Course overview

Digital Visual Effects, Spring 2009

Yung-Yu Chuang

2009/2/19

Logistics

- **Meeting time**: 2:20pm-5:20pm, Thursday
- **Classroom**: CSIE Room 104
- **Instructor**: Yung-Yu Chuang (cyy@csie.ntu.edu.tw)
- **Teaching assistants**: 李根逸
- **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

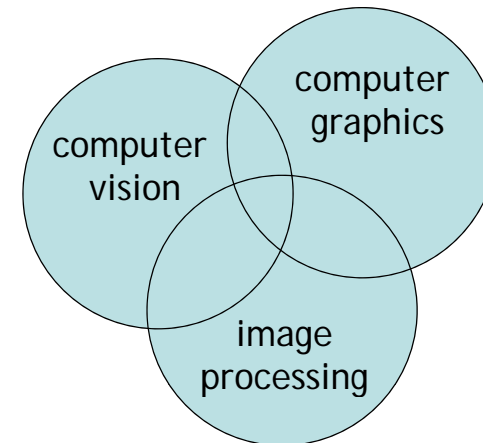## It's not about industrial tricks

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.

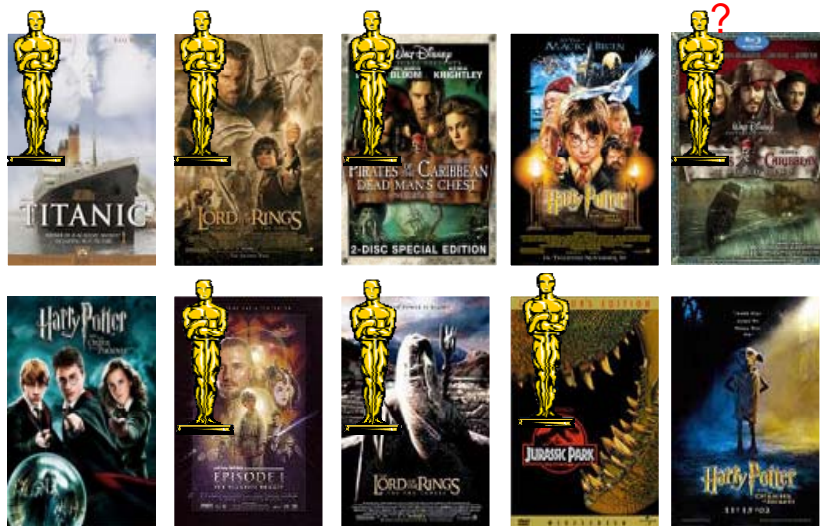computer graphics

computer vision

image processing

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.

This course is about …
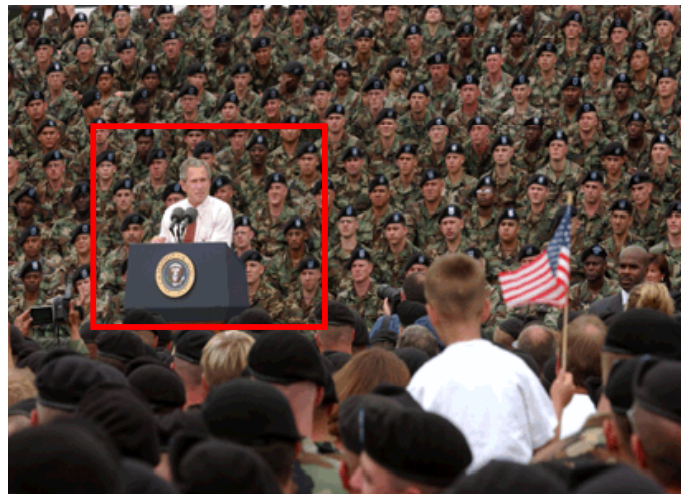
Digital Visual Effects

Reality?

Retouching

Iraq War, LA Times, April 2003

Digital photomontage
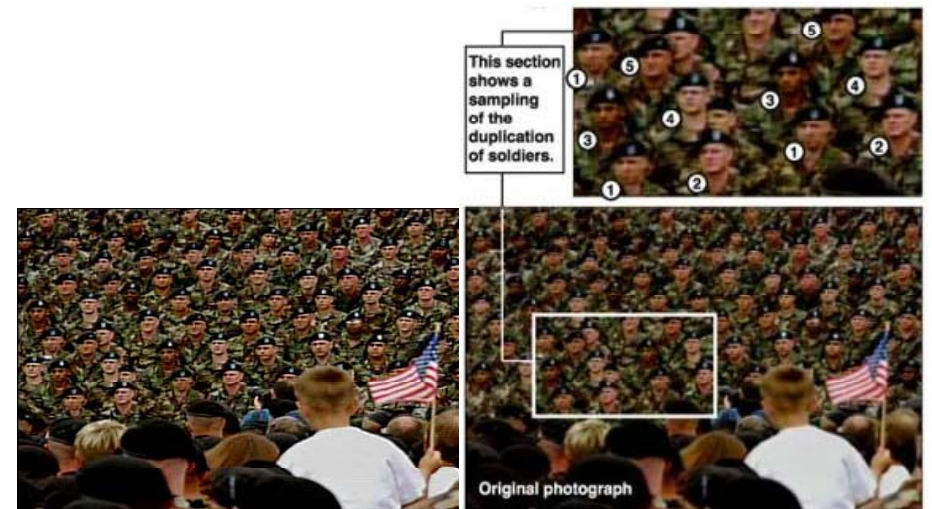
Bush campaign's TV AD, 2004

Texture synthesis and inpainting

This section shows a sampling of the duplication of soldiers.

