

A. Course Summary

1. Subject number and title

4.562/502 Architecture in Motion Graphics

2. Date(s) offered

2023 Fall Semester

3. Credits

4.562: 12 units (3-2-7, G-level), 4.502: 12 units (3-2-7, U-level)

4. Type of subject (lecture, seminar, studio, workshop, lab)

Lecture, Review, and Lab

5. Instructor(s)

Takehiko Nagakura (TA: Xiaoyun Zhang)

6. Prerequisites if any

4.560, 4.500, or experience in 3D geometric modeling

7. Subject overview/description

This course provides an opportunity to undertake a design and visualization project with an emphasis on the use of computer graphics animation, interactive content, and video production media. Students will be introduced to advanced visualization, game engine and video editing software, and explore the relationships between spatial design and its representation in motion graphics format.

Selected movies and literatures will be reviewed to study and analyze professional film language such as editing styles, camera movement, mise en scene, and lighting strategy. Technical topics include radiosity rendering (3DS Max Advanced Lighting), global illumination (V-Ray), texture mapping, texture baking (Substance 3D Painter), montage (Premiere), sound effect, key framing, photogrammetric modeling (Remake/Metashape), and interactive game engine (Unity3D). Additional exploration includes crowd simulation/character animation (Character Studio/Populate), stereo graphics, panoramic video, motion tracking, motion dynamics, inverse kinematics, chroma keying, and virtual set, and Virtual/Augmented Reality (VR/AR) application to limited scopes.

Final project is to design a place for architectural scenes and create a short film or an interactive presentation as its narrative. Students are expected to know how to build a simple geometric model in 3D modeling software.

8. Learning objectives

The main target of the course is to exploit the sense of phenomena, event and movement in space by means of digital design media. The class suggests use of film theories as referential background and create a narrative through architectural motion graphics.

The class addresses the issues of film form as well as architectural event, materiality and light. It is not only about *what* you place in the movie frame, but also *how* it is represented to the audience as experience. Students become at the same time stage designers (who design spatial forms as the main star in their films) and film/game directors (who design and choreograph the moving sequence/experience).

9. Completion requirements

Grades will be based on assignments, participation in class discussions and the final project.

- 4 assignments 55%
- reading/discussion 10%
- final project 35%

Assignments include the followings:

- Imagining Storyboard – Digital Previz - (1 week, small team)
- Opening Sequence : Light, Material, and Motion Camera (3+1 weeks, individual)
- Virtual Exhibition - Collaging Reality, Reconfiguring Experience (2 week, small team)
- Performing and Compositing – People in Space, People for Space (2 weeks, mid-size team)
- Final Project (4 weeks): There will be a pinup, a mid-term review and a final review.

* Students deliver their assignments and final projects as video clip/interactive content presentation. All the digital contents produced by students in this class (videos and interactive contents) will be publicly reviewed in the class, and submitted for class archive with selected projects allowing online access for future students and public education as reference. All student projects should include the full credit of any included contents within the digital material at the time of the assignment submission.

B. Syllabus (Schedule of topics, tests, and due dates for major assignments)

See the table at the end of this document.

Reference (Film Technicality)

The Five C's of Cinematography by J Mascelli
Michael Rabiger : Directing - Film Techniques and Aesthetics -
Richard Stromgre+Martin Norden : Movies -a language in light
Daniel Arijon : Grammar of the Film Language

Reference (Theory and Critique)

Andre Bazin: What is Cinema?
Eisenstein: Film Form, Film Sense
Rudolf Arnheim: Film as Art

Christian Metz: Film Language : A Semiotics of the Cinema
 Tarkovsky: Sculpting in Time
 The Architecture of Image - existential space in cinema -
 Anthony Vidler: The Explosion of Space (Film Architecture From Metropolis to
 Blade Runner)

Software used

Main tools: 3DS Max, Adobe Premiere, Unity 3D, Recap, MIT Design Heritage
 Other recommended/alternative tools: Metashape, Blender, V-Ray, Substance 3D
 Painter

Cost

- To work on the assignments using your own laptop computers:
 - a. Autodesk software (3DS Max, Remake, etc.): Student license is free.
 - b. Adobe Premiere: Adobe Creative Cloud for MIT students is free.
 For others, student license is available from Adobe for \$20/month
 - c. Unity3D: Personal/Student version is free.
- All necessary software/hardware is available in studios and PC classrooms but with limited quantities.
- Purchase of your own headphone is recommended to avoid annoying others while you are working on your assignments.

