

Course overview

Digital Visual Effects, Spring 2008

Yung-Yu Chuang

2008/2/19

DigiVFX

Logistics

- Meeting time: 10:20pm-1:10pm, Tuesday (17 weeks, no holiday this semester, :<)
- Classroom: CSIE Room 104
- Instructor: Yung-Yu Chuang (cyy@csie.ntu.edu.tw)
- Teaching assistants: TBD
- 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/>

DigiVFX

It isn't about photography



This course is **NOT** about ...

It isn't about 3D animations

DigiVFX



It isn't about watching movies

DigiVFX



It isn't about physical effects

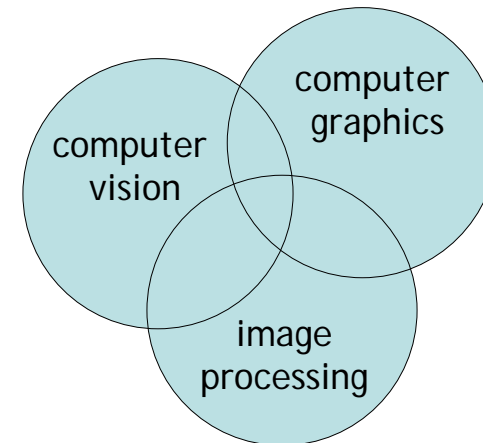
DigiVFX



It's not about industrial tricks

DigiVFX

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

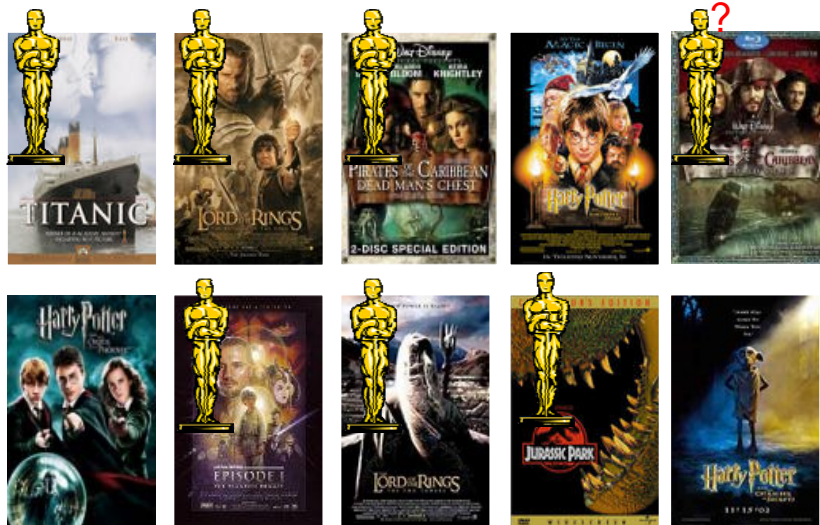
DigiVFX

- 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

DigiVFX



Reality?

