

Course overview

Digital Visual Effects

Yung-Yu Chuang

DigiVFX

Logistics

- Meeting time: 2:20pm-5:20pm, Wednesday
- Classroom: CSIE Room 104
- Instructor: Yung-Yu Chuang (cyy@csie.ntu.edu.tw)
- Teaching assistants: TBA
- 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/>

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

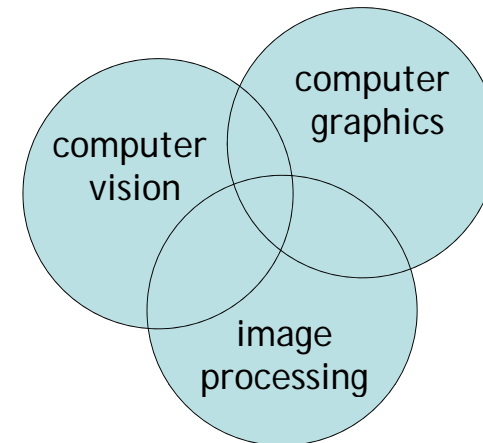
DigiVFX



It's not about industrial tricks

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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.

The vfx course

DigiVFX



what other professors
think you do

what other students
think you do

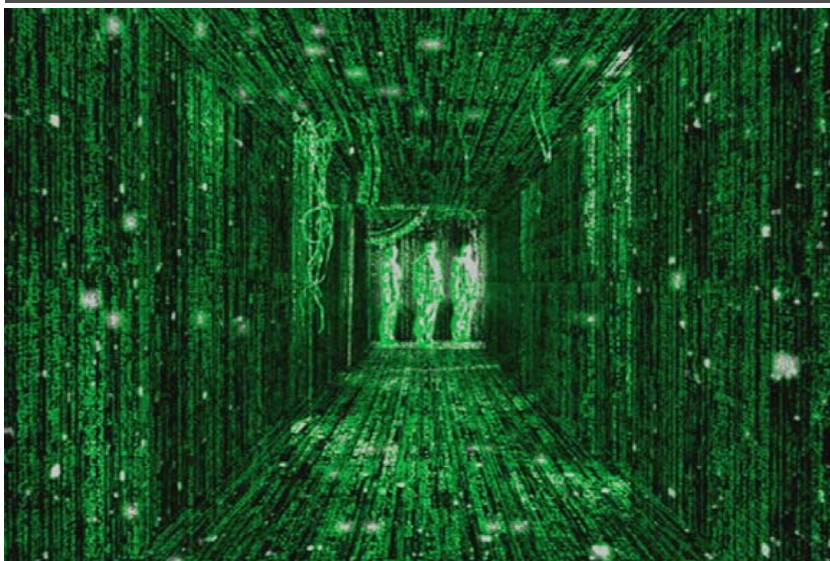
what you thought
you will do



what you actually do

The vfx course

DigiVFX



Warning from previous students

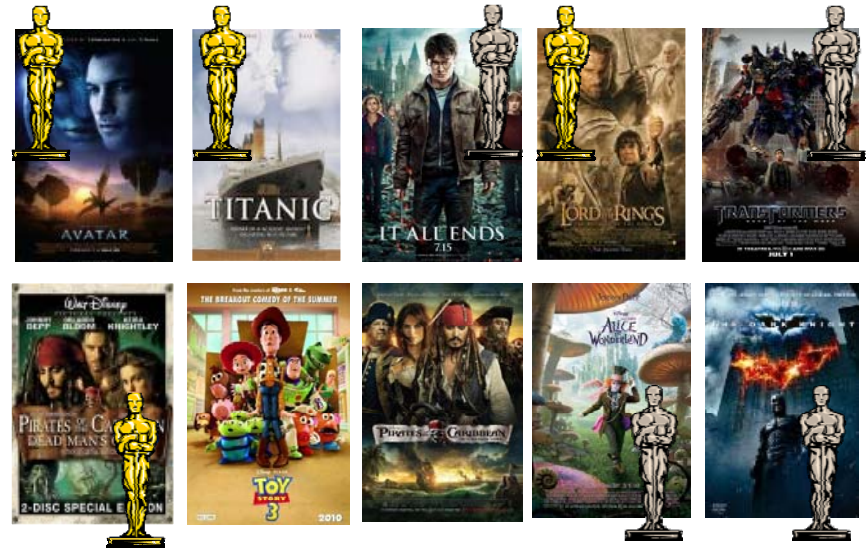
DigiVFX

- 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同學勿修，否則就會像我一樣停修 XD

This course is about ...

Digital Visual Effects

DigiVFX



Reality?

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Retouching

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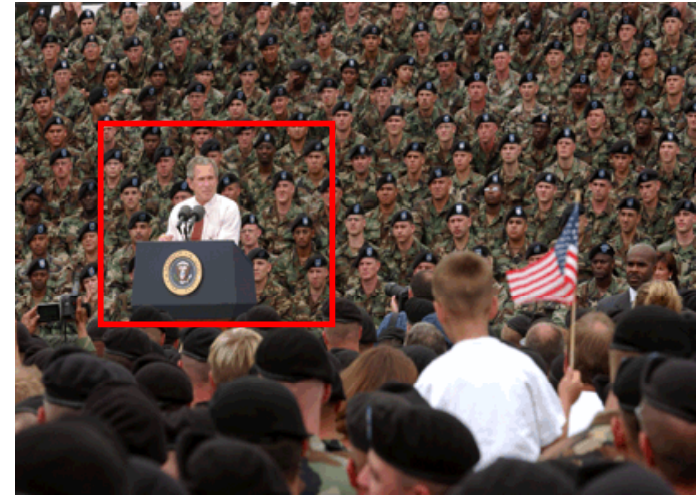
Iraq War, LA Times, April 2003