2023 MIT [4.562/4.502](#) Schedule (subject to change)

Takehiko Nagakura

Rev. 2023v0905

date:09-04 Mon		Labor Day holiday
date:09-05 Tue		Registration Day
date:09-11 Mon	Class 01 Lab	Introduction - Telling a story Digital NLE (Premiere/After Effects) Compositing and Editing with Audio Clips Lab Note for Premiere Tutorial * Login as 4.562. Password required.
	Excercise #1	OUT: Imagining Storyboard (Digital Pre-vis) Exercise 1 Handout Audio Clips and Demo Audio Clip Registration
	Screening Reading #1	Mr. Jones, My Architect OUT: Mascelli, The five C's of cinematography camera angle (pdf)
date:09-18 Mon	Class 02 Discussion Deadline Excercise #2	Composition and Motion Camera Reading #1 [required for 4.562] Excercise #1 (in-class presentation) OUT: Opening Sequence -Architecture of Cinematic Reality - Exercise 2 Handout Chair models Herman Miller 3D furniture

[CGtrader chair models](#)

	Lab	Radiosity Basics Lab Note for Max install/Setup READ THIS FIRST! Lab Note for Max radiosity Lab Note for Max importing files Radiosity Diagrams MIT 3dsMax2017 selector classic design.zip Camera Animation (Key framing and motion path) Lab Note for Max Camera animation Sample File (3D models) * When you open the models below in 3DS Max, the dialog to perform "scene conversion" may appear. For Radiosity, just close it without conversion. - Set 1 (Citrohan House): 3d citrohan v13c2.dwg/max (zipped) image sample - Set 2 (MIT office): rotch d 07b 4562 v01.dwg/max (zipped) image sample Lightscape (old tool: for reference only)
	Screening	Charade, Psycho, Ginza Walk Through
date:09-26 Mon	Class 03	Lighting the Scene Illumination Model, Radiosity and Raytracing
Max	Lab	Daylight Simulation, Photometric Lights in 3DS Radiosity Visualization IES Photometric Data, Render Farm/Cloud Rendering Lab Note for Max Photometric Light/IES Photometric Lights Catalogues Sample Photometric Lights Citrohan House Lighting Transformation Reference Film Analysis Example, Kyoung KWon (part #1) Stereographic imaging (See Class 04) Vray Introduction (See Class 10)
	Reading #2	[This assignment is moved to later class] OUT: Rudolph Arnheim: Film as Art Questions.pdf , FaA1.pdf , FaA2.pdf
	Screening	Lumiere Brothers First Film, Ruttmann's Berlin
date:10-02 Mon	Class 04	Materiality and Tectonics
	Discussion	Reading #2 [moved to later class]
	Lab	Texture UV Mapping, Procedural Mapping Lab Note for Max material and texture Lab Note for Max general tips Lab Note for Max rendering checklist Texture Coordinates Illustrations 3d citrohan model with no glass for texturing MAX Sample Textures (new) VIZ4 Sample Textures (old: only for reference) Adobe Substance 3D Painter (NEW) part1 2 3 4 5

Background, Sky, and Environment Map

[Lab Note for Max sky and ground](#)
[Examples for Max sky and ground](#)
[Sample Map for Sky and Ground](#)

Editing/Post-process Animation

[Lab Note for Importing/Post-process in Premiere](#)
[HDR Image Example and OpenHDR Viewer](#)
[Image Gamma Correction](#) (old: for reference)

Stereographic imaging

[Lab Note for Max stereoscopy](#)

TN Office [stereoscopic animation on YouTube](#)
(Chrome or FireFox needed to see anaglyphic 3D)

Citrohan House [Anaglyphic images and animation](#)

[3DS Camera Rig by TN 02.max \(zipped\)](#)
[Stereoscopic Player from 3dtv.at](#)

Vray Introduction (See Class 10)

~~date:10-08 Sat optional VR Lab tour~~

date:10-09 Mon

Indigenous Peoples Day holiday
~~Monday classes shift to Tuesday this week.~~

date:10-16 Mon

Class 05 Photogrammetric Model, Interactive Viewing
Deadline **Excercise #2** (in-class presentation)
Excercise #3 OUT: Online Gallery
-Collaging Dislocated Reality, Reconfiguring Experience-
[Exercise 3 Handout](#)

Reference [Baker House AR \(2021\) \(YouTube\)](#)
[MIT Machu Picchu Project \(YouTube\)](#)
[Capturing History Bit by Bit](#)
[Kangaku-in Villa Desktop VR](#)

Lab Photogrammetric capturing
Example (Use Chrome for viewing)
[Digital Heritage Workshop 2013 \(i palladio\)](#)

Tutorials 1

Photogrammetric software and tutorials
[Recap Photo/Metashape and more](#)

3D Collaboration Platform

[Design Heritage Introduction](#)

Tutorials 2 (for week 2)

[Baking to Texture in 3DS Max](#)

Reading #3 [moved to class 9] OUT: Eisenstein

date:10-23 Mon

Class 06 Shot Planning, Location Shot, Video Composite
Discussion **Reading #3** [moved to class 9]

Lab Video Composite
Premiere/Unity: Chroma key
[Lab Note for Premiere Chroma Key](#)
[Example \(Firminy Long Lounge\)](#)

