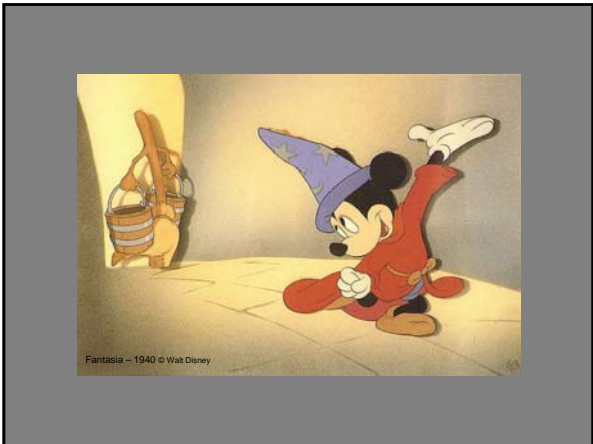


Character Animation

Based on "Principles of Traditional Animation Applied to 3D Computer Animation", John Lasseter, SIGGRAPH 1987







Disney Animators

- Sent to special drawing classes to **get past standard cartoon formulas**.
- Studied models in **motion** and live films.
- Studied actions **over and over**.
- The **analysis of action** became important to the development of animation.

Fundamental Principles

• Squash and Stretch	• Slow In / Out
• Timing	• Arcs
• Anticipation	• Exaggeration
• Staging	• Secondary Action
• Follow Through	• Appeal
• Pose-to-Pose	

Fundamental Principles

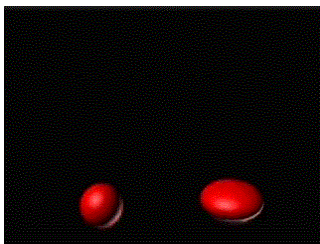
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Squash and Stretch

- Movement changes **object's shape**.
- The amount defines **rigidity**.
- Must **preserve volume**.
- On a face, it **connects** different parts.



Squash and Stretch

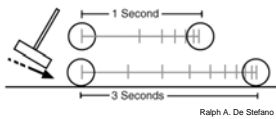


Fundamental Principles

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Timing

- Speed of action gives **meaning to motion**.
- Defines **weight** and/or **intent** of actor.
- **Realistic behavior** more important than looks.



Timing: Effect of Longer Action

Character turns his head and raises the chin slightly. How does the number of frames influence interpretation? (from few frames to many frames)

- ..has been hit by a tremendous force.
- ..has been hit by a rolling pin.
- ..has a nervous tic or a spasm.
- ..is dodging a rolling pin.
- ..is giving a crisp order "Move!"
- ..is more friendly "Over here".
- ..sees a nice car.
- ..tries to take a look at something.
- ..searches for tea on a shelf.
- ..appraises thoughtfully.
- ..stretches a sore muscle.

Action in Three Parts

- An action occurs in three parts:
 - Preparation → Anticipation
 - Action proper → Staging
 - Termination → Follow-Through

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Anticipation

- Anticipation provides:
 - Natural muscular anatomy
 - Device to catch audience's eye (will they see it?)
 - Direction of audience attention



Ralph A. De Stefano

Fundamental Principles

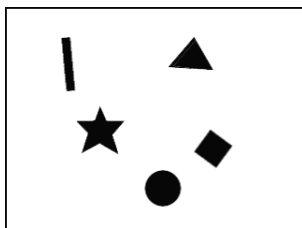
- Squash and Stretch
- Timing
- Anticipation
- **Staging**
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Staging

- Present an idea so it is **unmistakably clear**.
- **One idea** seen at a time.
- Object of interest should **contrast with scene**.
 - Sometimes ensured with silhouette.

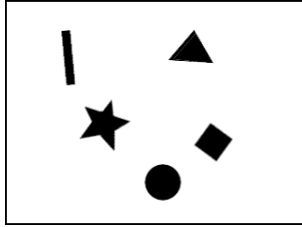
“Look at this, now look at this, then look at this...”

Staging



Ralph A. De Stefano

Staging



Ralph A. De Stefano

Fundamental Principles

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Follow-Through

- Action **seldom** terminates with a **sudden stop**.
- They often **carry past termination** point.
- **Lead part initiates** motion, other parts follow.
- Lead part stops, other parts stop later.
- E.g. the **eyes lead the head, which leads body**.
- Sequences of actions should **overlap**
(co-articulation).

Fundamental Principles

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Pose-to-Pose

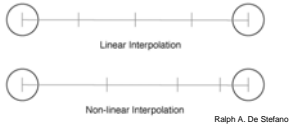
- The method of creating frames:
 - "Straight-ahead" let's animator do one drawing after another from a starting point
 - Slightly zany look for scrambling actions
 - "Pose-to-Pose" let's animator first pose character into key poses and then fill in between.
- Digital animation mostly done "Pose-to-Pose" through hierarchical posing of limbs (layered).

Fundamental Principles

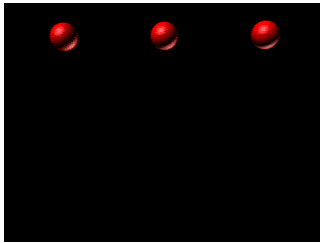
- Squash and Stretch
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Slow In / Out

- More time spent at the beginning and at the end of an action.
- Initially done because animators wanted audiences to see the action better.
- Achieved expressive “spirited results”.



Slow In / Out

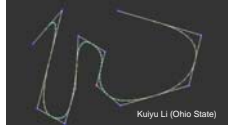


Fundamental Principles

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Arcs

- Action paths are always **arcs**.
 - Based on swining limbs and thrown object trajectories.
- Achieved with **splines**.
- Separate motion paths from timing arcs.



Fundamental Principles

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- **Exaggeration**
- Secondary Action
- Appeal

Exaggeration

- Make the **essence** of an idea **bigger**.
- Provide a “ground” for comparision in scene.



If he is angry, make him **furious**.

Ralph A. De Stefano

Fundamental Principles

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Secondary Action

- New actions can **result from an action**.
- Can be **subtle effects** (e.g. Luxor's cord)
- Might still **need staging** or it gets lost.



Fundamental Principles

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Appeal

- Live action actors have **charisma**.
- Animated characters have **appeal**.
- Avoid “sameness”, “stiffness” and “mirrors”.



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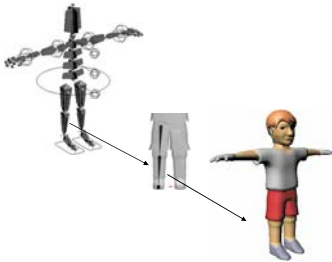
Tying it all together

- Consistent **personality**
 - An underlying personal **story** ties all the actions together into a believable whole.
 - The actions are merely a view into the **inner world** of the character.



3D Animation Basics

Preparing a Model: Skeletal Rigging



Joint Animation