History of Animation

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What is Animation

- Animation is about making things move
- (Merrian-Webster’s) A motion picture made by photographing successive positions of inanimate objects
  - cf). Live action movie
- Computer allows more flexibility
  - Eg). Special effects, Interactive animation

Early Animation Devices

- Flipbooks
- Stop motion (puppet, clay)
- Cel animation
- Chalk animation
- Silhouette animation

A Brief History of Animation

- 1887: Goodwin invented nitrate celluloid film
- 1892: Reynard invented the Praxinoscope

- 1893: Edison invented the Kinetscope
  - Only one viewer at a time
- 1894: Lumiere invented the cinematograph
  - Camera + Projector + Printer

A Brief History of Animation

- 1900: THE ENCHANTED DRAWING
  - Live action films + replacement technique
- 1906: HUMOROUS PHASES OF FUNNY FACES
  - The first animation recorded frame by frame

A resource for early animation:
http://memory.loc.gov/ammem/oahome/oahome.html

A Brief History of Animation

  - Lotte Reiniger, 1st feature animation
  - Silhouette animation
A Brief History of Computer Animation

- 1885: CRT (Cathode Ray Tube)
- 1961: John Whitney, Intro to Alfred Hitchcock’s Vertigo
- 1961: Spacewar, 1st video game
- 1963: Ivan Sutherland, Sketchpad
- 1974: z-buffer, Ed Catmull
- 1975: Phong shading
- 1980: Tron, 1st feature film by CG [tronBike.avi] [tronTransfer.avi]
- 1986: Luxo Jr. nominated for Oscar [ljr_320.mov]
- 1995: Toy Story, 1st full CG feature film

Short films of Pixar:
http://www.pixar.com/shorts/index.html

How to Create Expressive Animation?

Twelve Principles

- Squash and Stretch
- Anticipation
- Staging
- (Pose to Pose)
- Follow Through
- Slow In, Show Out
- Arcs
- Secondary Action
- Timing
- Exaggeration
- (Solid Drawing)
- Appeal

Principles of Animation

- “The Illusion of Life”, by Thomas Johnson and Ollie Johnson
- Principles of Traditional Animation Applied to 3D Computer Animation, John Lasseter, Siggraph 87.

Squash and Stretch

- Movement emphasizes rigidity
  - Preserve volume

Timing

- Timing, or the speed of an action gives meaning to movement
  - Weight, Scaling, Emotion
Timing

- Two keyframes of a head
  - No: hit by a tremendous force
  - ONE: hit by a frying pan
  - TWO: nervous tic
  - THREE: dodging a brick
  - FOUR: a crisp order “Move it!”
  - FIVE: friendly “Come on-hurry!”
  - SIX: tracing a good looking girl
  - ...
  - TEN: stretch a sore muscle

Anticipation

- The preparation of an action
  - Revealing
  - Indicating Speed
  - Directing Attention

Follow Through

- The termination of an action
  - Weight and drag
  - Initiation
  - Overlapping

Staging

- Staging is the presentation of an idea so that it is completely and unmistakably clear.
  - Readability
  - Personality
  - Mood

Slow In, Slow Out

- The spacing of the inbetweens
  - Non-linear interpolation

Arcs

- The visual path of action from one extreme to another is always described by an arc
Secondary Action

• A secondary action is an action that results directly from another action

Exaggeration

• Exaggerate the essence of the action
  – Action, emotion, shape, color, sound, …

Appeal

• The animated character has appeal
  – A quality of charm
  – Pleasing design
  – Simplicity

• It doesn’t mean that the character/animation should be realistic
  – NBM.mov
  – Cat.mov

Example – Final Fantasy

Uncanny Valley

• Human psychological reaction to animation
  – Coined by Japanese roboticist Masahiro Mori
  – Emotional response against similarity to human appearance and movement

Computer Graphics for Animation

• What can the computer do for the principles?
  – Keyframing: Timing, Arc, Slow In & Out
  – Geometric deformation: Squash and Stretch
  – Physically based techniques: Secondary Action
  – Rendering: Staging