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Retouching

DigiVFX



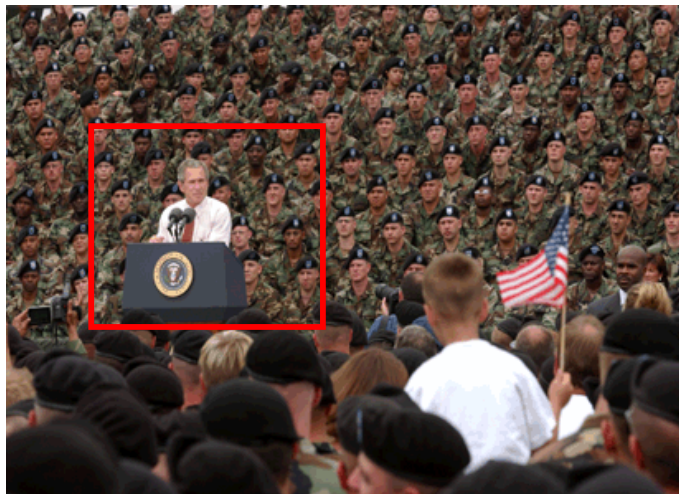
Iraq War, LA Times, April 2003

DigiVFX



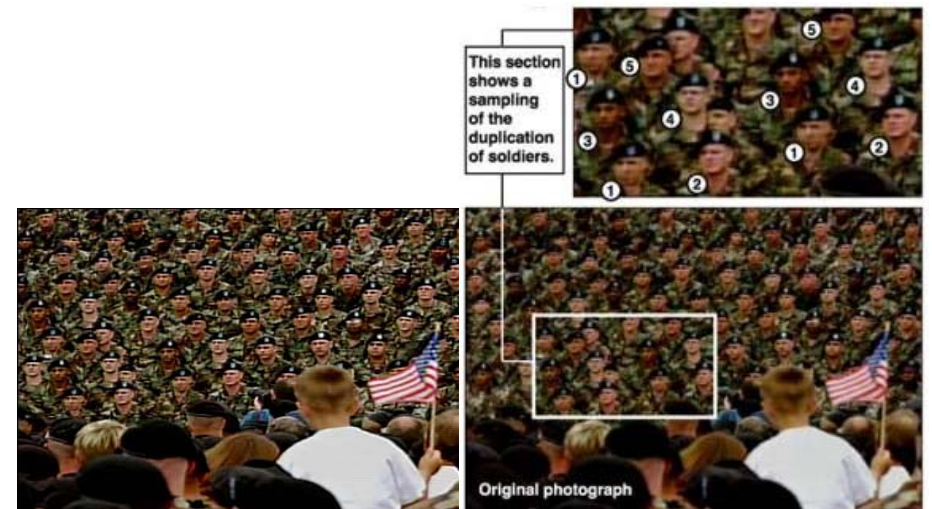
Bush campaign's TV AD, 2004

DigiVFX



Texture synthesis and inpainting

DigiVFX



Domestic example

DigiVFX



The Liberty Times
2007.12.17



Special effects

Stop action

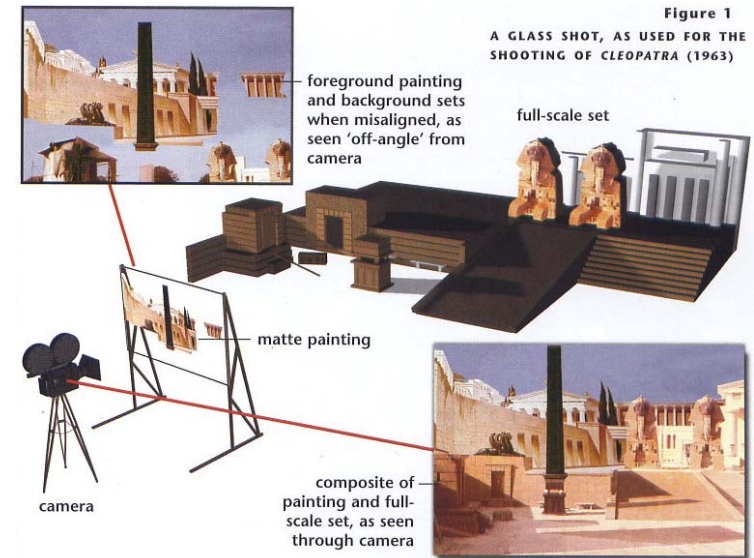
DigiVFX



The execution of Mary, 1895

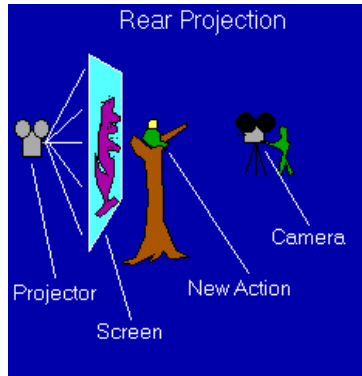
Glass shot

DigiVFX



Rear projection

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stop motion



King Kong, 1933

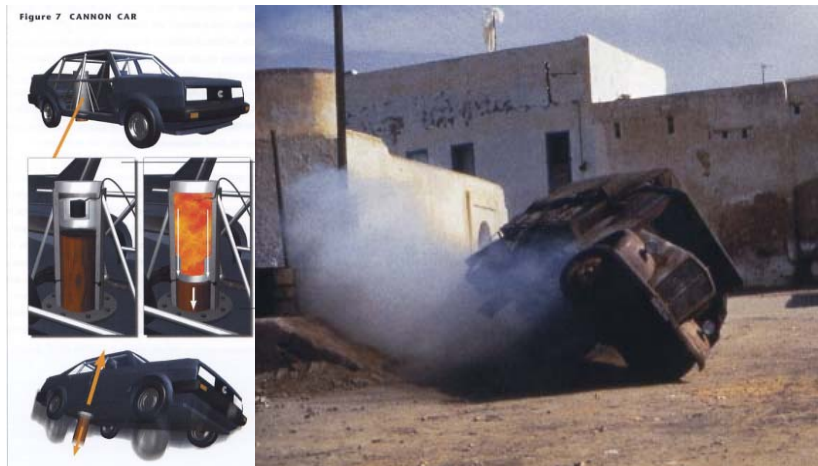
Special effects (make-up)

DigiVFX



Special effects (physical effects)

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Special effects (miniature)

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Special effects (matte painting)

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Lord of the Rings

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Illusion - forced perspective

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Computer-generated model

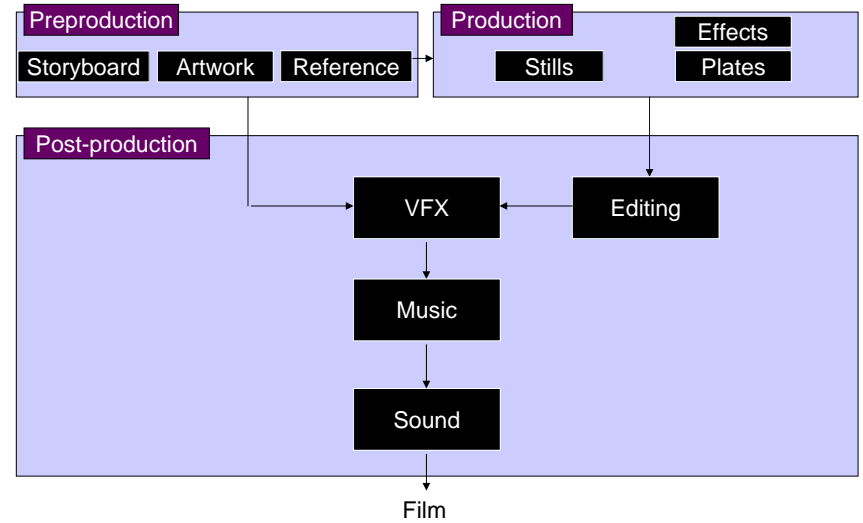
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Production pipeline