Original photograph

Domestic example
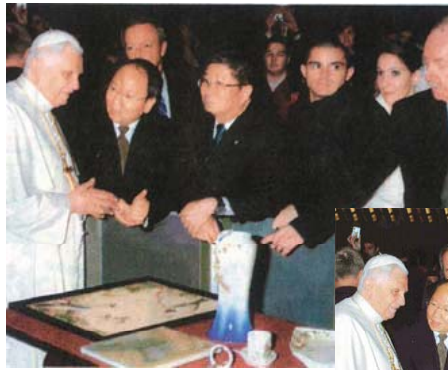
The Liberty Times
2007.12.17

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

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

camera
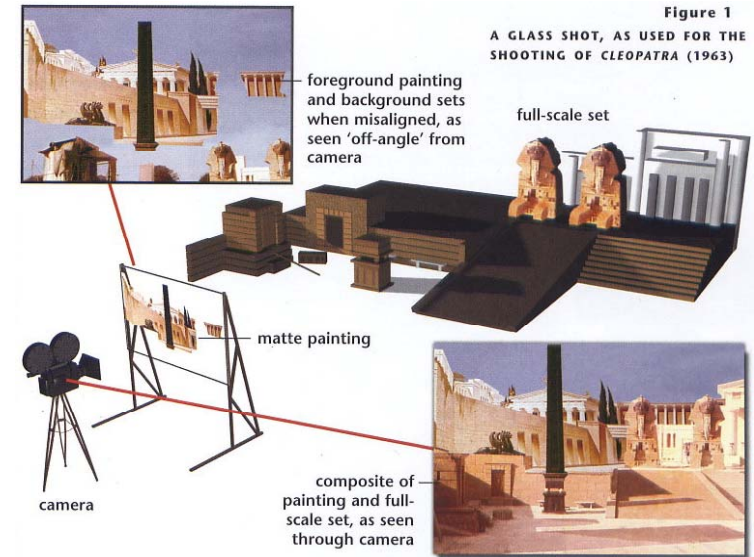
Rear projection
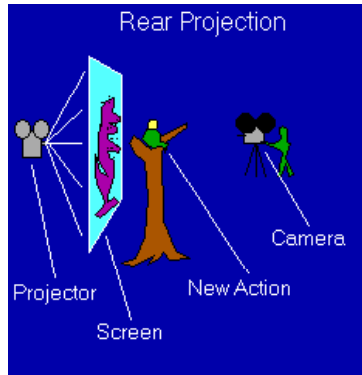
stop motion

King Kong, 1933

Special effects (make-up)

Special effects (physical effects)

Special effects (miniature)
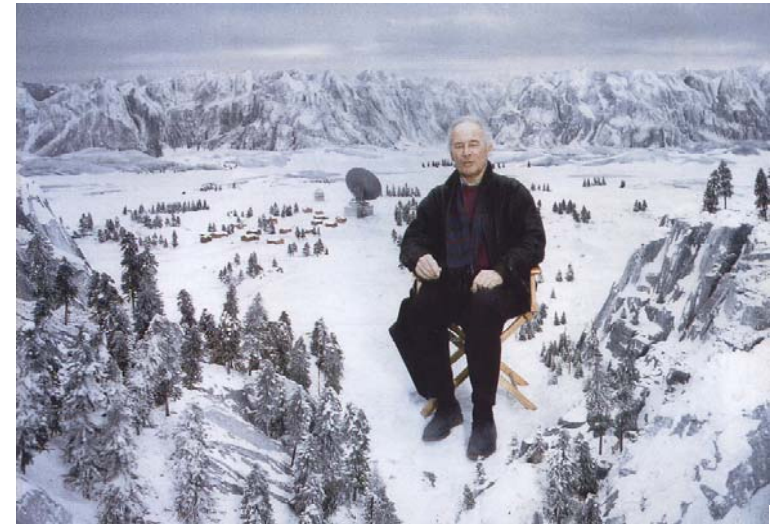
Special effects (matte painting)

