



Survey of Animation Techniques

also today: project brainstorming & feedback

CS 4300/5310

Computer Graphics

ANNOUNCEMENTS

Upcoming Deadlines

- HW4: Shaders
 - March 19th
- Reading Response
 - March 21st, 10:30am
- Final Project Proposal
 - March 22nd



Upcoming Schedule

- March 21st
 - Non-Photorealistic Rendering paper discussion
 - Class will end a little early
- March 26th
 - Guest lecture on augmented reality from Prof. Vona
- March 28th
 - No class, use the time to work on projects!

questions? discussion?

ASSIGNMENT 4

an overview of techniques

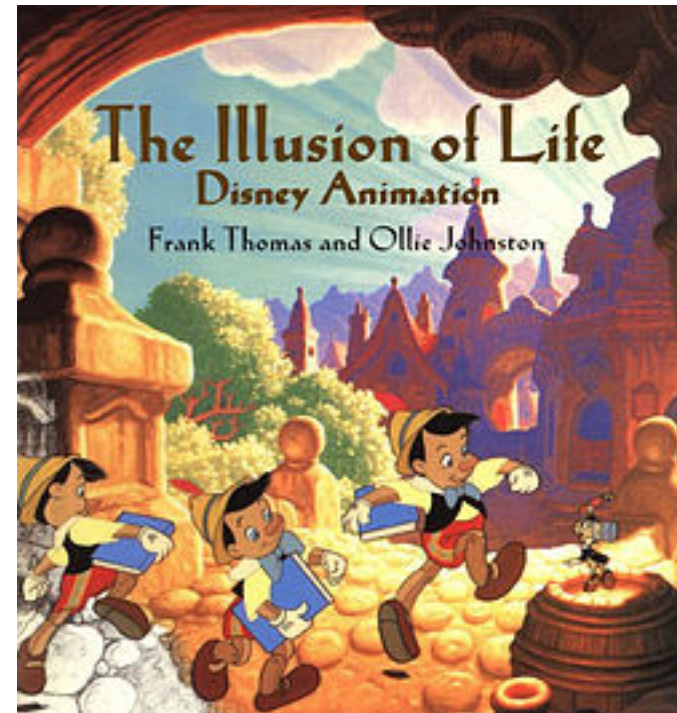
ANIMATION

What Do We Care About?

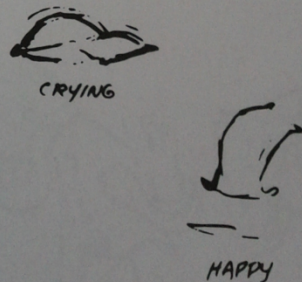
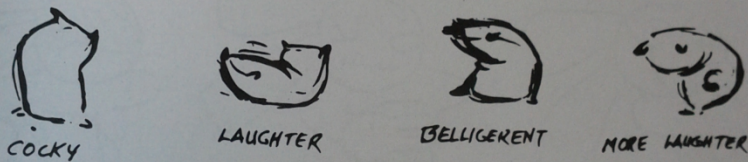
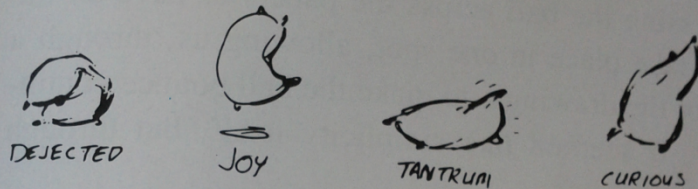
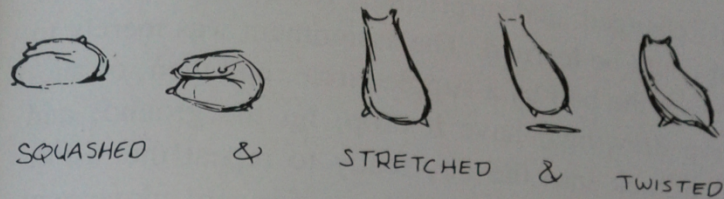
- Believability vs. Realism
- Ease of use for artists, programmers
- Controllability of animation

Animation's Guiding Principles

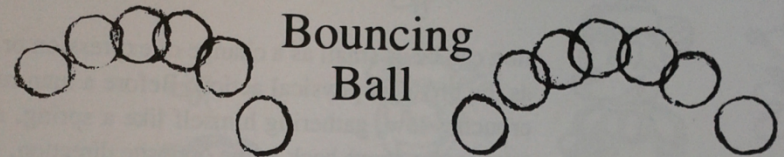
1. Squash and Stretch
2. Anticipation
3. Staging
4. Straight Ahead Action / Pose to Pose
5. Follow Through and Overlapping Action
6. Slow In and Slow Out
7. Arcs
8. Secondary Action
9. Timing
10. Exaggeration
11. Solid Drawing
12. Appeal



