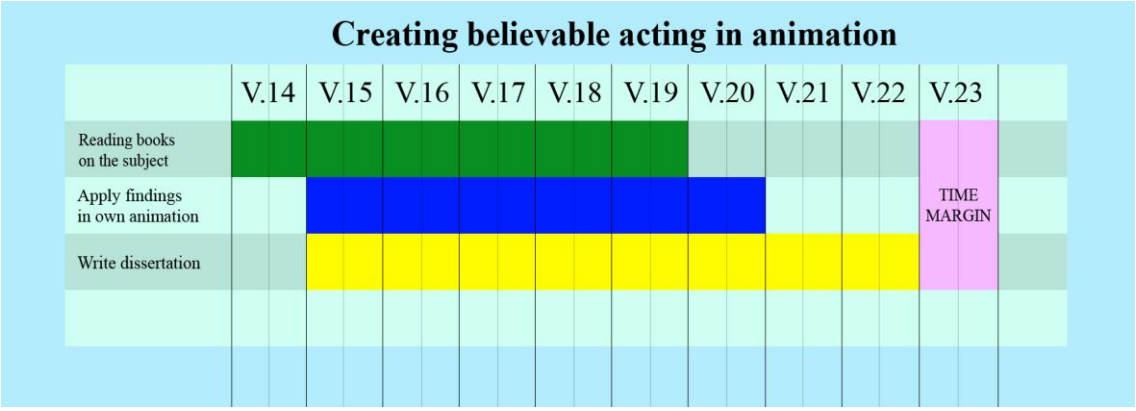
Tangent and interpolation – In 3D animation the animation itself is calculated numbers of different attributes. These attributes are shown in graphs. The computer calculates for example between the value 1 and 10, between these values which are represented by points, the computer draw lines in order to see how the value is changed to the other over time. This process can be done in more than just one way. The line can be a straight for example, linear interpolation, or it can be calculated with a curved line causing the animation between the two values appear in a completely different way.

Animated image plane – In Autodesk Maya there is a way to import images and play them in sequence on screen. These can then be used as references for the task at hand.

Inbetweens – Inbetweens are the drawings or poses that are created between key poses, extremes and breakdowns. Basically, the drawing or pose in between.

Auto tangent – This interpolation tries to make sure that the extreme values are not overshot and that the interpolation between is a smooth curve.

Appendix 2: Time management Gannt chart



Appendix 3: Web URL to final animations

First animation shot: https://vimeo.com/42967007
Second animation shot: https://vimeo.com/42967006