Production pipeline

DigiVFX



Preproduction

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Storyboard

Preproduction

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Artwork

Preproduction

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Reference & Research

Production

DigiVFX



Shooting

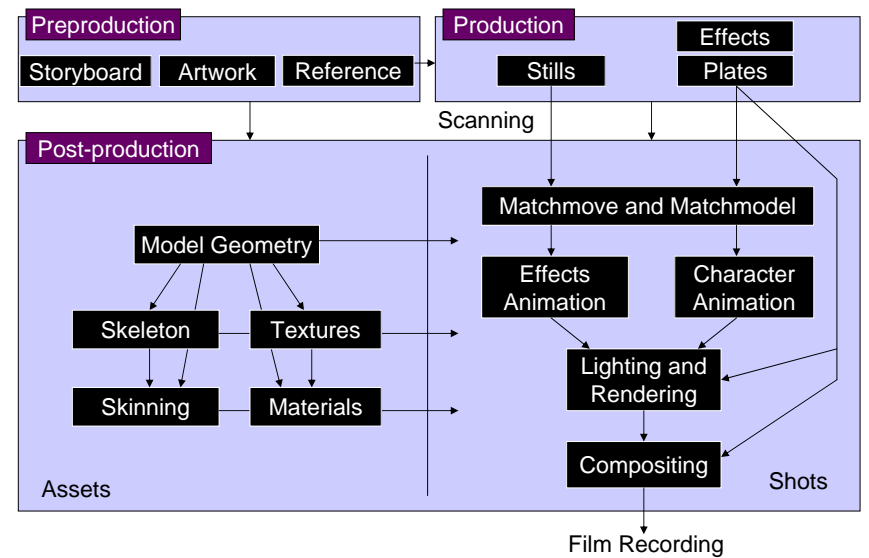
Post-production

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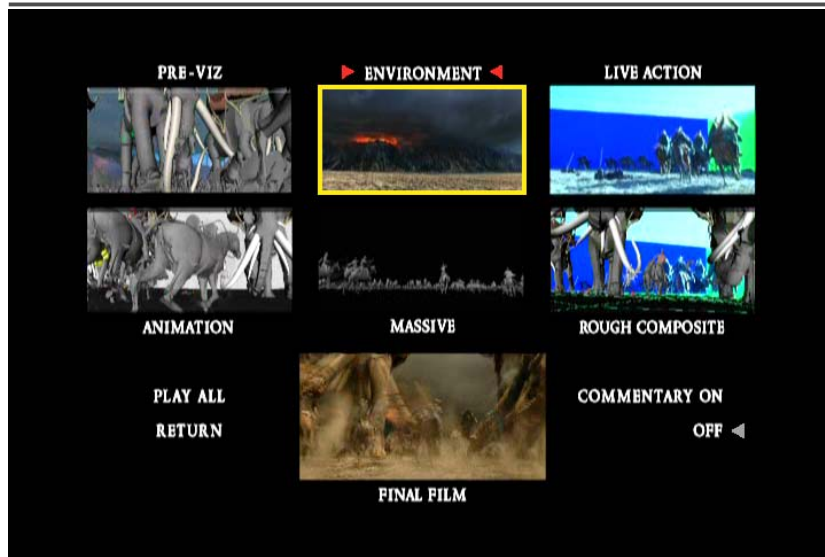
Visual effects production

DigiVFX



Visual effects post-production

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A case study

405: The Movie

DigiVFX

- 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/>



Making of 405

DigiVFX

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

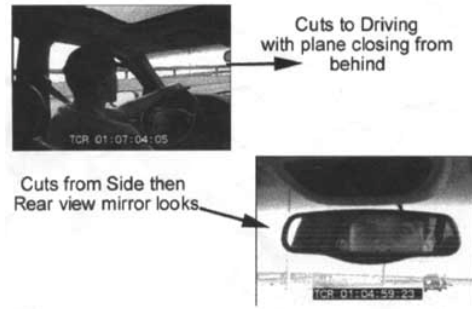
DigiVFX

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

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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

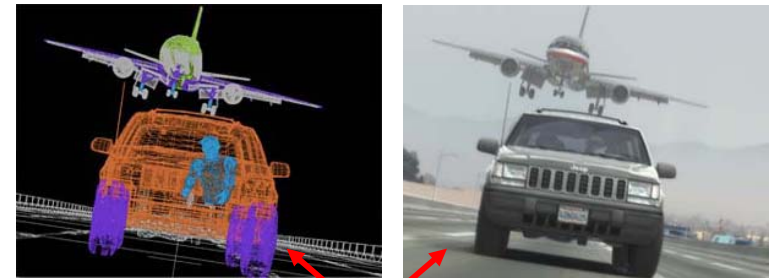


photo-based 3D environment

Making of 405

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Real cars were used for close-up and interior shots