Squash and Stretch



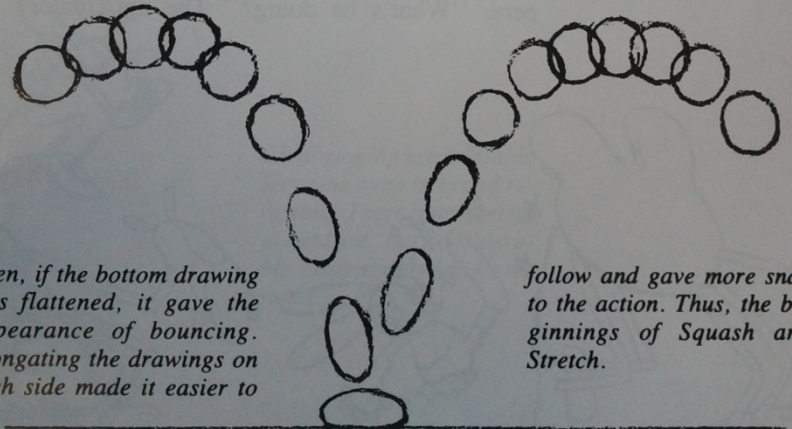
The famous half-filled flour sack, guide to maintaining volume in any animatable shape, and proof that attitudes can be achieved with the simplest of shapes.



Bouncing Ball

In moving the circle (representing the ball) down and back up, it was discovered that the ball would seem to

have more weight if the drawings were closer together at the top and spaced farther apart at the bottom.



Then, if the bottom drawing was flattened, it gave the appearance of bouncing. Elongating the drawings on each side made it easier to

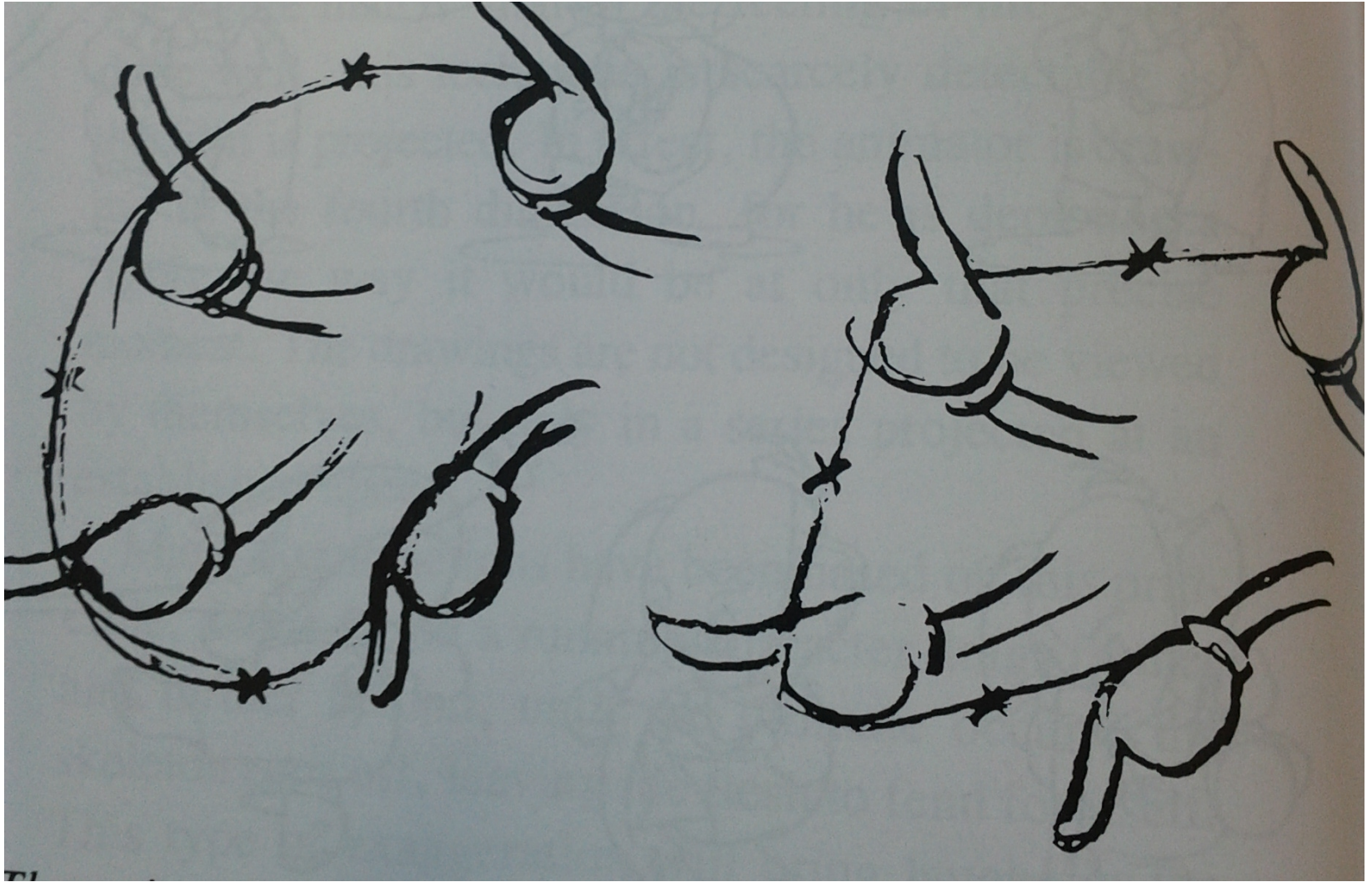
follow and gave more snap to the action. Thus, the beginnings of Squash and Stretch.