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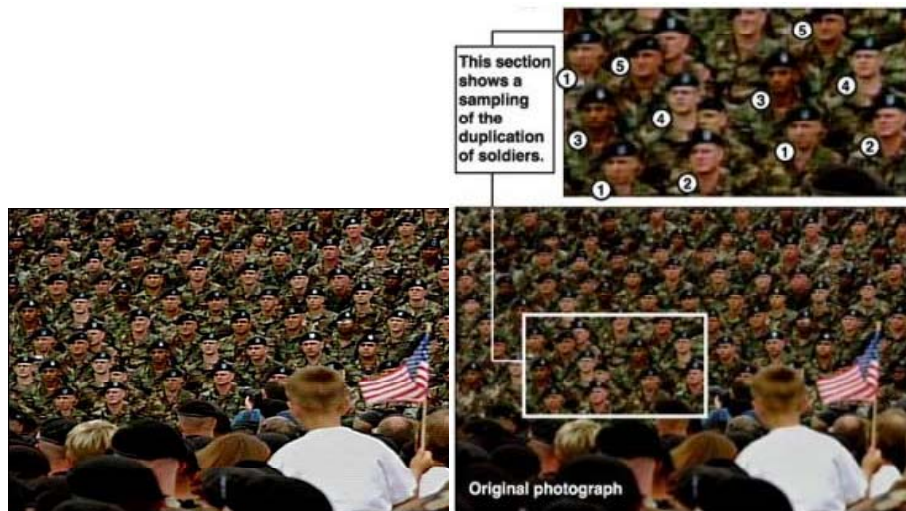
Bush campaign's TV AD, 2004

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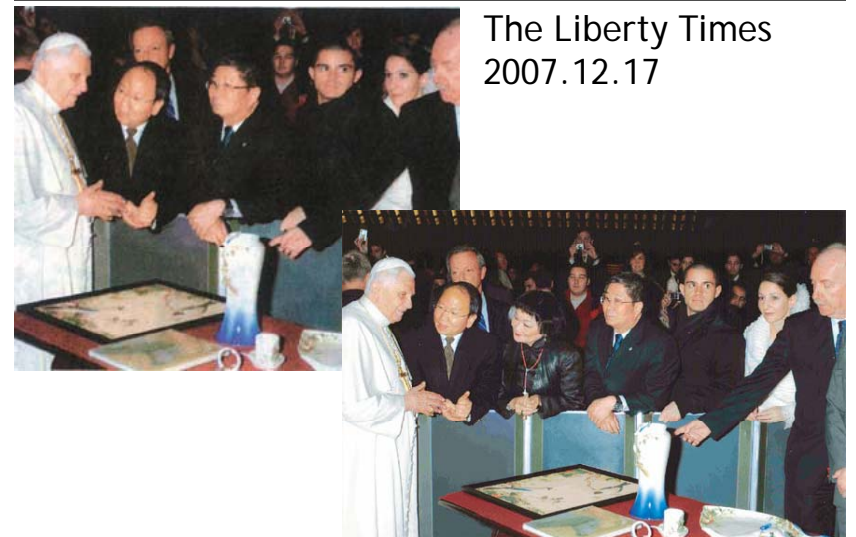
Texture synthesis and inpainting

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Domestic example

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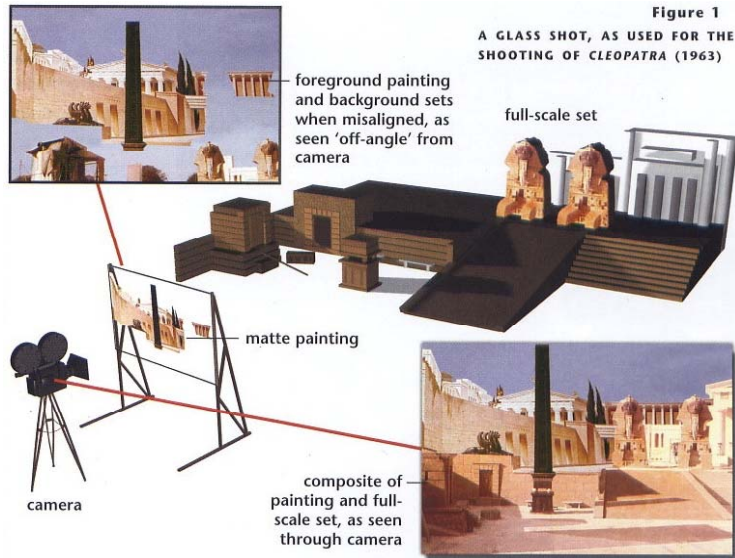
Special effects

Stop action

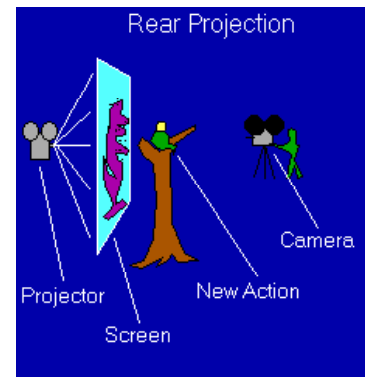


The execution of Mary, 1895

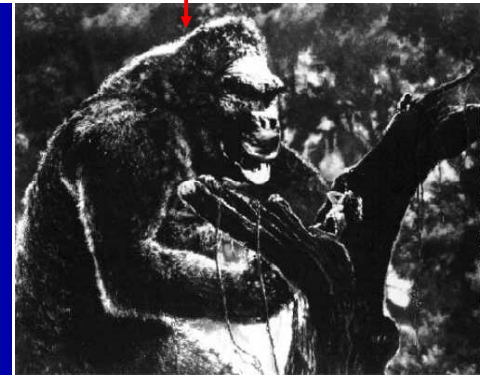
Glass shot



Rear projection



stop motion



King Kong, 1933

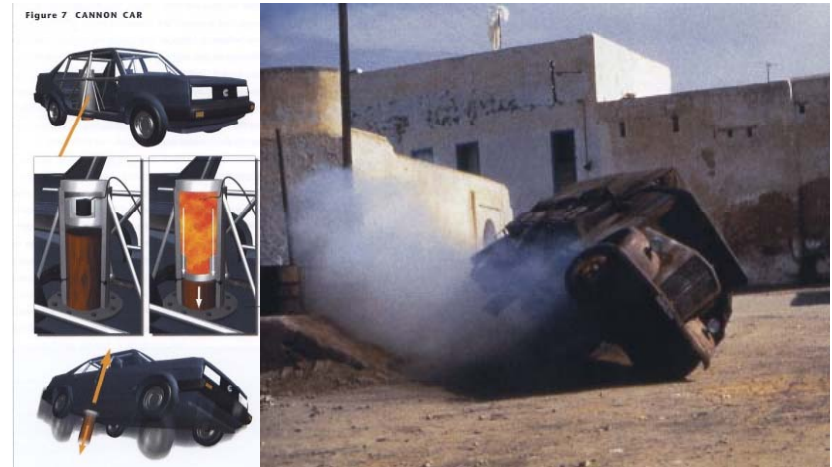
Special effects (make-up)

