Course overview

Digital Visual Effects

Yung-Yu Chuang

Logistics

- **Meeting time**: 2:20pm-5:20pm, Wednesday
- **Classroom**: CSIE Room 104
- **Instructor**: Yung-Yu Chuang (cyy@csie.ntu.edu.tw)
- **Teaching assistants**: 黃子桓
- **Textbook**: Readings from books, journals and proceedings.
- **Webpage**: (user name/password)
  http://www.csie.ntu.edu.tw/~cyy/vfx
- **Mailing list**: vfx@cmlab.csie.ntu.edu.tw subscribe via
  https://cmlmail.csie.ntu.edu.tw/mailman/listinfo/vfx/

This course is **NOT** about …

It isn't about photography

It isn't about 3D animations

## It isn't about watching movies

It isn't about physical effects

It's not about industrial tricks

You will learn more about Taylor and Poisson than Lucas and Spielberg in this course. If you hear Lucas in the class, it is more likely to refer to Bruce Lucas, not George Lucas.
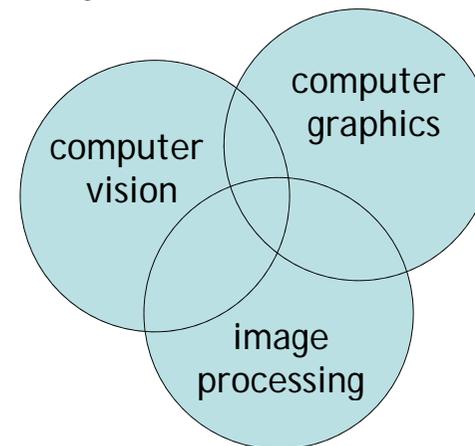
Prerequisites

- It is a *must* that you have programming experiences.
- It is a *must* that you have basic knowledge on linear algebra and probability.
- It is a *plus* if you have background knowledge on computer vision, image processing and computer graphics.
- It is a *plus* if you have access to digital cameras and camcorders.

Warning from previous students

- 請學期初老師要多提醒這門課的困難度請興趣或實力不足的同學勿修，否則就會像我一樣停修 XD

This course is about …

Digital Visual Effects
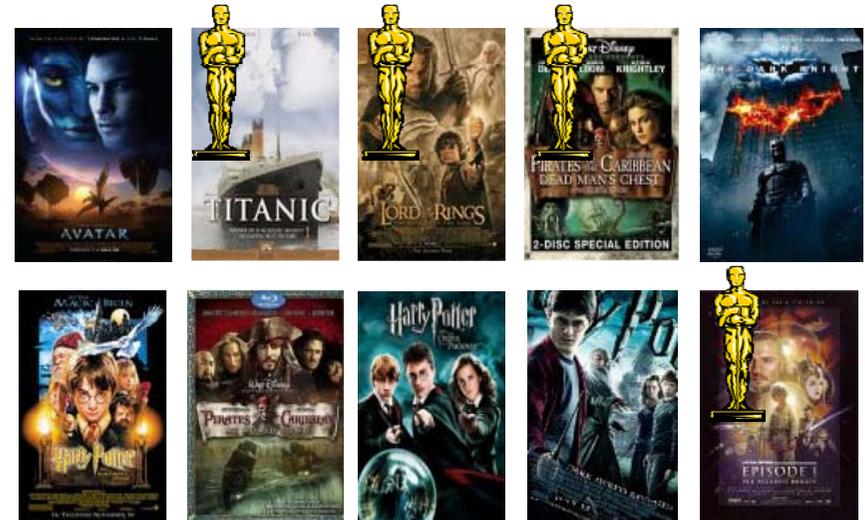
Reality?

Retouching

Iraq War, LA Times, April 2003

Digital photomontage

Bush campaign's TV AD, 2004
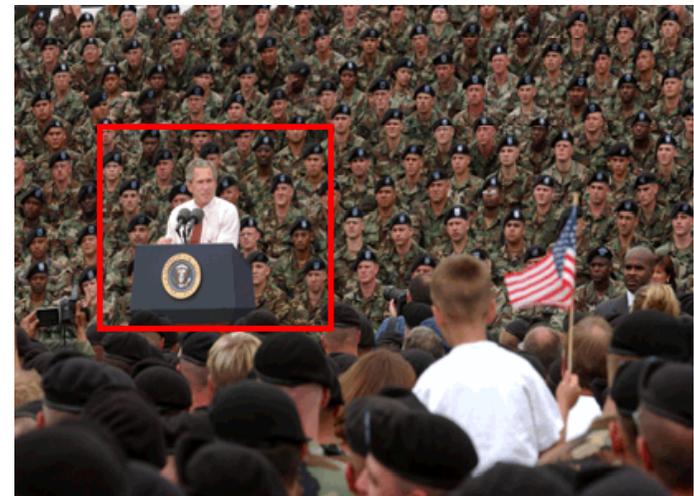
Texture synthesis and inpainting