Timing

- How does the number of in-between frames impact the feel of the animation?

No inbetweens	THE CHARACTER has been hit by a tremendous force. His head is nearly snapped off.
One inbetween	. . . has been hit by a brick, rolling pin, frying pan.
Two inbetweens	. . . has a nervous tic, a muscle spasm, an uncontrollable twitch.
Three inbetweens	. . . is dodging the brick, rolling pin, frying pan.
Four inbetweens	. . . is giving a crisp order, "Get going!" "Move it!"
Five inbetweens	. . . is more friendly, "Over here." "Come on—hurry!"
Six inbetweens	. . . sees a good-looking girl, or the sports car he has always wanted.
Seven inbetweens	. . . tries to get a better look at something.
Eight inbetweens	. . . searches for the peanut butter on the kitchen shelf.
Nine inbetweens	. . . appraises, considering thoughtfully.
Ten inbetweens	. . . stretches a sore muscle.

Arcs

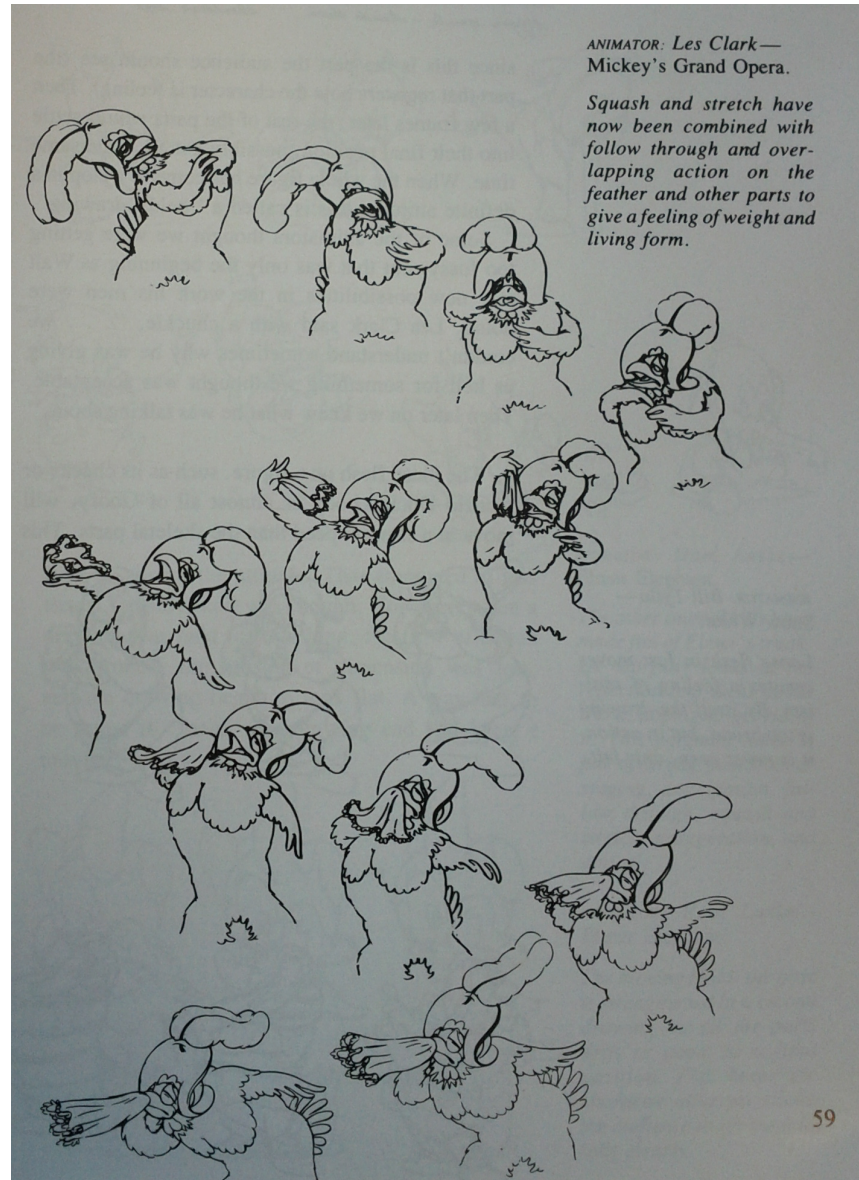


Slow-In and Slow-Out

- Avoiding mechanical-seeming action
- Caricature of realism for believability

- *“Our work must have a foundation of fact in order to have sincerity. The most hilarious comedy is always based on things actual.”*
 - Walt Disney