Lord of the Rings

Illusion - forced perspective

Computer-generated model

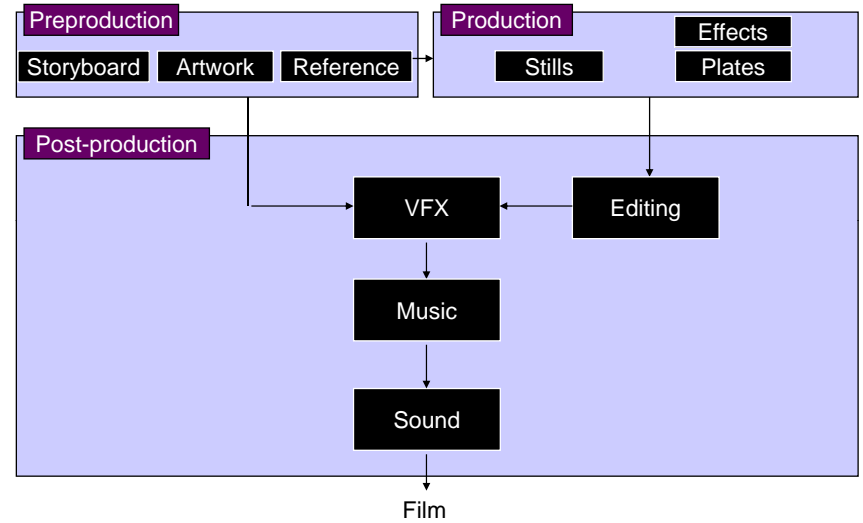# Production pipeline

Production pipeline

Preproduction
Storyboard Artwork Reference

Production
Stills Effects Plates

Post-production
VFX ← Editing
VFX → Music → Sound

Film

Preproduction

Storyboard

Preproduction

Artwork

Preproduction

Reference & Research

Production

Shooting

Post-production

Visual effects production

Preproduction			Production		
Storyboard	Artwork	Reference	Stills	Effects	Plates

Scanning

Post-production

Matchmove and Matchmodel

Model Geometry → Effects Animation, Character Animation

Skeleton, Textures

Skinning, Materials

Lighting and Rendering

Compositing

Assets | Shots

Film Recording
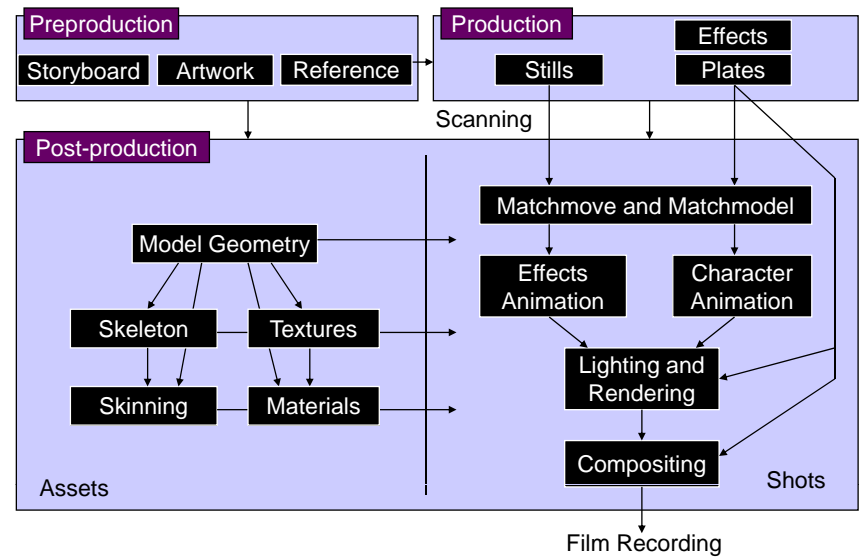
Visual effects post-production
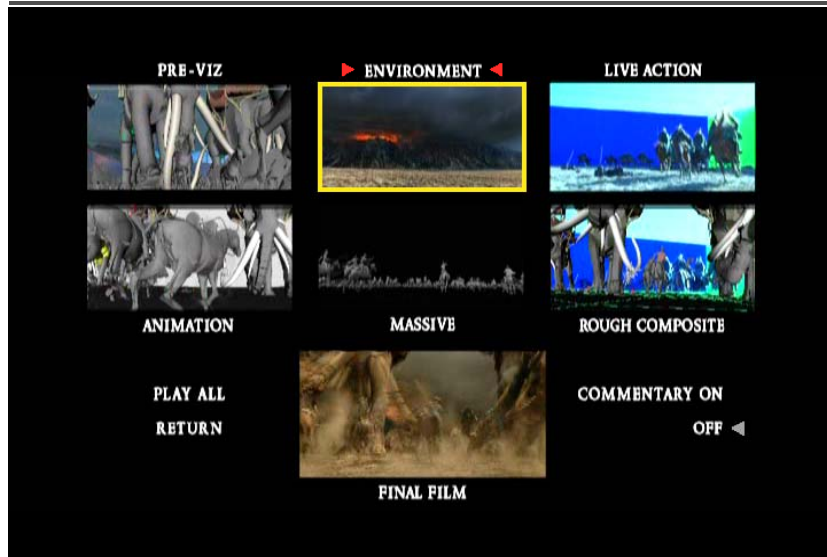
A case study

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
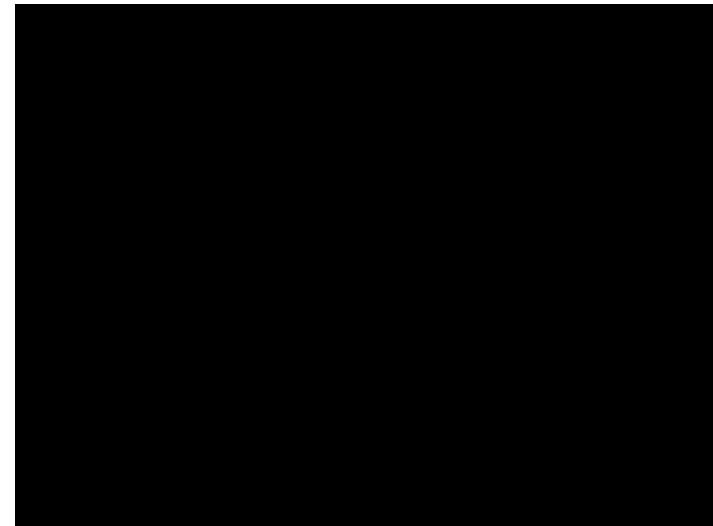
Making of 405

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

TCR 01:07:04:05

Cuts from Side then Rear view mirror looks.

