# Intro to Computer Graphics

CSE 457

# Today

- Logistics
- Motivation, topics, projects
- Displays and framebuffers

# Logistics

- Instructor:
  - Prof. Ira Kemelmacher-Shlizerman
- TAs:
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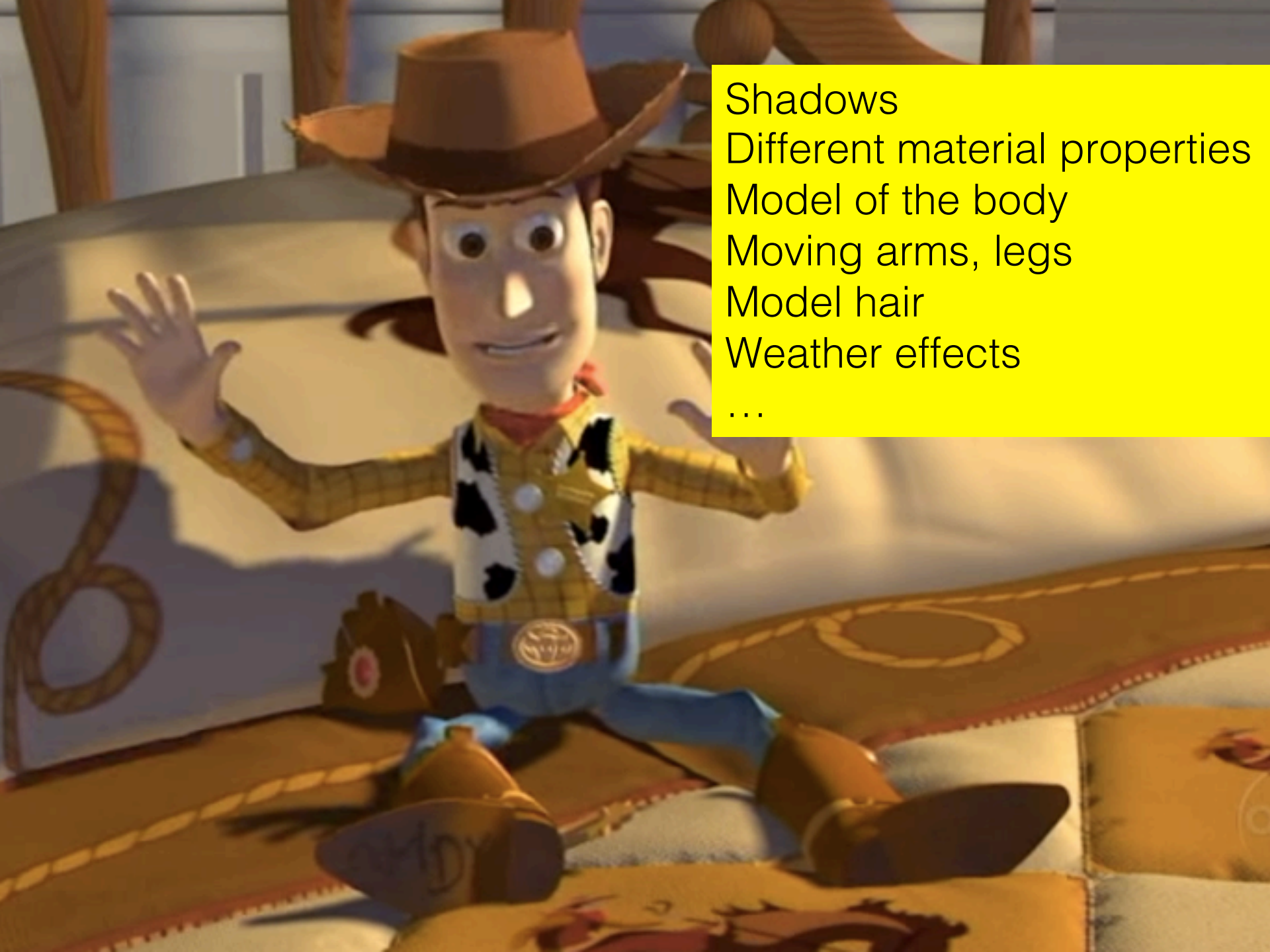
  - Francis Ge
  - Menghong Chhay
- Webpage:
  - http://courses.cs.washington.edu/courses/cse457/15au/