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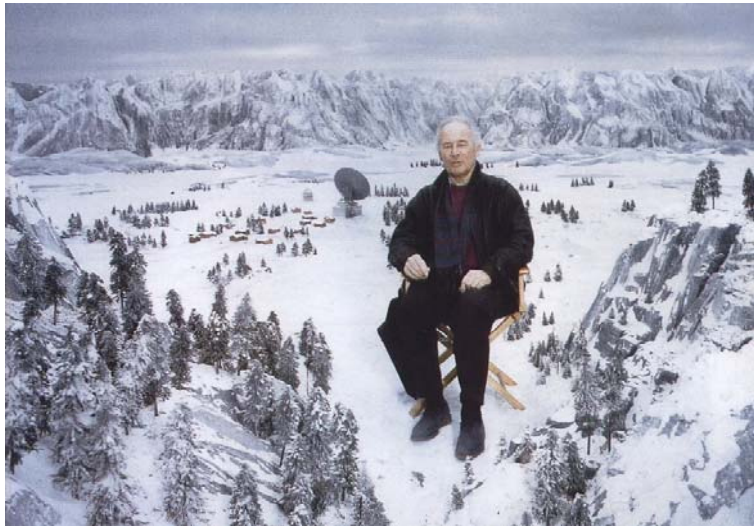
Special effects (physical effects)

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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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Visual effects 100 Years

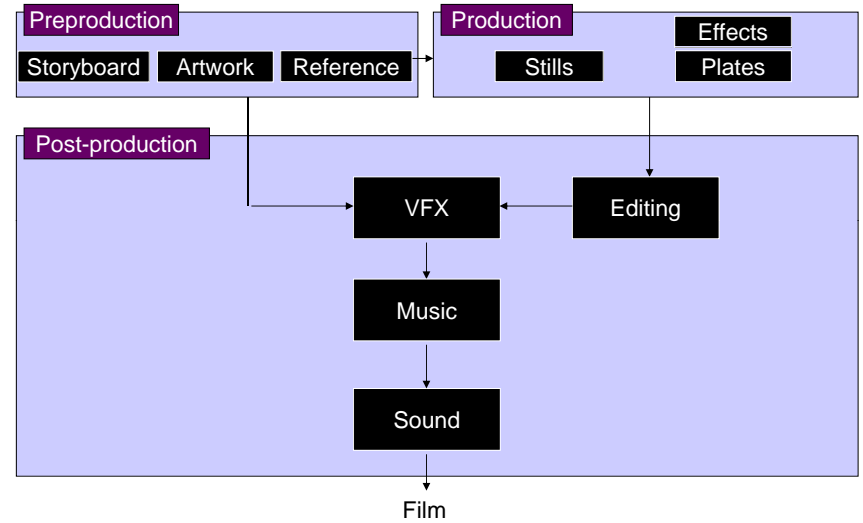
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Production pipeline

Production pipeline

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Preproduction

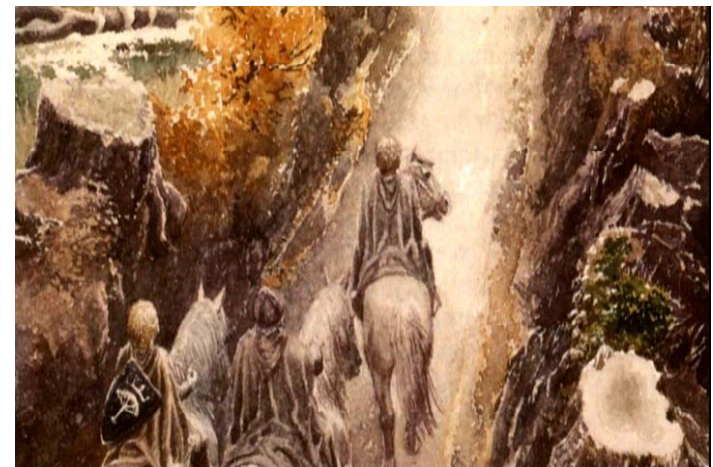
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Storyboard