TCR 01:04:59:23
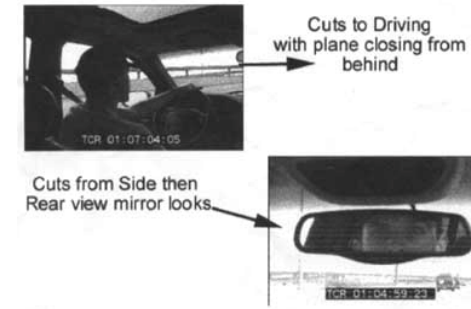
Making of 405

Step 2: building CG world
total 62 shots, 42 enhanced with digital VFX.
19 shots are entirely digital creations.
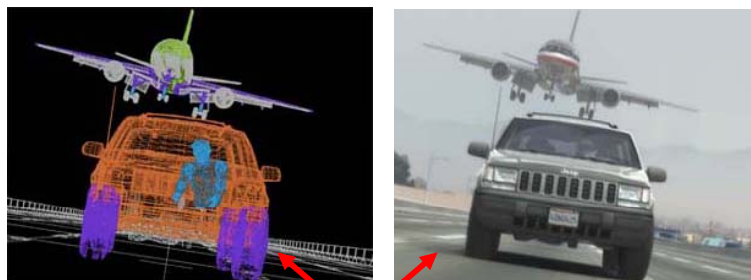plane, two cars, freeway background are digital

photo-based 3D environment

Making of 405

Real cars were used for close-up and interior shots

DC10_FX22 TCR 01:41:17   www.405themovie.com

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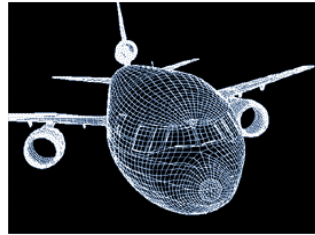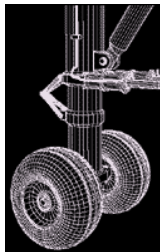
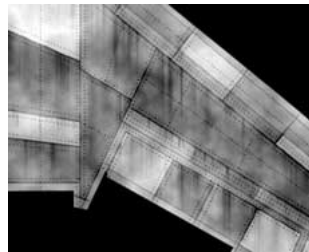DC-10 plane took a month to model in details for the needs of close-up shots.

59 objects, 142,439 polygons

reference   modeling   material painting

Step 3: traffic clearing   clean plate

close-up shots

inpainting

Step 4: compositing

shot with the vehicle standing still in a backyard

Making of 405

Step 5: fine touchup

3D hat

compositing and inpainting

Making of 405

Step 6: music and delivery
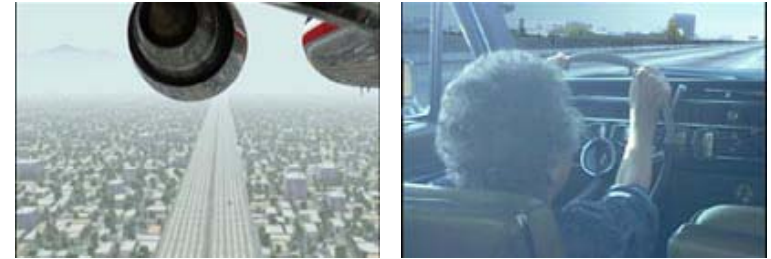
Bloody Omaha

Topics we plan to cover

Camera

Canon 10D

High dynamic range imaging/display
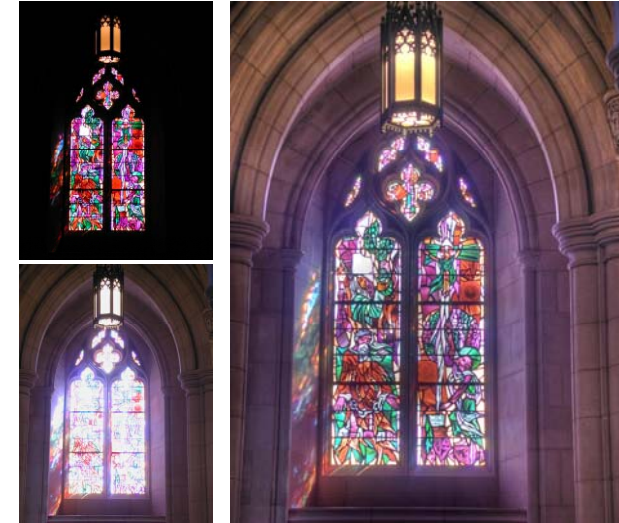
Image warping/morphing
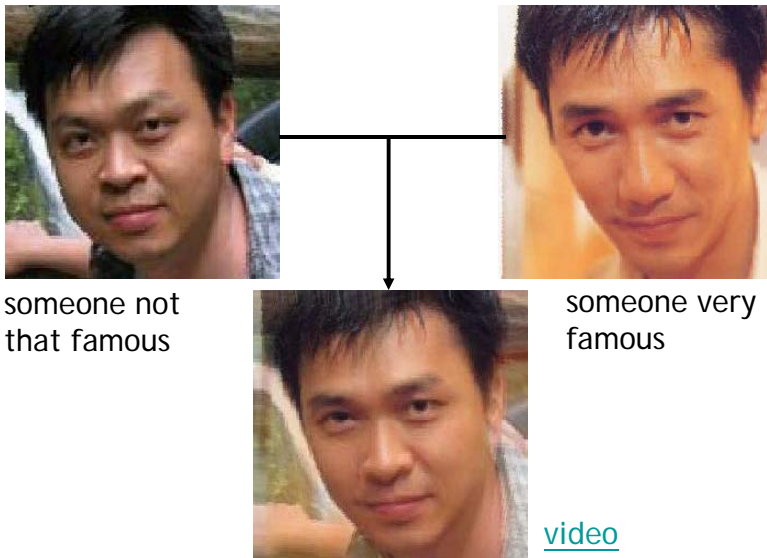
someone not
that famous