# Why graphics?


PIXAR
ANIMATION STUDIOS
TOY STORY

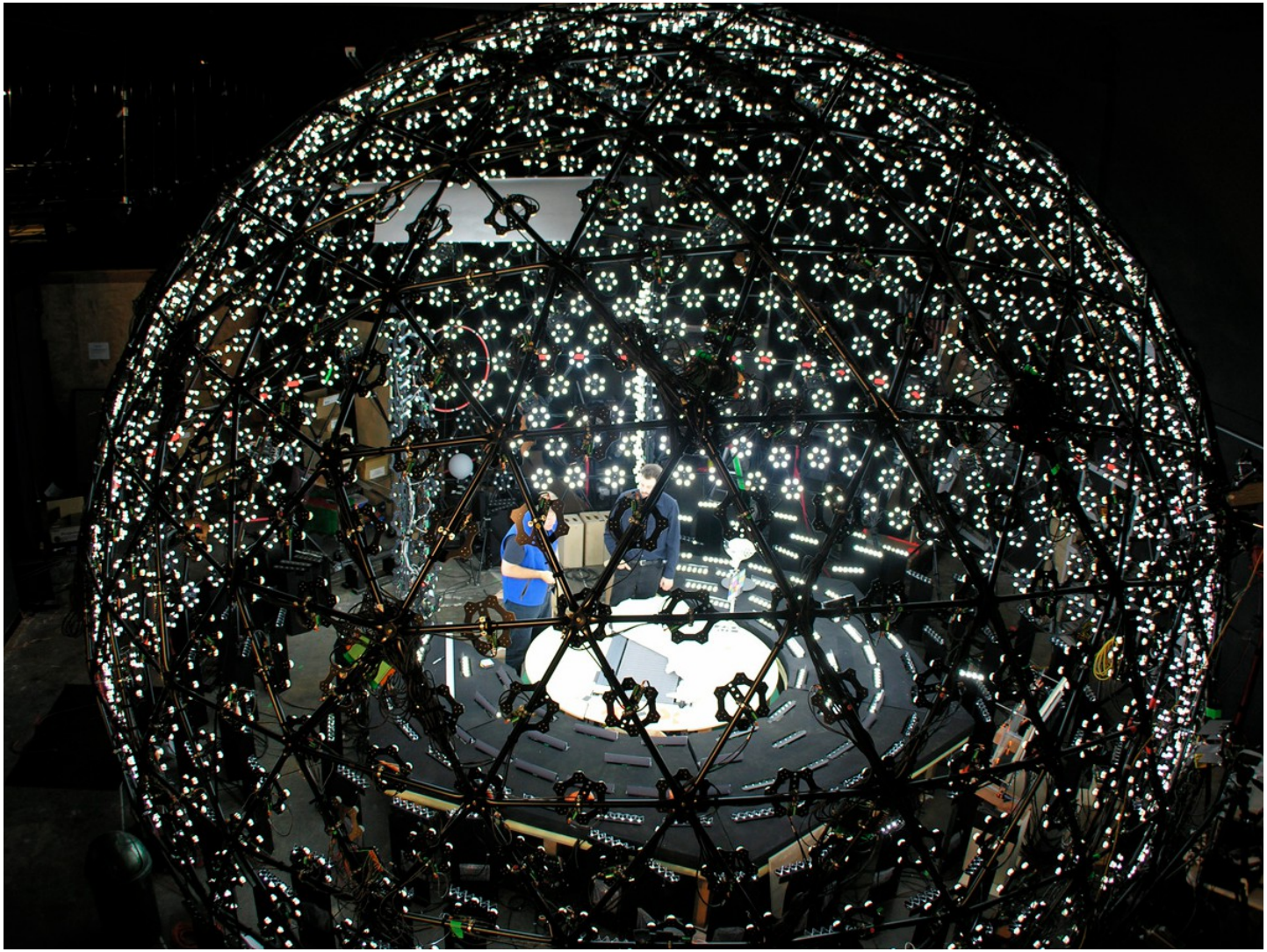

Shadows
Different material properties
Model of the body
Moving arms, legs
Model hair
Weather effects
…

