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](mailto:cyy@csie.ntu.edu.tw))
- **Teaching assistants:** 張明旭
- **Textbook:** Readings from books, journals and proceedings. Richard Szeliski’s *Computer Vision: Algorithms and Applications*.
- **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/](https://cmlmail.csie.ntu.edu.tw/mailman/listinfo/vfx/)

It isn’t about photography

This course is **NOT** about …
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

**The vfx course**

- what other professors think you do
- what other students think you do
- what you actually do

**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

Domestic example

Special effects
Stop action

*The execution of Mary, 1895*

Glass shot

*King Kong, 1933*

Rear projection

Special effects (make-up)
Special effects (physical effects)

Special effects (miniature)

Special effects (matte painting)

Lord of the Rings
<table>
<thead>
<tr>
<th>Illusion - forced perspective</th>
<th>Computer-generated model</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image-url" alt="Image" /></td>
<td><img src="image-url" alt="Image" /></td>
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</table>

<table>
<thead>
<tr>
<th>Visual effects 100 Years</th>
<th>Production pipeline</th>
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<tr>
<td><img src="image-url" alt="Image" /></td>
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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/)

Making of 405

Step 0: script and shooting plan

<table>
<thead>
<tr>
<th>Shot</th>
<th>Description</th>
<th>Full CB</th>
<th>CG</th>
<th>Length Frames</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td>Plane swings into landing position toward freeway</td>
<td>X</td>
<td>X</td>
<td>138</td>
</tr>
<tr>
<td>08</td>
<td>Hand on Gear shift</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Plane towers into view through rear window</td>
<td>X</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Plane nears Car</td>
<td>X</td>
<td>X</td>
<td>65</td>
</tr>
<tr>
<td>11</td>
<td>J looks to side mirror—plane visible behind</td>
<td>X</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Plane in sideview mirror</td>
<td>X</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>J looks from side view to rear view mirror—plane behind</td>
<td>X</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Jeyes read in rear view mirror—remove traffic</td>
<td>X</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Plane chases Car toward camera</td>
<td>X</td>
<td>X</td>
<td>77</td>
</tr>
</tbody>
</table>
Step 1: shooting

two days with a Canon Optura DV camera with progressive mode.
⇒ a 70-minute raw footage

⇒ initial editing
⇒ pickup shots

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

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
Making of 405

Step 3: traffic clearing
- Clean plate
- Close-up shots
- Inpainting

Step 4: compositing
- Shot with the vehicle standing still in a backyard

Step 5: fine touchup
- 3D hat
- Compositing and inpainting
Making of 405

Step 6: music and delivery

Bloody Omaha

Image warping/morphing

Topics we plan to cover

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

Photo tourism

Photo Tourism
Exploring photo collections in 3D

Video matching

Matrix
MOCO (Motion control camera)
Video matching

Matting and compositing

Matting

Object selection
Image-based modeling

photogrammetric modeling and projective texture-mapping

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
<table>
<thead>
<tr>
<th>Image-based rendering</th>
<th>View interpolation</th>
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</thead>
<tbody>
<tr>
<td><img src="image1" alt="Surface lightfield" /></td>
<td><img src="image2" alt="Bullet time video" /></td>
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</tbody>
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<table>
<thead>
<tr>
<th>View interpolation</th>
<th>Stereoscopic films</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="High-Quality Video View Interpolation" /></td>
<td><img src="image4" alt="Stereoscopic films" /></td>
</tr>
</tbody>
</table>
Making face

Gollum

Spacetime face

Video rewrite

Trainable videorealistic speech animation

Inpainting (wire removal)

Inpainting

Texture synthesis/replacement

Texture replacement
Semi-automatic matte painting

Image analogies

Video editing

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

source  morph  destination

source  morph  destination
Final projects from a similar course in Georgia Tech.

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

The Making Of In Your Face

Tennis, GaTech DVFX 2007

MatchMove/CGI

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

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