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

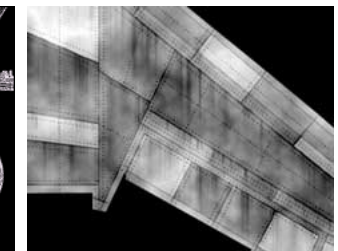
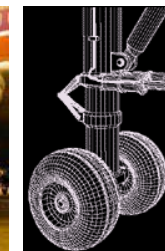
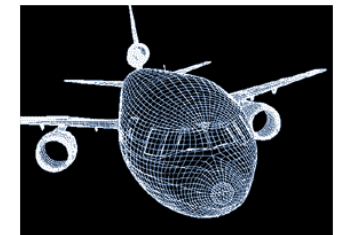


Making of 405

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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

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Step 3: traffic clearing

clean plate



close-up shots



inpainting

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Step 4: compositing



shot with the vehicle standing still in a backyard



Making of 405

DigiVFX



Making of 405

DigiVFX

Step 5: fine touchup



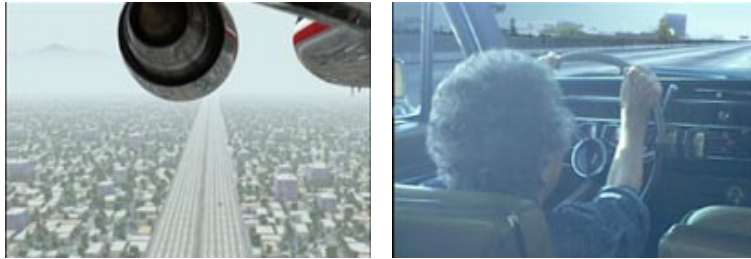
3D hat

compositing and inpainting

Making of 405

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Step 6: music and delivery



Bloody Omaha

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Topics we plan to cover

Camera

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Canon 10D

High dynamic range imaging/display

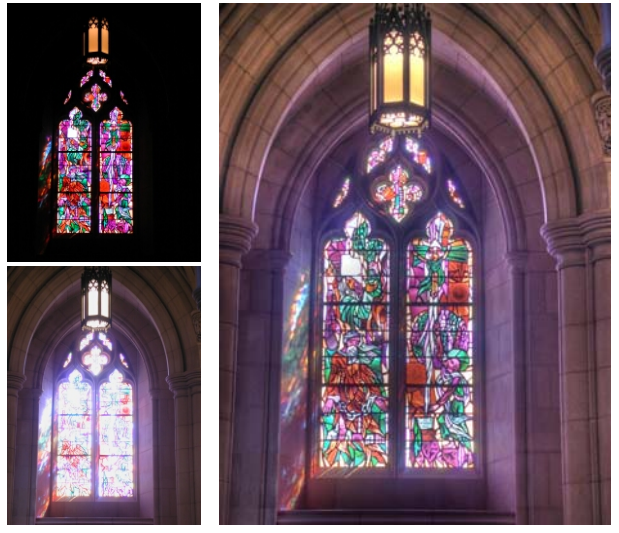


Image warping/morphing

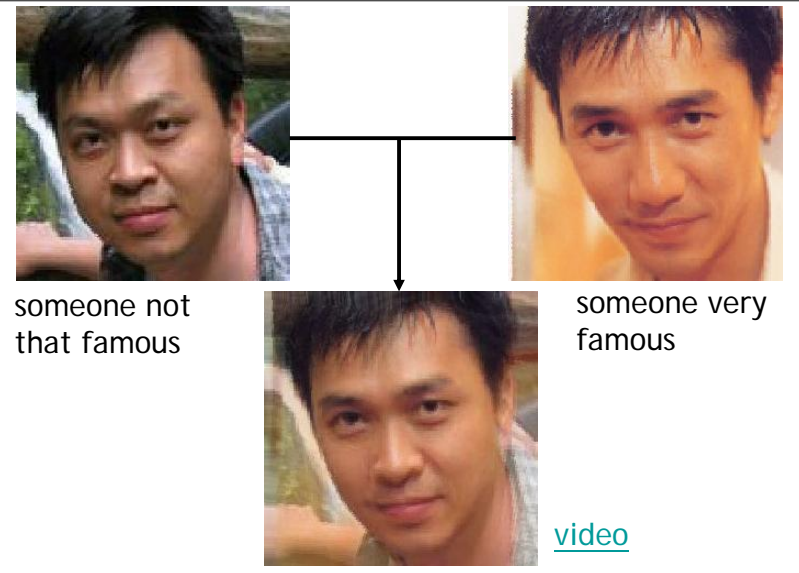
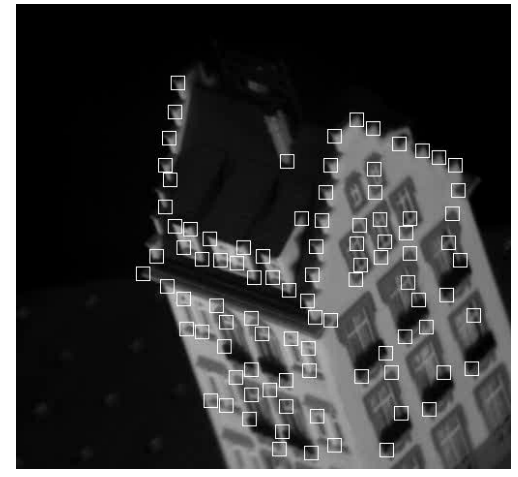