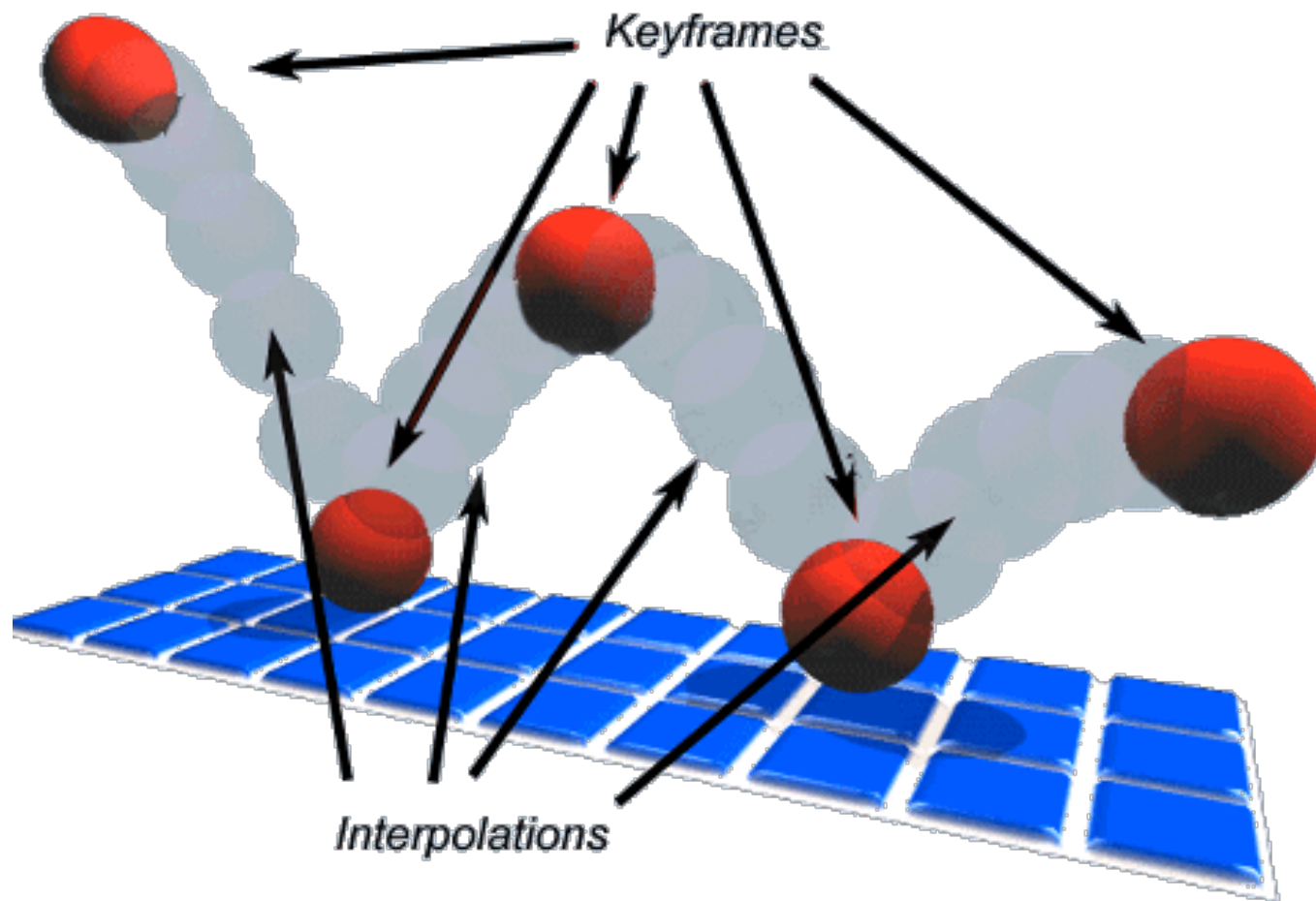
Follow Through and Overlapping Action



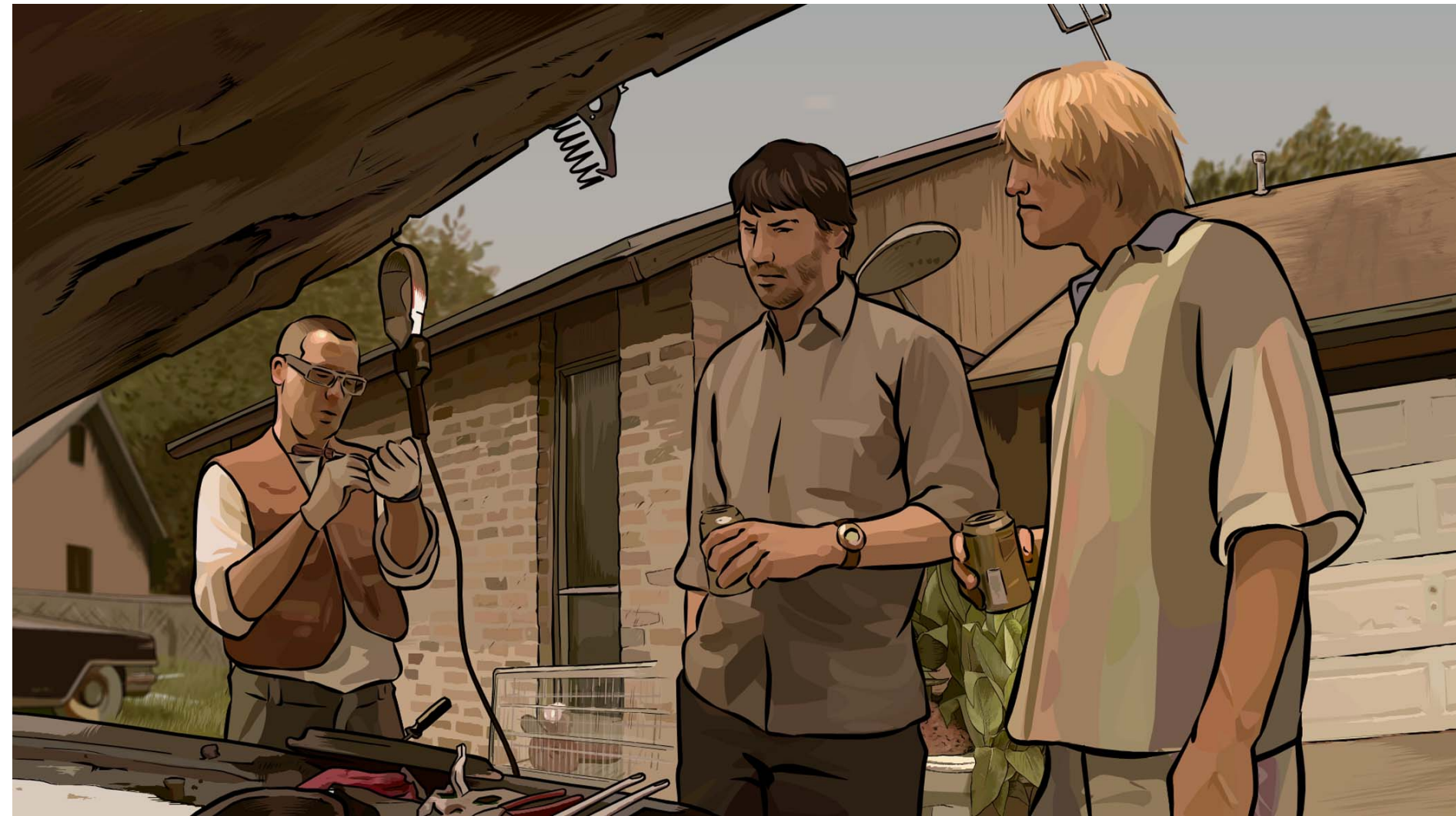
Animation Techniques Grabbag

- Keyframing
- Rotoscoping
- Video Textures
- Blend Shapes
- Skeletal Animation
- Physical Simulation
- Inverse Kinematics
- Motion Capture
- Procedural Generation
- ...