someone very
famous

video

Image warping/morphing
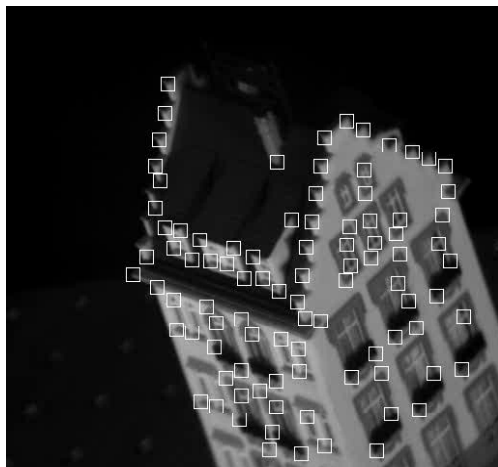
Tracking

Feature tracking

Image stitching
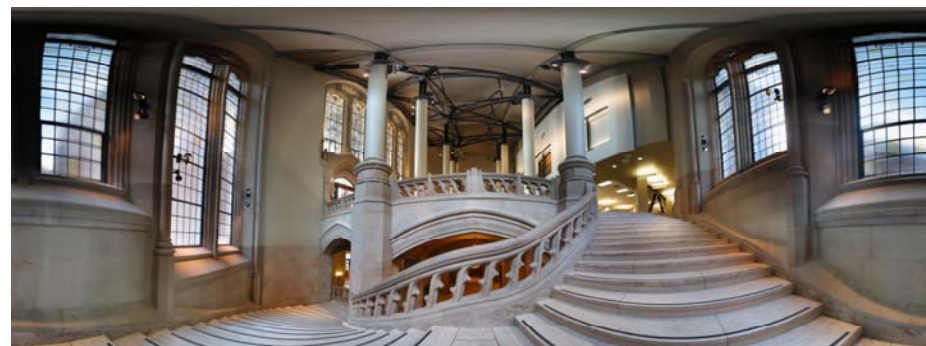
MatchMove

Move matching using scene planes

Matchmove

Frame [0] (f = 0 i)
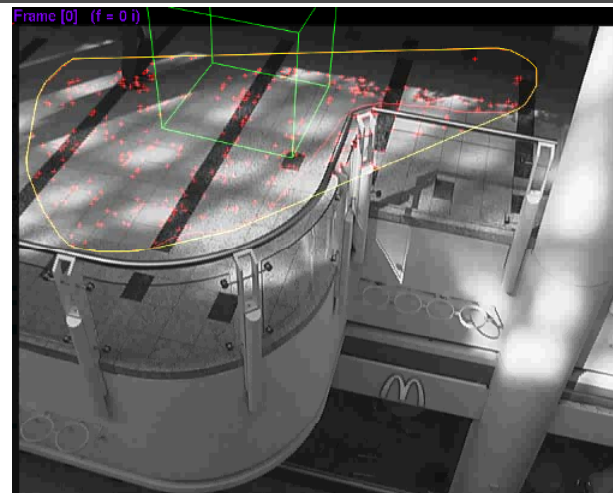
Move matching using scene planes

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

3D photography (active)

Cyberware whole body scanner

3D photography (active)
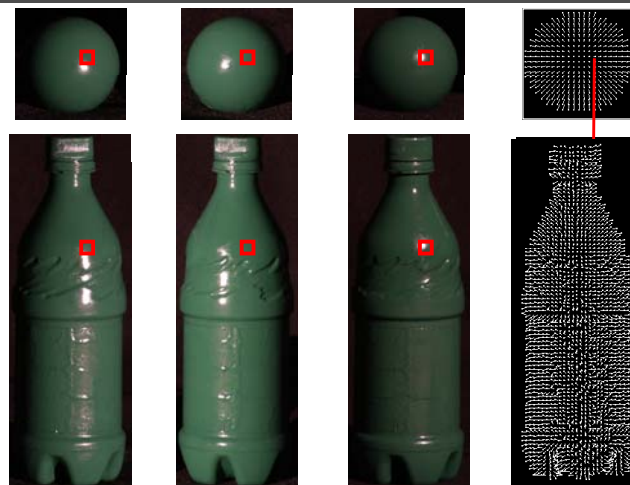
Photometric stereo

