

Introduction to Computer Animation

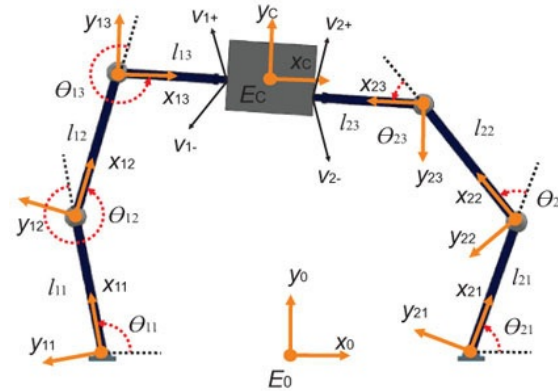
Animation in production

Animation in Computer Graphics

Two main ways to describe animation

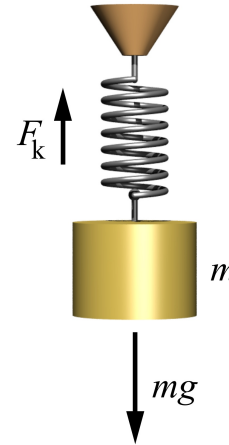
1- Kinematics

Shape deformation/motion without knowledge of the physical cause of the motion



2- Dynamics

Motion through forces acting on shapes (ex. physically based simulation)



Animation in Computer Graphics

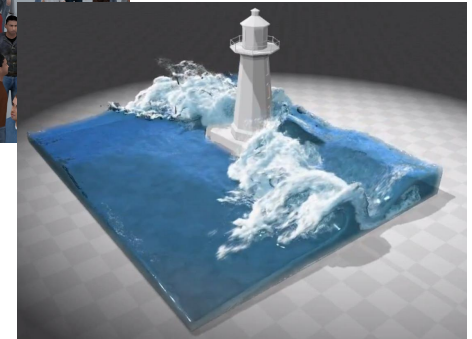
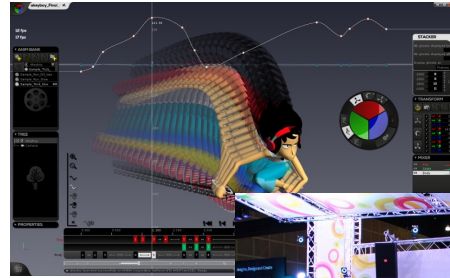
Four ways to generate animation

1- Descriptive animation

2- Acquired motion

3- Procedural generation

4- Physically based simulation



Descriptive Animation

The artist/an algorithm fully describes the motion and deformation.

pro

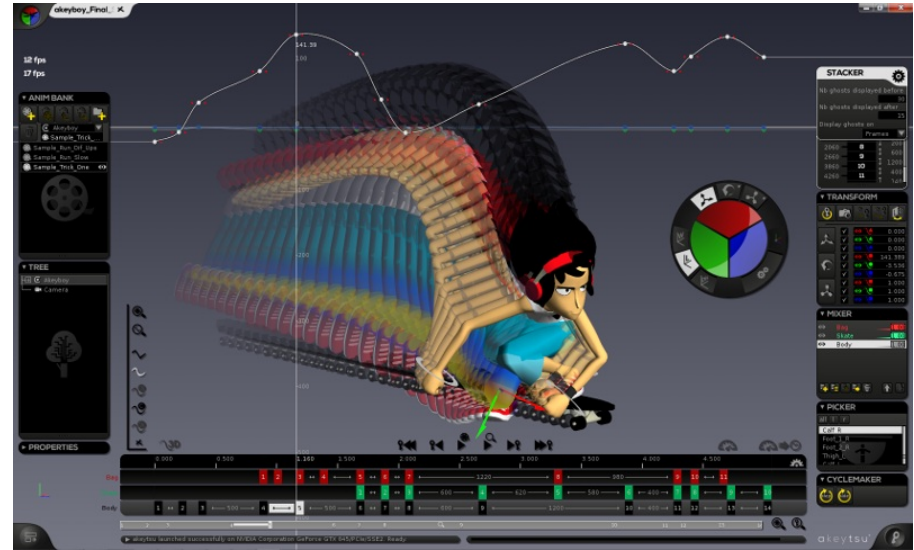
- + Full control on the result

cons

- May introduce un-physical artifacts



© Disney/Pixar



History of CG Animation

First production of animated films (Disney)

