



OPENCOURSEWARE

MULTIMEDIA SYSTEM BITM 1113 ANIMATION (2D & 3D)

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INTRODUCTION

- An illusion creating a movement through assembling a sequence of static images is called animation.
- All pictures are a group of composed static images that give effect to the eye at rate of 12 to 24 image per sec.
- The physiological effect known as '**persistence of vision**' are produced by the illusion movement .

- Animation according to **Computer Animation Dictionary** (1968) is:

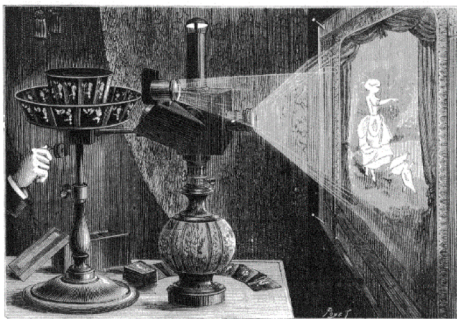
"producing a film/video that involve illusion movement by photographing, or otherwise recording, a series of single frames, it shows each of the changes in incremental of the subject images position shown in sequence at a high speed, give the illusion movement."



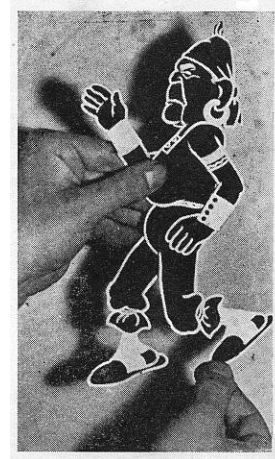
- A variety of techniques can produce individual frames from image generate by computer and also hand-drawn cell."

TRADITIONAL ANIMATION METHOD

- In animation, the whole frames need to be draw by hand before the invention of computer animation is used.
- Every second in animation involves 24 frames (film), the tremendous amount of work can only be illustrated which has to go into creating even to produce a very short animated films.
- To produce an animation by hand, several different techniques were introduced.



Revue perspective à projection de M. Reynaud.



