Intro to Computer Graphics

CSE 457

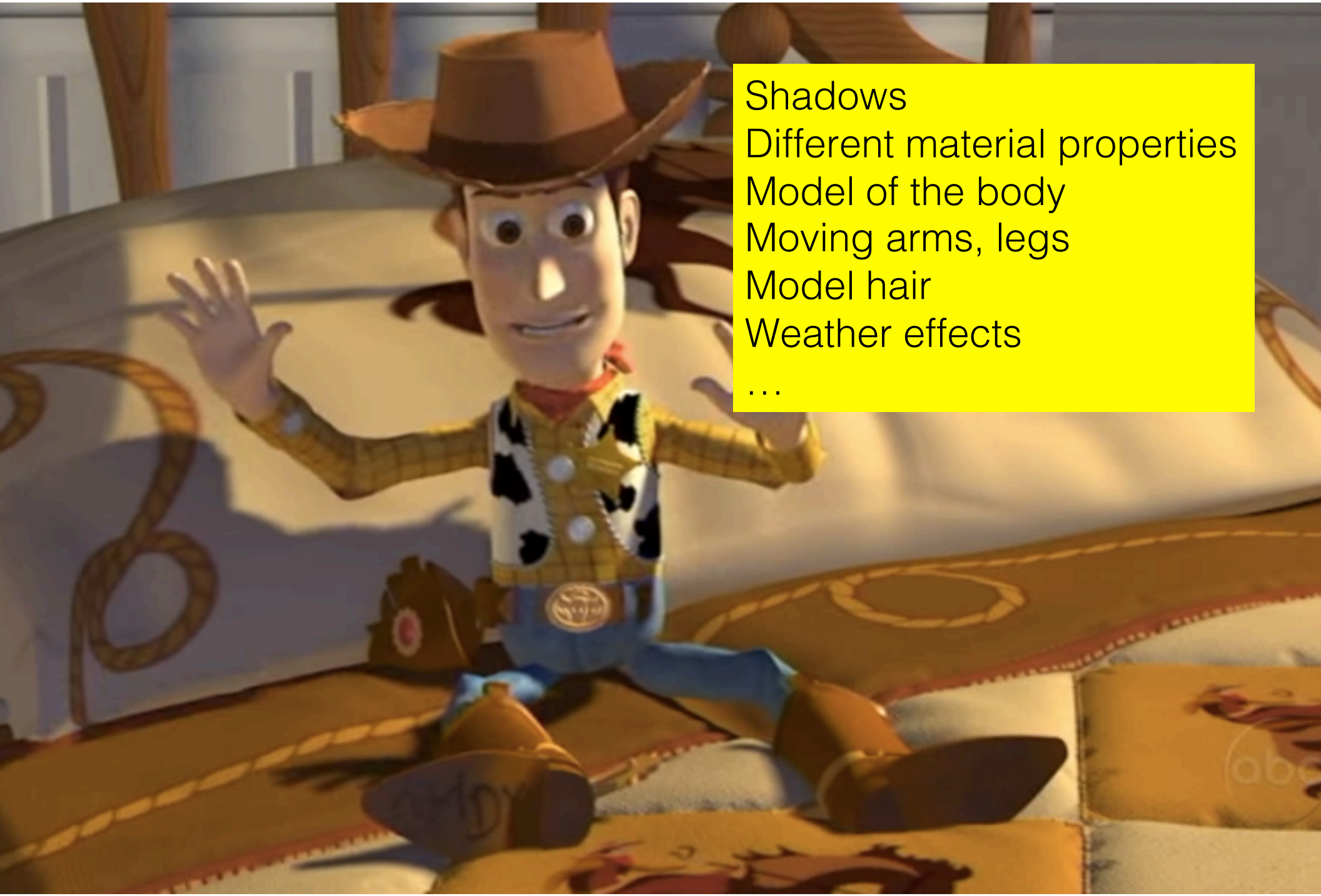
Winter 2015

Today

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

Logistics

- Instructor:
  - Prof. Ira Kemelmacher-Shlizerman
- TAs:
  - Alon Milchgrub
  - Bobby Gebert
  - Xiangguang Zheng (Sherwood)
- Webpage:
  - http://courses.cs.washington.edu/courses/cse457/15wi/

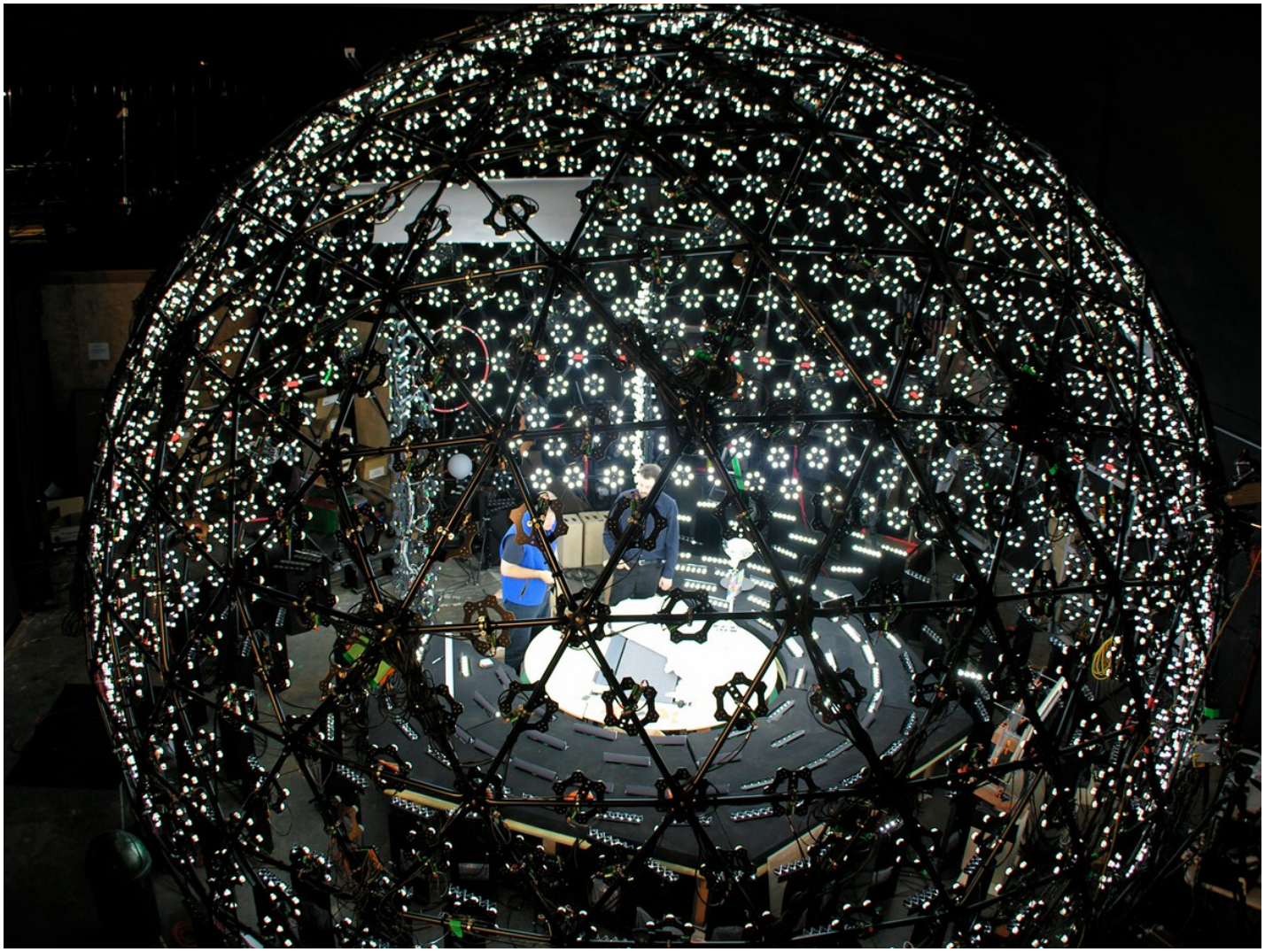

Shadows
Different material properties
Model of the body
Moving arms, legs
Model hair
Weather effects
…