Image warping/morphing



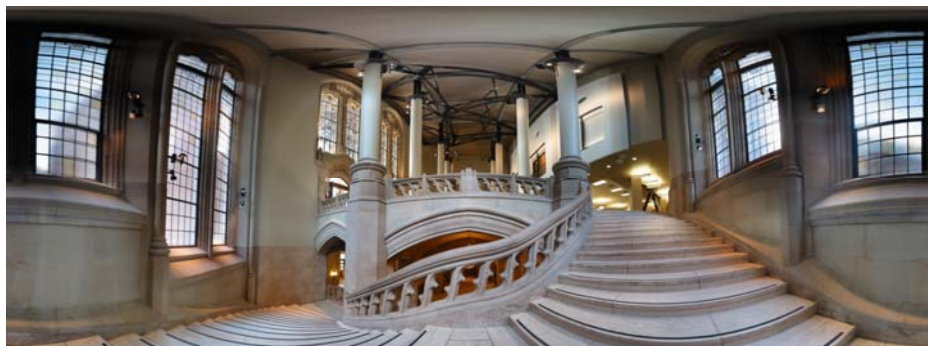
Tracking



Feature tracking

Image stitching

DigiVFX



MatchMove

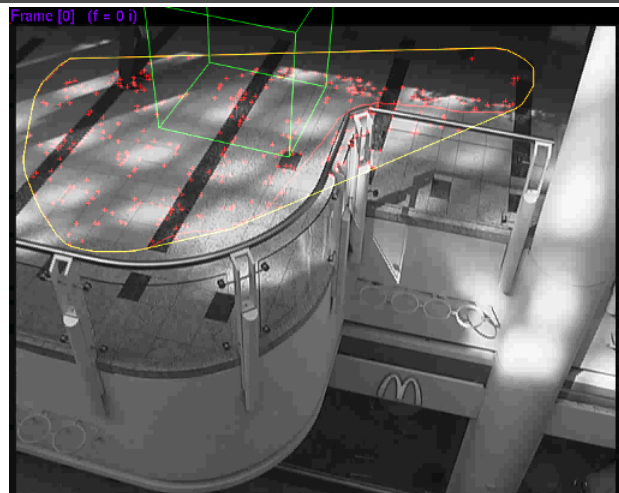
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Move matching using scene planes

Matchmove

DigiVFX



Move matching using scene planes

Matchmove

DigiVFX



Move matching using scene planes

Photo tourism

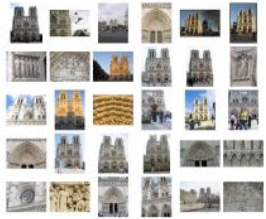
DigiVFX



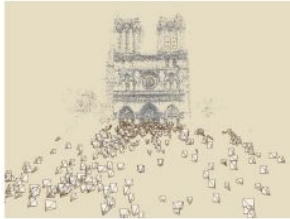
Photo Tourism

Exploring photo collections in 3D

Microsoft



(a)



(b)



(c)

Video matching

DigiVFX



Matrix



MOCO (Motion control camera)

Video matching

DigiVFX



Video matching

Matting and compositing

DigiVFX



Titanic

Matting

DigiVFX



Object selection

DigiVFX



LazySnapping

Image manipulation

DigiVFX



GraphCut Texture

Image manipulation

DigiVFX



Poisson blending

Image-based modeling

DigiVFX



photogrammetric modeling and projective texture-mapping

Image-based modeling

DigiVFX



photogrammetric modeling and projective texture-mapping

Image-based modeling

DigiVFX



photogrammetric modeling and projective texture-mapping

Image-based modeling

DigiVFX



Tour into a picture

Image-based modeling

DigiVFX



Tour into a picture

3D photography (active)

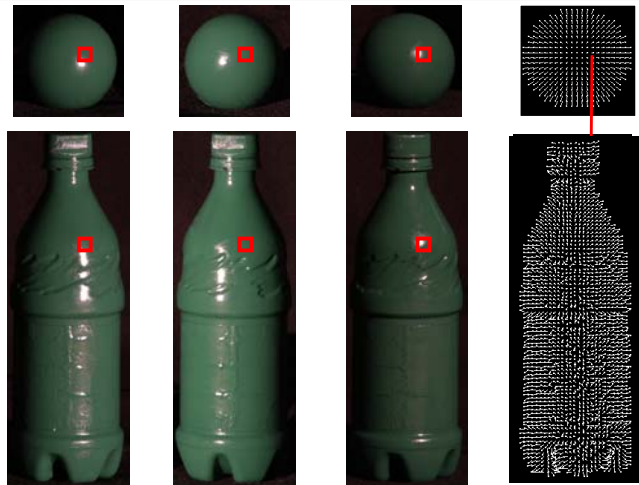
DigiVFX



Cyberware whole body scanner

3D photography (active)