Preproduction

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Artwork

Preproduction

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Reference & Research

Production

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Shooting

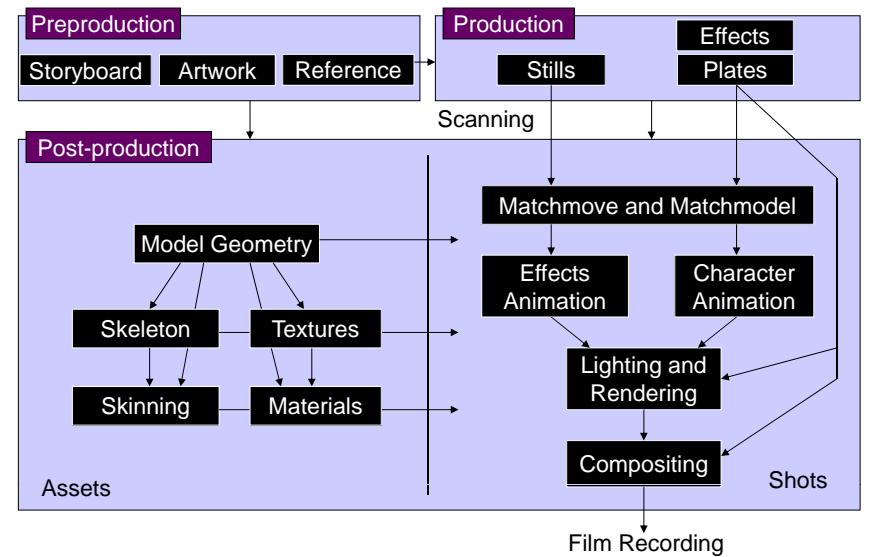
Post-production

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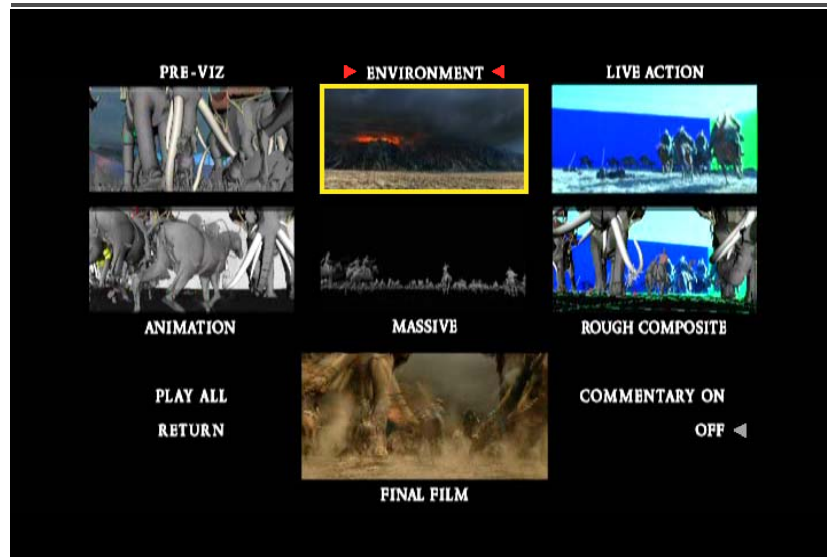
Visual effects production

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Visual effects post-production

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A case study

405: The Movie

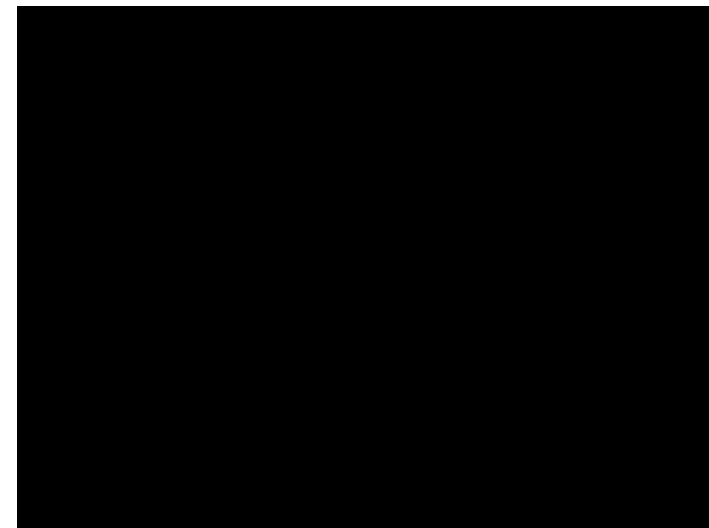
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- This movie were created solely by two visual effects artists in the year of 2000. It was a process that took over three months of nights, weekends and any spare moments that they could find.
- <http://www.405themovie.com/>



405: The Movie

DigiVFX



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

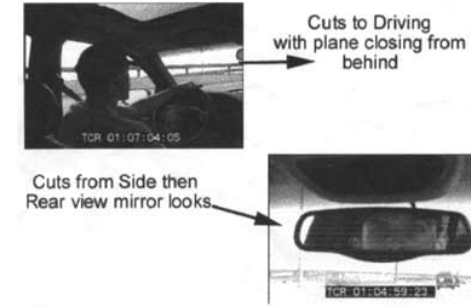
Making of 405



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



initial editing
 ⇒ pickup shots



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

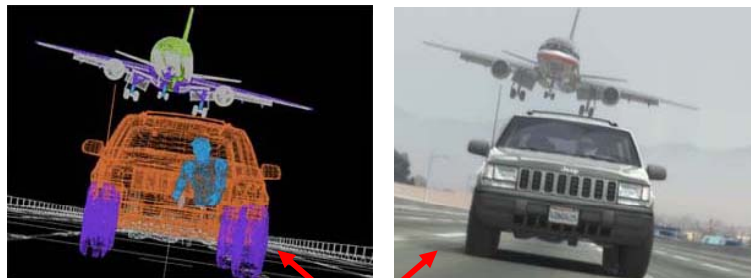


photo-based 3D environment

Making of 405



Real cars were used for close-up and interior shots



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

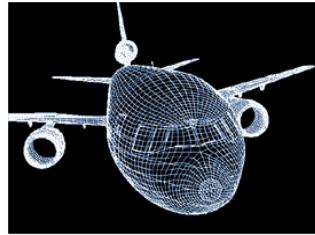


Making of 405

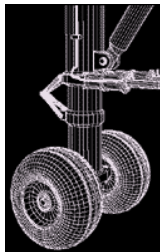
DigiVFX

DC-10 plane took a month to model in details for the needs of close-up shots.

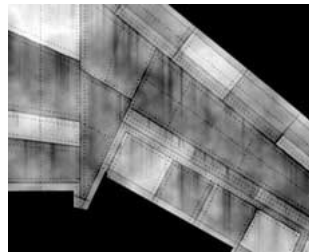
59 objects, 142,439 polygons



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



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Making of 405

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Step 5: fine touchup



3D hat

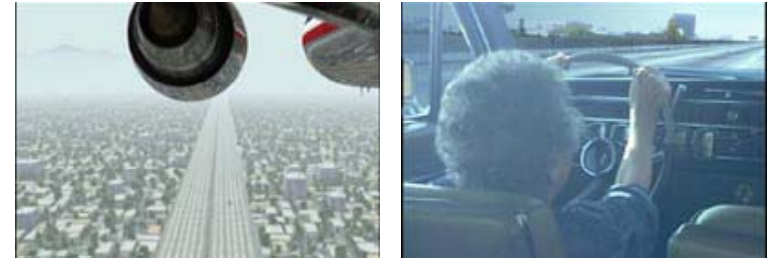


compositing and inpainting

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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