- 30 drawings / sec

Principle

- *Animator in chief*: Create **Key Frames**
- *Assistants*: Fill the *in between* (secondary drawings)



=> Principle of **Key Framing**



(c) Walt Disney Company, from "The Illusion of Life"

Key Framing in CG

- Create *manually* a set of **Key Frames** at specific time steps
- Compute automatically intermediate frames (30 fps) using **interpolation**

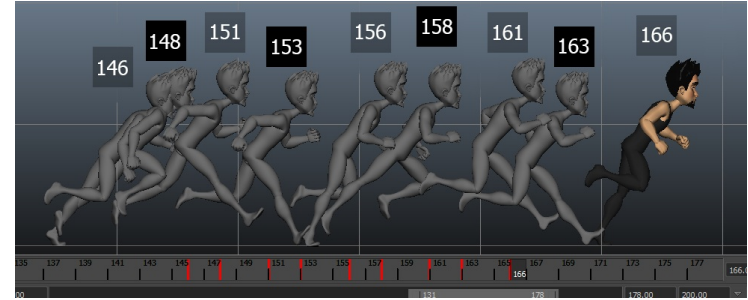


Animator Terminology

1- **Posing** the key frames

Set the main general posture of the character

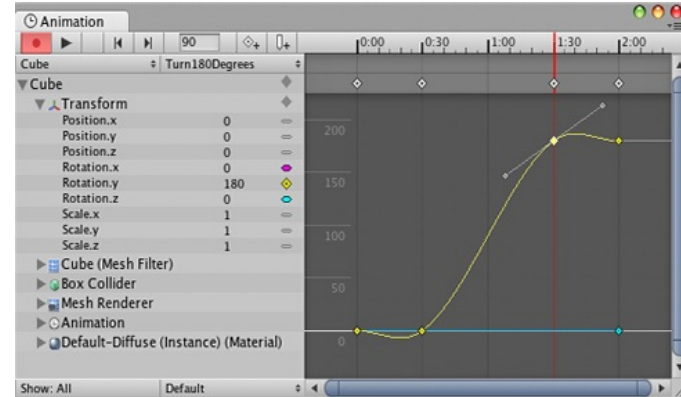
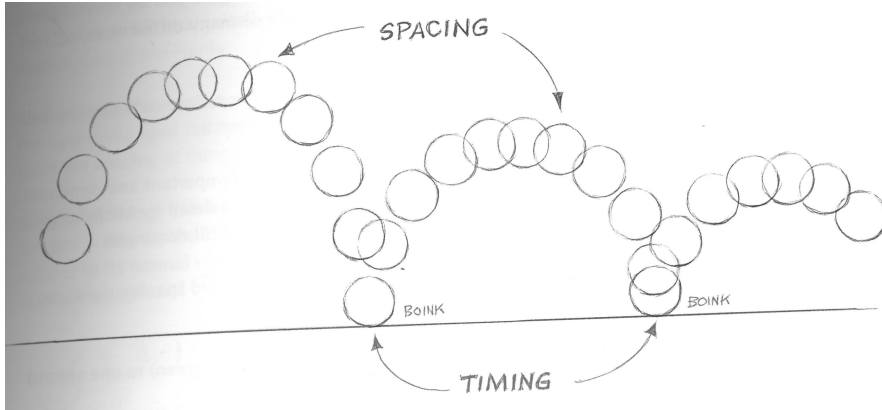
*Linked to geometric **character deformation**, time is not involved*