3D photography (passive)

left

right

depth

Stereo
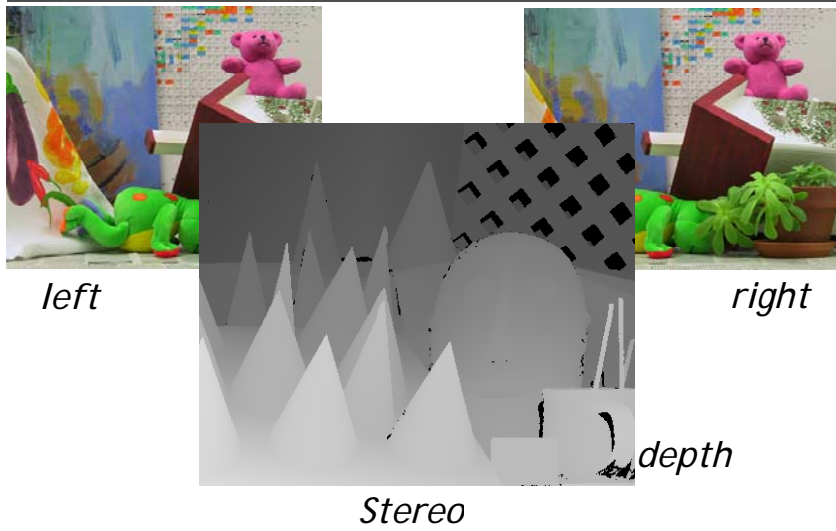
Image-based rendering
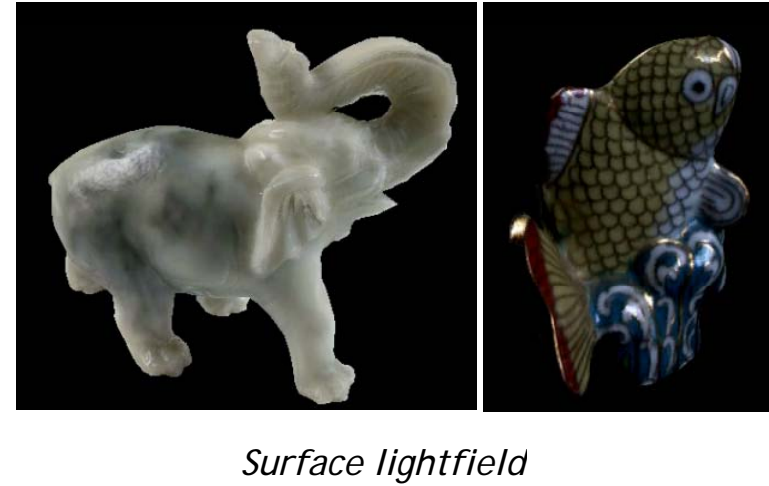
Surface lightfield

View interpolation

Bullet time video

View interpolation

High-Quality Video View Interpolation

Making face
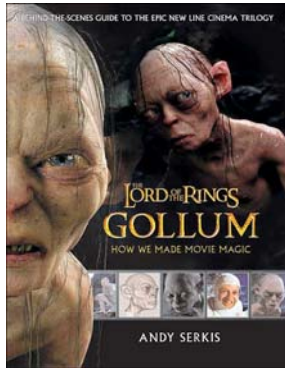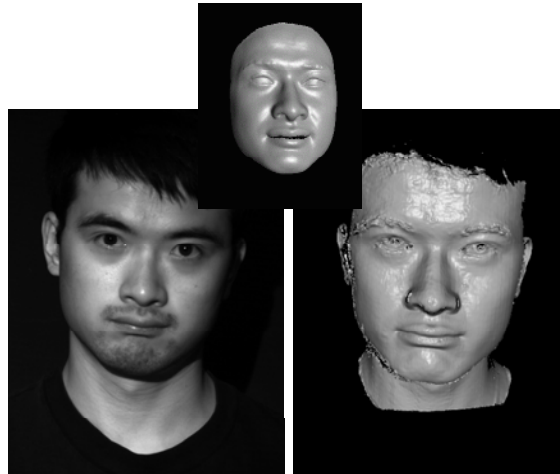
Gollum *Spacetime face*

Video rewrite

Trainable videorealistic speech animation

Inpainting (wire removal)

Inpainting

Texture synthesis/replacement

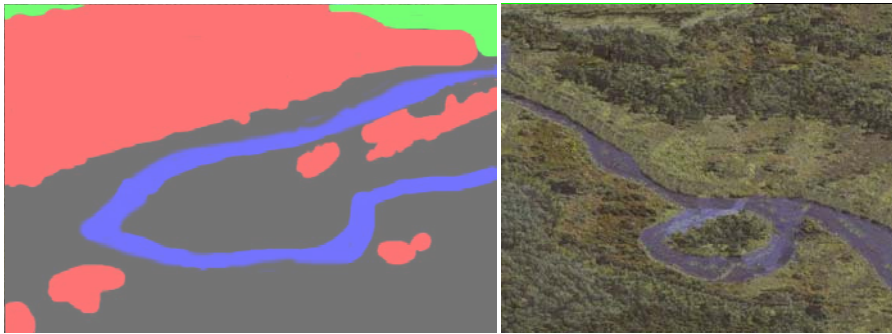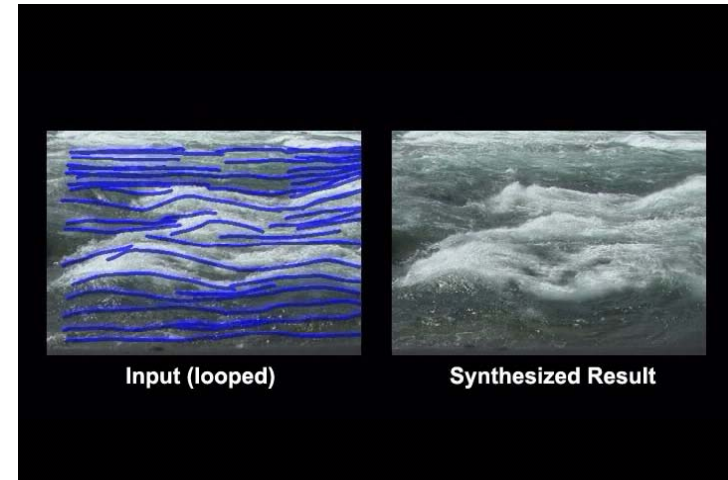*Texture replacement*