# Facial animation in movies

The Story of Benjamin Button

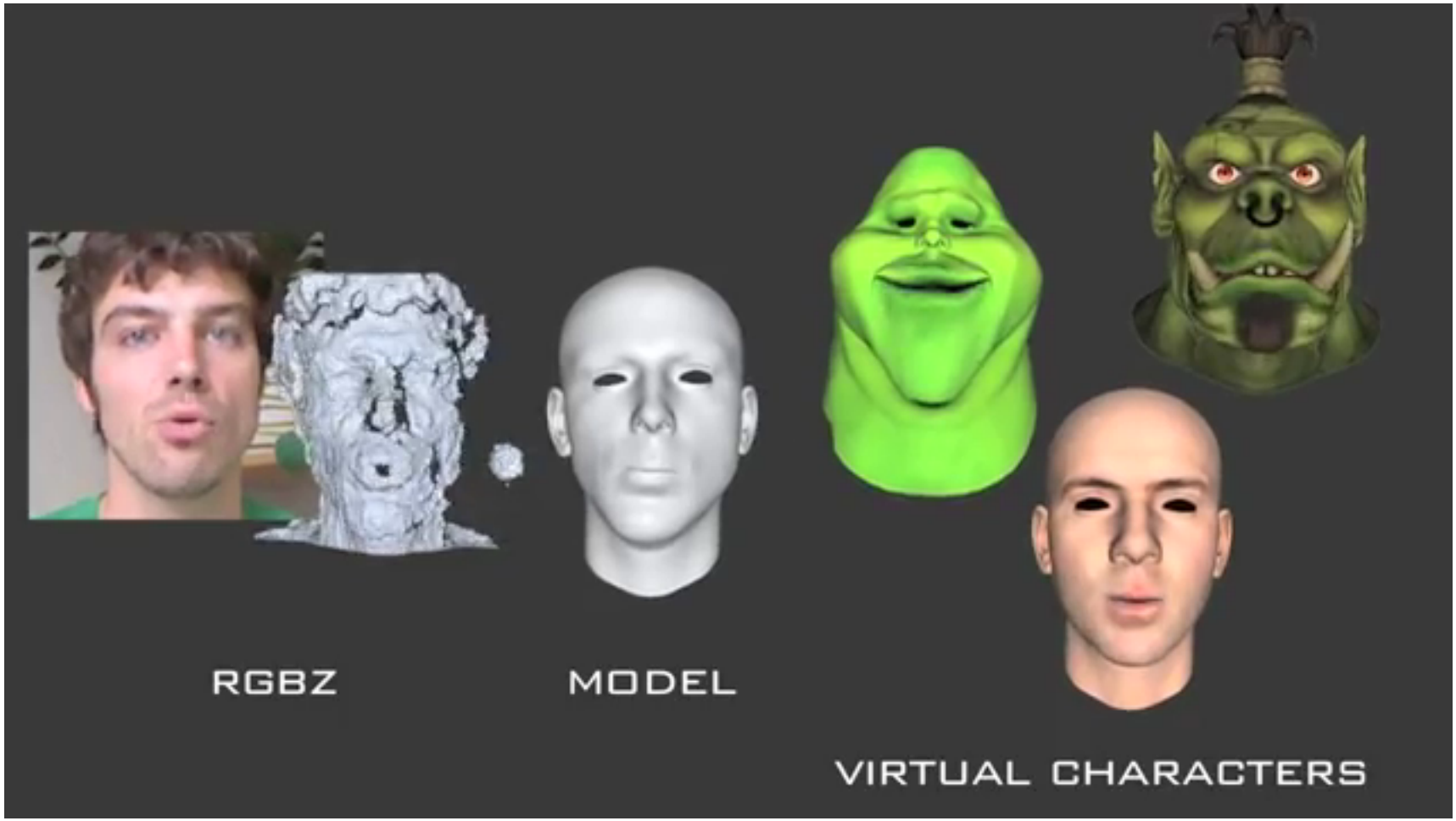
# Digital Ira

# Capturing facial shapes with Light Stage



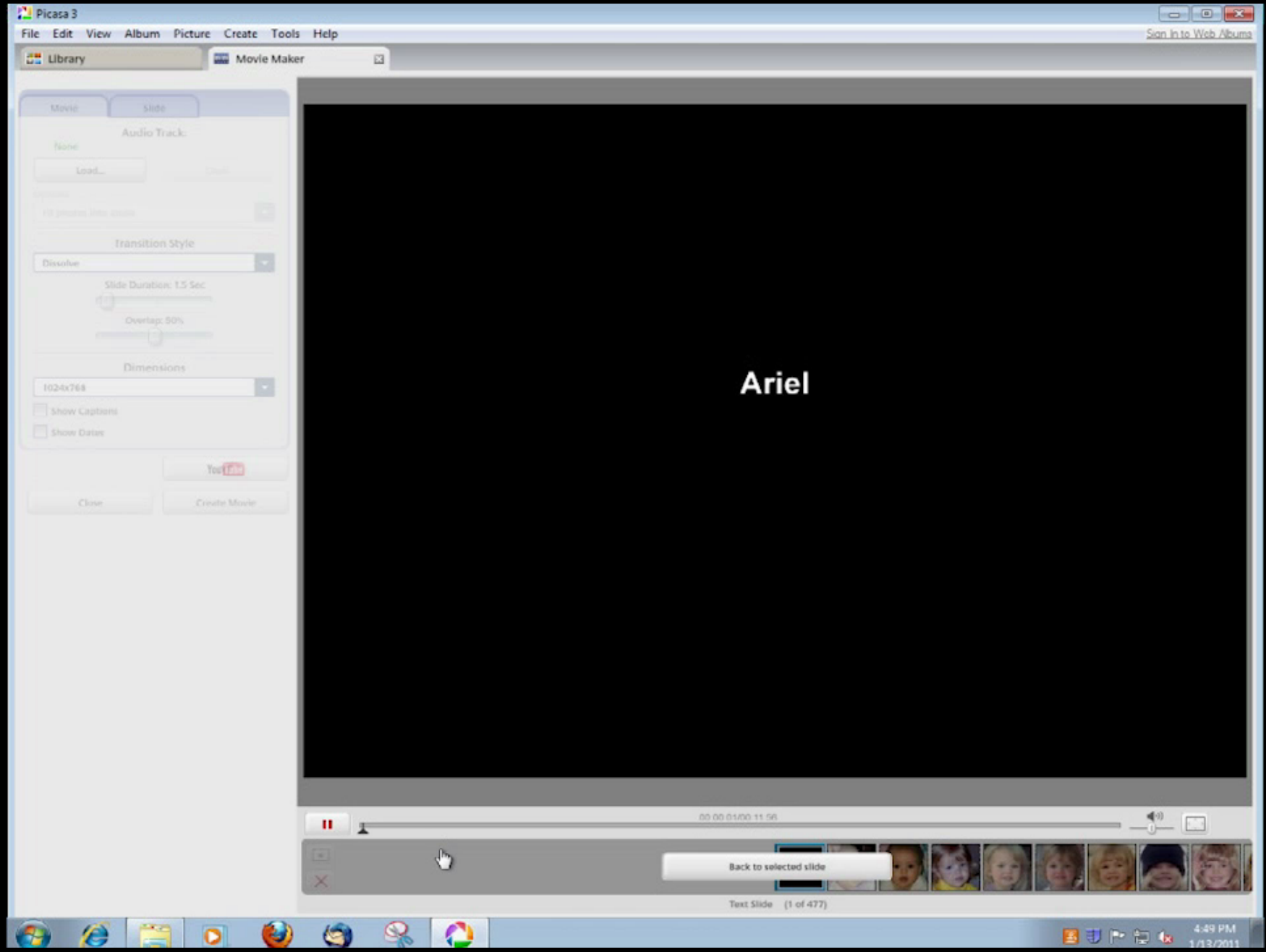
USC

# RGBD (kinect) → animation



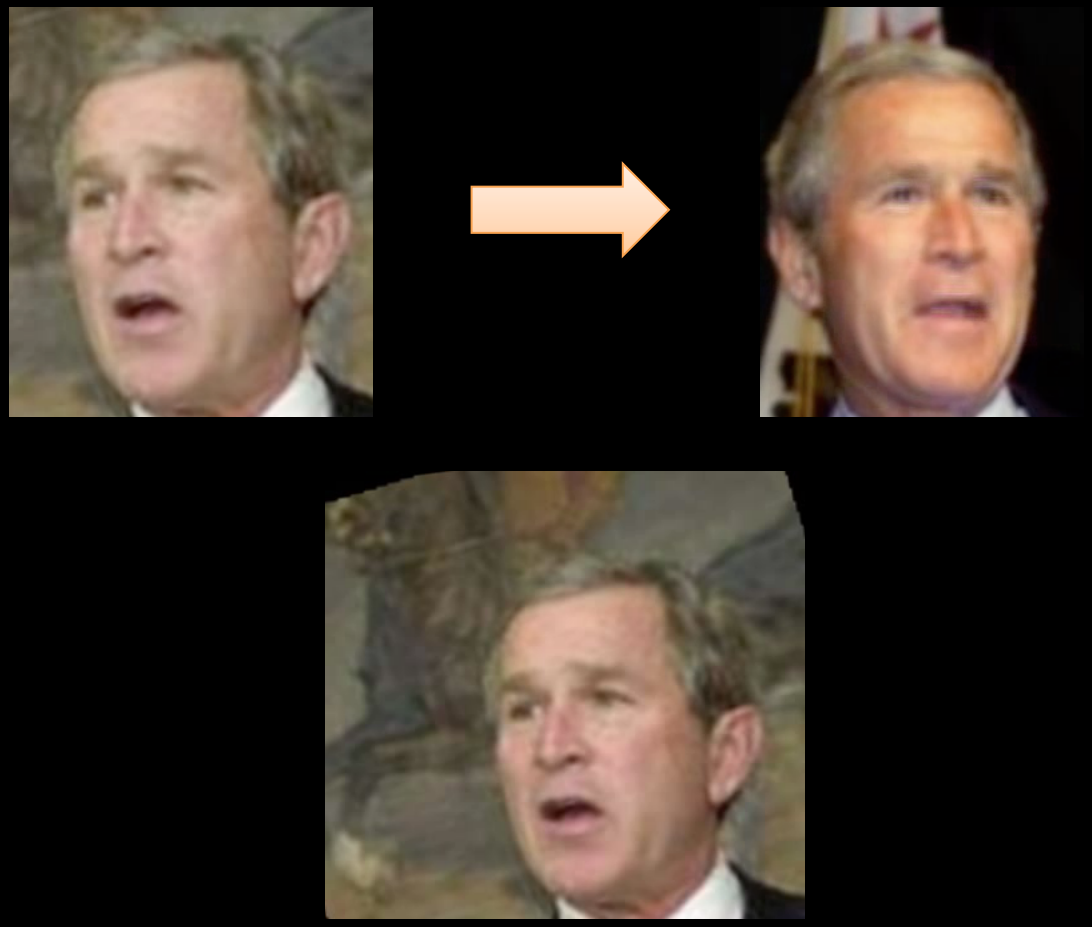

FaceShift

Magic Leap



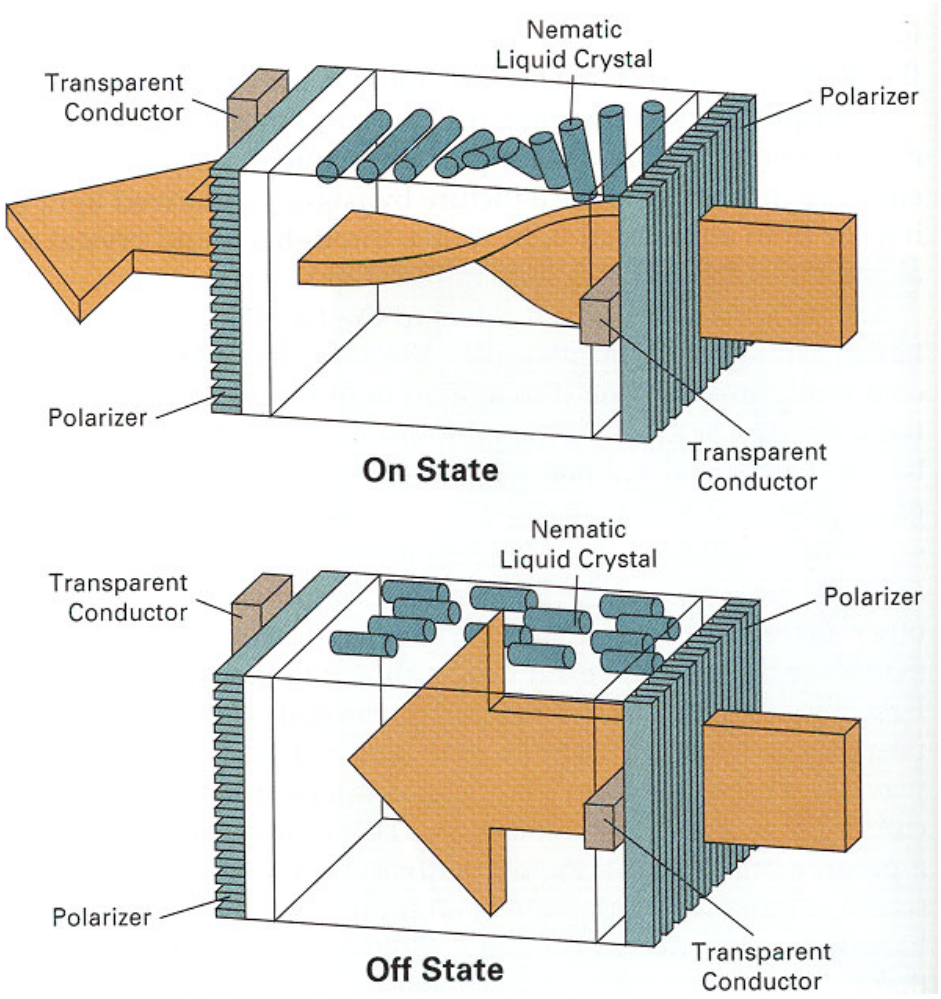