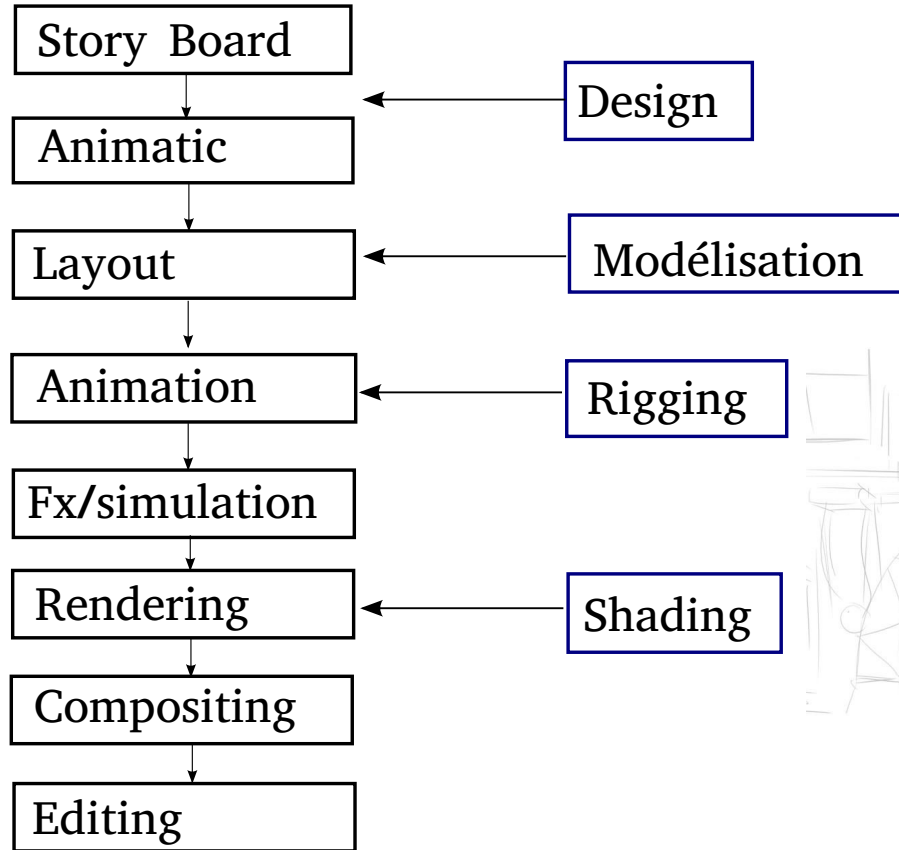
2- **Animating** the in-betweens

- **Timing** : Place key frames at specific times (global length of an action)

- **Spacing** : Speed of the interpolation (dynamic of the action)



Animation in production



- Animators: about 3/4 of production artists team.

- One animator can do 1s-10s animation per day.