CELL ANIMATION

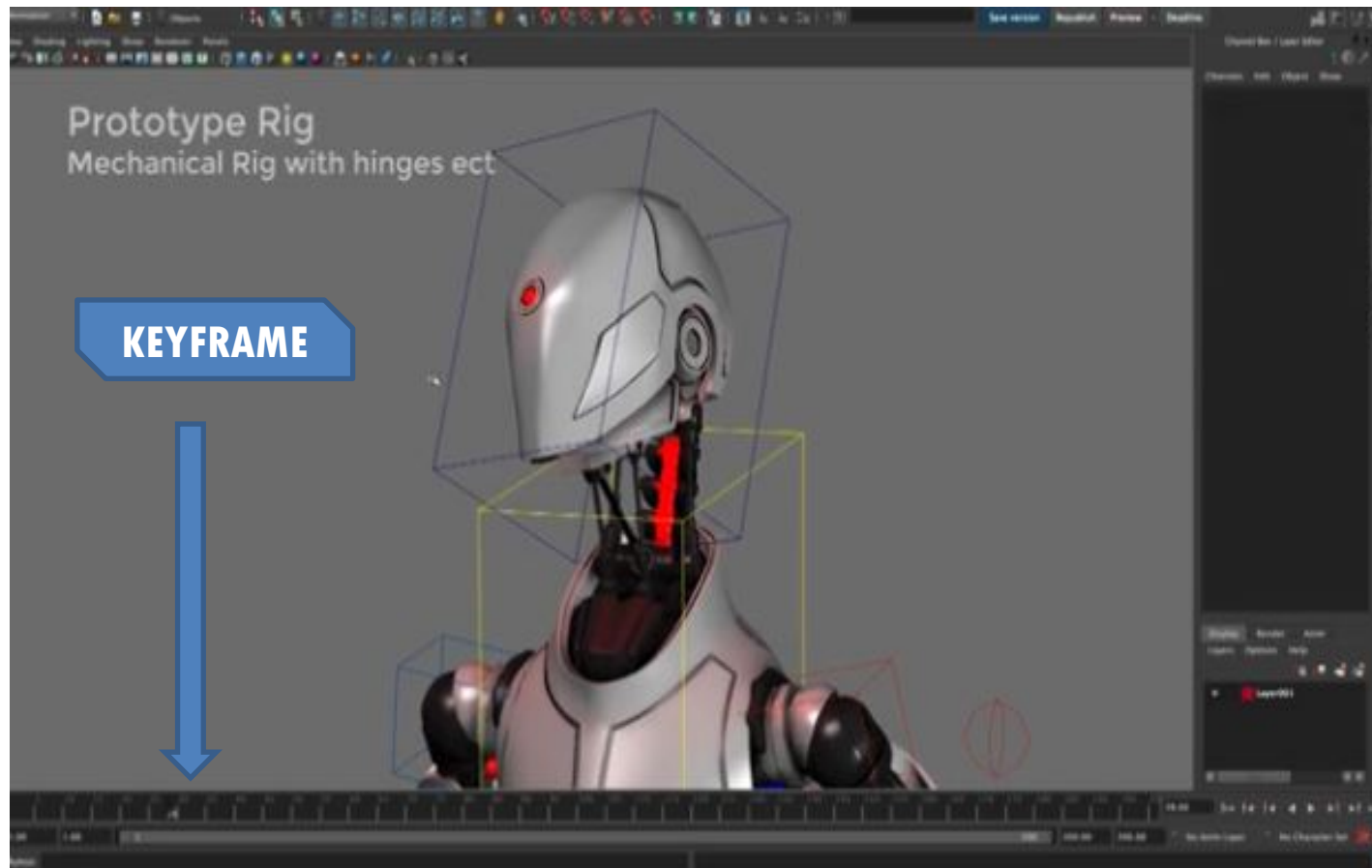
- The origin of word 'Cell' is came from '**celluloid**', which is the material that was used in initial motion pictures and it also refer to the hand-drawn animation that use transparent pieces film.
- Every single character is draw on a piece of separated transparent film.
- A separate sheet of opaque paper is also use to draw a background.



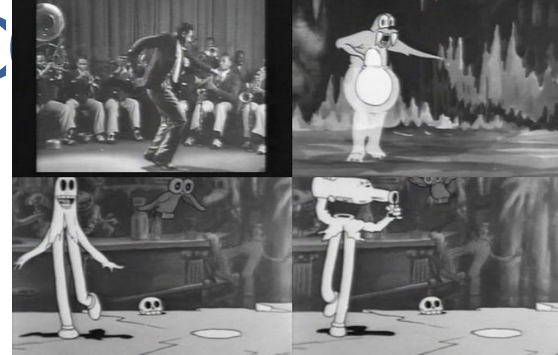
- All different kind of character are overlap on top of the background in each frame is the process of animation **shooting**.
- The artists just need to make changes at the specific part as individual character instead of having to draw in the entire frames.

KEY FRAME

- Normally, the drawing or painting work is done by a group of people. Senior artists has to go and draw the main animation frame as soon as storyboard has been laid out.
- That main frames are the frames that occur many changes. It is the animation **key points**.
- After that, junior artists team will draw in the frames in between. By this method, the task is distributed and the process is control by **key frames**.
- The work is done simultaneously by many people which result in reducing time used to get final product output. The key frames '**tweening**' still being use in most computer animation forms.