		Blue Screen (Chroma Key) demo Blue background session rig files (zipped) Camera Motion Capture/Tracking Blender Tracking tutorial(See Dropbox location) SynthEyes (optional for self-learning) Example (Firminy Pepsi Can) Blender home page (free) Blender Tutorial (pointers to videos) SynthEyes home page Syntheyes (Video) Tutorials Syntheyes Manual for v2013 (Old Manual for v2008+1) 3DS Max Channel rendering, Video post, G-channel (Render by Elements and Video Composite) example
	Reference	Mies van der Rohe's drawings (zipped jpg) Shot examples in pre-vis. format
	Marker-based	Motion Tracking example GE Plugin Smartgird.com AR Media 3DS Plug-in
	Screening	Video: Setting up a Blue Screen Studio at MIT
date:10-30 Mon	Class 07	Interactive Experience vs Linear Montage
	Lab	Game Engine software Setting up a Scene in Unity 3D Download Free Personal Edition of Unity 3D
	Deadline	Excercise #3 (in-class presentation)
	Excercise #4	OUT: Virtual Tour of Location X Exercise 4 Handout Examples (desktop VR and AR) Mies van der Rohe's drawings (zipped jpg)
	Reference	Automated Cinematographer A Synthetic Movie maker (Siggraph 2006 paper) Man with the Movie Camera (YouTube link)
	Screening	The Umbrellas of Cherbourg
date:11-05 Sat	extra lab	Bluescreen studio live recording session (Subject to the COVID-19 pandemic situation)
date:11-06 Mon	Class 08	Figures and Props
	Lab	Animating Figures in Spatial Design Populate video tutorial (Autodesk tips/tricks) 1 , 2 , 3 , 4 , 5 , 6 Lab Note for 3DS Max Populate/Unity 3D Export Biped Character Animation (Character Studio) Lab Note for 3DS Max Character Animation Sample figures and setup (Skinned Figures/BIP Motion/Blue Screen Set: Download and unzip the Max file and texture file to a directory together before use.) Emerging "Video to Motion" apps (Figure Mo-cap)

		Modeling by Gesture Tracking a walk by Kinect Circulating a figure in architectural model example Space Re-Actor by Taro Narahara
date:11-13 Mon	Class 09	Precedents: Final project for 4.502/4.562 Physics Simulation
	Deadline	Excercise #4 (in-class presentation)
	Excercise #F	OUT: Final project Final Project Handout Spatial Experience in Motion Graphics
	Reading #3	OUT: Eisenstein: Film Form/Sense Questions.pdf arch.pdf , form.pdf , sense.pdf Acropolis 360 on Plan YouTube video by TN (Use Chrome for 360 view)
	Screening	Final projects of previous students Kuleshov Experiment, Psycho, Battleship Potemkin Psycho, Hitchcock 1964 Interview on Montage
	Lab	Motion Dynamics/Inverse Kinematics in MassFX demo file (MassFX basics): after Max 2012 demo file (Reactor, part 1): before Max 2011
	(old)	Lab Note for Max MassFX Lab Note for Max ART rendering Lab Note for Max iray rendering (old) Physics Animation Examples example (gravity, collision, wind) More procedural material Simple Water in 3DS Max
	Screening	SONY Bravia CF /transformating daily life (at MIT)
date:11-20 Mon	Class 10	Predictive Visualization: Unbuilt Monuments
	Discussion	Reading #3 [required for 4.562]
	Reference	Automated Cinematographer A Synthetic Movie maker (Siggraph 2006 paper) Man with the Movie Camera (YouTube link)
	Deadline	Final Project Proposal review (Storyboard + Set)
	Lab	VRay (Global Illumination Rendering with Caching) Lab Note for 3DS Max Vray (Check yellow part.) Rendering Animation with VRay
	Reading #4	OUT: Andre Bazin: What is Cinema? Questions.pdf bazin.pdf Special Effect use in Citizen Kane (YouTube) YouTube Clips (Flaherty/Lamorisse/Chaplin, etc)
	Reading #5	Christian Metz: Film Language
	Screening	Unbuilt Monuments
date:11-23 Thu	No class	Thanksgiving Holiday Week (Th 23, Fr 24)
date:11-27 Mon	Class 11	Augmented and Virtual Reality

Discussion [Reading #4](#) [required for 4.562]
~~[Reading #5](#) [required for 4.562]~~
Lab [Palladio Burns and 360](#) (Chrome recommended.)
[Double Tour: S. Giorgio Maggiore Refectory](#)
[QuickTime VR by Apple](#) (History)
[Interior Panorama with IES Light \(Citrohan House\)](#)
[QTVR Panorama conversion tool](#)
demo file: [3d citrohan v13c panorama.max \(zipped\)](#)
Workshop (Consultation for Final Projects)

Reference 4: Augmented Reality in Architectural Exhibitions
(Nagakura, et. al.)

date:12-04 Mon Class 12 TBA

date:12-11 Mon Class 13 Final Presentation 1 (Recommended for UG
Students)
Lab ~~Clothes, Hair, Snow, etc.~~
Workshop (Consultation for Final Projects)

date:12-13 Wed Last day of class at MIT

date:12-18/22 (during MIT F