Keyframing



Rotoscoping

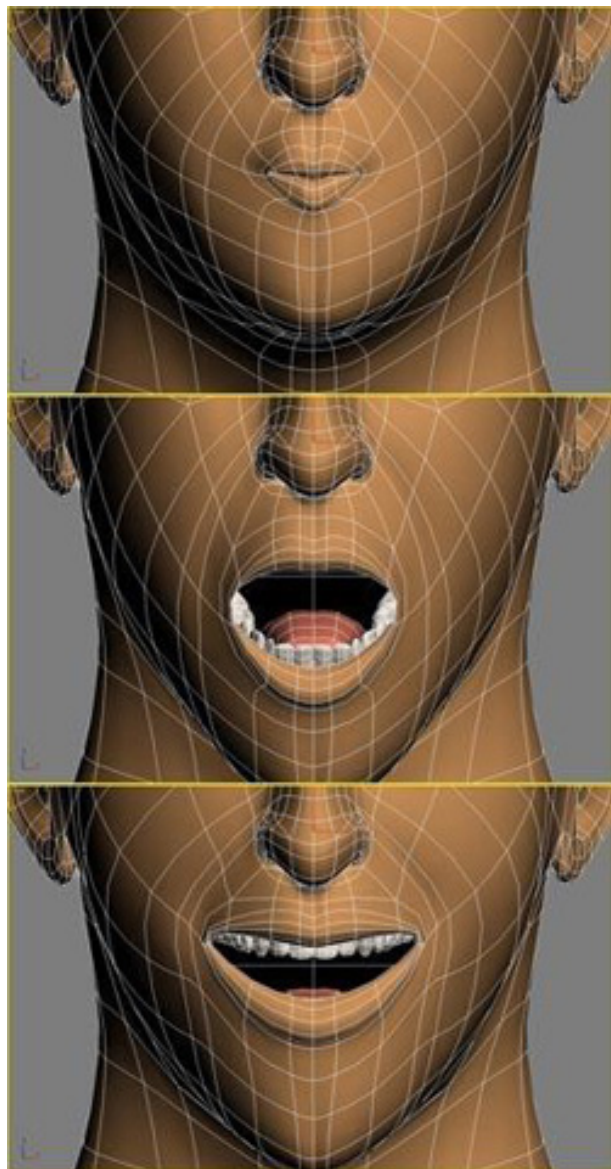


Video Textures

- Automatically generate longer, looping video clips from single video
- Transition between similar frames
 - Blend/morph if necessary to avoid artifacts

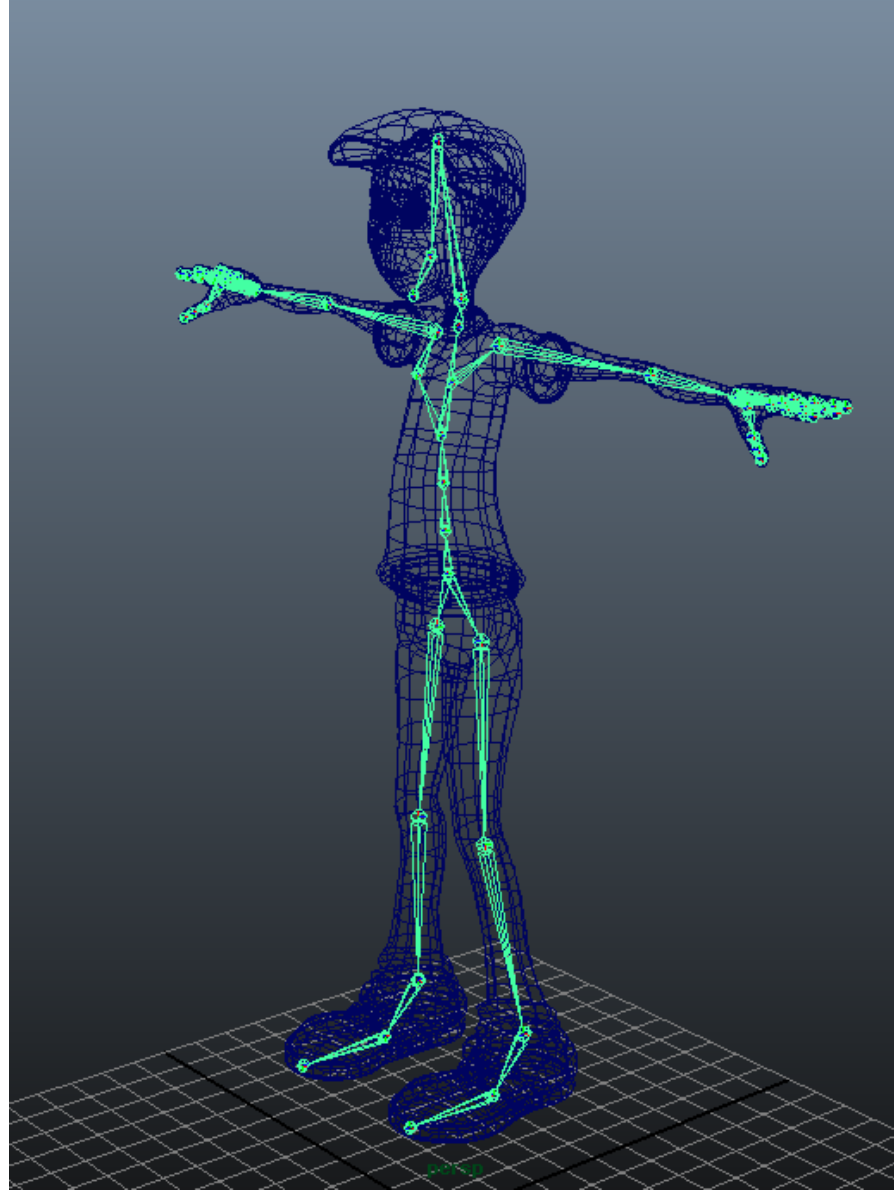


Blend Shapes



- Specify several initial models
- Blend between models by interpolating vertices
- Good coverage of spoken English by blending between visemes