Original photograph

Domestic example

The Liberty Times
2007.12.17
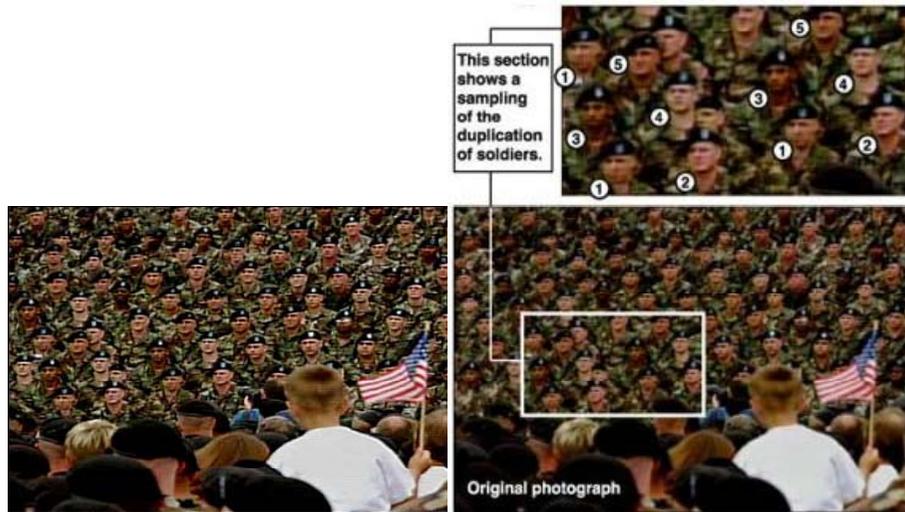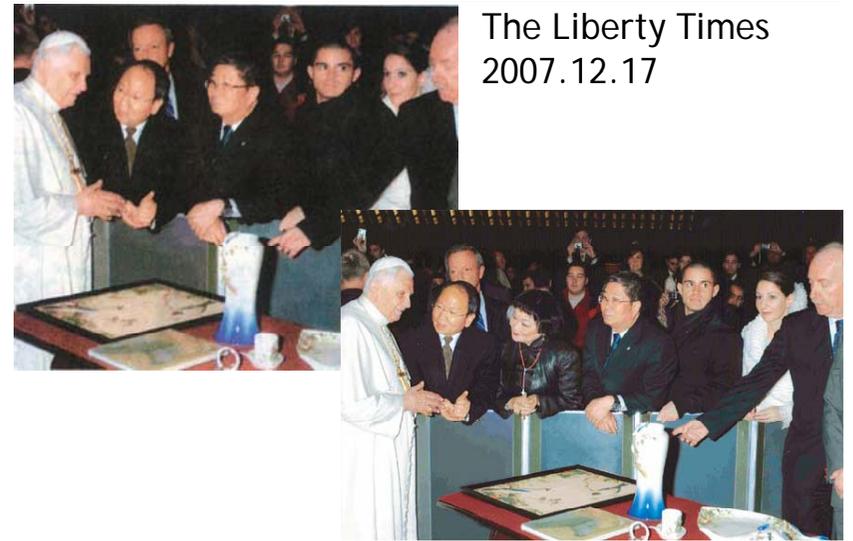
Special effects

Stop action

The execution of Mary, 1895

Glass shot

Figure 1
A GLASS SHOT, AS USED FOR THE SHOOTING OF *CLEOPATRA* (1963)

foreground painting and background sets when misaligned, as seen 'off-angle' from camera

full-scale set

matte painting

camera

composite of painting and full-scale set, as seen through camera

Rear projection

stop motion

Rear Projection

Projector

Screen

New Action

Camera
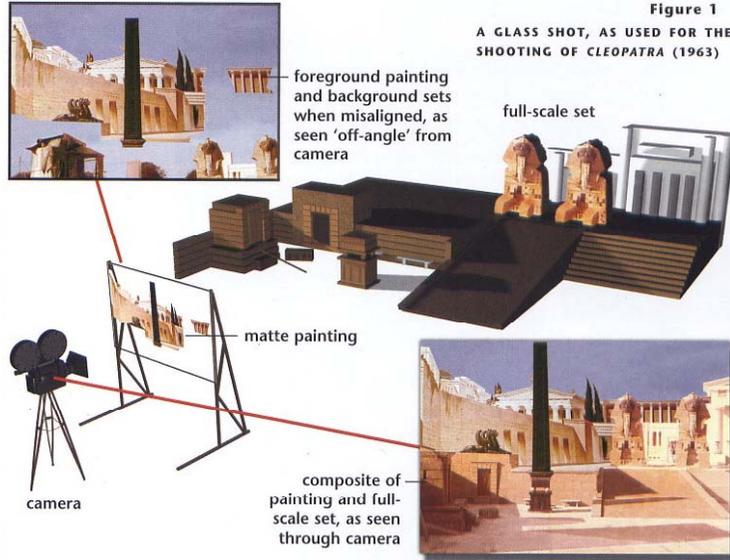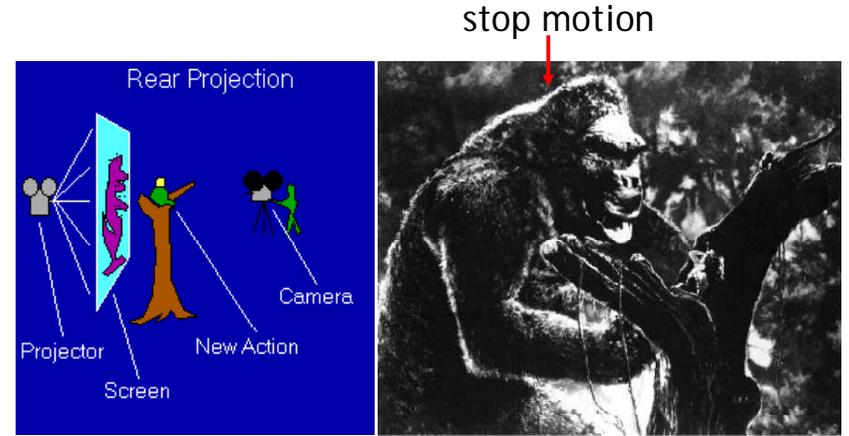
King Kong, 1933

Special effects (make-up)

Special effects (physical effects)