Part of Google's Picasa

# Animation from Internet photos



# Topics of our class

# Displays


Nematic
Liquid Crystal
Transparent
Conductor
Polarizer
Polarizer
Transparent
Conductor
On State
Nematic
Liquid Crystal
Transparent
Conductor
Polarizer
Polarizer
Transparent
Conductor
Off State

# Image processing

Original

Smoothed

Sx + 128

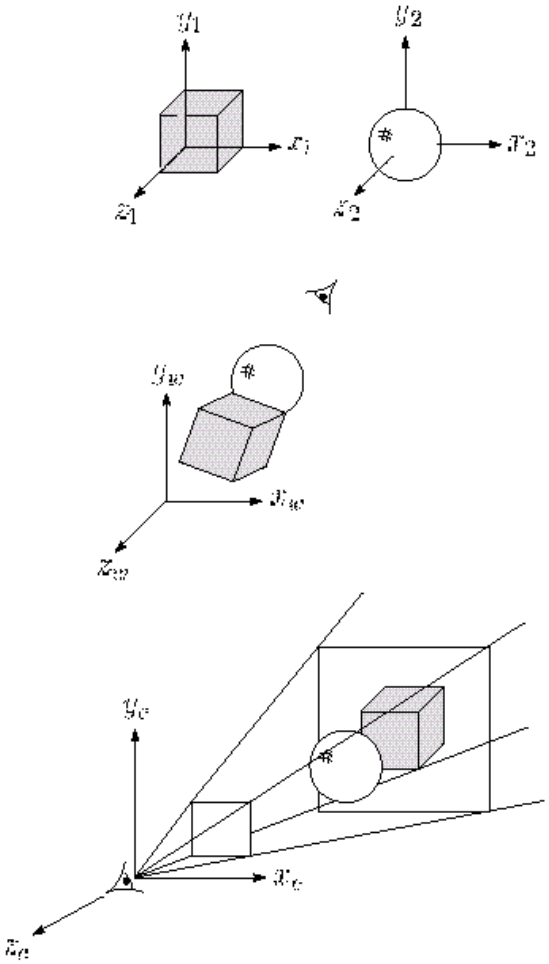
Sy + 128

Magnitude

Threshold = 64

Threshold = 128

# Geometric transformations



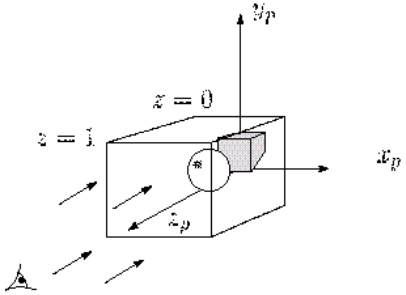
**Model space**
(Object space)

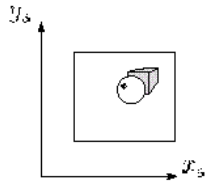
*scale, translate, rotate, ...*

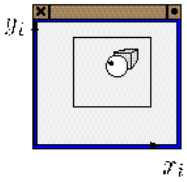
**World space**
(Object space)