Facial animation in movies

The Story of Benjamin Button

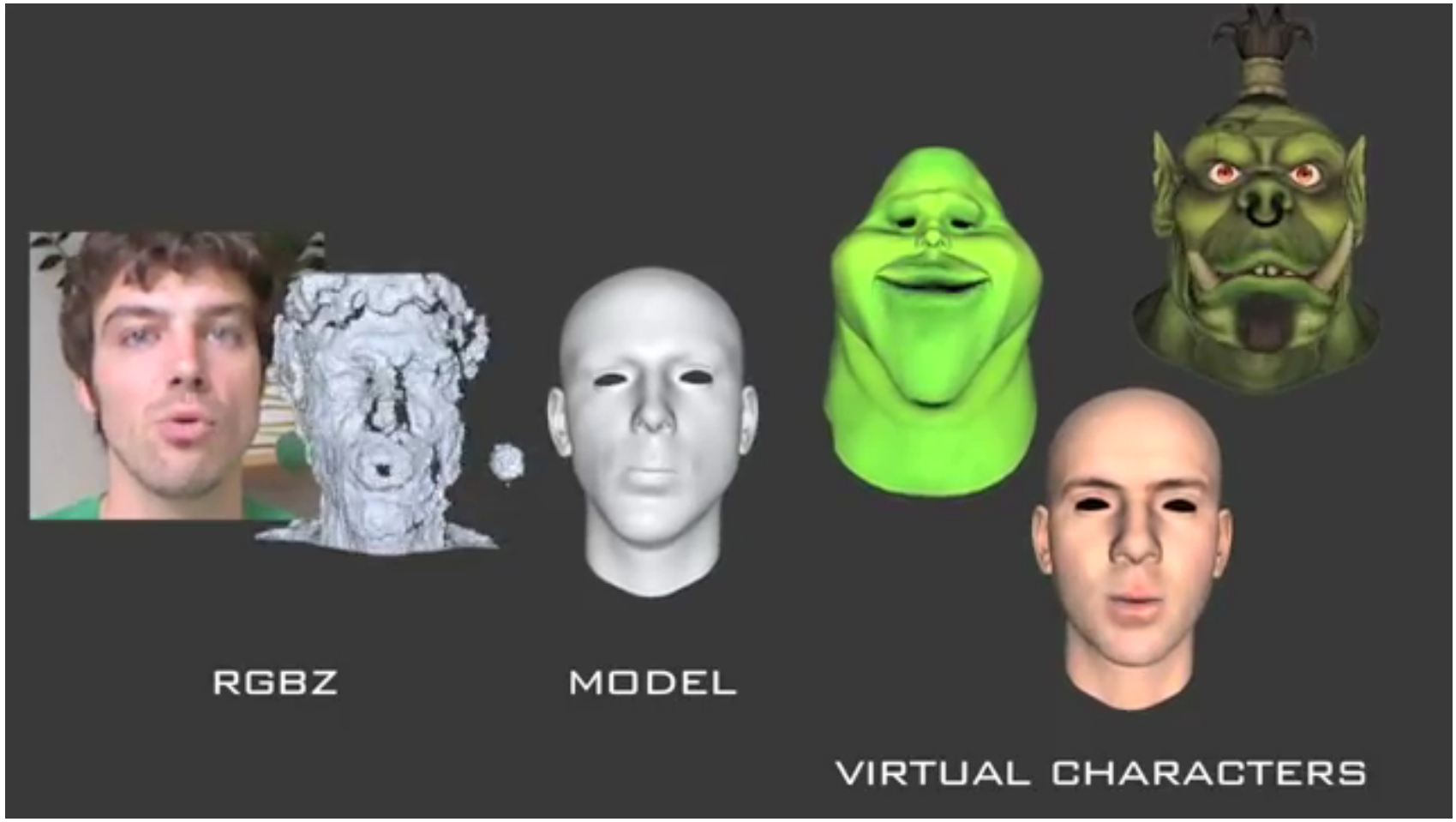
Digital Ira

Capturing facial shapes with Light Stage



USC

RGBD (kinect) → animation



FaceShift

RGBD → body pose estimation and games

Microsoft XBox

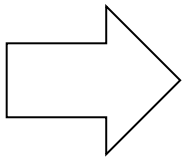
Virtual and Augmented Reality

- Oculus VR
- Magic Leap AR

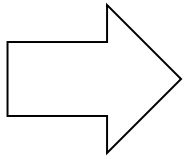
Magic Leap

A bit about me and my group

Big Visual Data:



Computer Vision



Computer Graphics

Photos
Videos
Depth data
…

3D reconstruction
Recognition
Search

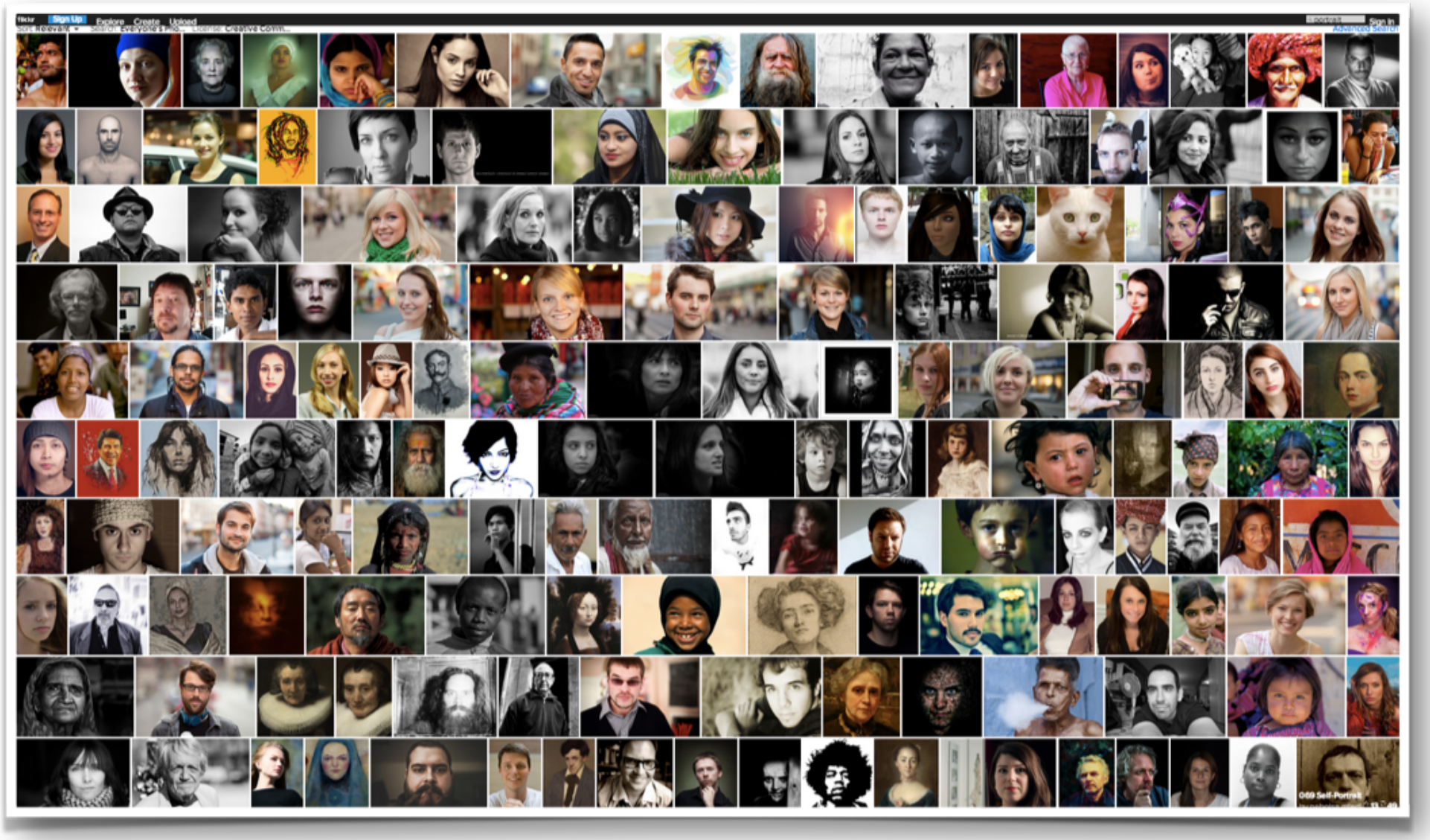
CSE 455

Synthesis
Animation
Visualizations

This class

Focus on People

Trillions of photos of people



Modeling people all over the world

Organizing massive photo collections via face modeling

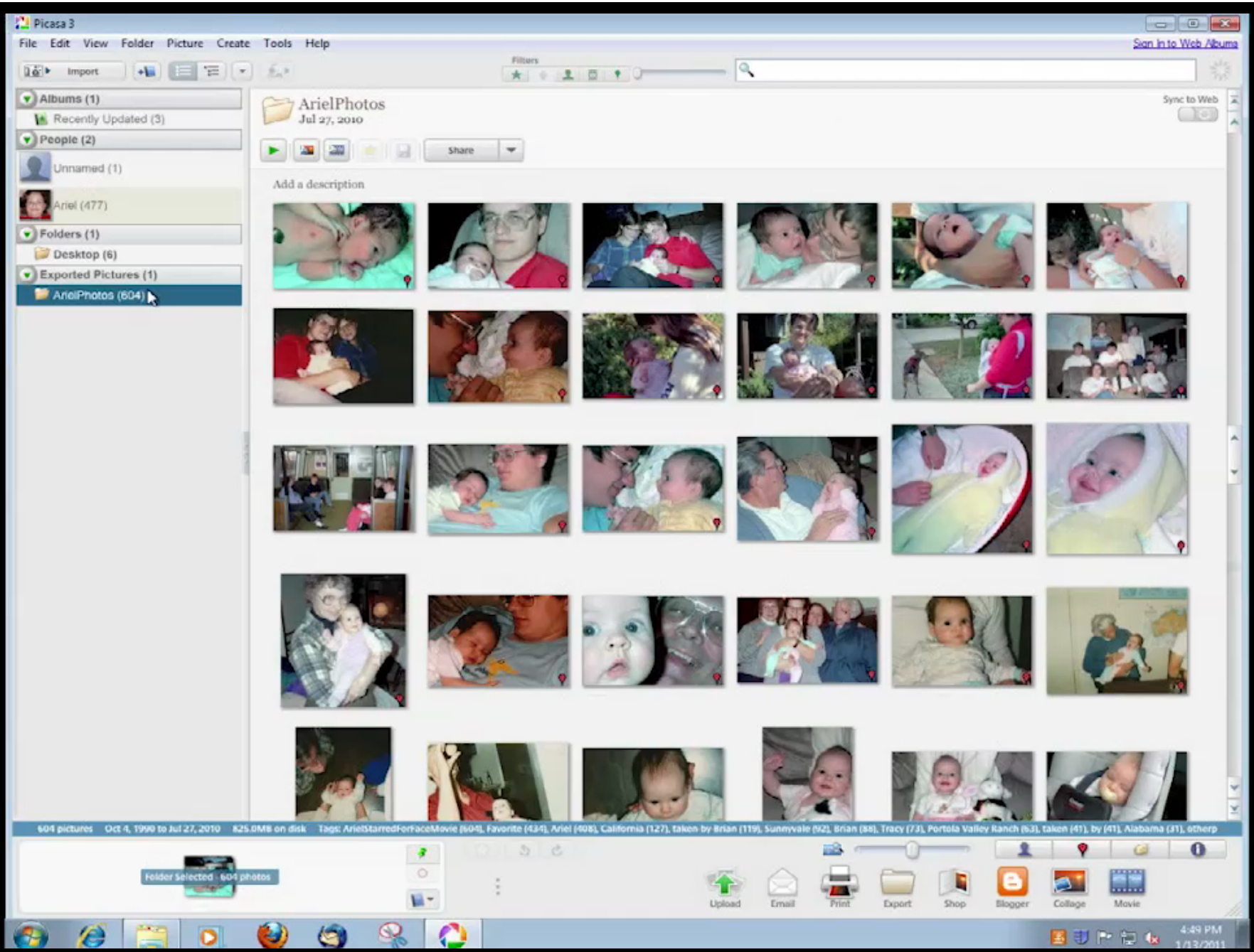
Recognition, Search, Visualizing …

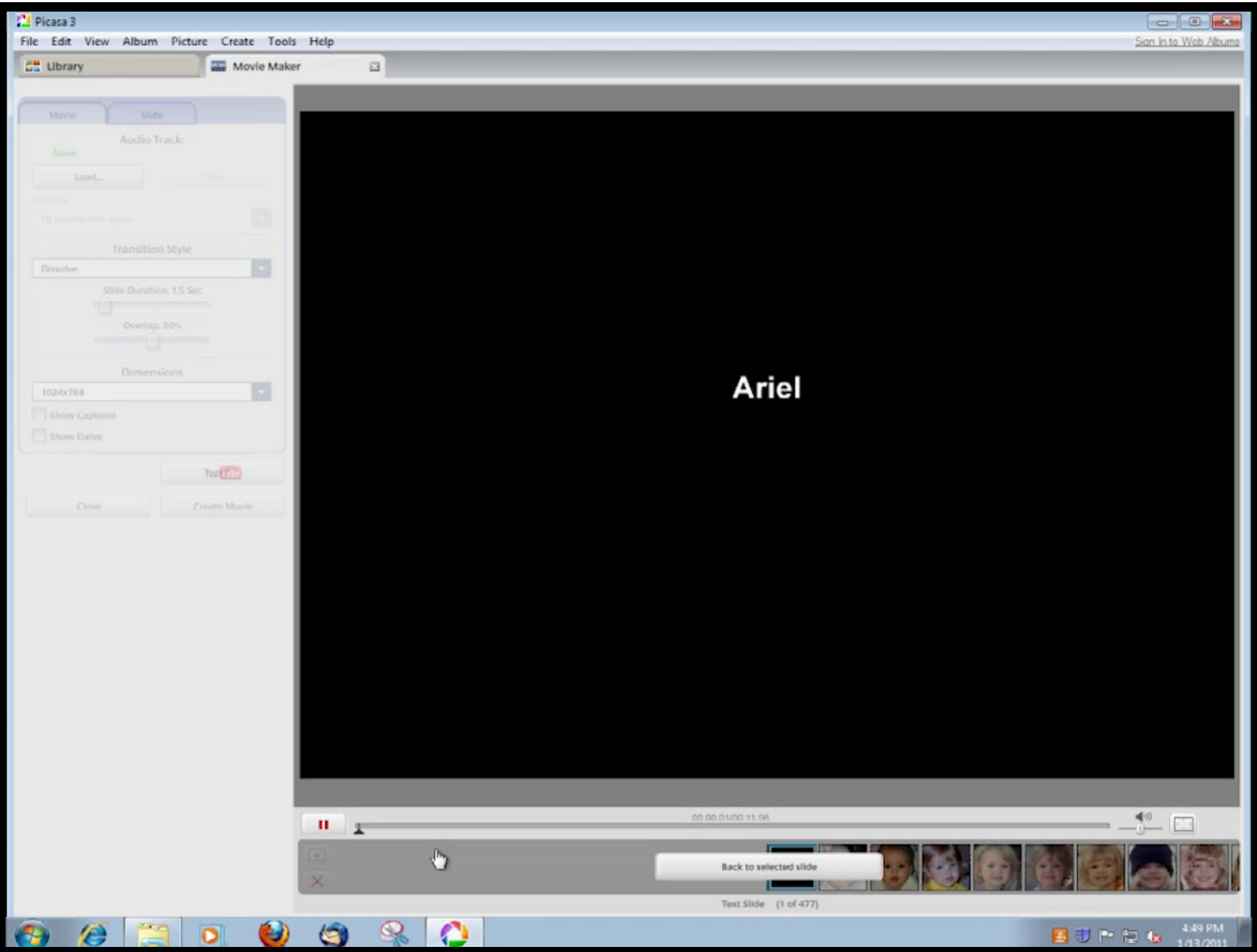
Examples of our works

- Moving Portraits

  Kemelmacher, Shechtman, Garg, Seitz, CACM Research Highlights Sep 2014

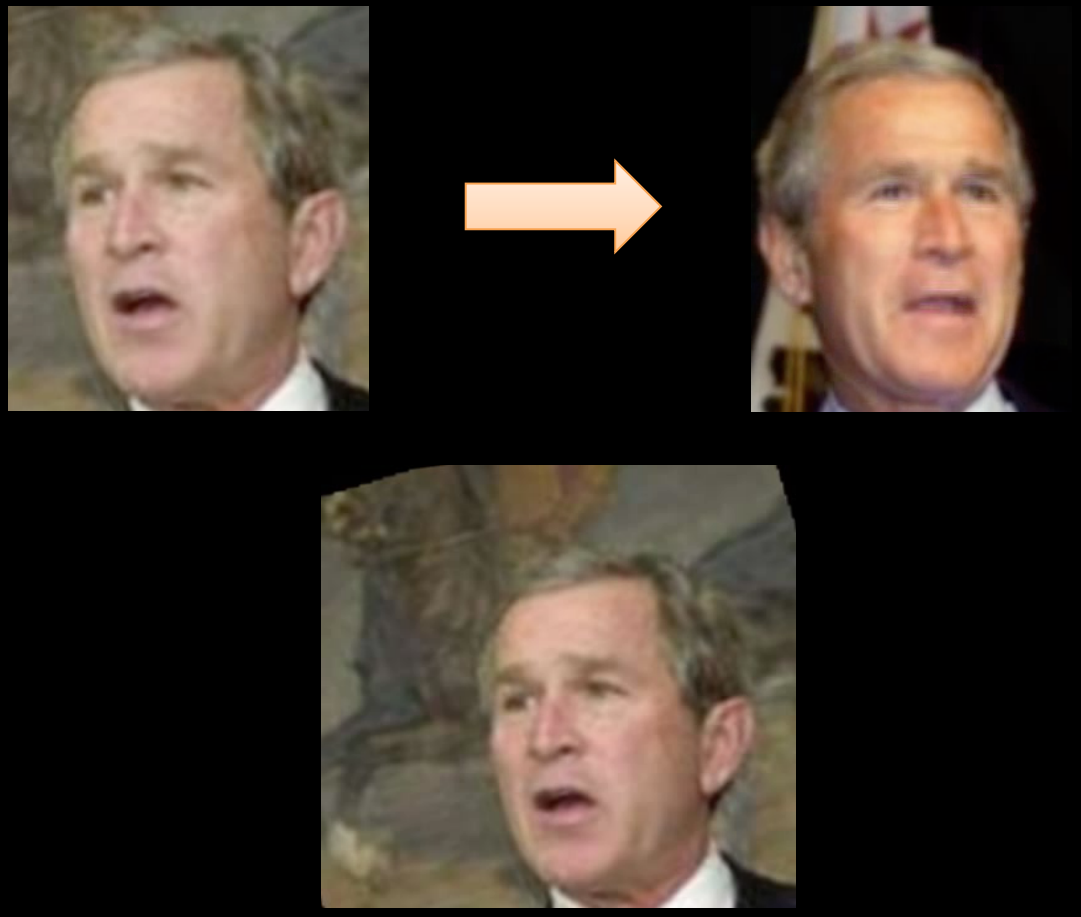
© Photos: Ariel McClendon


Picasa 3
File Edit View Folder Picture Create Tools Help
Sign In to Web Albums
Import
Filters
Albums (1)
Recently Updated (3)
People (2)
Unnamed (1)
Ariel (477)
Folders (1)
Desktop (6)
Exported Pictures (1)
ArielPhotos (604)
ArielPhotos
Jul 27, 2010
Sync to Web
share
Add a description
604 pictures Oct 4, 1999 to Jul 27, 2010 825.0MB on disk
Folder Selected - 604 photos
Upload
Email
Print
Export
Shop
Blogger
Collage
Movie
4:49 PM