Semi-automatic matting painting

Image analogies

Video editing

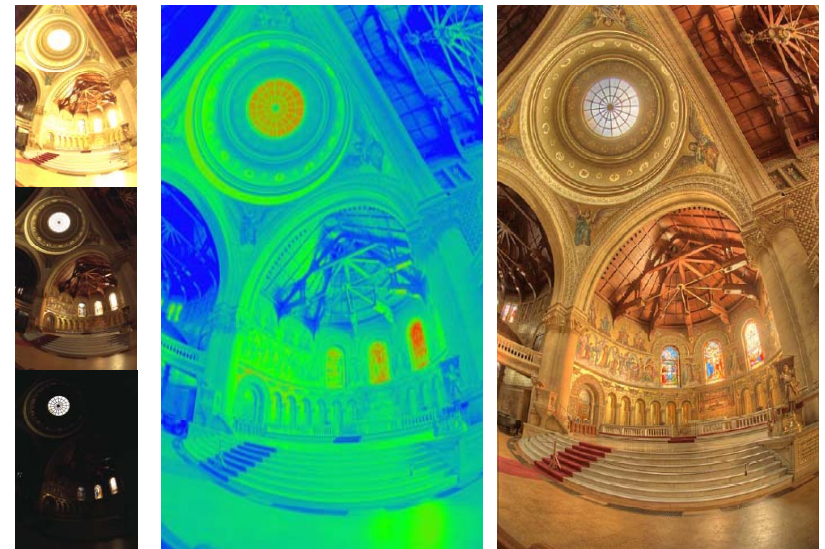Input (looped)   Synthesized Result

Flow-based video editing

Grading

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

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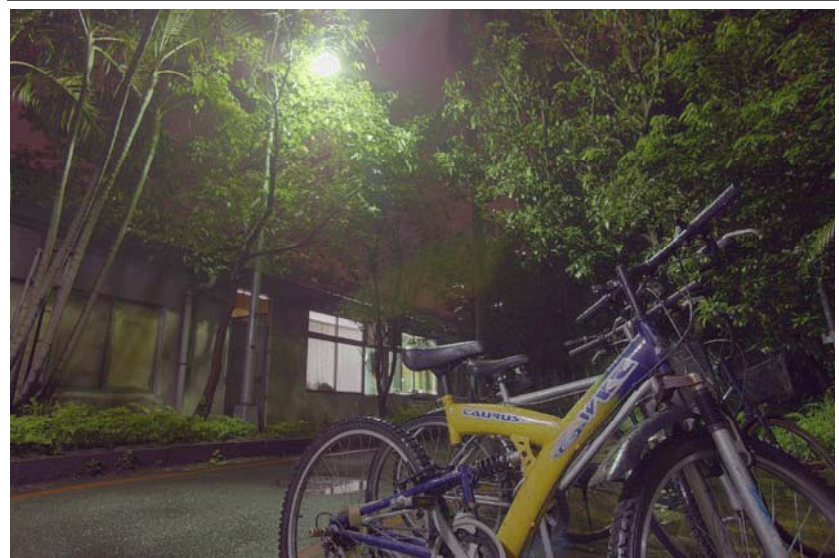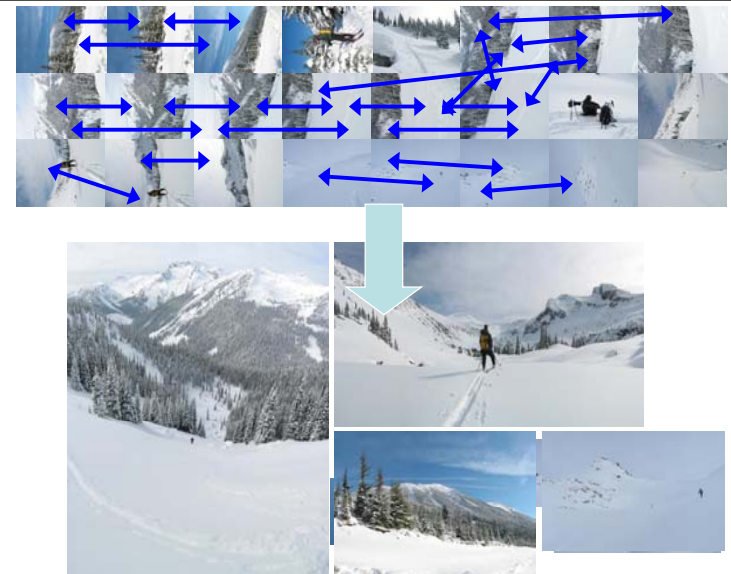
From past semesters (鄭逸廷 陳柏叡)