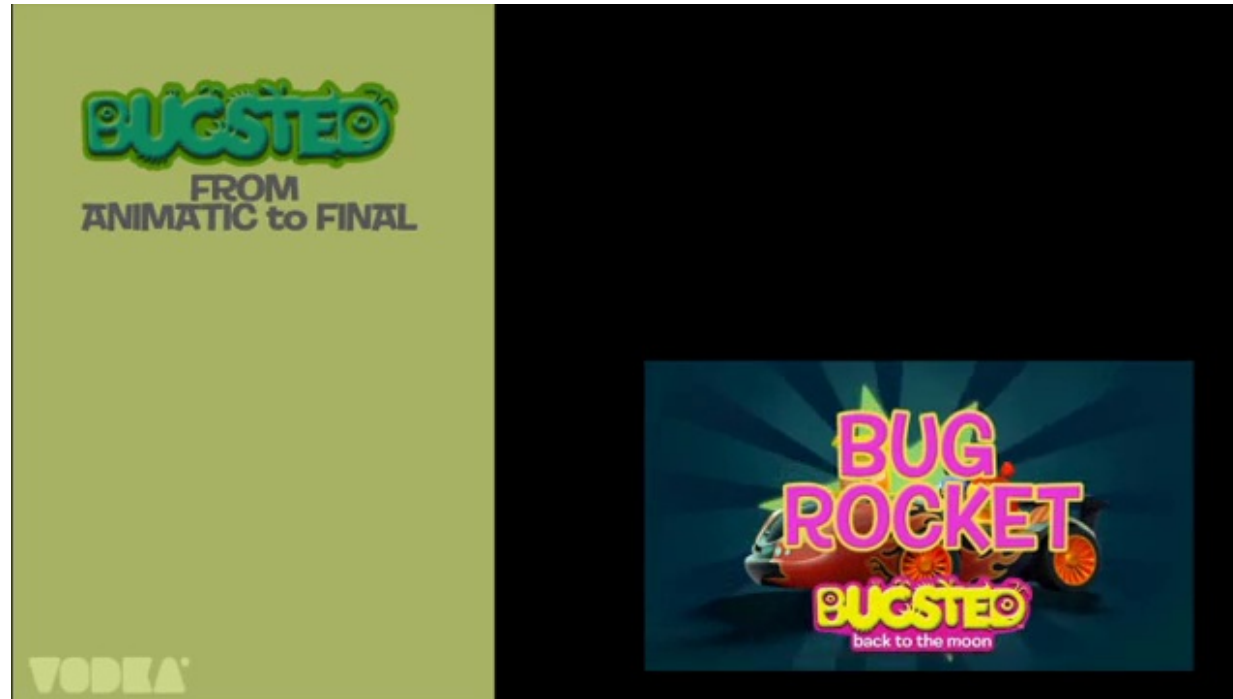


"MONSTERS UNIVERSITY" Progression Image 1 of 6: STORY
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"MONSTERS UNIVERSITY" Progression Image 4 of 6: LAYOUT
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Animation in production - example



- In production *Animation* refers only to rigged character animation
- All other effects (dynamic hair, cloth, explosions, etc) are called *special effects*.

Character Animation Posing - Line of Action

- Line of action: *Medial axis* expressing the character pose
- Express *statically* the dynamic of the action
 - Unstable pose $\Rightarrow$ Dynamic action/motion

SLIGHT CURVE



HAPPIER!



EXAGGERATED
HAPPY POSE



SLIGHT CURVE

SEEMS LIGHTER



EXAGGERATED EFFORT POSE

SEEMS HEAVIER

ACCENTUATED
CURVE



SLIGHT CURVE



ACCENTUATED
CURVE



EXAGGERATED
SAD POSE



Expressive animation

- Interpolation between realistic poses isn't enough for expressive animation
- *12 principles of animation* by Disney *Illustion of Life*, 1981

- Timing
- Spacing
- Slow-in, Slow-out
- Squash & Stretch
- Anticipation
- Follow Through
- Secondary Action
- Exaggeration
- Appeal
- Arcs
- Staging
- Straigh Ahead/Pose to Pose

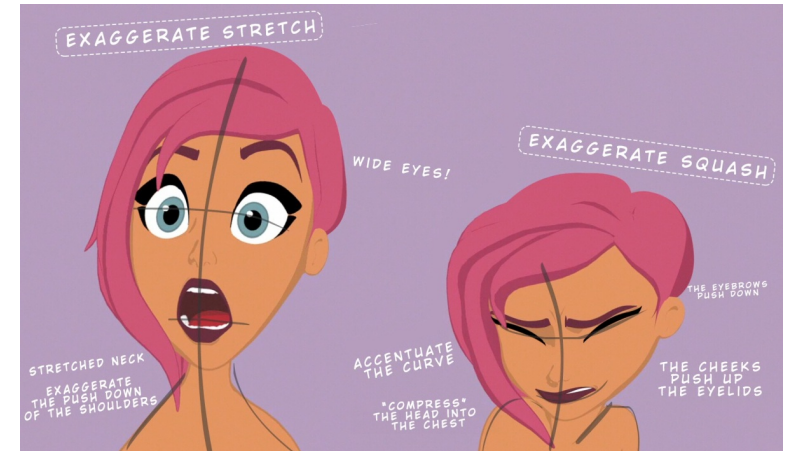
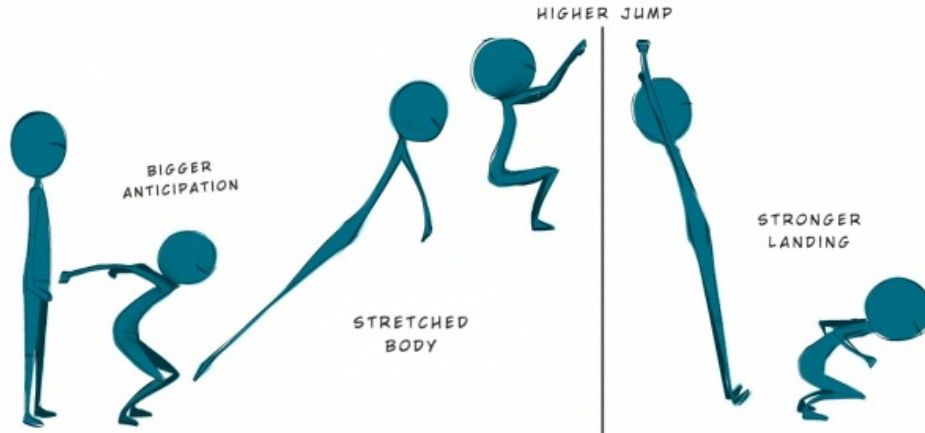
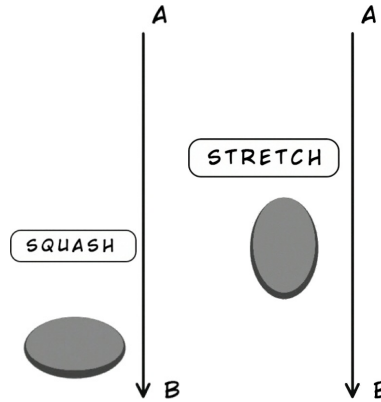