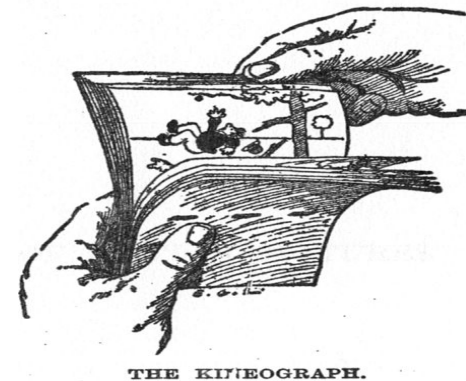
ROTASCO



- Image usage from moving video or film is the basis for an animation.
- Example: To do animated **jumping frog** . It is more easy to draw the frog motion and shape in few different part of the animation when referring to a reference like visual to opposed imagining in mind.
- Having assistant of rotascoping , the complex scenes that is difficult to visualize can be animated.

FLIP BOOK ANIMATION

- Even known as '**frame-based**' animation and is the most simple animation to be visualized.
- It contain a progressive drawings series, one on each page of a book that will create an illusion movement when user flipped it.
- Flip-book animation is a way of displaying a sequence of independent graphics files in computer environment.



COMPUTER ANIMATION

- Computer animation refers to a more wide area than cell or keyframe animation. The computer have several animation role such as :
 - Animating a basic images creation (digitized or created with graphics tool) and background
 - Motion addition to prefabricated image through generating trajectory paths for a whole objects (in-betweening) or components motion object (e.g. a human hand) or otherwise transform its color, shaping and level of bright
 - creating a realistic look by coloring the images

- The graphics motion synchronize with the sound
- Recording an animation sequence or follow a virtual camera program in order to control a physical movie camera.
- The postproduction stage is the process of editing and synchronizing the animated films.



FRAME BASED ANIMATION

- A **frame-based animation** imitate the original animation drawing technique in every single frame by hand.
- Creating each frame enhance the speed and ease of use.
- Assembling the final animation from a frame sequences (bitmaps) and in a form of a video file format (.avi or .mov suffix).
- Create animation by using computer tools is automatically depend on our choice of "Create a movie" or similar instruction.

CELL BASED ANIMATION

- To speed up the production process, a **cell-based animation** evolved from frame-based techniques of animation.
- The name derives from a technique of overlaying an elements that is active in frame of animation on a static background using celluloid layers.
- The process of creating such animation is completely computer automated - specifying 2 position of an object and the computer will be create the frame approximately to the movement of the object between specified position (works on Macromedia Director).

OBJECT ANIMATION

- **Object animation** (also called as Sprite, Path and Vector Animation) is the most simple of those three.
- Other than importing created animation files to our presentation, program or title, the object can be animated within the title-building software (eg : AfterEffect).
- Animation of object basically involve moving the unchanging object along a path. The object can also enable to do rotating, resizing or adding filters to it as it move.

PROCEDURAL ANIMATION

- The used procedure is define as the movement over time.
- It also include the procedure that use physic law (Physically - based modeling) or animator generated method.
- A motion is the result of some other action (known as "secondary action"), for example throw a ball that hit a wall and cause the ball to make the next move.

REPRESENTATIONAL ANIMATION

- This method allow object to make changes of shape throughout the animation.
- There are **3 subcategories**:
 - ☐ The **first** is the **articulated objects animation**, i.e., complex object composed of connecting rigid segment.
 - ☐ The **second** is **for deforming and animating the deformation of object using soft object animation used** , e.g. body skin or face muscle.
 - ☐ The **third** is **the changes of a shape into another different shape known as morphing**. It can be done in two or three dimensions.

STOCHASTIC AND BEHAVIORAL

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- There are **3 subcategories**:
 - ❑ The **first** is the **animation of articulated objects**, i.e., complex object composed of connecting rigid segment.
 - ❑ The **second** is **soft object animation used for deforming and animating the deformation of object**, e.g. body skins or face muscle.
 - ❑ The **third** is **morphing which is the changes of one shape into another quite different shape**. It can be made with 2 or 3 dimension.