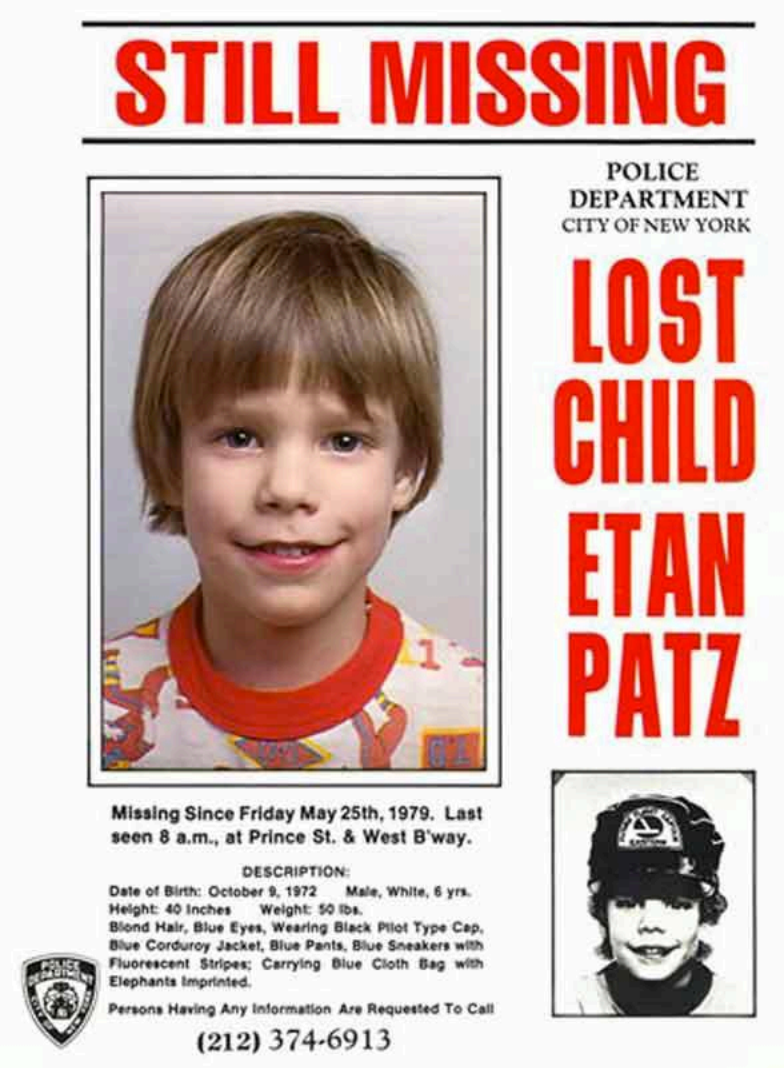


Part of Google's Picasa

Animation from Internet photos



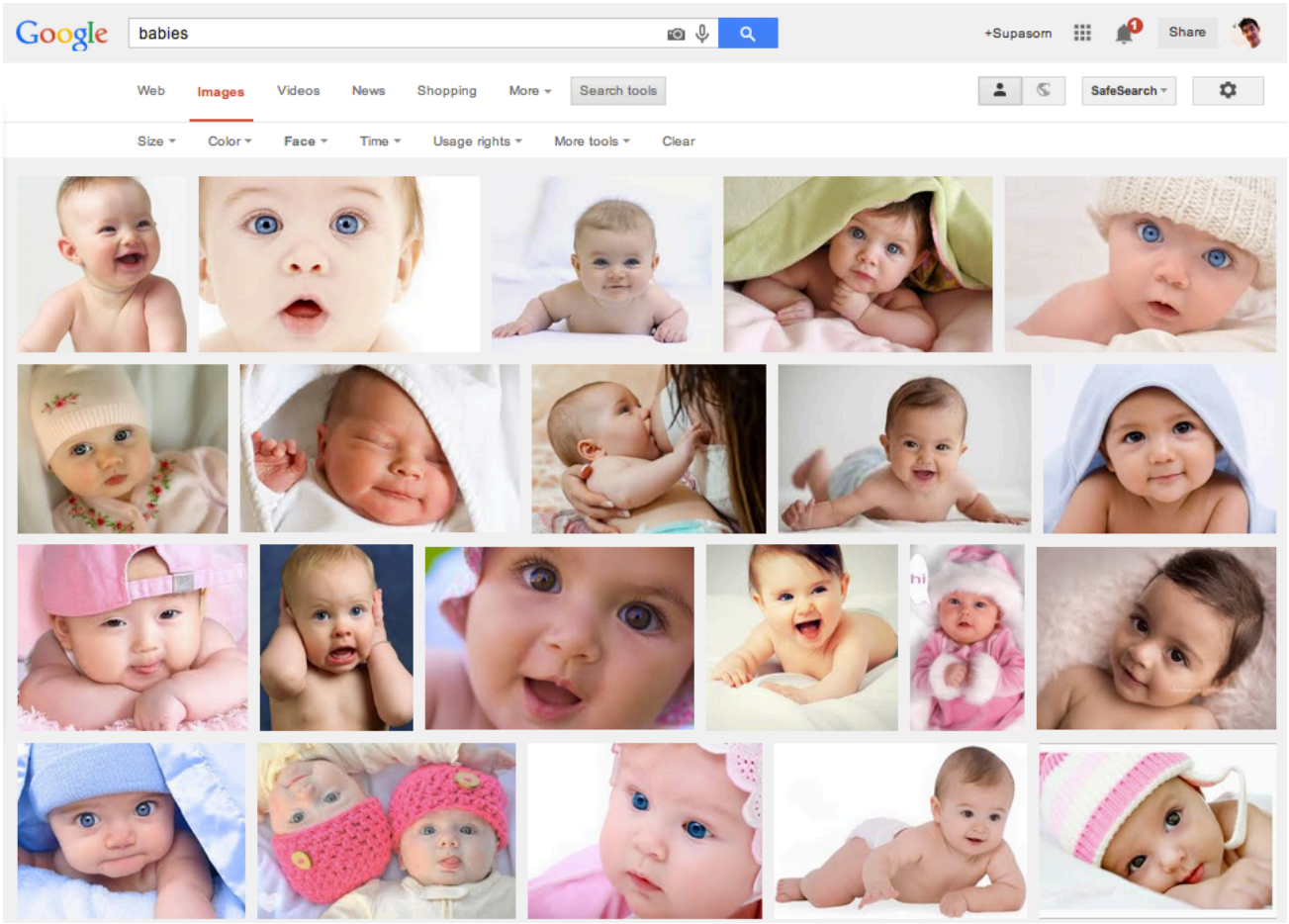
Synthesizing photos



How would he look like in age 20?

Age Progression in the Wild

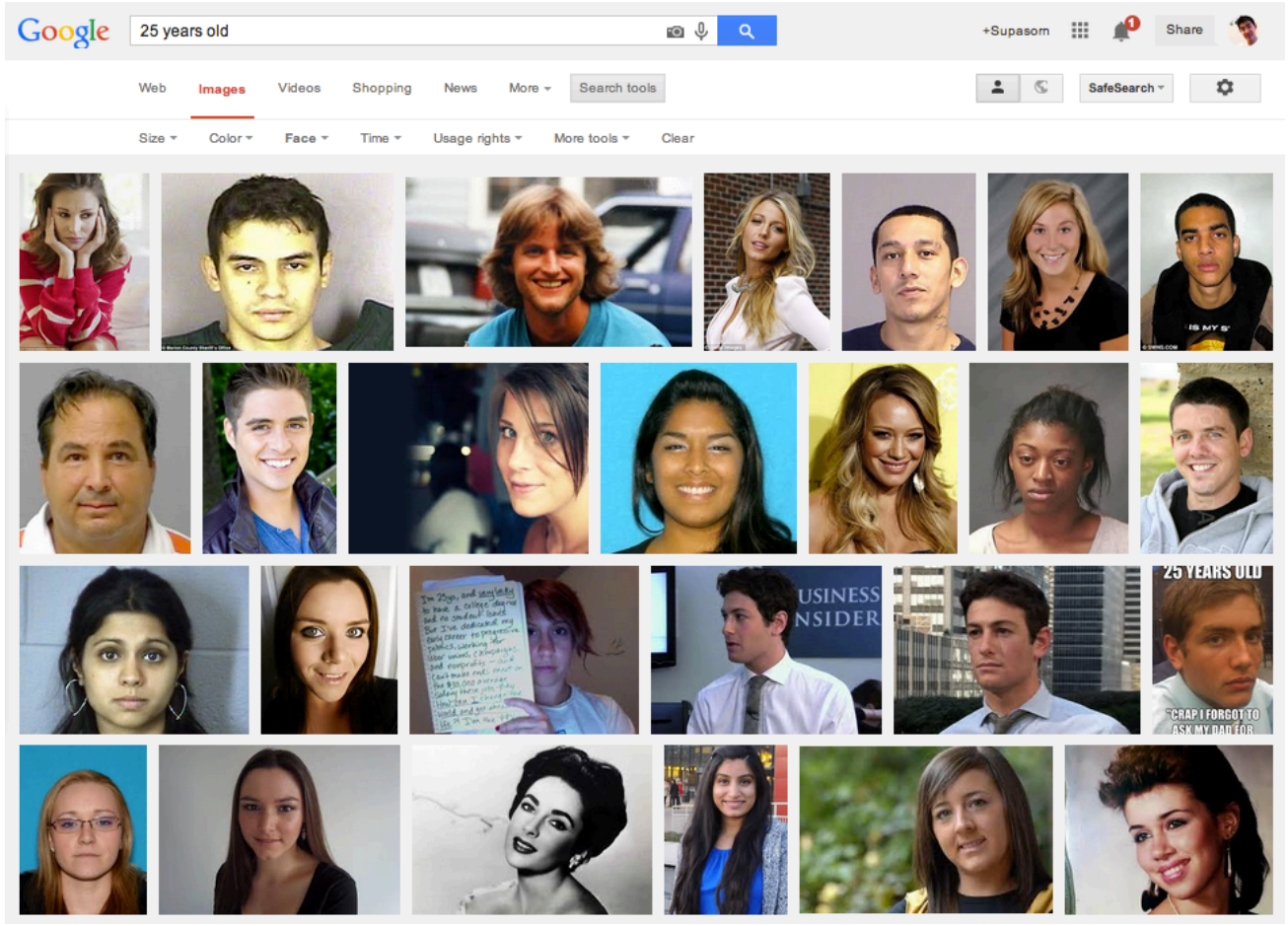
- Search for “babies”