(C) Chiara Porri

Expressive animation

Squash & Stretch

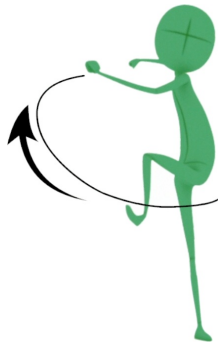
- Very common in cartoon
- Unrealistic, but surprisingly *plausible*



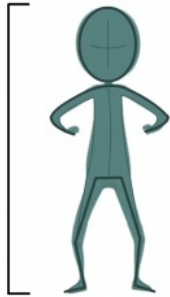
(C) Chiara Porri

Expressive animation

Anticipation

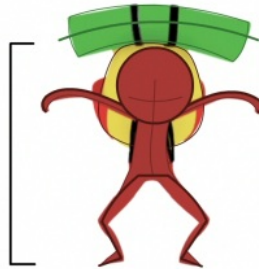


the character is pretty light



Softer Anticipation

the character is bringing
an heavy object

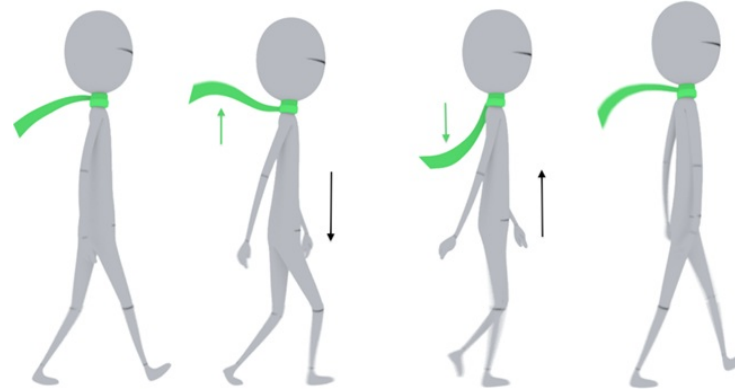
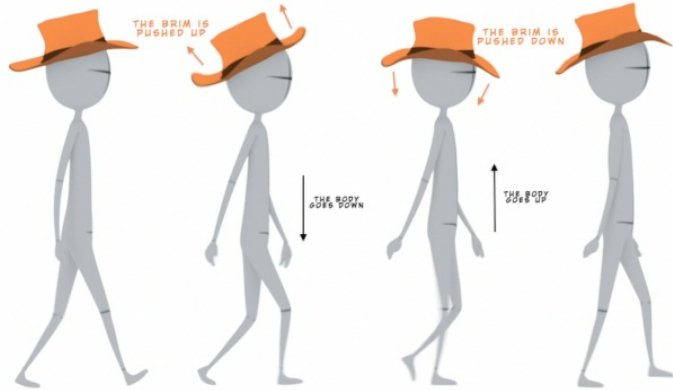


Stronger Anticipation



Expressive animation

Follow Through / Secondary motions



(C) Chiara Porri