*rotate, translate*

**Eye space**
(View space)







*Projective transformation, scale, translate*

**Normalized projection space**

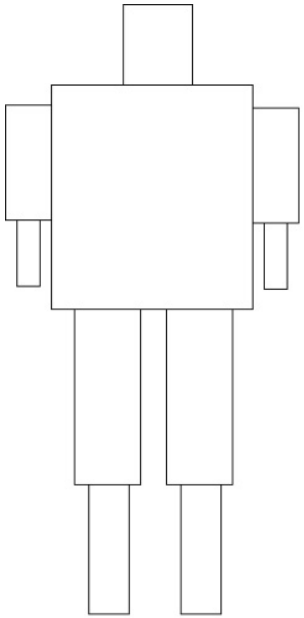
*Project, scale, translate*

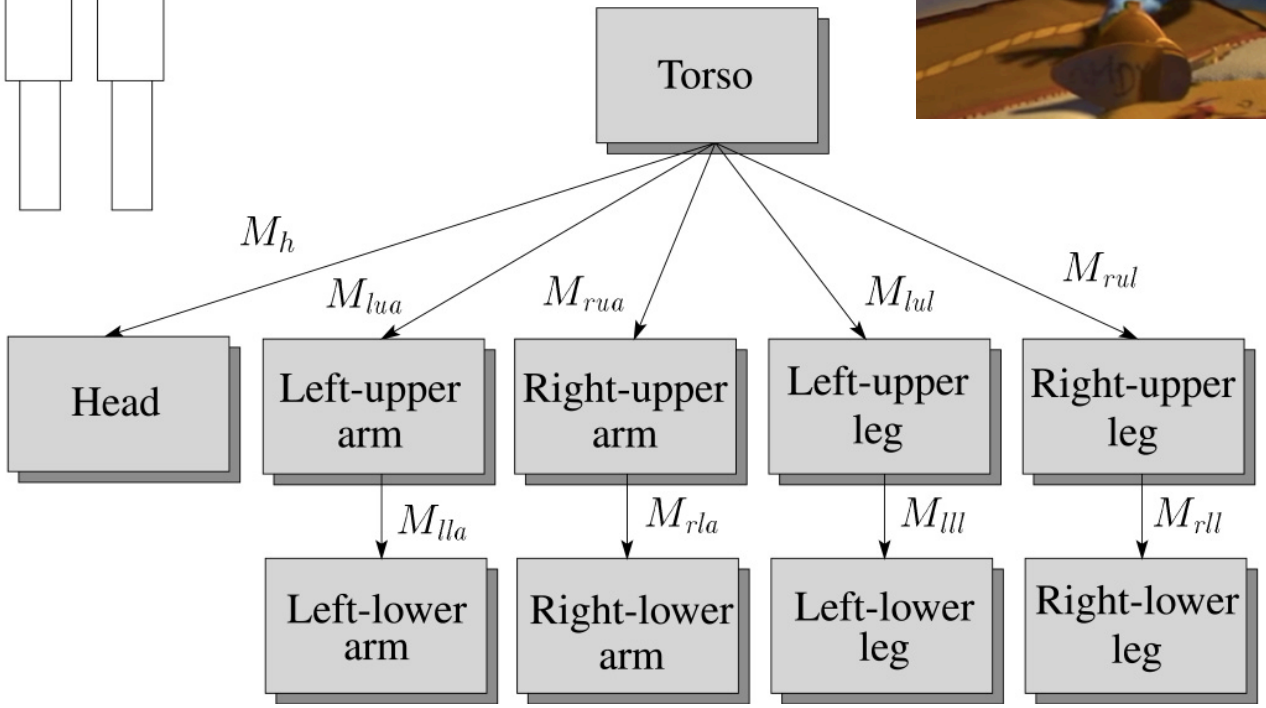
**Normalized device space**
(Screen space)