Skeletal Animation



Kinematics

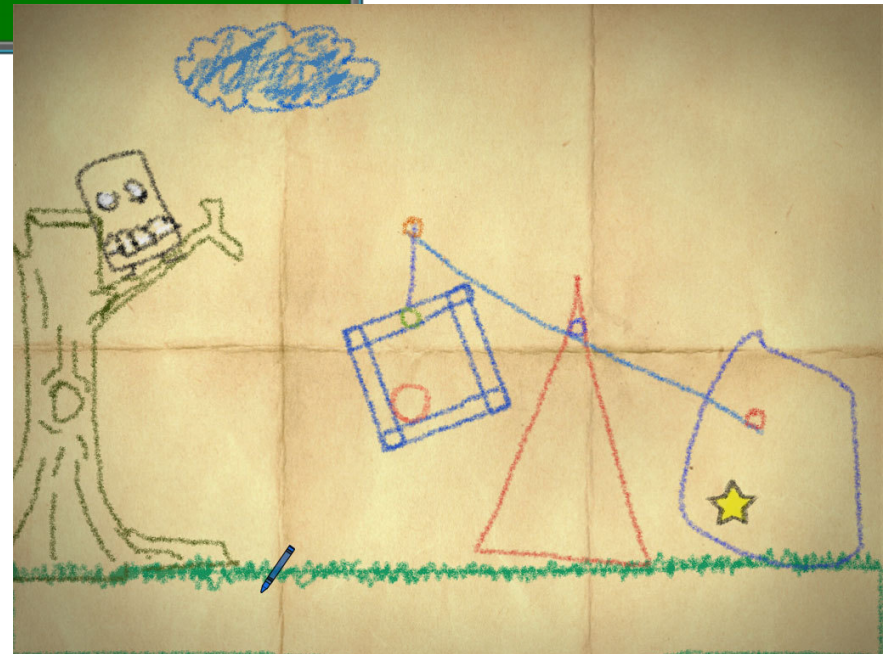
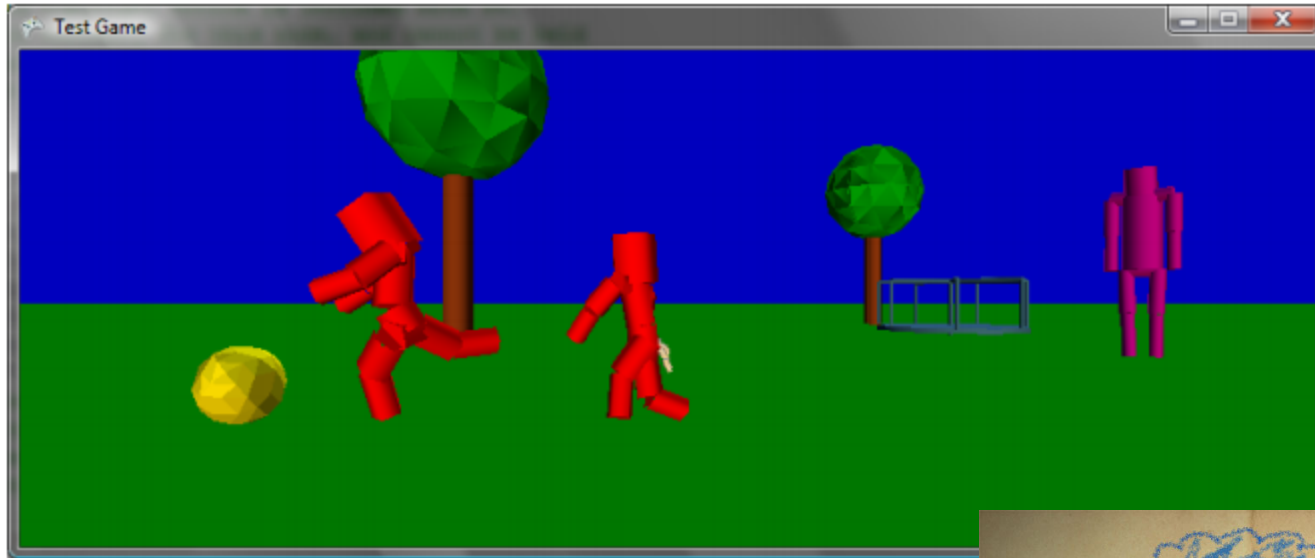
- Forward Kinematics