3D ANIMATION

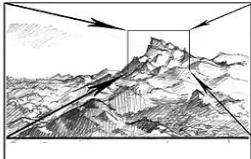
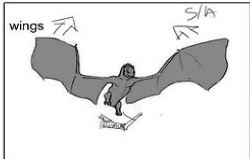
Consist of five categories:

1. **Storyboarding** – pre-production
 2. **Modeling**
 3. **Animation**
 4. **Scene layout setup**
 - Materials, Texture Interfaces, Lighting & Shading
 5. **Rendering** - post-production
- } production



1.STORYBOARD

- Screenplay visual interpretation, many images and production notes is used is best describe storyboard.
- It consist a series of panel that contain in visual form of the scene and shot specify on the screenplay.

TITLE George and the dragon		PAGE 1	
S-1	1/1	S-2	1/7
			
			
ACTION zooming in Still image		Dragon come out from cave	
DIALOGUE Far, far way in the high, high mountains		there lived a mighty dragon.	
TRANSLATION		Dragons starts swing his wings	
TIMING last about 8 sec 00:00:00:00		SFX: waving wings	
		00:00:09:16	
		00:00:09:20	

3 CATEGORY OF STORYBOARD

Conceptual Storyboard

- To develop the basic ideas(characters action, position of camera, motions & transitions of scenes)

Presentation Storyboard

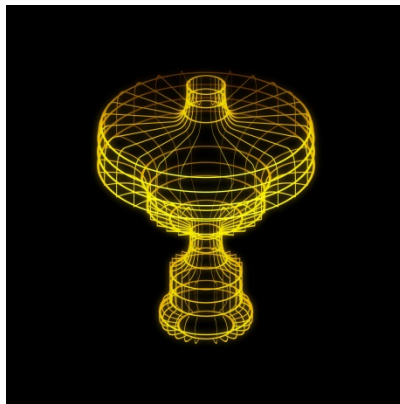
- To illustrate a detail summary of visual of the project to individual with authority of decision making (client-supervisor).Includes important scenes.

Production Storyboard

- Guiding the production in animation project. The document that everyone involved in the production process (detailed & precise)

2.MODELLING PROCESS

- The modeling stage can be describe as shaping individual objects that will be use in the scene later.
- There exist a number of modeling techniques, including, but not limited to the following:
 - ❑ **Constructive solid geometry** (Boolean operators to combine objects)
 - ❑ **NURBS modeling**(Non Uniform Rational B-Spline)
 - ❑ **Polygonal modeling**
 - ❑ **Subdivision surfaces** (the limit of an infinite refinement process)

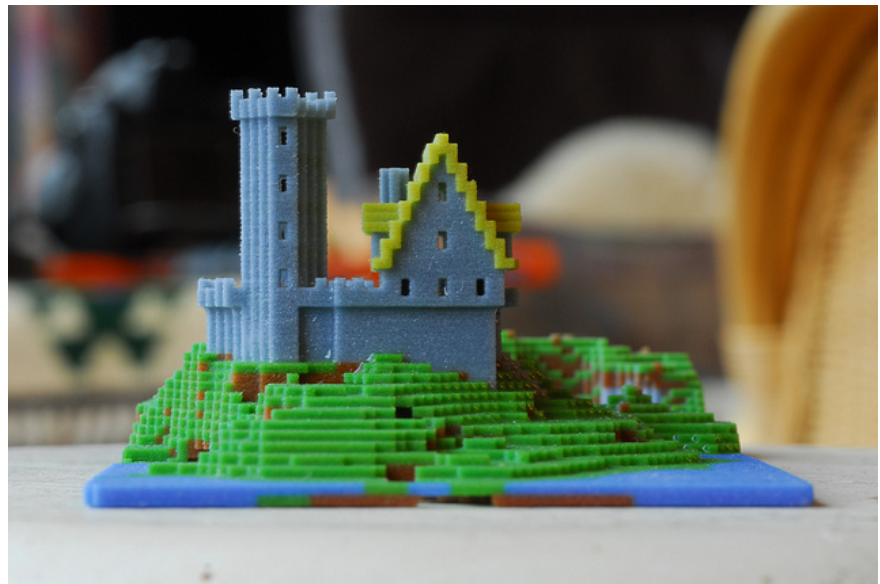


modelling

- Include **editing** object surface or properties of material (e.g., color, luminosity, diffuse and specular shading components)
- May also include several activities related to preparing a 3D model for **animation**

