Course overview

Digital Visual Effects

Yung-Yu Chuang
Logistics

- Meeting time: 2:20pm-5:20pm, Thursday
- Classroom: CSIE Room 104
- Instructor: Yung-Yu Chuang (cyy@csie.ntu.edu.tw)
- Teaching assistants: 張明旭
- 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.
The vfx course

what other professors think you do
what other students think you do
what you thought you will do

what you actually do
Warning from previous students

- Please note that this course is difficult. It is recommended for students with strong interest or sufficient ability to enroll. Otherwise, you will have to drop the course like me. XD
This course is about ...
Digital Visual Effects

2011

2011
Reality?
Retouching
Iraq War, LA Times, April 2003

Digital photomontage
Bush campaign’s TV AD, 2004
Texture synthesis and inpainting
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
- camera
- matte painting
- composite of painting and full-scale set, as seen through camera
Rear projection

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
- Plates

Effects:

Post-production:
- VFX
- Editing
- Music
- Sound

Film
Preproduction

Storyboard

THE RETURN OF THE KING
Book Six - Chapter III
"Mount Doom"
Preproduction

Artwork
Preproduction

Reference & Research
Production

Shooting
Post-production
Visual effects production

Preproduction
- Storyboard
- Artwork
- Reference

Production
- Stills
- Plates

Effects
- Matchmove and Matchmodel
- Effects Animation
- Character Animation

Post-production
- Model Geometry
- Skeleton
- Textures
- Skinning
- Materials

 Assets

Shot
- Lighting and Rendering
- Compositing

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/](http://www.405themovie.com/)
405: The Movie
# Making of 405

## Step 0: script and shooting plan

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

A low-resolution mesh scanned by a cyberscanner.
Mapped with photographs.
Making of 405

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
Making of 405

Step 3: traffic clearing

close-up shots

inpainting

clean plate
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
Topics we plan to cover
Image warping/morphing

someone not that famous

someone very famous

video
Image warping/morphing
Feature tracking
Image stitching
MatchMove

*Move matching using scene planes*
Matchmove

Move matching using scene planes
Matchmove

Move matching using scene planes
Photo tourism

Photo Tourism
Exploring photo collections in 3D

(a) (b) (c)
Video matching

Matrix  MOCO (Motion control camera)
Video matching
Matting and compositing

Titanic
Matting
Object selection

LazySnapping

LazySnapping
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

Stereo

depth
Image-based rendering

Surface lightfield
View interpolation

Bullet time video
View interpolation

High-Quality Video View Interpolation
Stereoscopic films
Making face

Gollum

Spacetime face
Video rewrite

Trainable videorealistic speech animation
Inpainting (wire removal)
Texture synthesis/replacement

Texture replacement
Semi-automatic matte painting

Image analogies
Video editing

*Flow-based video editing*

*Input (looped)*

*Synthesized Result*

*Flow-based video editing*
Grading (subject to change)

- 3 programming assignments (60%)
  - Morphing (18%)
  - AutoStitch (24%)
  - MatchMove (18%)

- Class participation (5%)

- Final project (35%)
  - Research
  - System
  - Film
Morphing
Morphing

source #1

source #2

source #3

source

morph

destination
羅聖傑

連奕婷 張宇蓓
Final projects from a similar course in Georgia Tech.
Tour into pictures

Making of *Life in Paints*
Stop action

The Making Of
In Your Face

Making of *In Your Face*
Tennis
Final projects from the past.
YoYo Flight

YoYo Inc. present
Jun, 28, 2005

B87506003 Tian-Hau Chang
B90902003 Yu-Hsin Chang
B90902096 Yu-Ting Tseng
B90902099 Pei-Shiu He
Making of YoYo Flight

YoYo Flight !!

YoYo Inc. present
Jun, 28, 2005
That’s it for today!

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