- Figure out where bone positions should be based on joint angles

- Inverse Kinematics

- Figure out what joint angles should be based on bone position

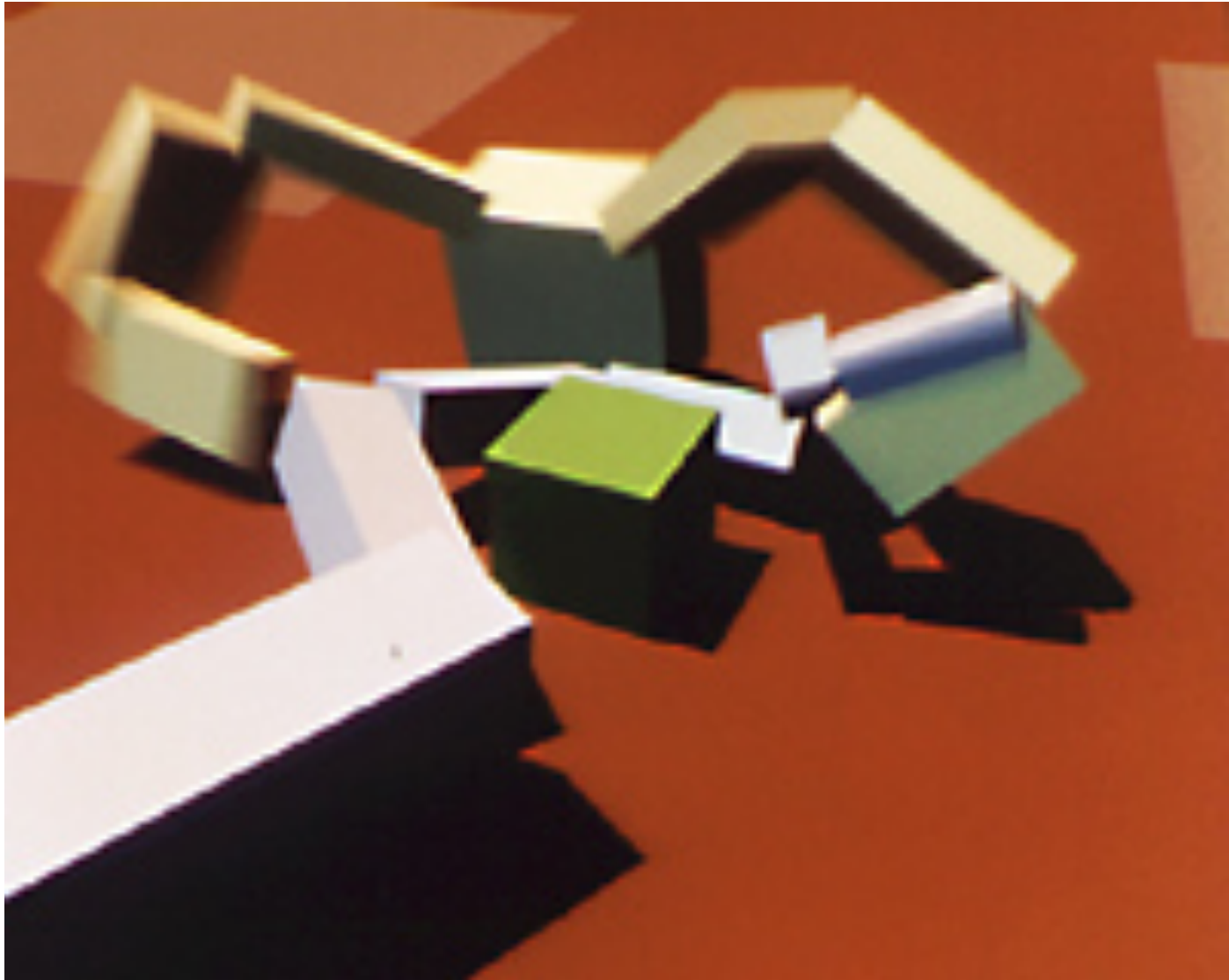
Physics Simulation



Motion Capture



Procedural Animation: Evolving Creatures



brainstorming and feedback

FINAL PROJECT

Project Structure

- 2-3 person groups
 - Prefer not mixing grad/undergrad
- Proposal: March 22nd
- Checkpoints: In class April 2nd
- Presentations: In class April 9th, 11th, 16th
- Report and Video: April 19th

Suggested Topics

- Extension to Raytracer
 - More complex geometry
 - Experiment with different camera types
 - Texturing and/or bump mapping
- Interactive Applications
 - Make a game
 - 3D Data Visualization
 - Interactive Art

Writing Requirements

- Project proposal: 3-5 pages
 - What are you going to do?
 - How are you going to do it?
 - Why is it interesting? What is the problem you are trying to solve?
 - What are some related projects?
- Project report: 6-8 pages ACM format
 - What did you do?
 - How was it related to what other people have done?
 - What were the results?

Project Brainstorming Activity

- Assignments form a “sampler” of 3D graphics
 - Raytracing
 - Interactive 3D
 - Shaders
- What do you find interesting?
- What do you wish your assignment could do that it can't?
- What do you wish you knew more about?