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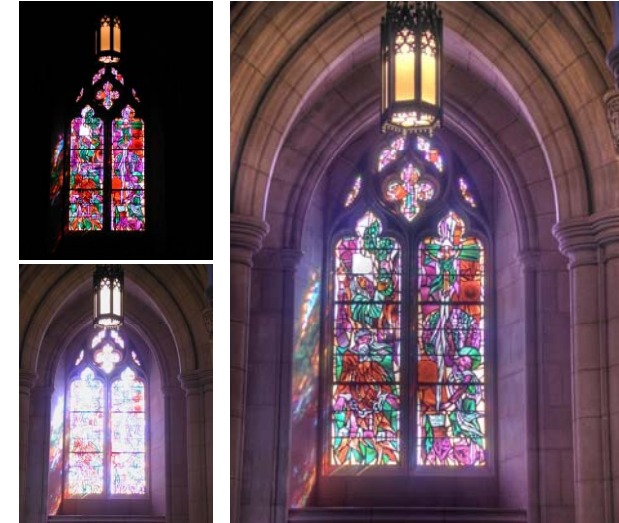
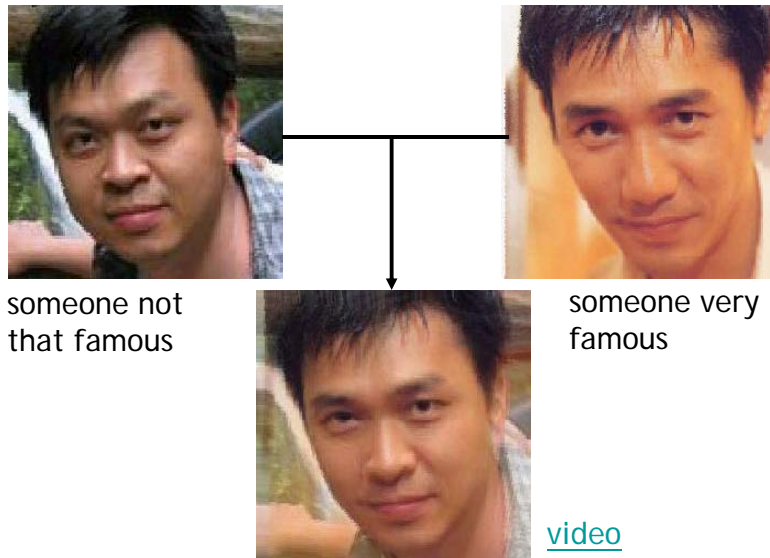


Image warping/morphing

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someone not that famous

someone very famous

[video](#)

Image warping/morphing

DigiVFX

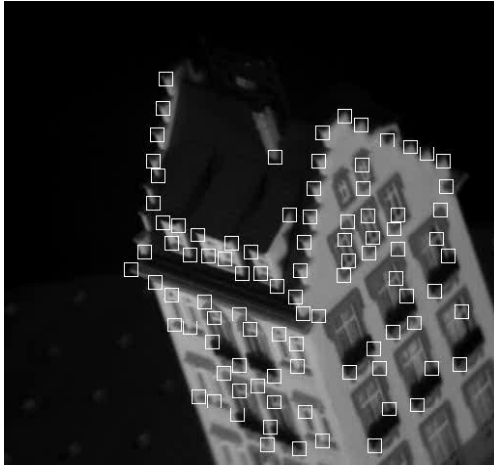


Created by UNREGISTERED
<http://fantomorph.com>

Created by UNREGISTERED
<http://fantomorph.com>

Tracking

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Feature tracking

Image stitching

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MatchMove

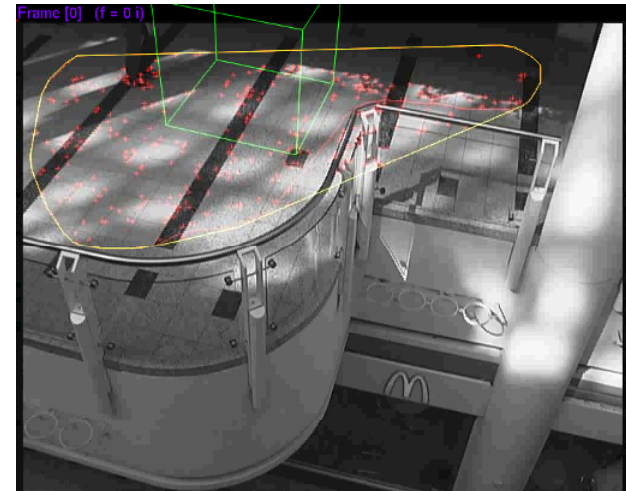
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Move matching using scene planes

Matchmove

DigiVFX



Move matching using scene planes

Matchmove

DigiVFX



Move matching using scene planes

Photo tourism

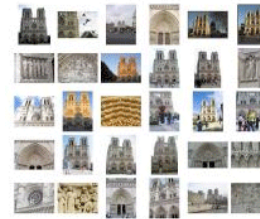
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Photo Tourism

Exploring photo collections in 3D

Microsoft



(a)



(b)



(c)

Video matching

DigiVFX



Matrix



MOCO (Motion control camera)