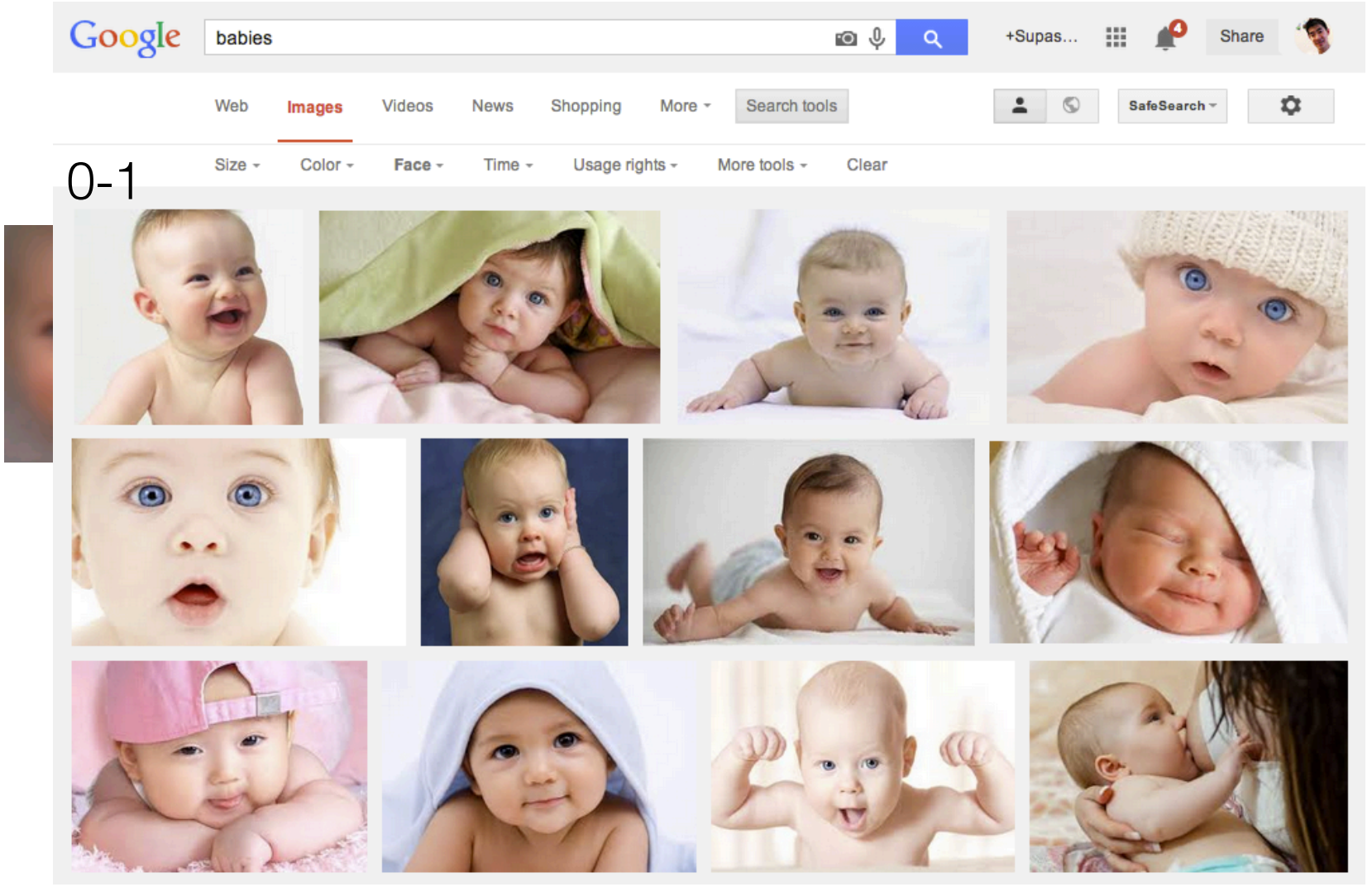
0-1 year-olds

Age Progression in the Wild

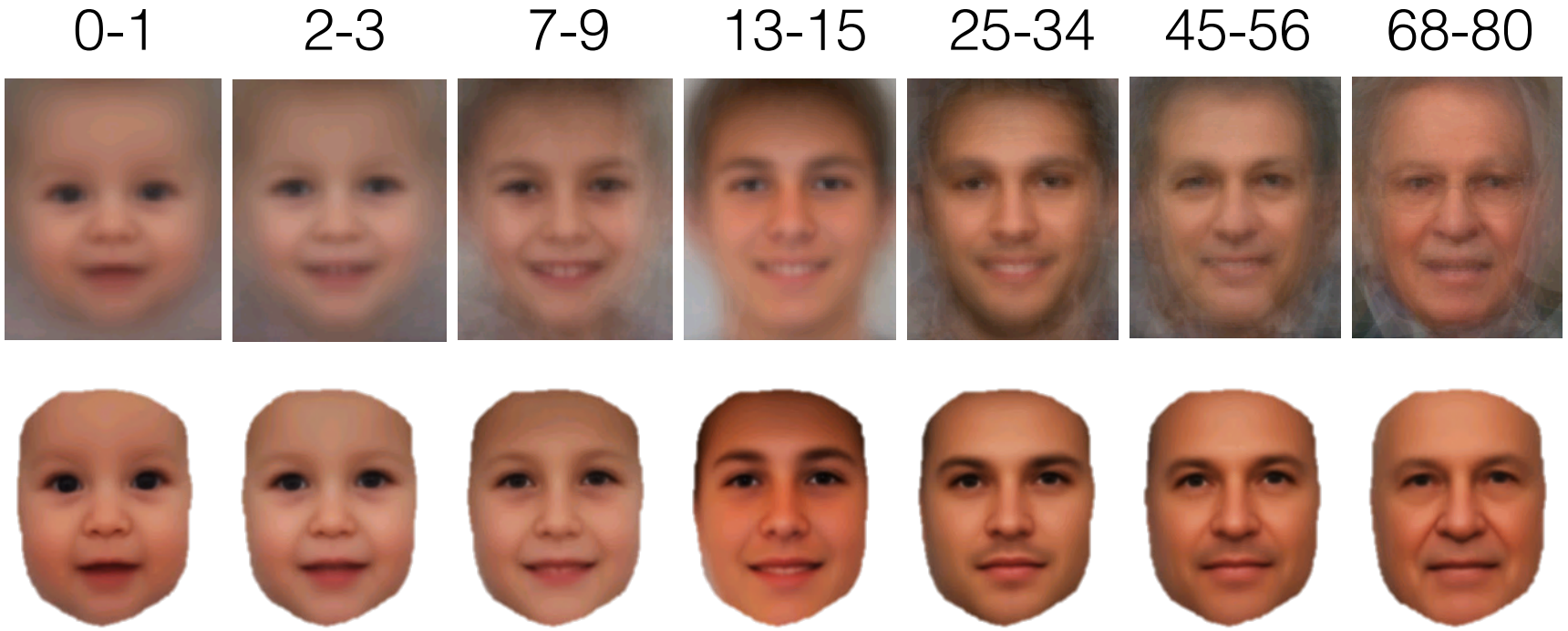
- Search for “25 years old”



25 year-olds


Google
babies
+Supas...
Share
Web
Images
Videos
News
Shopping
More
Search tools
SafeSearch
Size
Color
Face
Time
Usage rights
More tools
Clear

0-1


0-1
2-3
7-9
13-15
25-34
45-56
68-80

Input
3 years old

Output
80 years old

3 years old (single input)

5-7

14-16

26-35

46-57

58-68

81-100

Input
3 years old

Output
58 years old

Input
4 years old

Output
69 years old

The Seattle Times
Winner of Nine Pulitzer Prizes

Originally published May 8, 2014 at 9:21 PM | Page modified May 9, 2014 at 6:55 AM

What will you look like when you grow old? UW has software to show you

Share:
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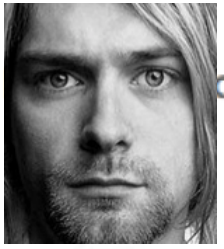
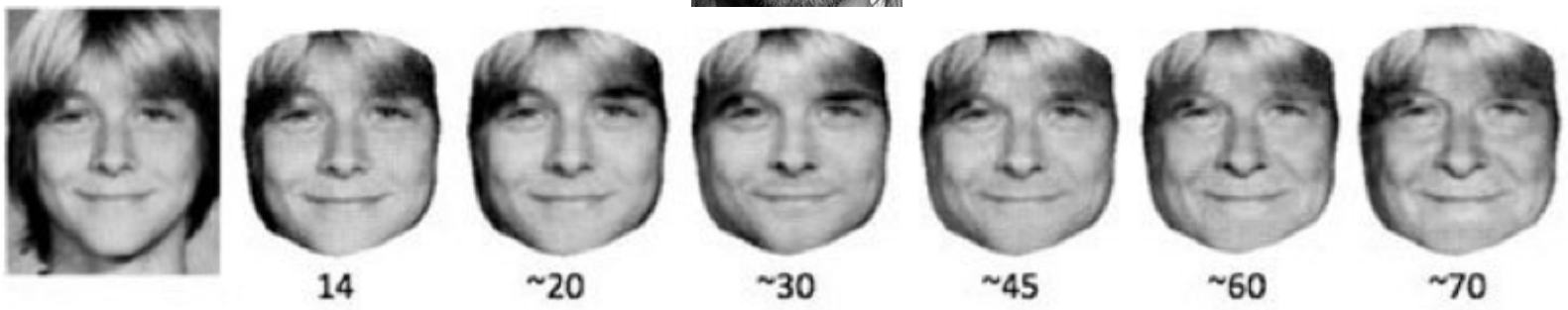
E-mail article
Print

At the UW, sophisticated software ages  conds and lets you see them at age 60. It's remarkably



EMP MUSEUM, UNIVERSITY OF WASHINGTON COMPUTER SCIENCE & ENGINEERING

First two photos show Kurt Cobain at age 14 in real life. Other photos show him with computer aging.

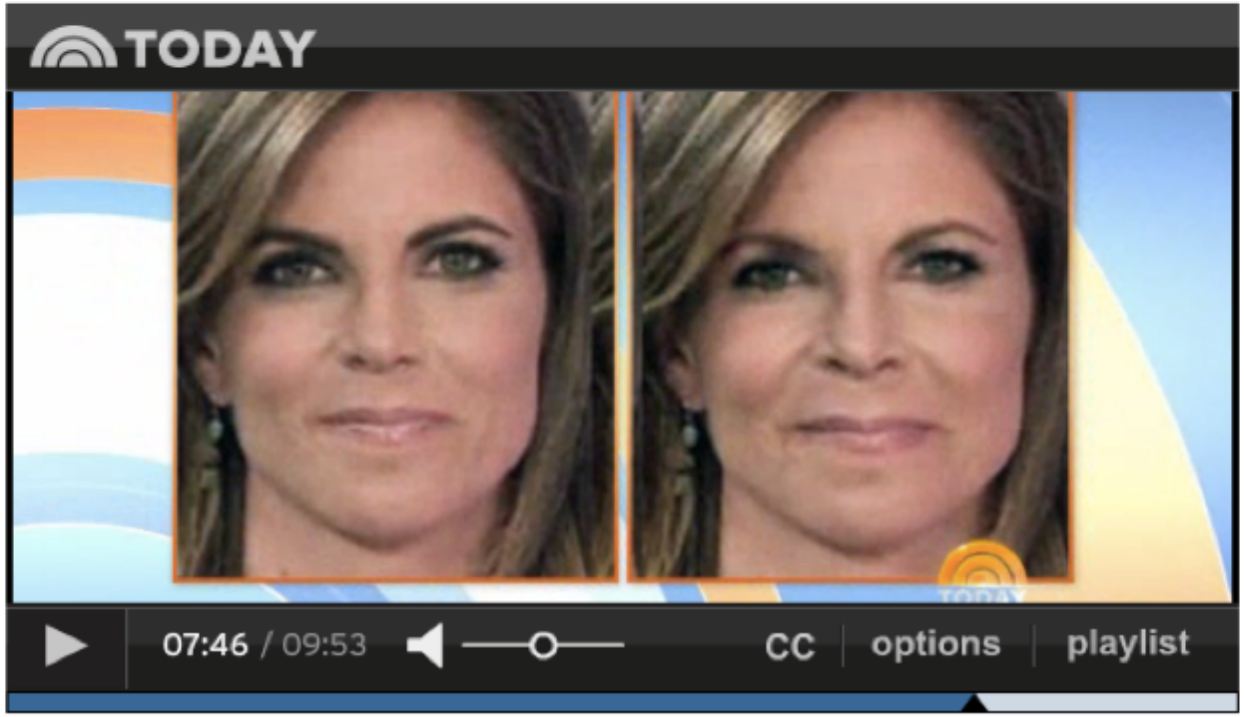
By Erik Lacitis
Seattle Times staff reporter