Figure 7 CANNON CAR
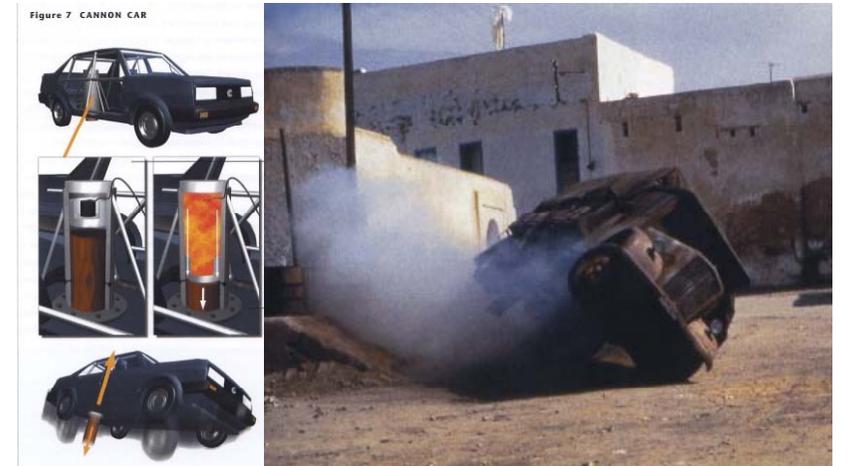
Special effects (miniature)
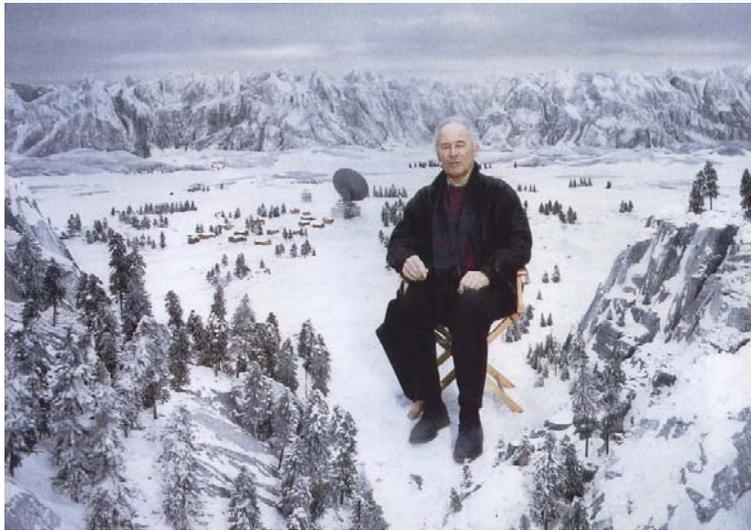
Special effects (matte painting)

Lord of the Rings

Illusion - forced perspective

Computer-generated model

108/1 v.65   182 (72-224)

Models-6

Visual effects 100 Years

VISUAL EFFECTS:
100 YEARS OF INSPIRATION

Production pipeline

Production pipeline

Preproduction

Storyboard   Artwork   Reference

Production

Effects

Stills   Plates

Post-production

VFX ← Editing

Music

Sound

Film
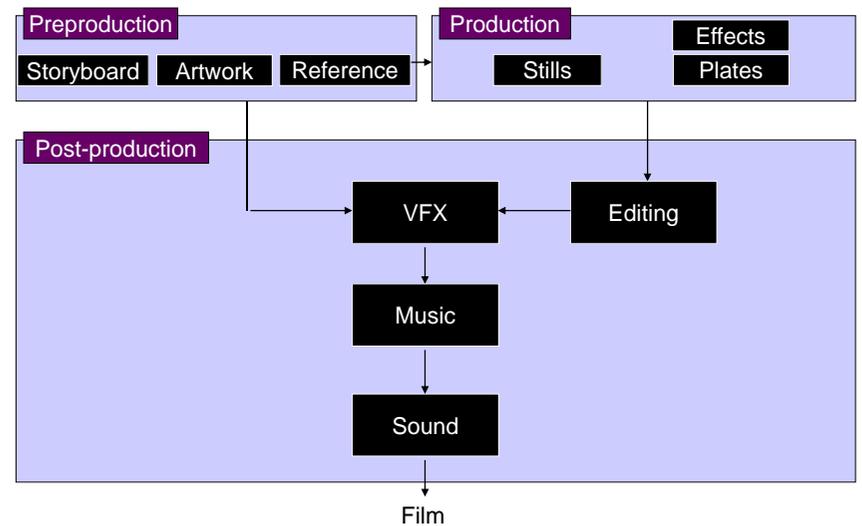
Preproduction

Storyboard

Preproduction
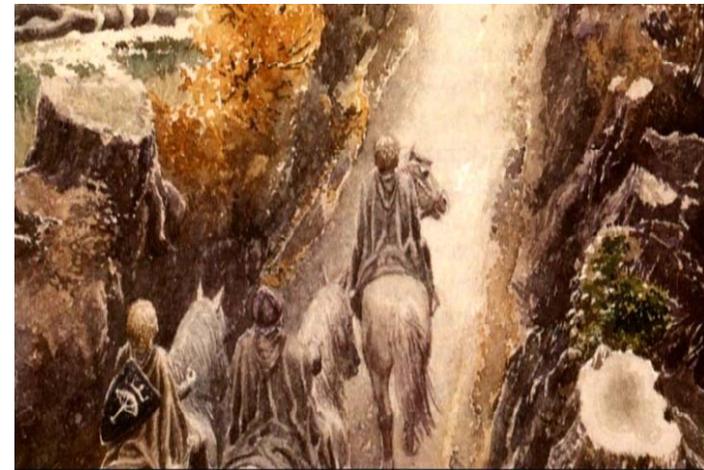
Artwork

Preproduction

Reference & Research

Production

Shooting

Post-production
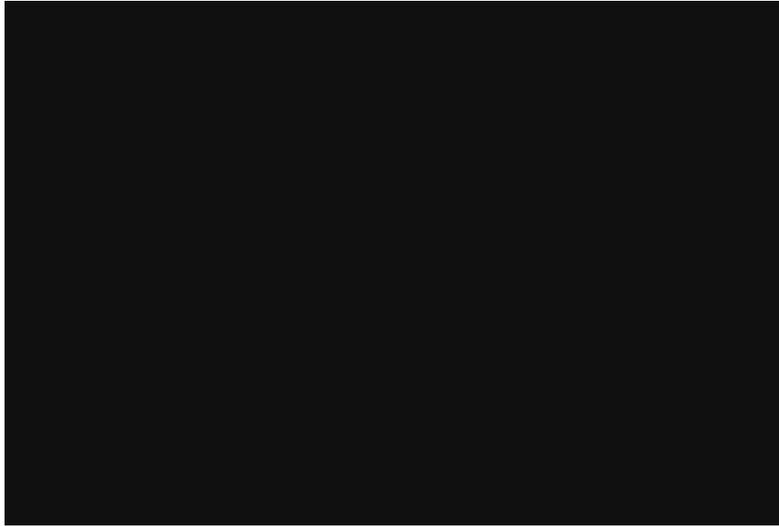
Visual effects production