*scale*

**Image space**
(Window space)
(Raster space)
(Screen space)
(Device space)

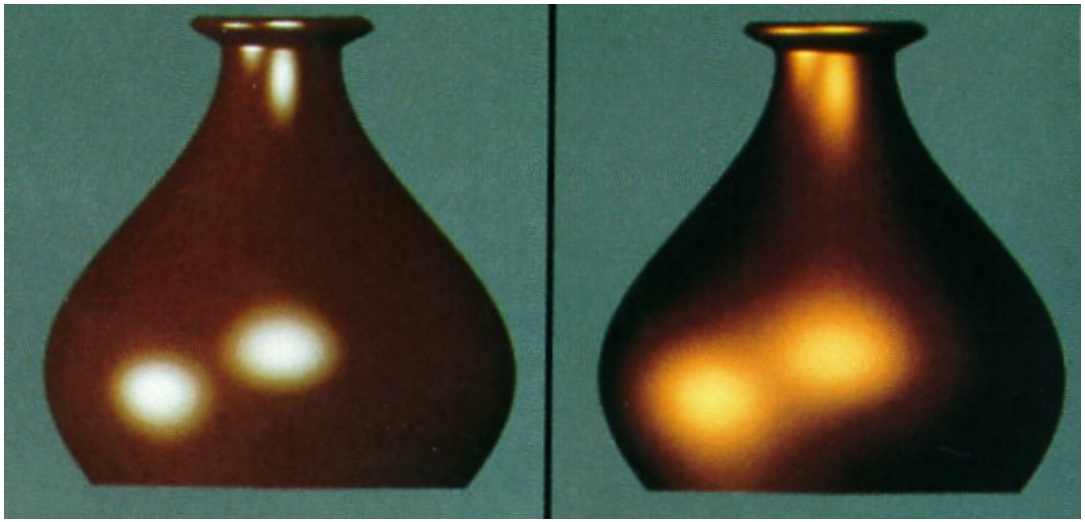
# Hierarchical modeling



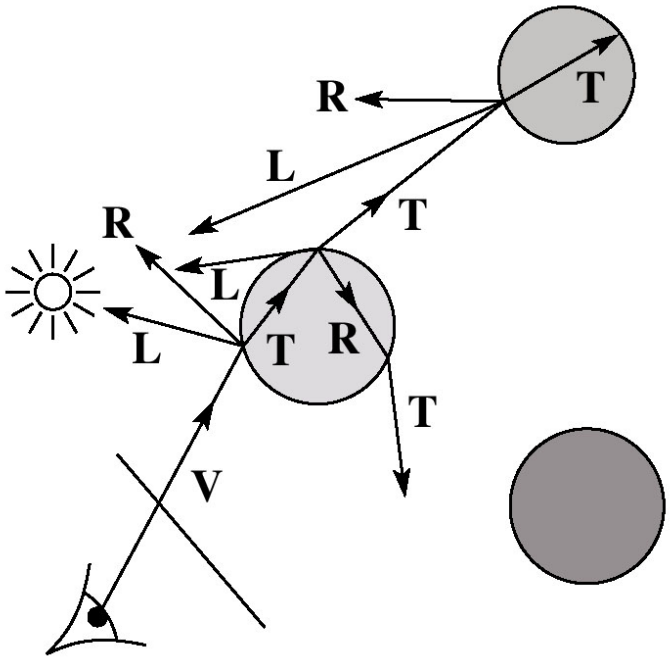


# Shading

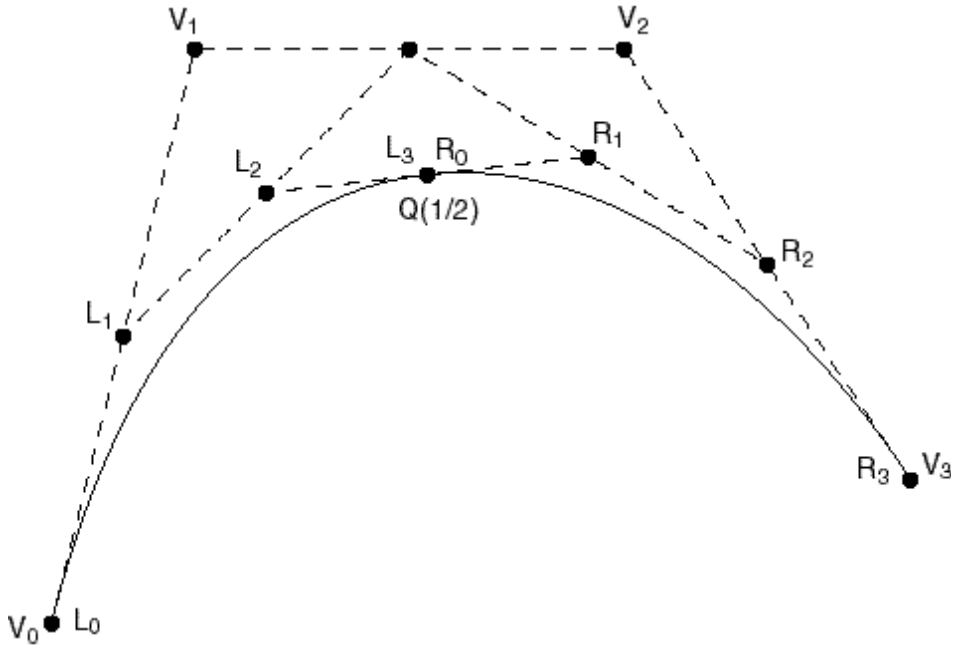
Plastic Metal



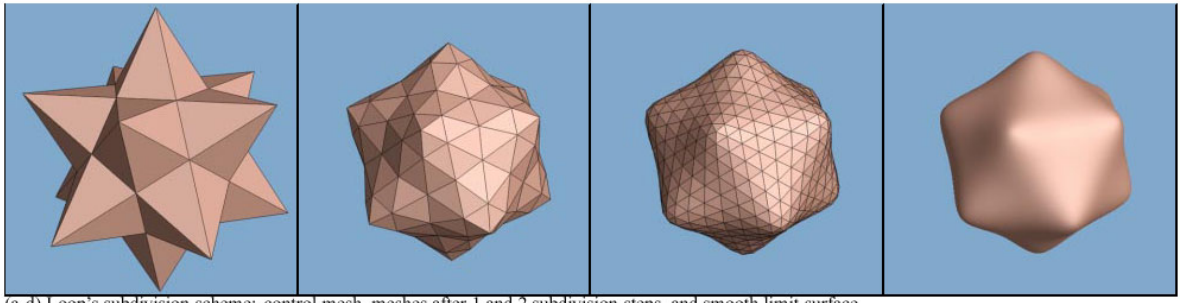
# Ray tracing



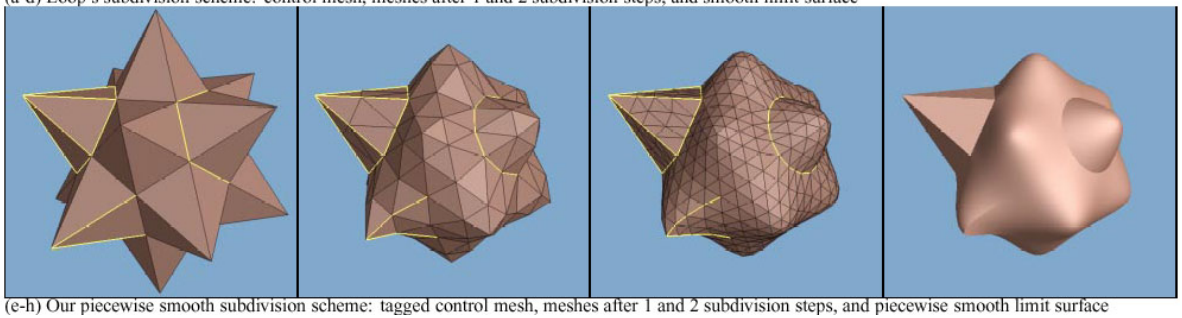

# Curves



# Surfaces

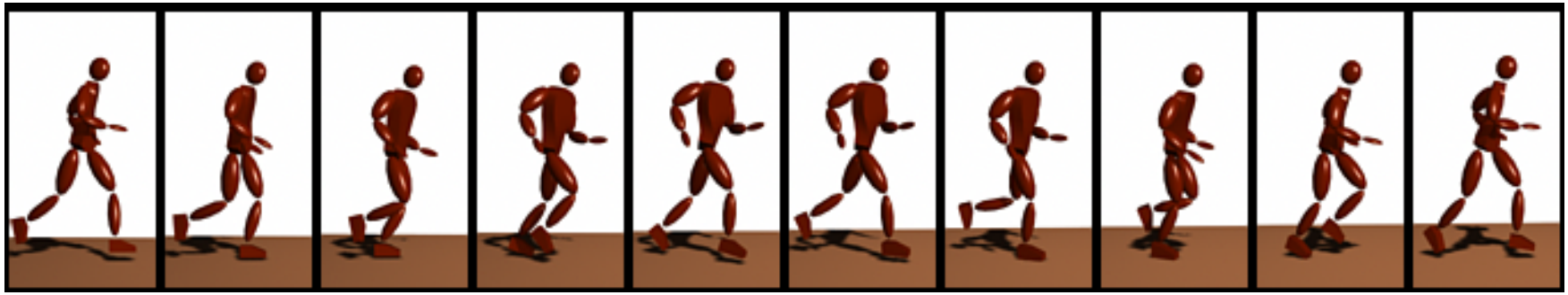


(a-d) Loop's subdivision scheme: control mesh, meshes after 1 and 2 subdivision steps, and smooth limit surface