Video matching

DigiVFX

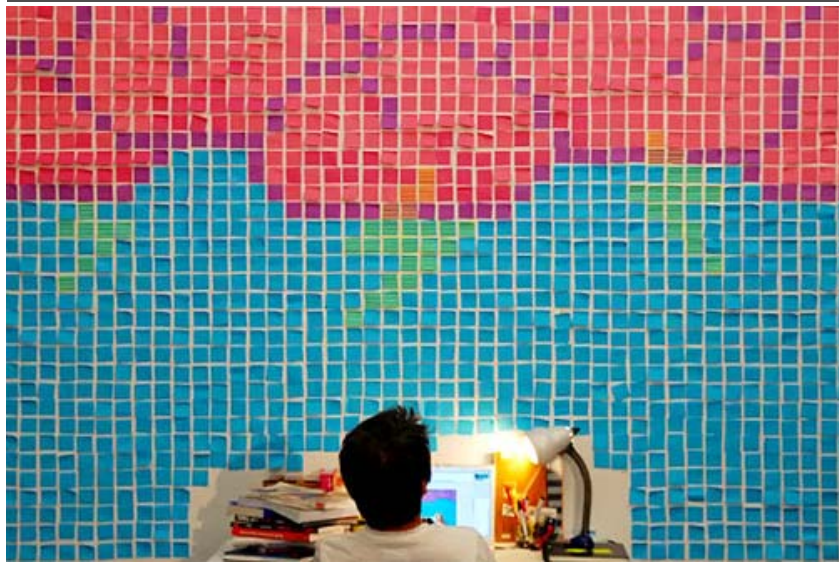


Primary Video

Video matching

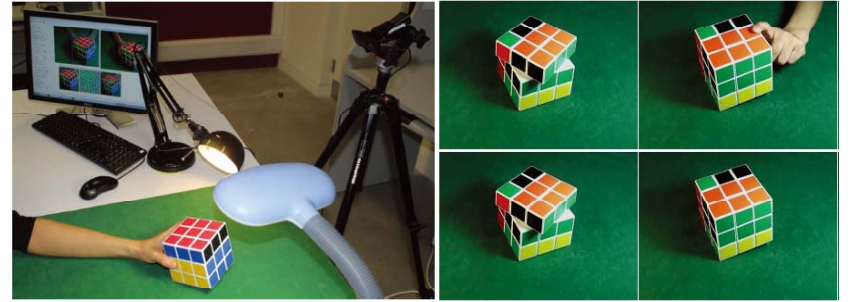
Stop motion

DigiVFX



Stop motion

DigiVFX



Matting and compositing

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Titanic

Matting

DigiVFX



Object selection

DigiVFX



LazySnapping

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

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Tour into a picture

3D photography (active)

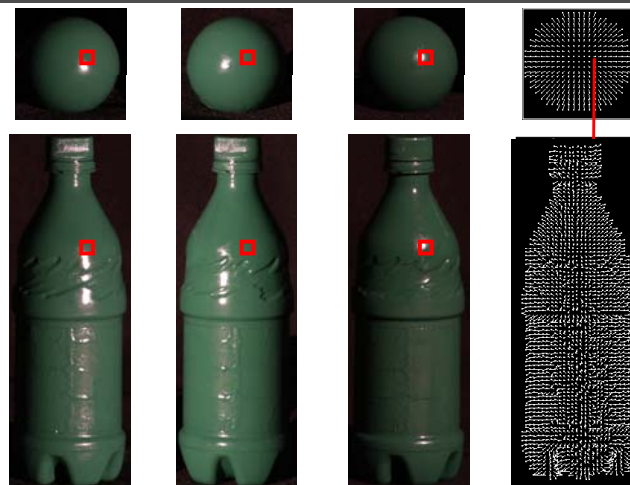
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Cyberware whole body scanner

3D photography (active)

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Photometric stereo

3D photography (passive)

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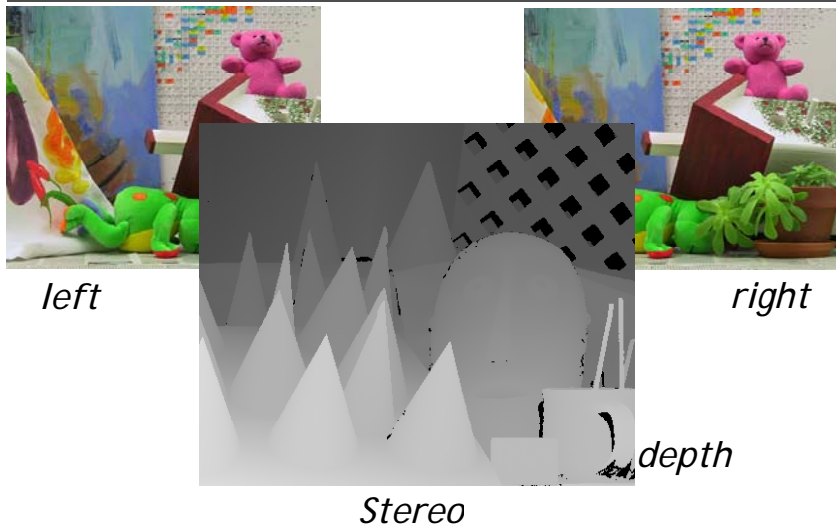
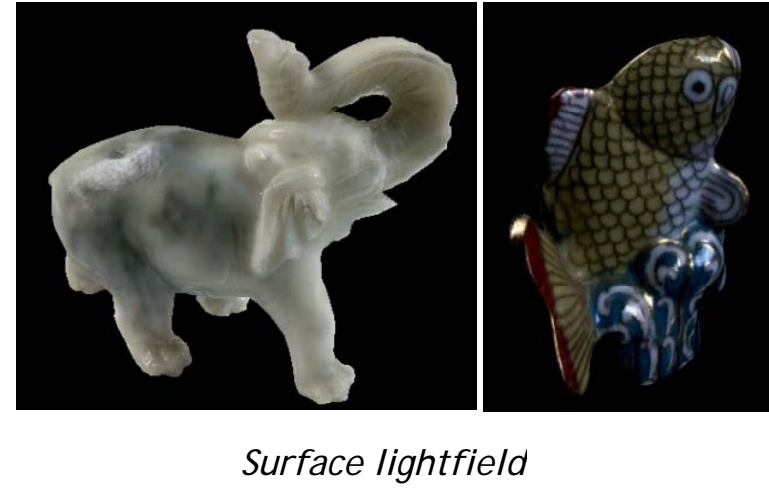


Image-based rendering

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View interpolation

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View interpolation

DigiVFX



Image manipulation

DigiVFX



GraphCut Texture

Image manipulation

DigiVFX



Poisson blending

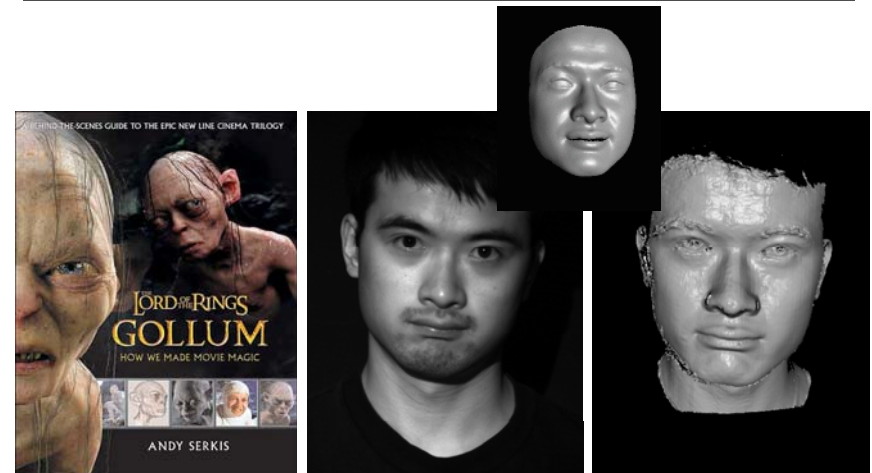
Stereoscopic films

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Making face

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Gollum

Spacetime face

Virtual human

DigiVFX



Video rewrite

DigiVFX



Trainable videorealistic speech animation

Inpainting (wire removal)