Preproduction
Storyboard · Artwork · Reference

Production
Stills · Effects · Plates

Scanning

Post-production

Model Geometry → Matchmove and Matchmodel

Skeleton · Textures → Effects Animation · Character Animation

Skinning · Materials → Lighting and Rendering

Compositing

Assets · Shots

Film Recording
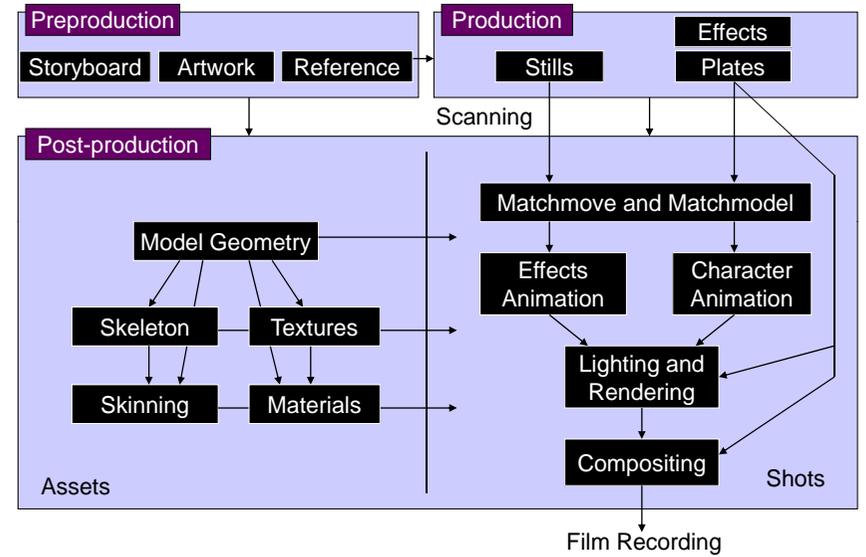
Visual effects post-production

PRE-VIZ · ► ENVIRONMENT ◄ · LIVE ACTION

ANIMATION · MASSIVE · ROUGH COMPOSITE

PLAY ALL · COMMENTARY ON

RETURN · OFF ◄

FINAL FILM
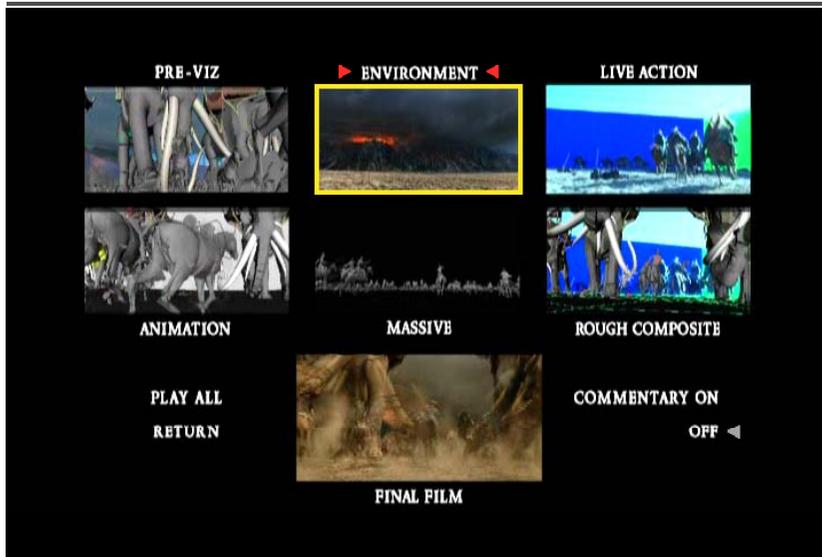
A case study

405: The Movie

- This movie were created solely by two visual effects artists in the year of 2000. It was a process that took over three months of nights, weekends and any spare moments that they could find.

- http://www.405themovie.com/

405: The Movie
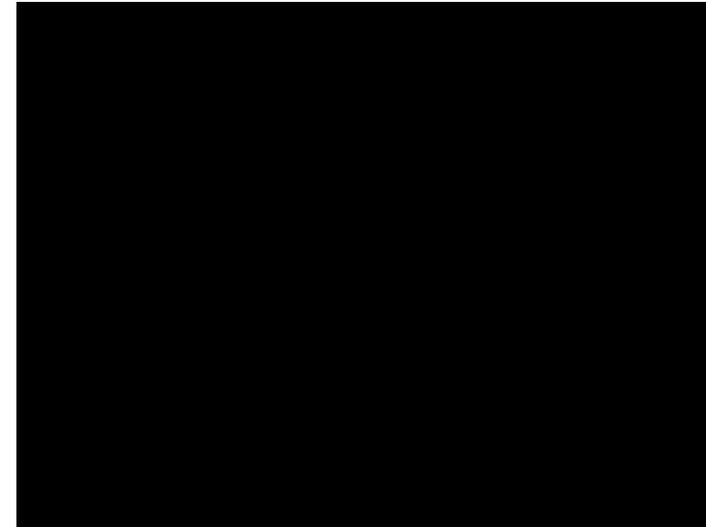
Making of 405

Step 0: script and shooting plan

Shot#	Description	Full CG	CG	Length Frames
01	Title Animation	X	X	401
02	Freeway speeds beneath car			123
03	Speed Limit 65			120
04	LA Freeway from Overpass			238
05	Empty Freeway--Car enters frame	X	X	150
06	Pan From Freeway J looks at lack of traffic			237
07	Plane swings into landing position toward freeway	X	X	139
08	Hand on Gear shift			36
09	Plane lowers into view through rear window		X	84
10	Plane nears Car	X	X	65
11	J looks to side mirror--plane visible behind		X	84
12	Plane in sideview mirror		X	65
13	J looks from side view to rear view mirror -- plane behind		X	27
14	J eyes react in rear view mirror--remove traffic		X	33
15	Plane chases Car toward camera	X	X	77

Making of 405

Step 1: shooting
two days with a Canon Optura DV camera with progressive mode.
⇨ a 70-minute raw footage

initial editing
⇨ pickup shots

Cuts to Driving with plane closing from behind

Cuts from Side then Rear view mirror looks
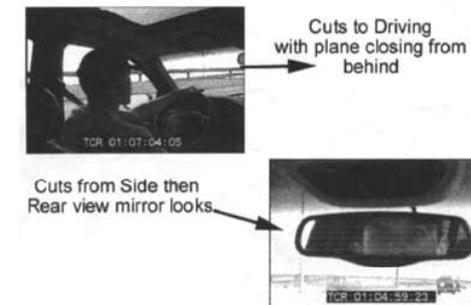
Step 2: building CG world
total 62 shots, 42 enhanced with digital VFX.
19 shots are entirely digital creations.