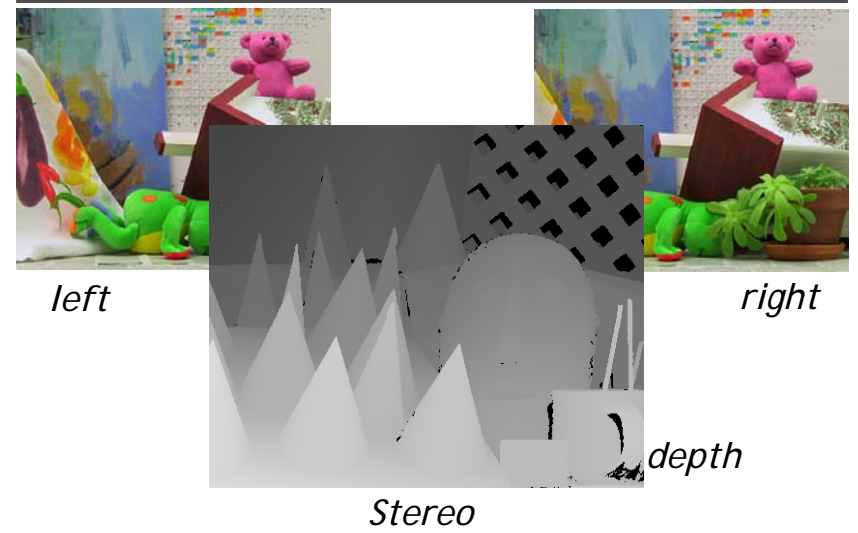
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Photometric stereo

3D photography (passive)

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left

right

depth

Stereo

Image-based rendering

DigiVFX



Surface lightfield

View interpolation

DigiVFX



Bullet time video

View interpolation

DigiVFX



High-Quality Video View Interpolation

Making face

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Gollum

Spacetime face

Video rewrite

DigiVFX



Trainable videorealistic speech animation

Inpainting (wire removal)

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Inpainting

Texture synthesis/replacement

DigiVFX



Texture replacement

Semi-automatic matting painting

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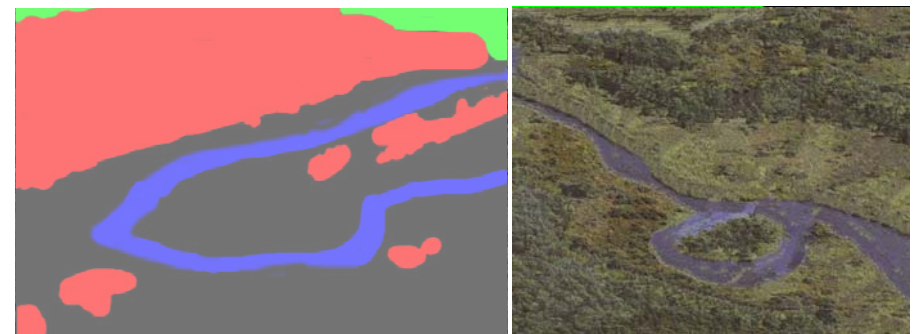
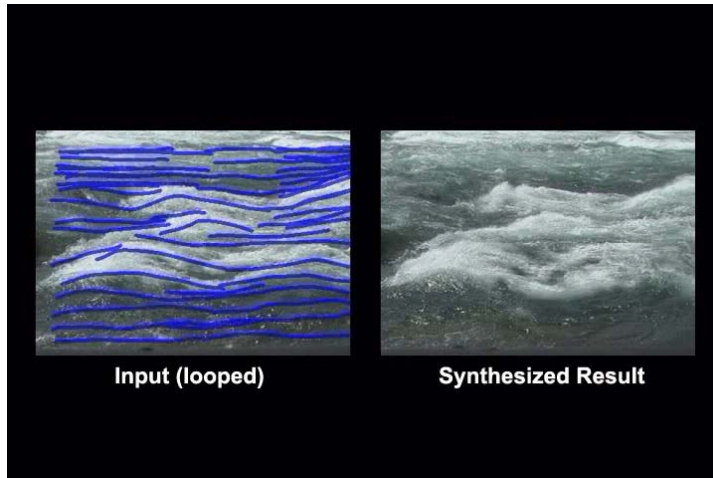


Image analogies

Video editing

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Flow-based video editing

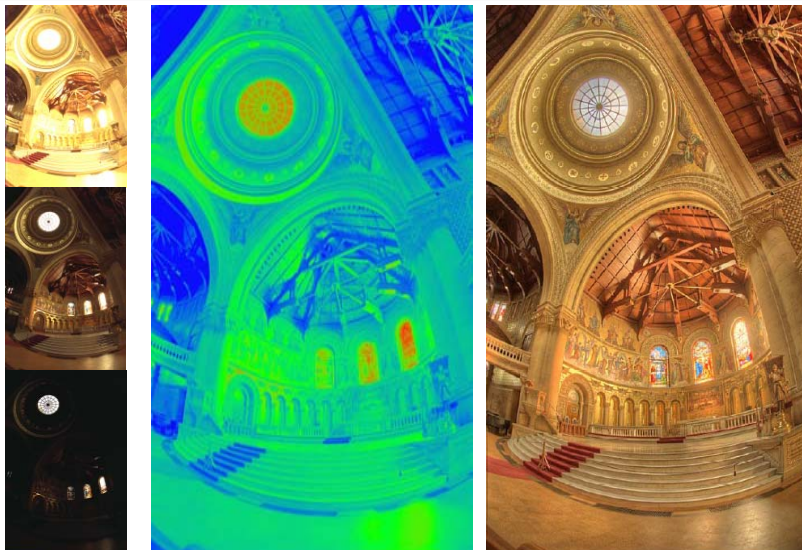
Grading

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- 3 programming assignments (50%)
 - HDR Imaging
 - AutoStitch
 - MatchMove
- Class scribe (8%)
- Class participation (6%)
- Final project (36%)
 - Research
 - System
 - Film