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Inpainting

Texture synthesis/replacement

DigiVFX



Texture replacement

Semi-automatic matte painting

DigiVFX

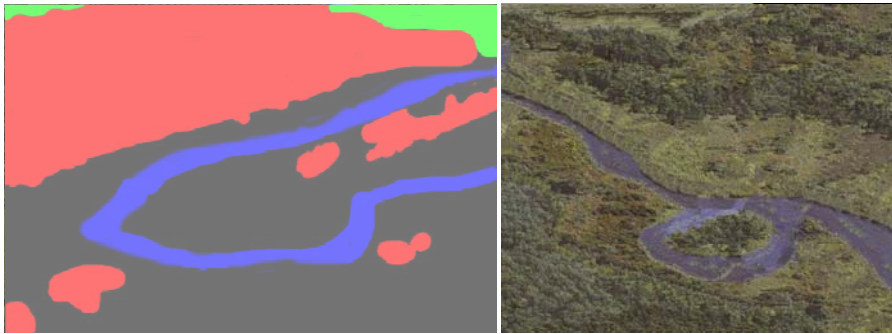
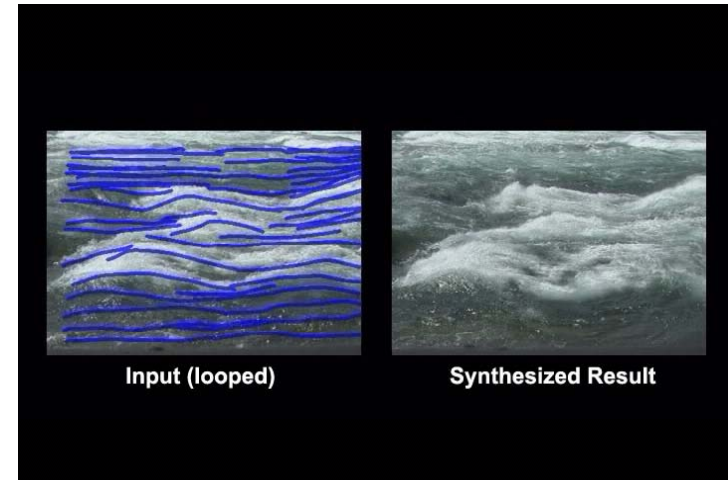


Image analogies

Video editing

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Flow-based video editing

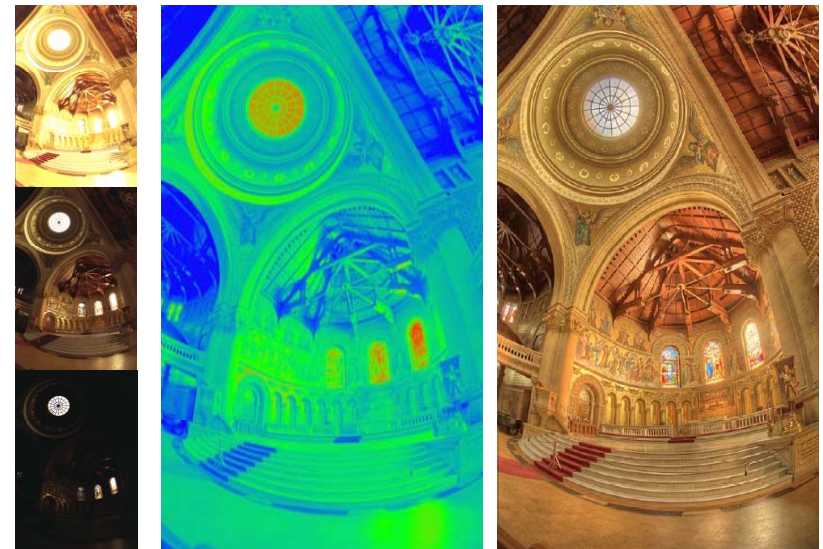
Grading (subject to change)

DigiVFX

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

High dynamic range imaging

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From past semesters (鄭逸廷 陳柏叡) DigiVFX



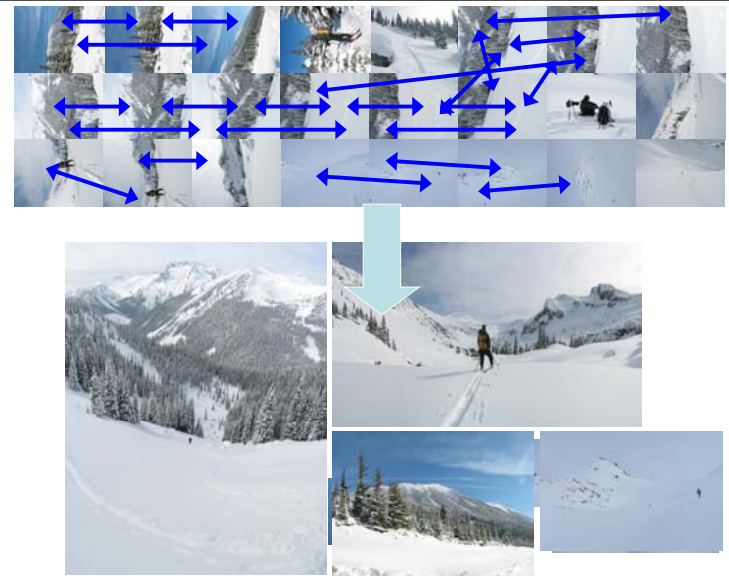
From past semesters (吳侑親, 張書瑋) DigiVFX



From past semesters (王瑋馥, 余雁雲) DigiVFX



AutoStitch DigiVFX



AutoStitch

DigiVFX



羅聖傑



連奕婷 張宇蓓

Final projects from a similar course
in Georgia Tech.