(e-h) Our piecewise smooth subdivision scheme: tagged control mesh, meshes after 1 and 2 subdivision steps, and piecewise smooth limit surface

# Animation

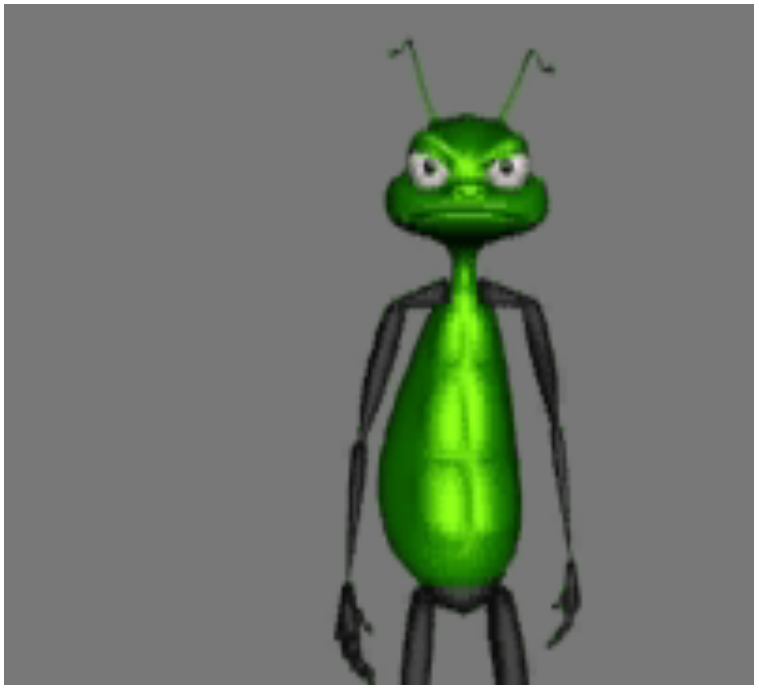


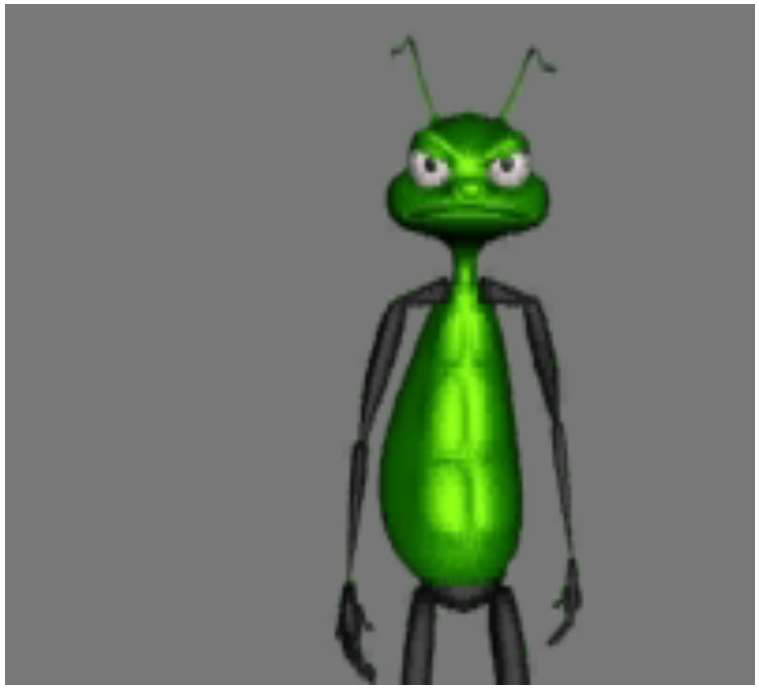
Keyframing and interpolation

# Particle systems

Physical simulation with particle systems

# Principles of Character Animation





# Projects

- Show webpages
- Check out examples from previous year

http://courses.cs.washington.edu/courses/cse457/15wi/projects/animator/artifacts/