High dynamic range imaging

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From last semester (鄭逸廷 陳柏叡)

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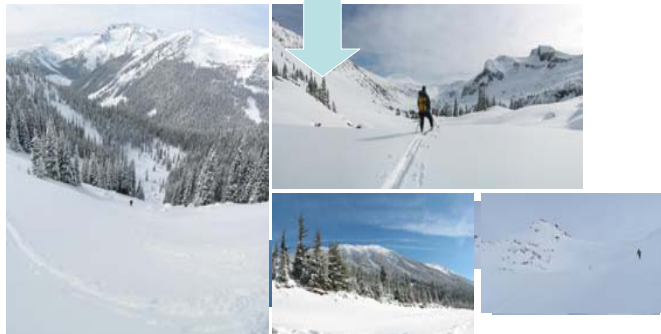
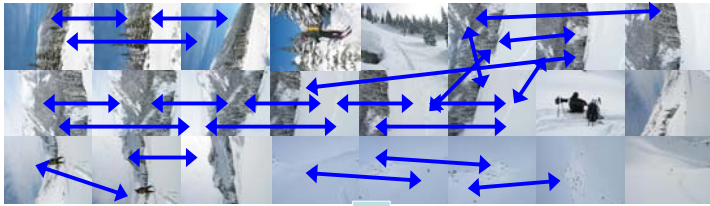
From last semester (吳侑親, 張書瑋) DigiVFX



From last semester (王瑋馥, 余雁雲) DigiVFX



AutoStitch DigiVFX



From last semester DigiVFX



鄭逸廷 陳柏叡



李佳燕 黃政基

MathMove

DigiVFX



梁家愷 鐘志遠



姜任遠 林立峯



楊宗碩 林柏劭

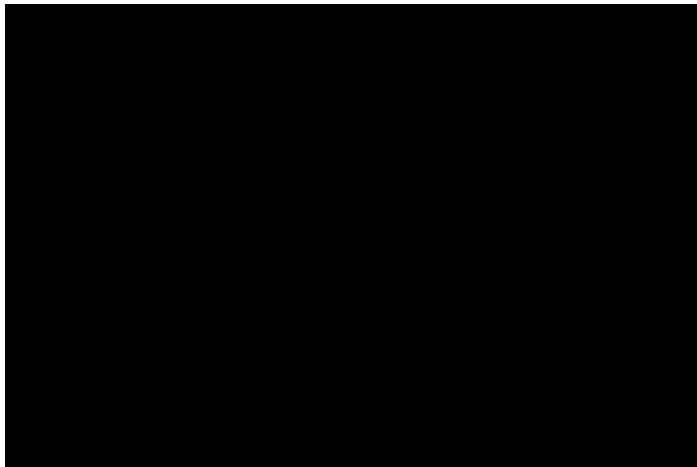


翁憲政 洪韶憶

Final projects from a similar course
in Georgia Tech.

Life in Paints

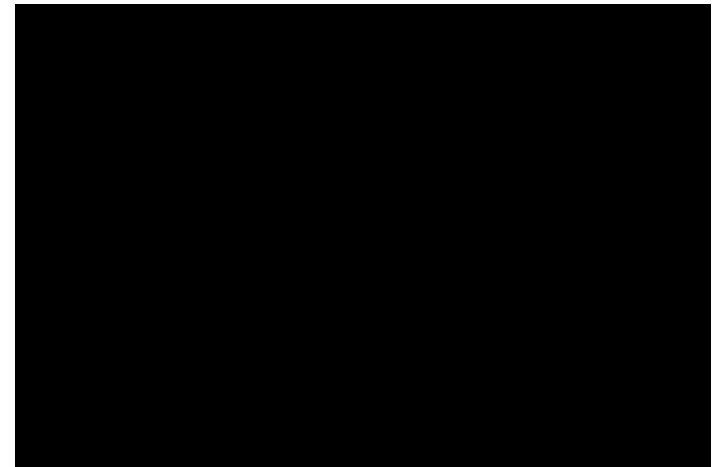
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Life in Paints, GaTech DVFX 2003