plane, two cars, freeway background are digital
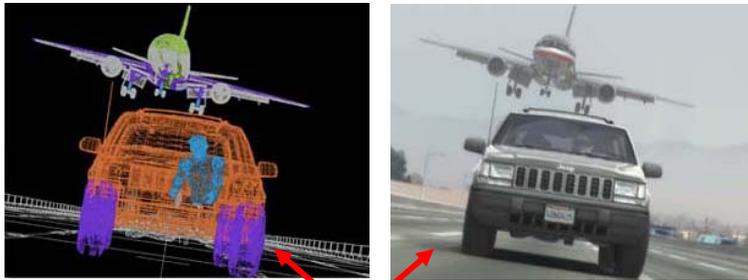
photo-based 3D environment

Real cars were used for close-up and interior shots

A low-resolution mesh scanned
by a cyberscanner.
Mapped with photographs.
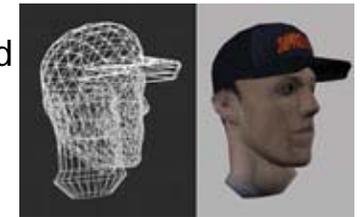
DC-10 plane took a month
to model in details for the
needs of close-up shots.

59 objects, 142,439 polygons
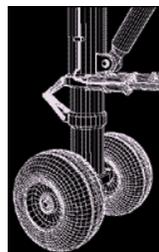
reference   modeling   material painting
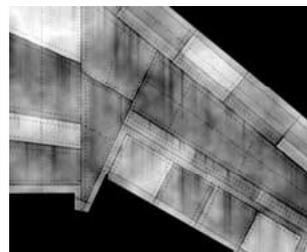
Step 3: traffic clearing   clean plate

close-up shots

inpainting

Making of 405

Step 4: compositing

shot with the vehicle standing still in a backyard

Making of 405

Making of 405

Step 5: fine touchup

3D hat   compositing and inpainting

Making of 405

Step 6: music and delivery
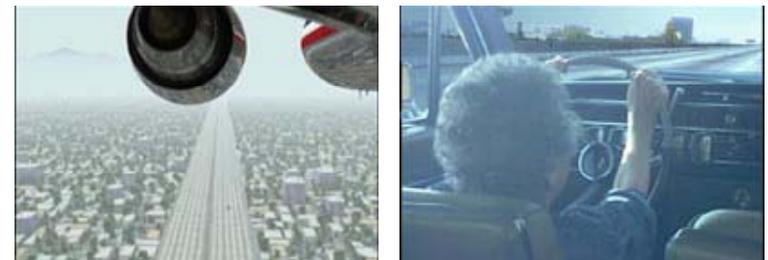
Bloody Omaha

Dan Schick VFX Shot Breakdowns

- Video 1
- Video 2

Topics we plan to cover

Camera

Canon 10D

High dynamic range imaging/display
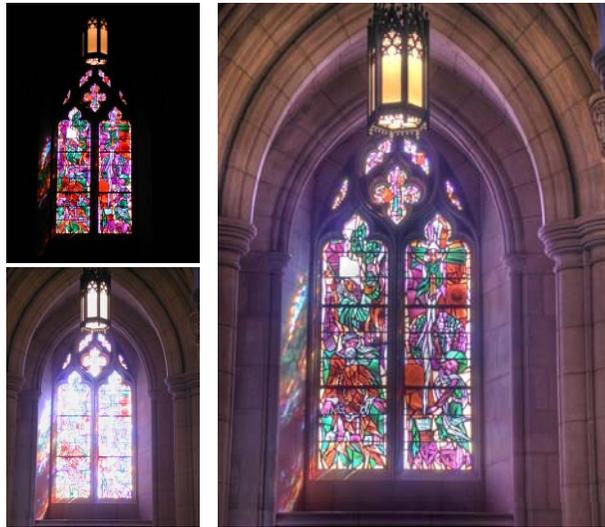
Image warping/morphing

someone not
that famous

someone very
famous

video
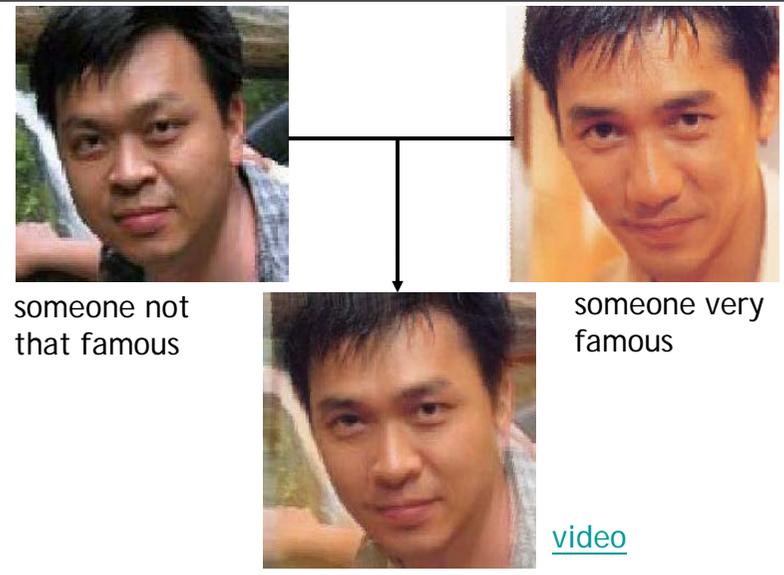
Image warping/morphing
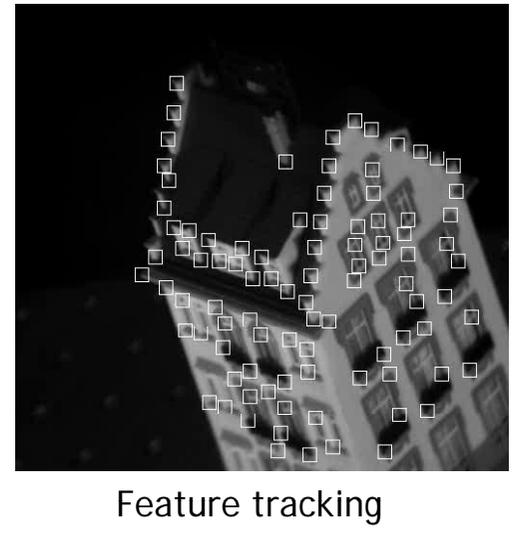
Tracking