3D Viewing

- Top View
- Bottom View
- Left View
- Right View
- Front View
- Perspective View



3.ANIMATION

The **12 principles of animation** (1930s-Walt Disney)

1. Squash and stretch
2. Anticipation
3. Staging
4. Pose-to-pose action
5. Follow-through action
6. Slow-in & slow-out
7. Arcs
8. Secondary action
9. Timing
10. Exaggeration
11. Solid modeling & drawing
12. Appeal

The
12
principle of
animation

(1930s –Walt
Disney Frank
Thomas
& Ollie
Johnston

Squash & stretch

- The most important principle
- Movement emphasize any rigidity in the object
- On real world, the most rigid shape just like chair pan stay still during motion
- However, it will have changes in shape while action occur if anything composed of living flesh.

example:

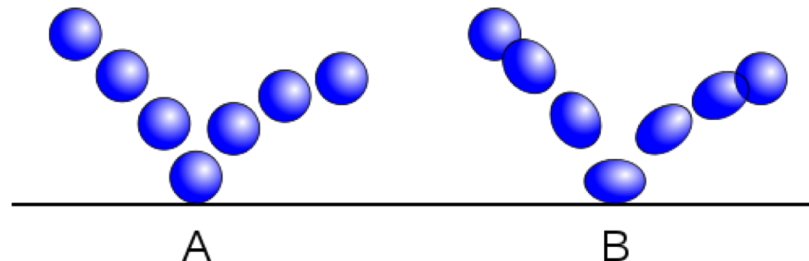
- Bending a swelling biceps arm to straightens out
- Expression changes occur during chewing, smiling and talking

- The position of squashed depict the form either flatted out by external pressure or have been own power constricted
- Every extended condition remain in the same form of stretched position
- An object do not need deform to do squash and stretch
- squashed object shows:
 - object is made from a soft and pliable material
 - flexible part must squash more and less rigid parts.



Timing

- The action speed, mainly called as timing, is one of most important principle since it refer to the movement
- Behind the action that will expose to a viewer, it also show how good the idea been done.
- It reflect the mass, size of object and also illustrate emotional feeling.



Timing

- Attention of audience will wander when too much movement time is used
- Too little/short time for the movement could be finish before the audience acknowledge it.

Anticipation

- Preparation for the action is called anticipation

Example:

- Before muscle can contract, it must be extended first.
- Swung the foot forward to kick a ball but it need to be pulled back first.



Anticipation

Anticipation frequent use :

- Catch the viewer's attention and give them prediction before it actually happen.
- Explaining the action that will do
- Grab the audience attention to a fight scene on the screen during the fight moment.
- Avoiding the viewer from miss some vital action
- Anticipation can also emphasize other principles such as timing for lifting and picking weight object.

Staging

- The idea presentation is called staging, that it will be clearer and easy to understand
- 2D hand drawn animation is directly translated by the principle.
- Staging a personality so that it is able to be recognize; expression that able to be seen; an emotion so that it give effect to the viewer's feeling
- If staging is not clearly it will lead to wasting anticipation time



Straight ahead & pose-to-pose action(keyframe)

Straight ahead action

- Animator works directly from their first drawing scene. Animator acknowledge where the scene suitable in the story and the process it has to attach in it.
- After many drawing been made, animator get new fresh idea as they go along, until they reach the ending scene.
- The process basically produce drawing and action that have a freshly and slight zany look, since the entire process was keep creative.