Tour into pictures

DigiVFX



Making of *Life in Paints*

In Your Face

DigiVFX



In Your Face, GaTech DVFX 2002

Stop action

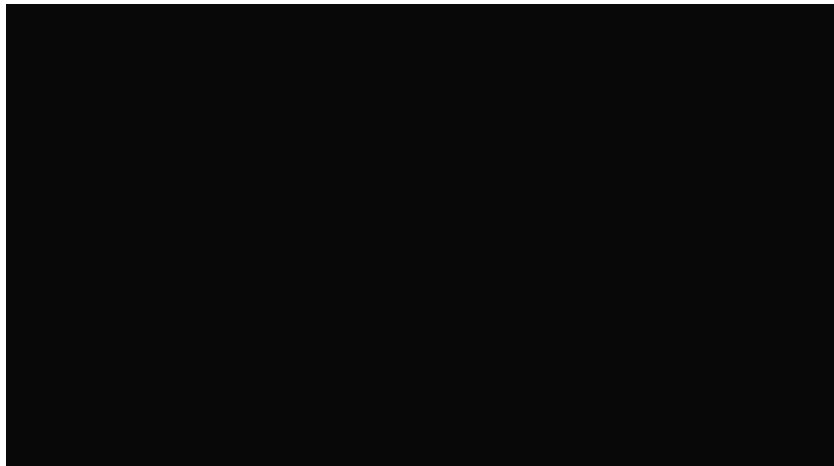
DigiVFX



Making of *In Your Face*

Tennis

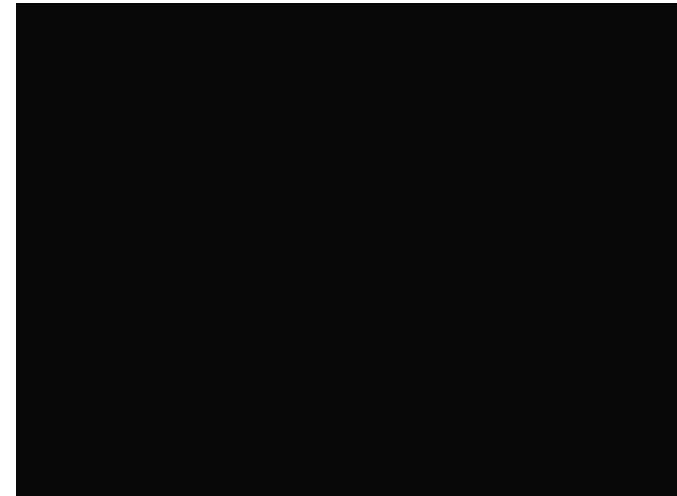
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Tennis, GaTech DVFX 2007

MatchMove/CGI

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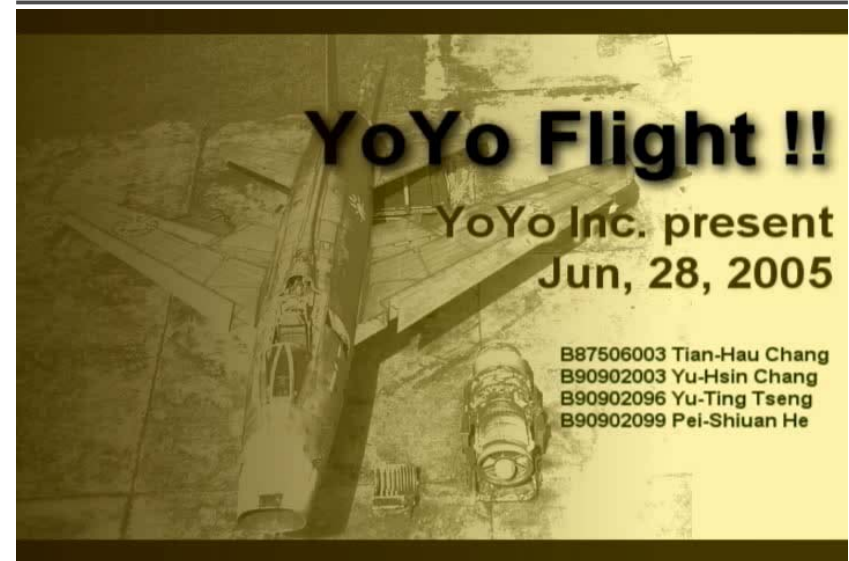


Making of Tennis

Final projects from the past.

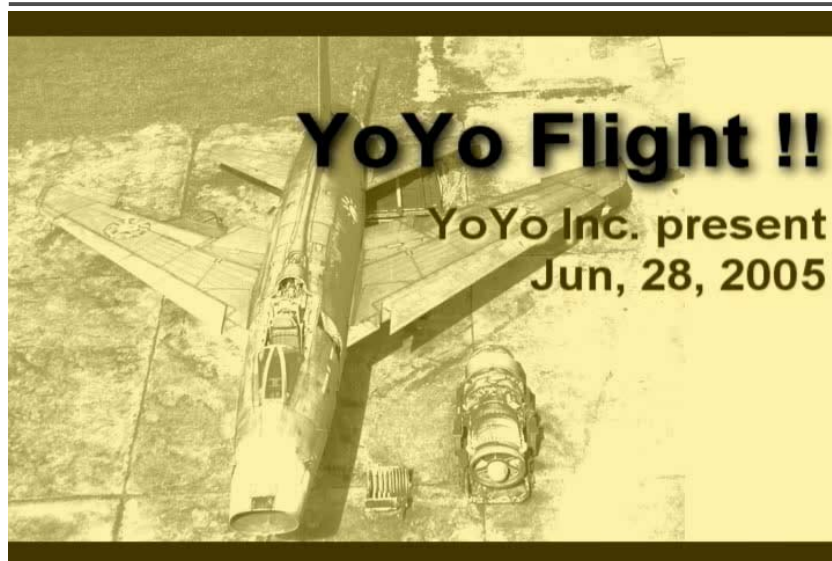
YoYo Flight

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Making of YoYo Flight

DigiVFX



That's it for today!

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