Feature tracking

Image stitching

MatchMove

Move matching using scene planes

Matchmove

Move matching using scene planes

Matchmove

Move matching using scene planes

Photo tourism
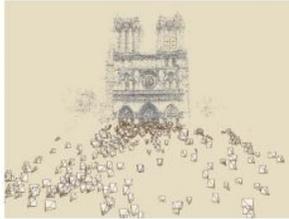
Video matching

Matrix   *MOCO (Motion control camera)*

Video matching

Video matching

Matting and compositing

Titanic

Matting

Object selection

LazySnapping

Image manipulation

GraphCut Texture

Image manipulation
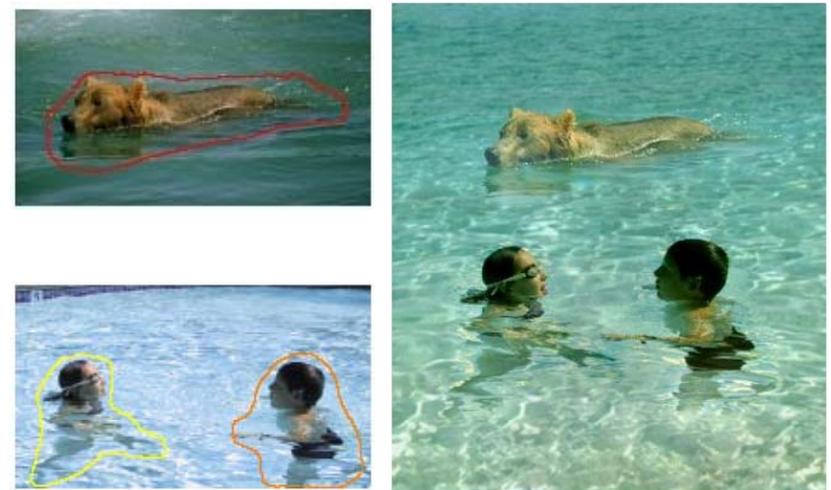
Poisson blending

Image-based modeling

photogrammetric modeling and projective texture-mapping

Image-based modeling

photogrammetric modeling and projective texture-mapping

Image-based modeling

photogrammetric modeling and projective texture-mapping

Image-based modeling

Tour into a picture

Image-based modeling

Tour into a picture

3D photography (active)

Cyberware whole body scanner

3D photography (active)
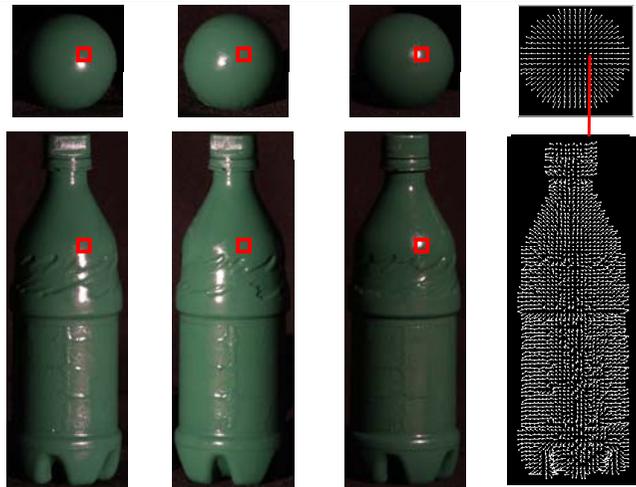
Photometric stereo

3D photography (passive)

left

right

depth
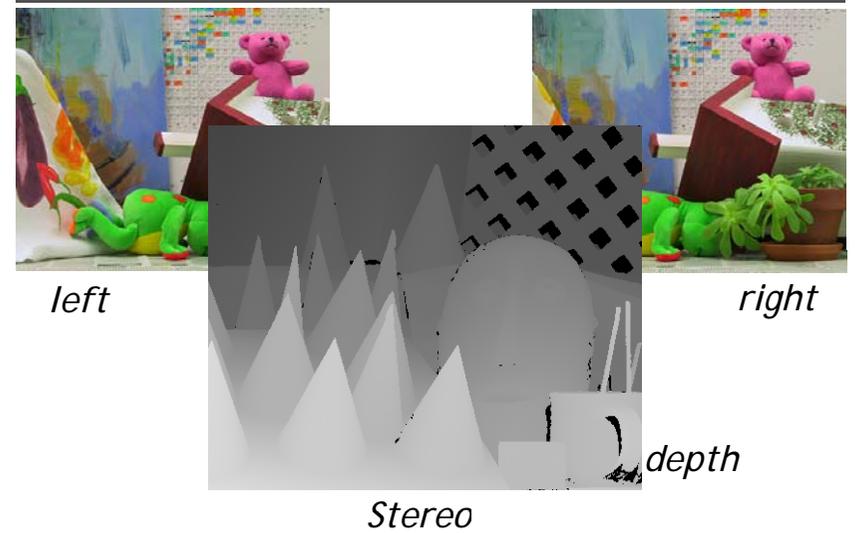
Stereo

Image-based rendering
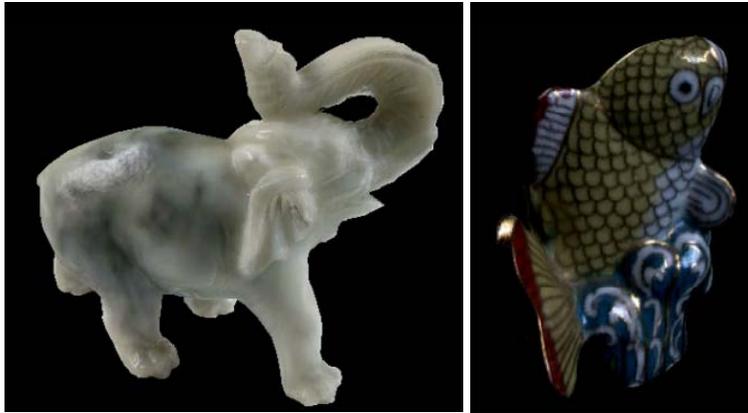
Surface lightfield