Straight ahead & pose-to-pose action (keyframe)

Pose-to-pose

- Animator plan actions and concentrate on make the drawing on main poses, relate them to each other in size and action, and then draw the in-betweens.
- Pose-to-pose requires good acting is use for animation, where the poses and timing are all crucial.

Straight ahead & pose-to-pose action(keyframe)

Pose-to-pose

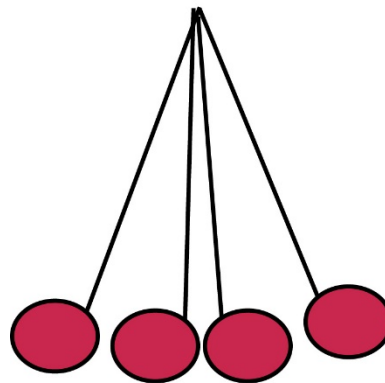
- This technique applies to keyframe computer animation with timing and pose control of extremes and in-betweens.
- Controlling the in-betweens difficulty makes it incorrect to approach keyframe computer animation exactly as one would pose-to-pose hand drawn animation.
- While working with a complex model, creating a complete pose at a time would make the in-betweens too unpredictable.
- The path of action will in general be incorrect and objects will intersect one another. It will result in much time-consuming reworking of in-betweens.

Solid Drawing

- Solid drawing principles is taking into account form in 3D space, or give it weight and volume.
- The skilful animator is needed draughtsman and has to clearly know the basic of 3D shape, anatomy, weights, balances, lights and shadows.
- One thing in particular that Johnston and Thomas warned against was creating "twins": character whose left and right side mirrored each other, and look life less.

Slow –in & Slow-out

- In animation early stage, the action was limited to fast and slow the movement, the space from one drawing to the next.
- in-betweens closer to each frame indicate slow moves, meanwhile far to each other



Slow –in & Slow-out

- Slow-In & slow-Out deal with the space in between drawing between the extremely pose.
- Mathematically, the term refer to 2nd and 3rd of the continuous motion
- The action of animation is limited to fast and slow movement and the space from the first drawing to second drawing is different.
- in-betweens closer to each frame indicate slow movement, meanwhile far to each other

Arc

- It is important to keep track of the paths your character and their limbs take while moving across the screen while animating.
- It helps animation flow smoothly and more naturally and look less robotic and reduce stiffness.

Exaggeration

- In general, exaggeration is obvious.
- But it doesn't mean arbitrarily distorting shape, object or make a violent and unrealistic action.
- The animator must dive deep in mind, understand the reason about it, so that the viewer will also understand it equally.
- If a character is happy, make him happier; if he is cheerful, make him shine; worries, make him fret; wild, make him frantic.

Exaggeration

- A scene can be so unrealistic to the viewer if we exaggerating everything.
- One or more element must be based on nature, with other unnaturally exaggerate.
- If there is elements that the viewer could recognize and feel very natural to it, that become the ground for comparison of the exaggeration of the other element, and the entire remaining scenes seems very realistic to the audience.

Secondary action

- A secondary action is an act that get results directly from another action.
- Heightening interest and adding a realistic complexity to the animation is very important in Secondary actions.
- Secondary action always keep subordinates to the primary action. When the conflict become worse or dominate, it is either the made a wrong selection or not properly staged.



Appeal

- anything that people likes to see is called appeal: a charm, pleased look, simplicity, communicating or magnetism.
- The eyes was drawn to the figure or subject that need to be appeal, and then you will appreciate the piece of art.



Follow through & Overlapping

- Overlapping action is the idea that parts of a character do not move all at the once or one at a time; they start and end moving at different times, resulting in overlap.
- Coupled overlapping action is follow-through. The attached parts will continue moving until they, too, settle to a stop, a leading part ceases motion.

Follow through & Overlapping

- Termination of an action is called *Follow Through* . Action not usually happen to completely stop, but generally past the carried termination point.
- As example, a hand after throw a book will continue pass the actual release point.