Aging

What will I look like at 60? New computer program gives sneak peek

Meghan Holohan
TODAY contributor

May 12, 2014 at 5:08 PM ET



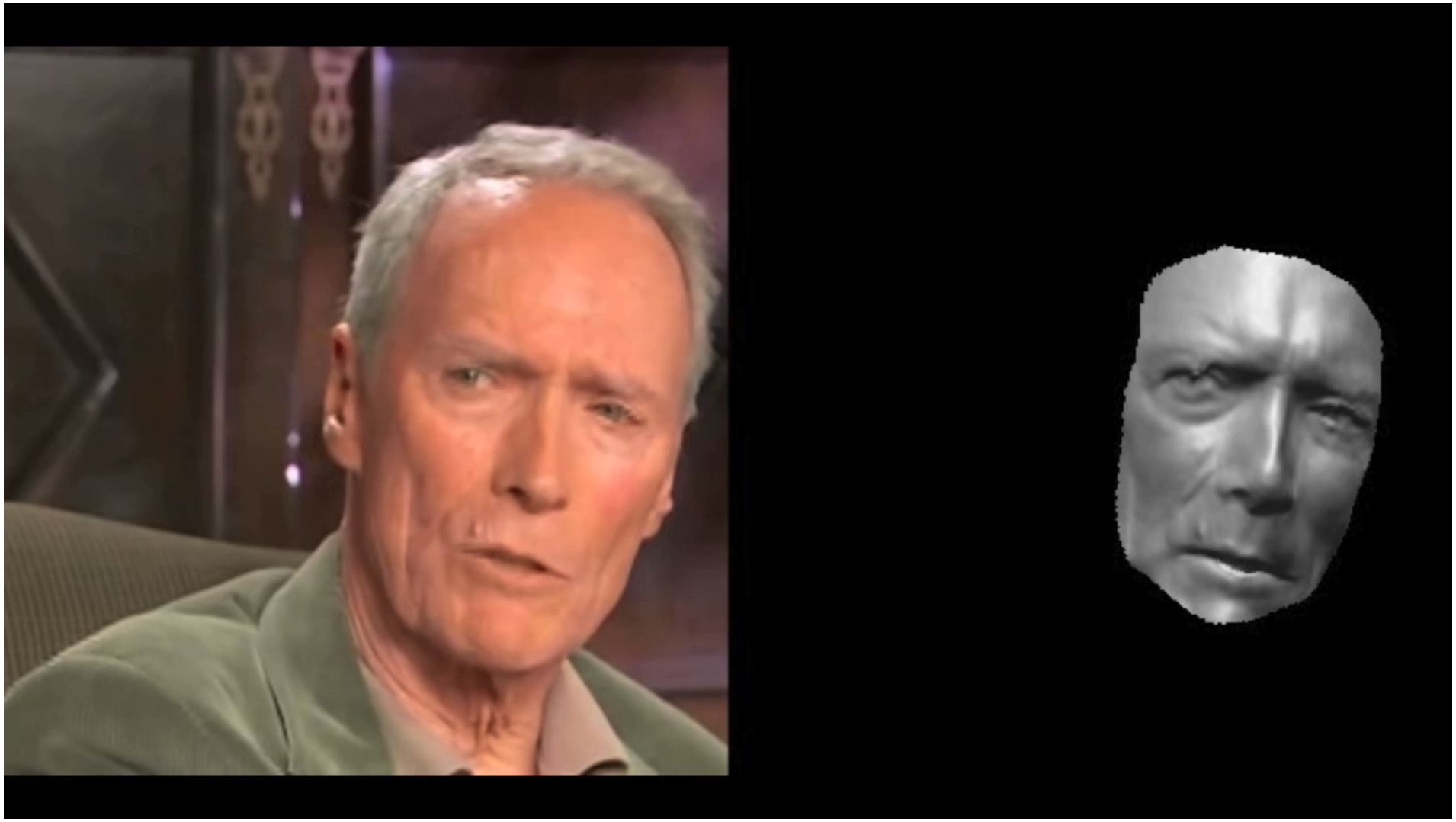
advertisement

TIME
President Bush?
GEORGE W. BUSH
TIME

Suwajanakorn, Kemelmacher-Shlizerman and Seitz,
Total Moving Reconstruction, ECCV 14

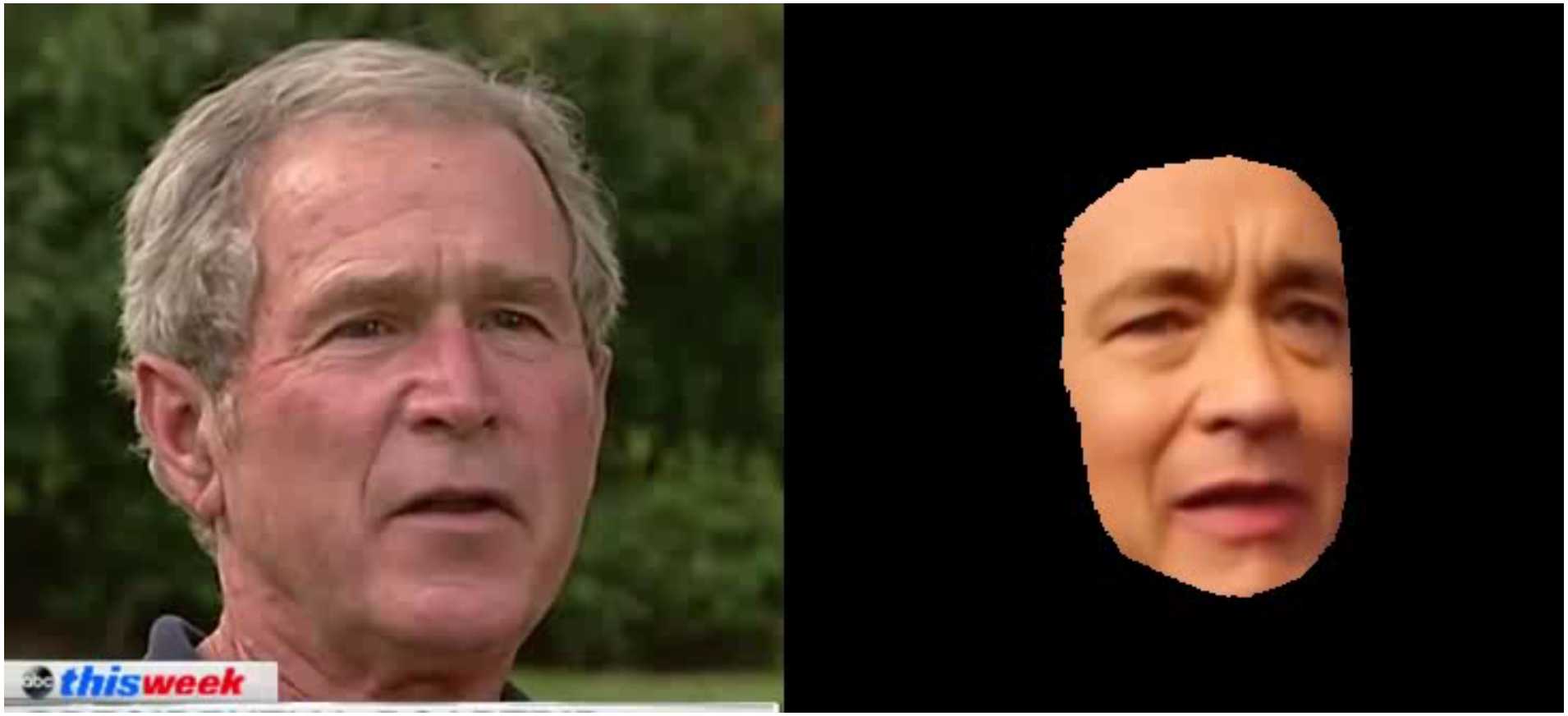
Moving 3D models

Suwajanakorn et al., ECCV 2014



Suwajanakorn et al.
Preliminary results 2015

Suwajanakorn et al.
Preliminary results 2015



Suwajanakorn et al.
Preliminary results 2015

Suwajanakorn et al.
Preliminary results 2015

And much more…

Contact me and my students to do a project

http://cs.washington.edu/homes/kemelmi

Topics of our class

Displays

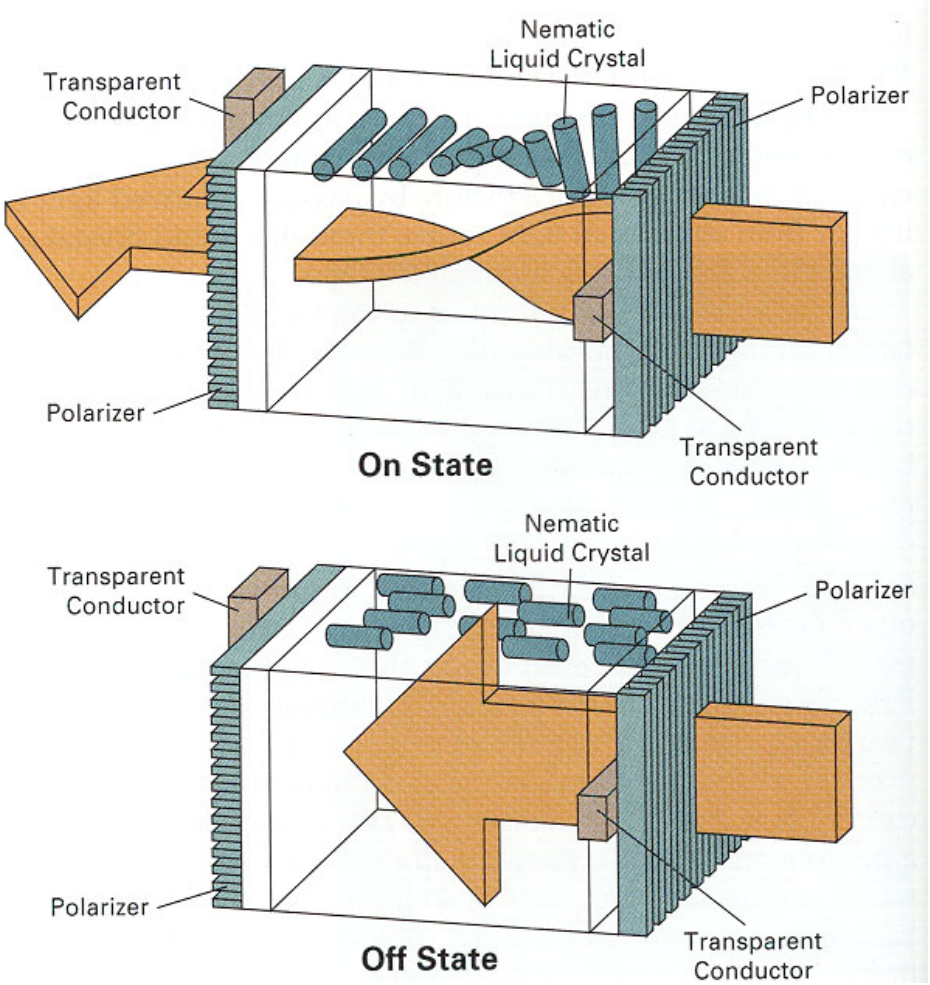

Nematic
Liquid Crystal
Transparent
Conductor
Polarizer
Polarizer
Transparent
Conductor
On State
Nematic
Liquid Crystal
Transparent
Conductor
Polarizer
Polarizer
Transparent
Conductor
Off State