MathMove

DigiVFX



梁家愷 鐘志遠



姜任遠 林立峯



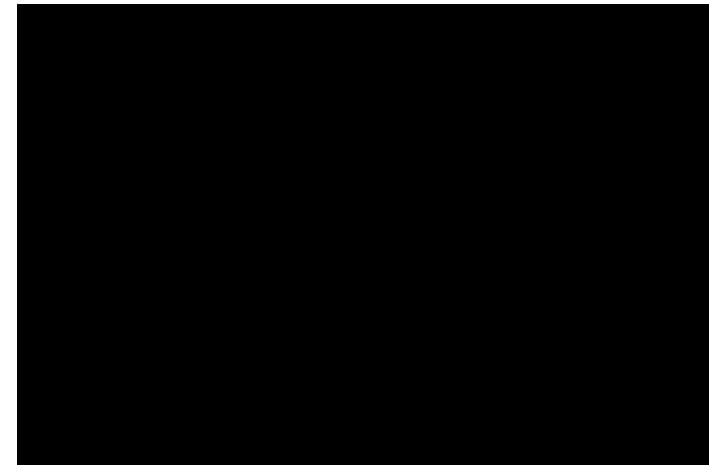
楊宗碩 林柏劭



翁憲政 洪韶憶

Life in Paints

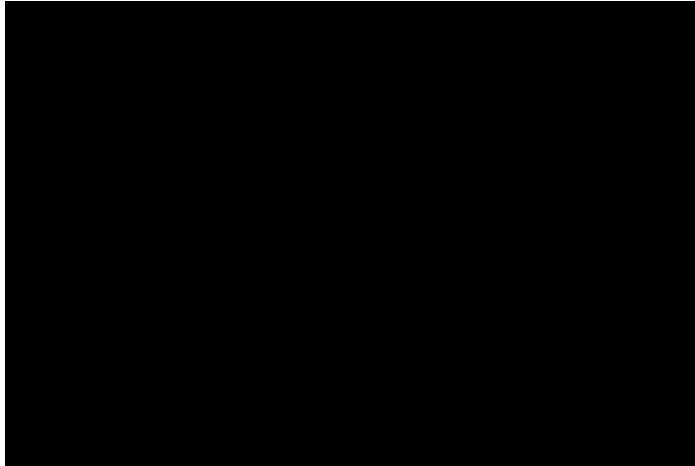
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Life in Paints, GaTech DVFX 2003

Tour into pictures

DigiVFX



Making of *Life in Paints*

In Your Face

DigiVFX



In Your Face, GaTech DVFX 2002

Stop action

DigiVFX

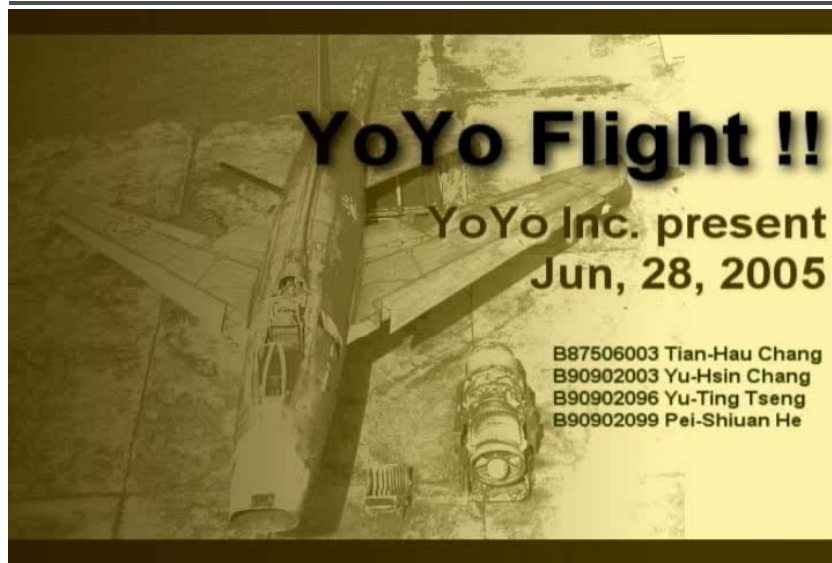


Making of *In Your Face*

Final projects from the past.

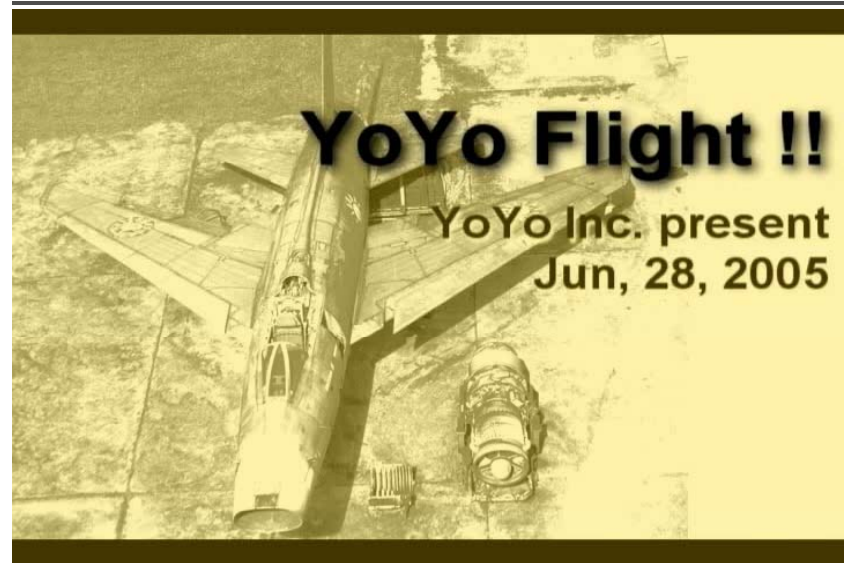
YoYo Flight

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Making of YoYo Flight

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That's it for today!

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