View interpolation

Bullet time video

View interpolation

High-Quality Video View Interpolation

Making face
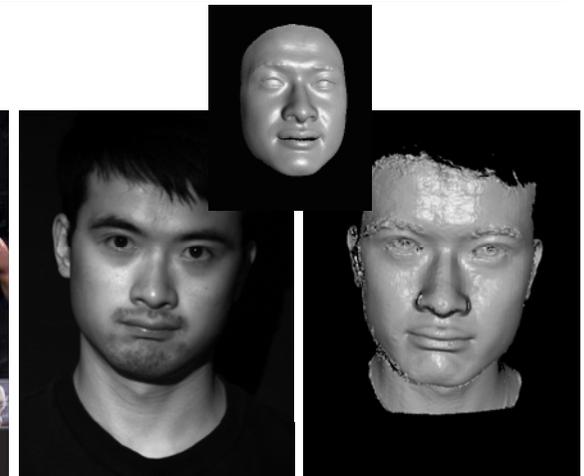
Gollum   *Spacetime face*

Video rewrite

Trainable videorealistic speech animation

Inpainting (wire removal)

Inpainting

Texture synthesis/replacement

Texture replacement

Semi-automatic matting painting

*Image analogies*

Video editing
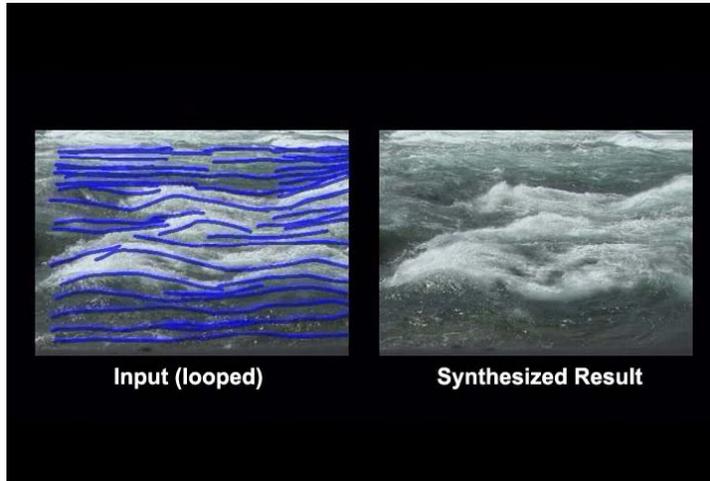
Flow-based video editing

Grading (subject to change)

- 3 programming assignments (60%)
  - HDR Imaging (18%)
  - AutoStitch (24%)
  - MatchMove (18%)
- Class participation (5%)
- Final project (35%)
  - Research
  - System
  - Film

High dynamic range imaging
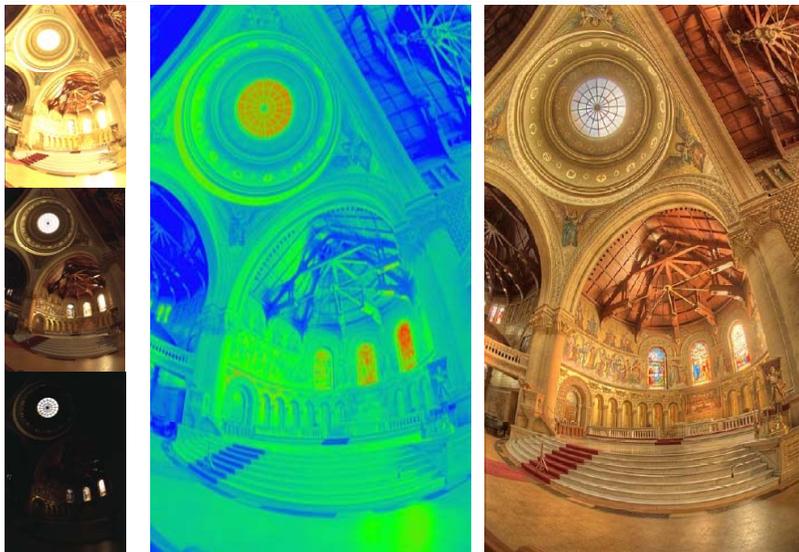
From past semesters (鄭逸廷 陳柏叡)

From past semesters (吳侑親, 張書瑋)

From past semesters (王瑋馥, 余雁雲)

AutoStitch
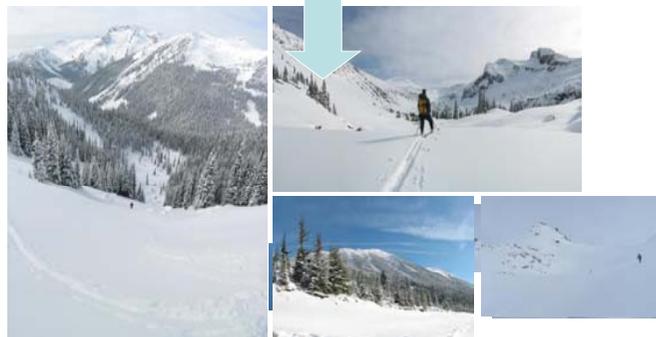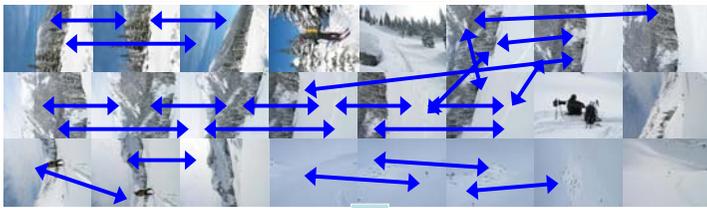
From past semesters

鄭逸廷 陳柏叡



李佳燕 黃政基

MathMove

梁家愷 鐘志遠

姜任遠 林立峯

楊宗碩 林柏劭
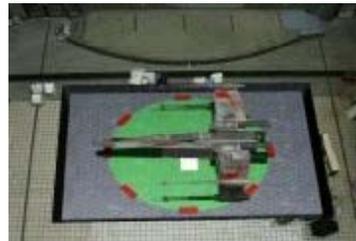
翁憲政 洪韶憶

---

Final projects from a similar course in Georgia Tech.