Image processing

Original

Smoothed

Sx + 128

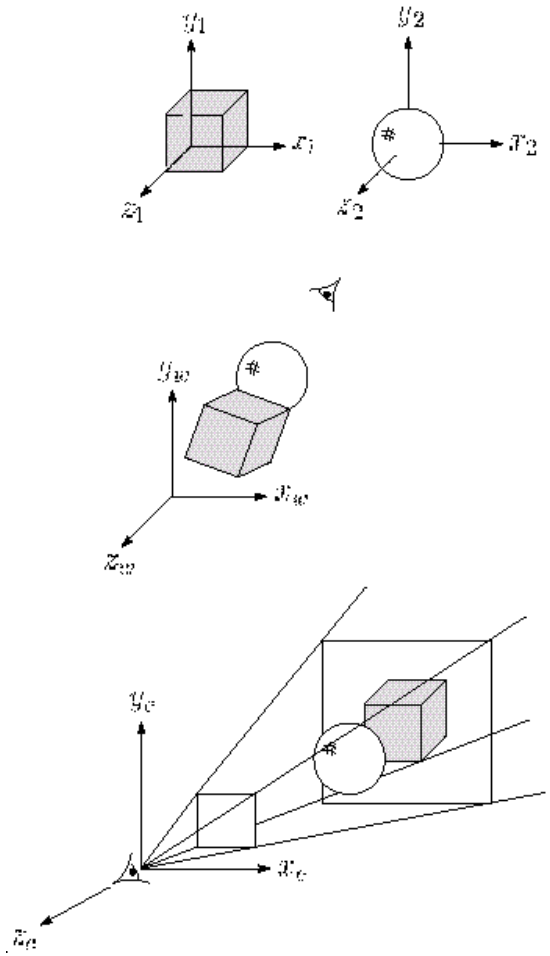
Sy + 128

Magnitude

Threshold = 64

Threshold = 128

Geometric transformations



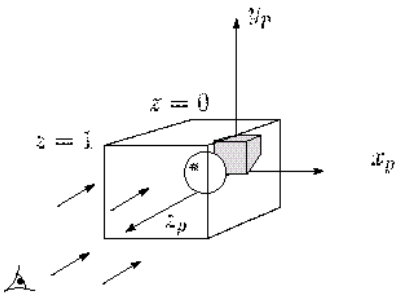
Model space
(Object space)

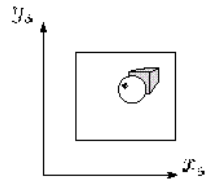
scale, translate, rotate, ...

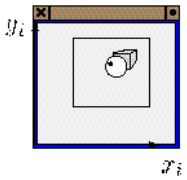
World space
(Object space)

rotate, translate

Eye space
(View space)







Projective transformation, scale, translate

Normalized projection space

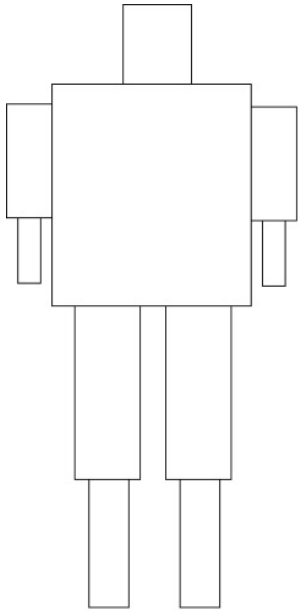
Project, scale, translate

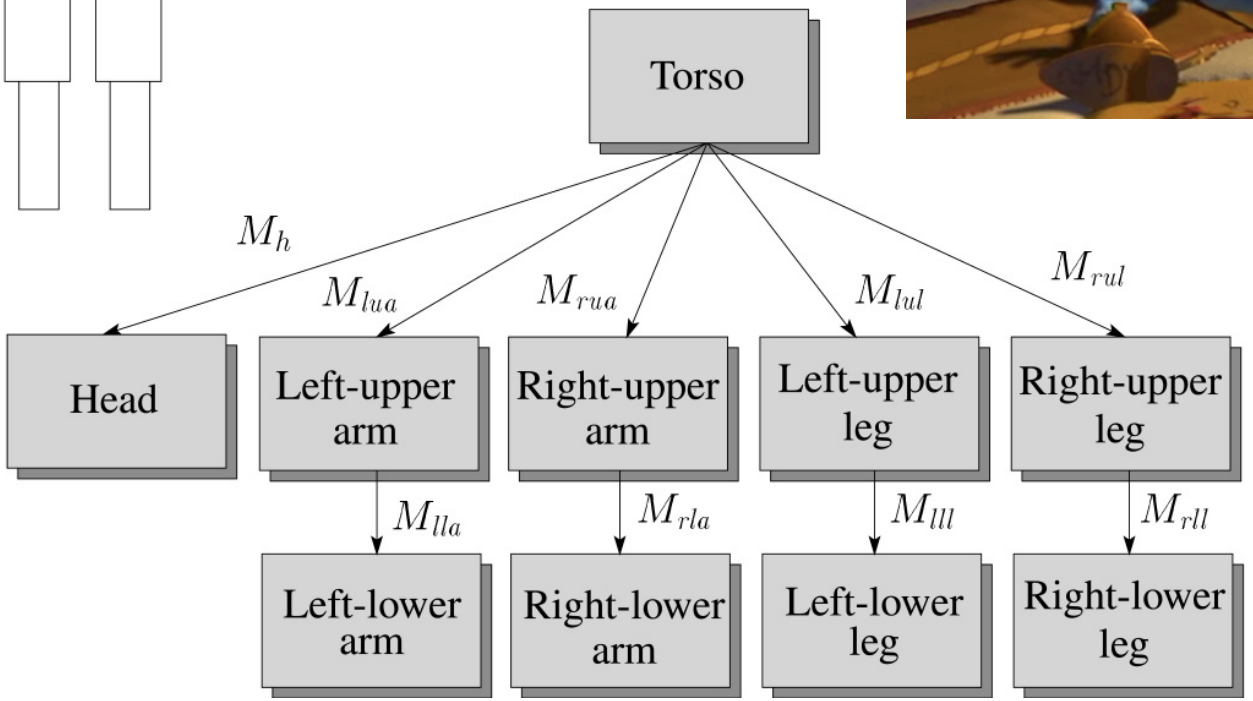
Normalized device space
(Screen space)