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

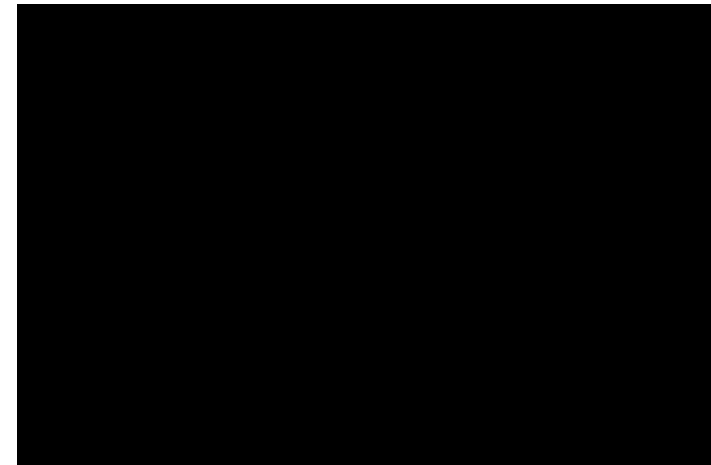
李佳燕 黃政基

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

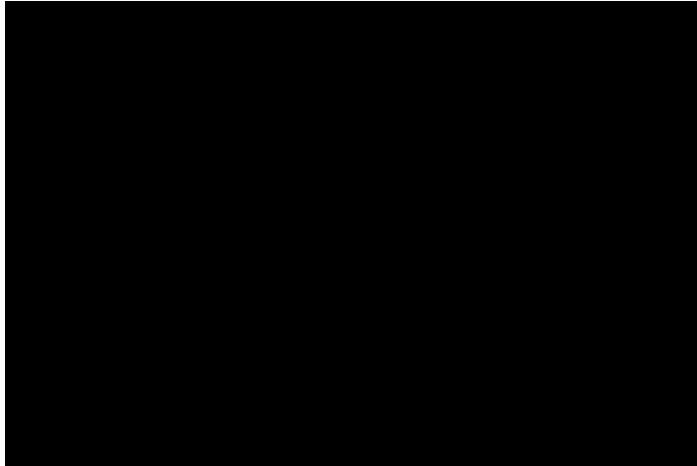**Final projects from a similar course in Georgia Tech.**

Life in Paints

Life in Paints, GaTech DVFX 2003

Tour into pictures

Making of *Life in Paints*

In Your Face

Flying Goldfish Productions

In Your Face, GaTech DVFX 2002
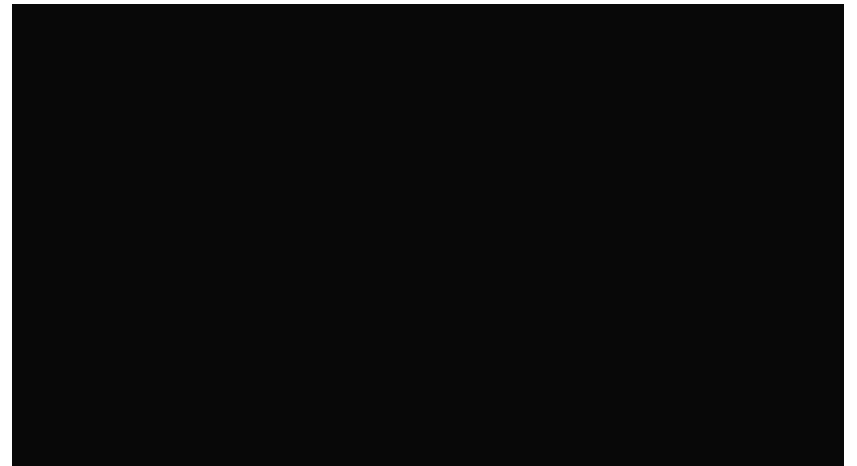
Stop action

The Making Of
In Your Face

Making of *In Your Face*

Tennis

Tennis, GaTech DVFX 2007

MatchMove/CGI
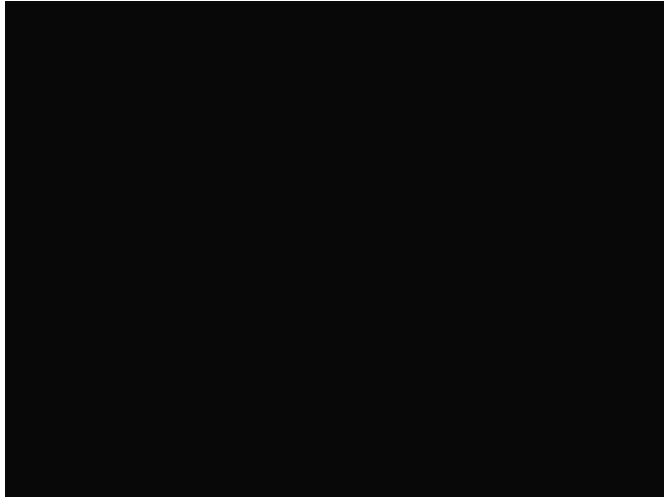
Making of Tennis

Final projects from the past.

YoYo Flight

YoYo Flight !!
YoYo Inc. present
Jun, 28, 2005

B87506003 Tian-Hau Chang
B90902003 Yu-Hsin Chang
B90902096 Yu-Ting Tseng
B90902099 Pei-Shiuan He

Making of YoYo Flight

YoYo Flight !!
YoYo Inc. present
Jun, 28, 2005