Life in Paints

Life in Paints, GaTech DVFX 2003

Tour into pictures

Making of *Life in Paints*

In Your Face

In Your Face, GaTech DVFX 2002

Stop action

Making of *In Your Face*

Tennis
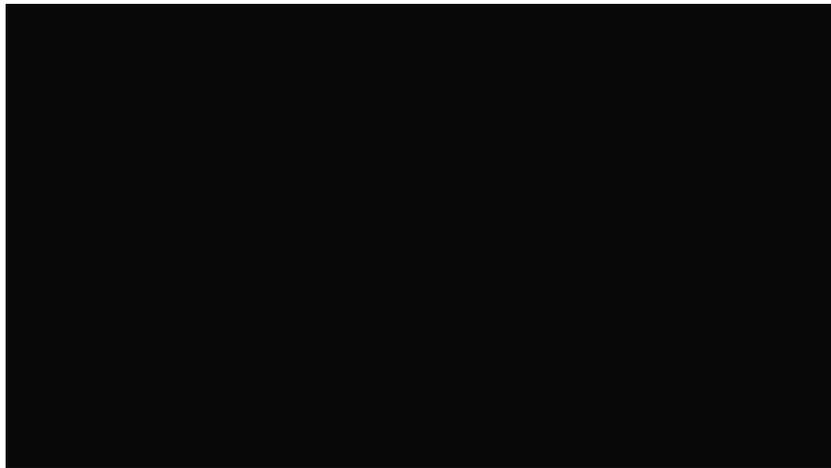
*Tennis*, GaTech DVFX 2007

MatchMove/CGI
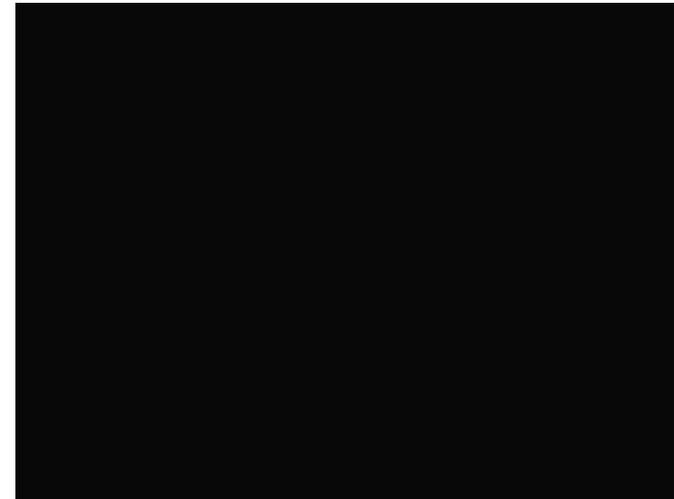
Making of Tennis

Final projects from the past.
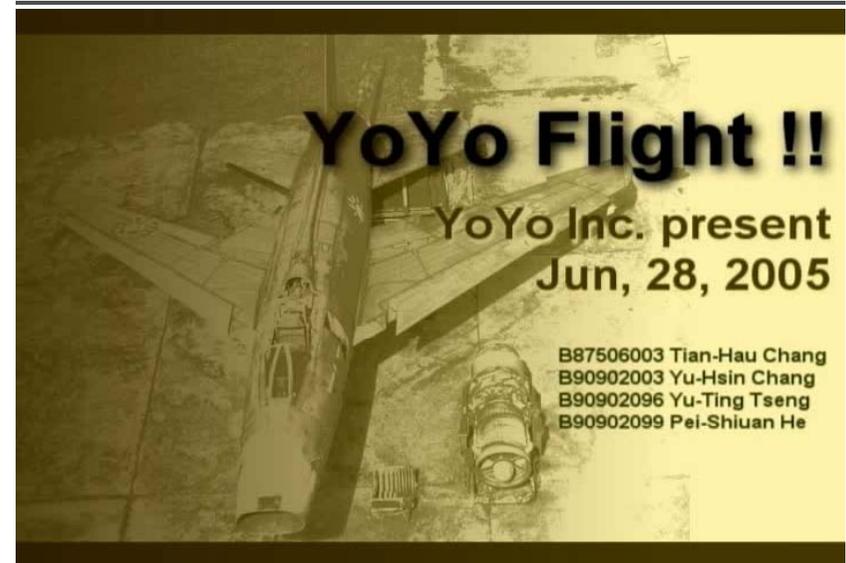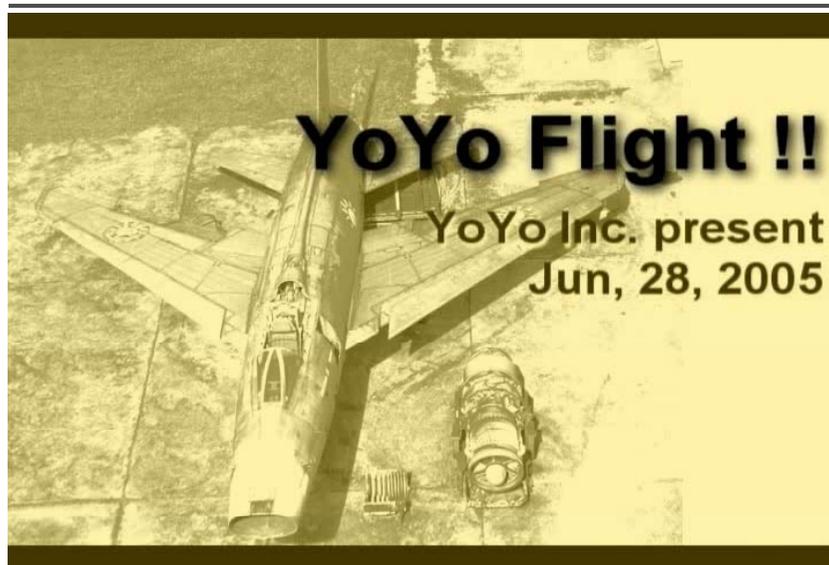
That's it for today!

- Don't forget to subscribe the mailing list.
- Check out the course website.