scale

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

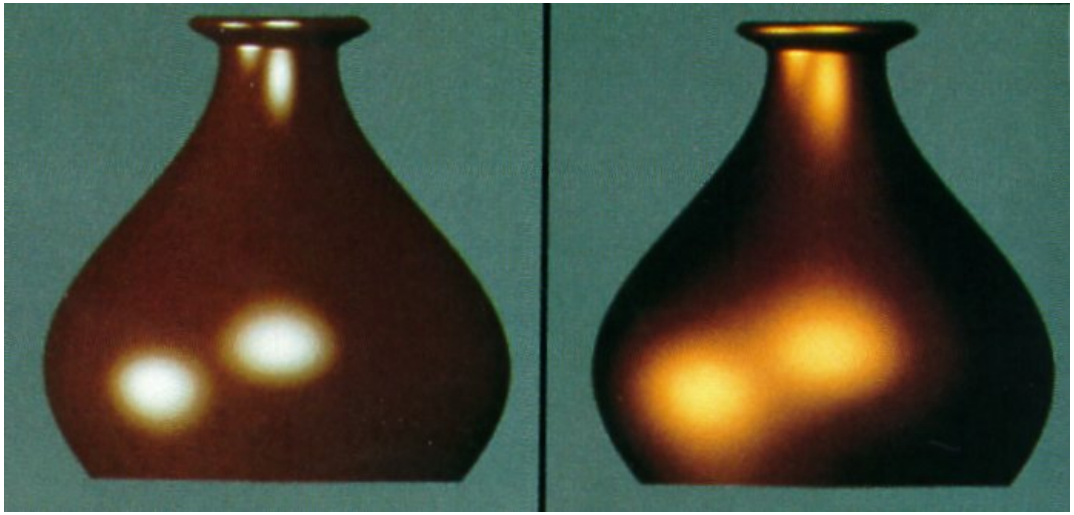
Hierarchical modeling



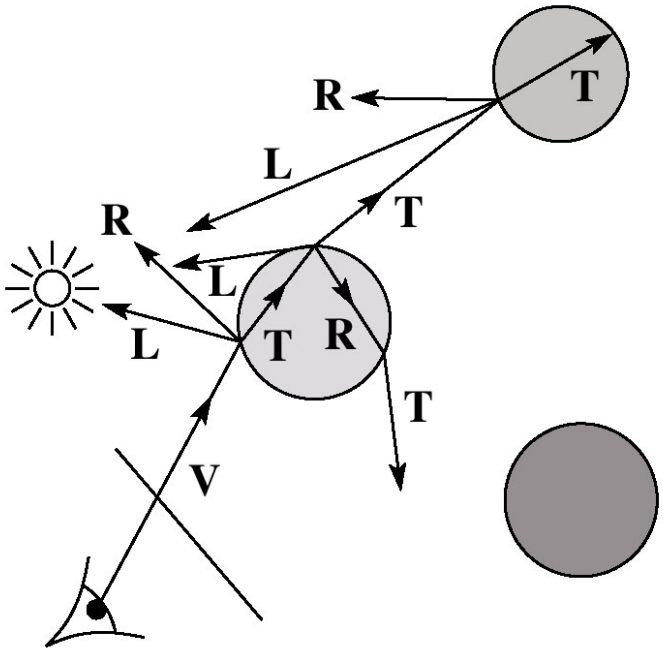


Shading

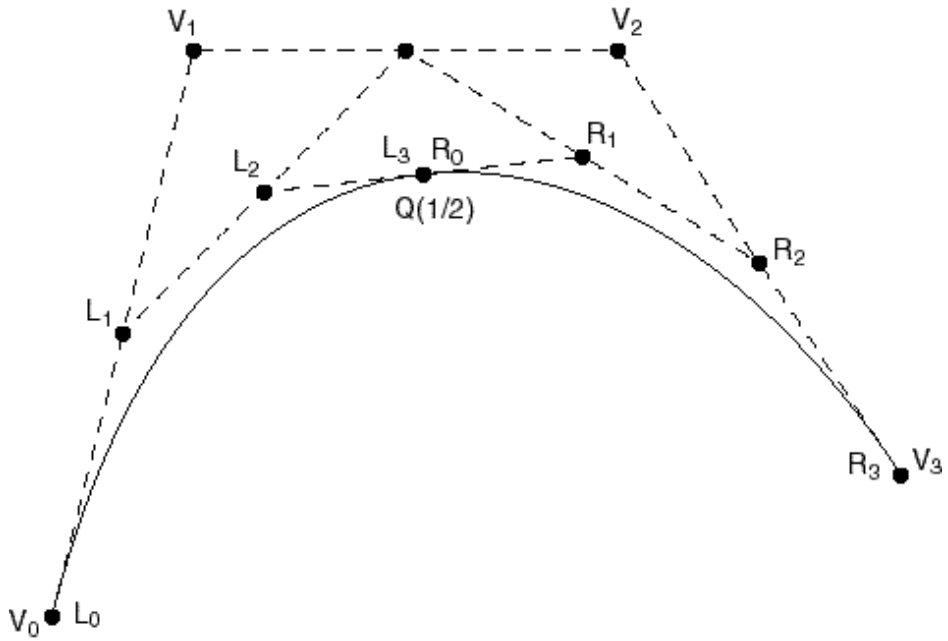
Plastic Metal



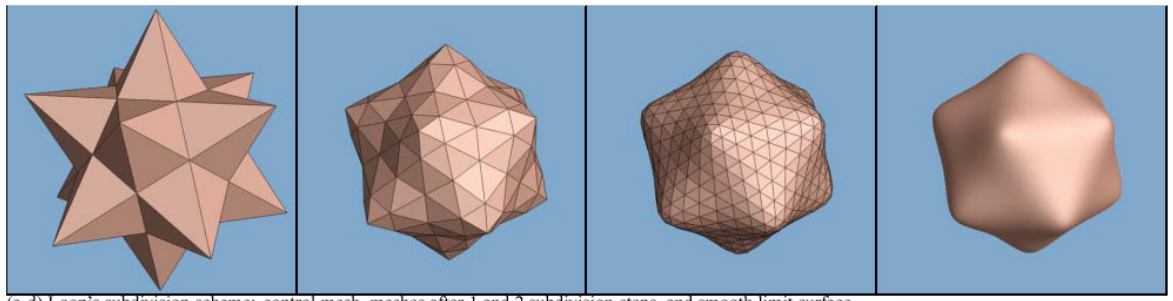
Ray tracing



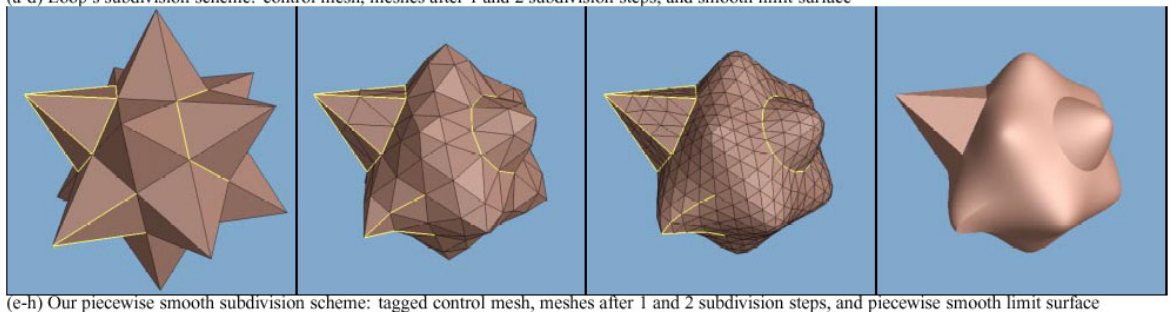
Curves



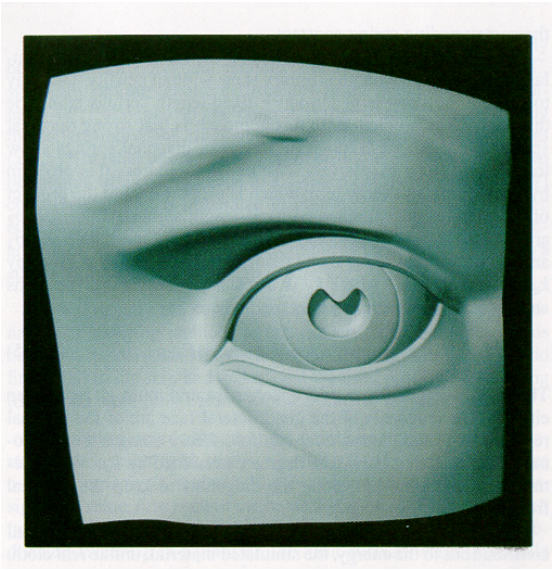
Surfaces



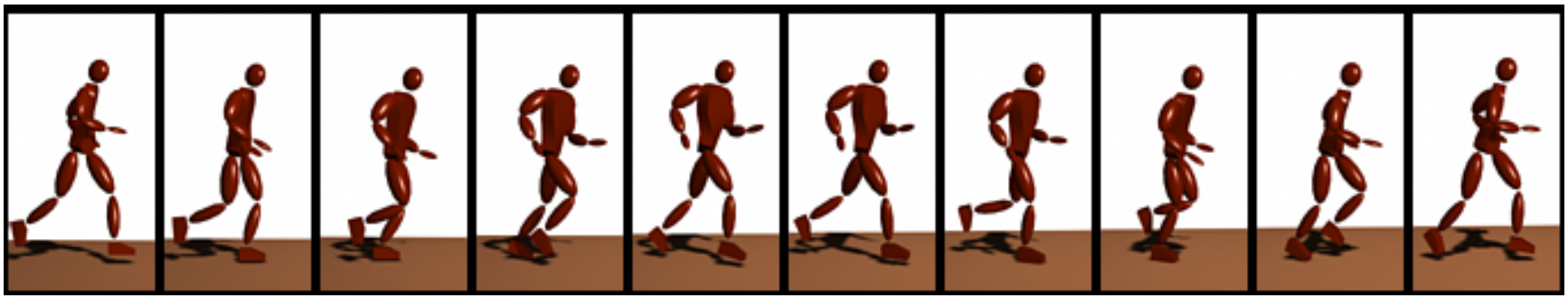
(a-d) Loop's subdivision scheme: control mesh, meshes after 1 and 2 subdivision steps, and smooth limit surface



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



Animation

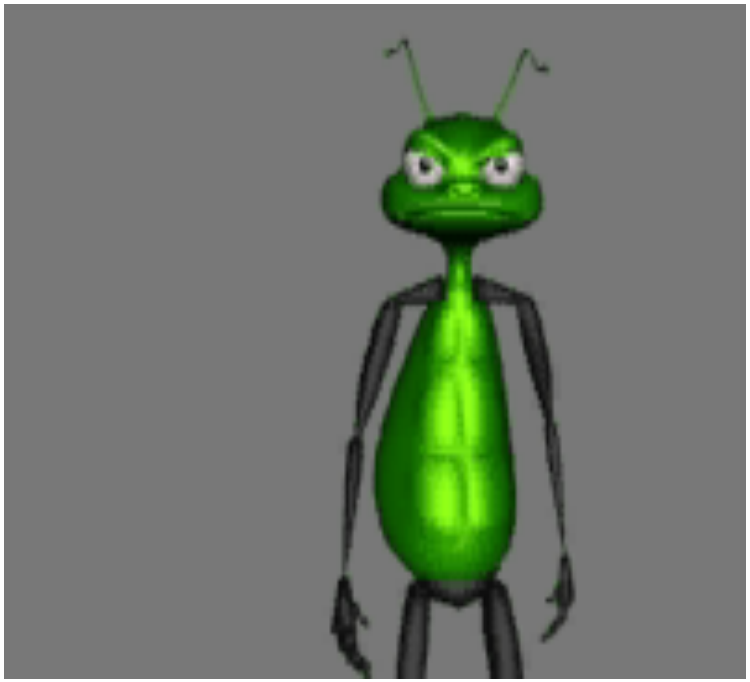


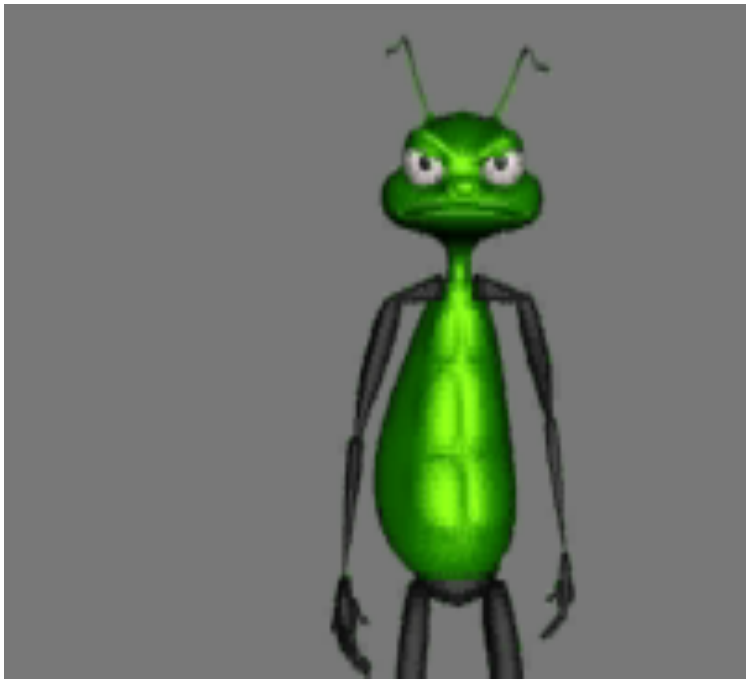
Keyframing and interpolation

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/cse457/14wi/projects/animator/artifacts/