

<<Last Updated:2022/01/18>>

Course Schedule Information

Course Code	29E719
Semester	Fall and Winter Term
Day and Period	Tue4
Course Name (Japanese)	複合現実感システム論
Room	School of Engineering Science/Lecture Room E401
Course Name	Mixed Reality Systems
Capacity	999
Course Numbering Code	29FRMS5M801,29MESB5M801,29ELOS5M801,29SSAI5M801,29MSS5M801
Credits	2.0
Student Year	1,2
Instructor	IWAI Daisuke
Course of Media Class	Not Applicable

※About Course of Media Class

"Course of Media Class" are classes in which more than half of the classes are held in places other than classrooms by making advanced use of various media.

Undergraduate students can include up to 60 credits in media class course as requirements for graduation. Even if this is not the case, we may hold classes using the media.

Detailed Syllabus Information

Course Name	Mixed Reality Systems
Language of the Course	English
Type of Class	Lecture Subject
Course Objective	Mixed reality (MR) system supports our daily activities by seamlessly merging physical and cyber spaces. For instance, a camera-equipped phone is widely used as a platform of an MR system which provides a user with various location-aware information such as navigation by overlaying it on the captured image of a street displayed on the phone. This types of MR systems are realized based on computer vision and graphics technologies. Those who take this class will learn these basic technologies as well as state-of-the-art techniques which realize better user experiences. They will also learn MR technique in terms of tactile and auditory modalities.
Learning Goals	Through the series of lectures, you will be able to: - Define MR by explaining the difference of MR from VR - Explain how geometric consistency is achieved - Explain how radiometric consistency is achieved - Explain how real-time constraint is achieved - Explain how geometric and radiometric corrections are achieved in projection-based MR - Know new MR research directions (diminished reality/non-visual MR/cross-modal MR/light field MR) - Plan own MR system - Criticize MR systems in terms of novelty and the validity of chosen techniques
Requirement / Prerequisite	CLE, KOAN and e-mail are used for providing information. Basic C/C++ programming skills are required. << The class is held in English this year. Japanese class will be held in the next year. >>
Class Plan	All classes are held in online media style. 1. Overview of MR systems 2. 3D shape reconstruction, Shape-from-X 3. Marker-based AR, Marker tracking, CG rendering basics 4. Marker-less AR, Face recognition & tracking, Image feature points 5. Inverse rendering, Reflectance estimation, Light source estimation

	6. High dynamic range imaging 7. Parallel processing, Multi-thread processing, GPU 8. Projector-camera systems 9. 3D display techniques 10. Computational Photography 11. Mobile AR, Retargeting 12. Multimodal MR, Crossmodal MR 13. Mixed reality systems project 1 14. MR Applications 15. Mixed reality systems project 2
Independent Study Outside of Class	Homework (assignments) should be done outside of class. Students also should work on the mixed reality systems project outside of class.
Textbooks	Not specified. Provided via CLE.
Reference	Oliver Bimber and Ramesh Raskar. Spatial Augmented Reality: Merging Real and Virtual Worlds. A K Peters, 2005. Erik Reinhard, Wolfgang Heidrich, Paul Debevec, Sumanta Pattanaik, Greg Ward, and Karol Myszkowski. High Dynamic Range Imaging, Second Edition: Acquisition, Display, and Image-Based Lighting. Morgan Kaufmann, 2010. Sing Bing Kang, Yin Li, and Xin Tong. Image-Based Rendering. Now Publishers Inc, 2007. Richard Szeliski. Computer Vision: Algorithms and Applications. Springer, 2010.
Grading Policy	Mixed reality systems project 50% and homework 50%.
Other Remarks	n/a
Special Note	Due to COVID-19, this course will be held as a hybrid (media and in-person) course. When students with disabilities take this course and request reasonable accommodation, please contact the Graduate Students Section or the instructor in advance and discuss the concerns.
Office Hour	Any questions are accepted via email. If needed, oral QA is done via Zoom.
Keywords	
Messages to Prospective Students	

Instructor(s)

Instructor Name	Name (hiragana)	Affiliation, Title, Course	Office	Extension	E-mail
Daisuke Iwai	Daisuke Iwai	Graduate School of Engineering Science, Associate Professor	D552	6371	daisuke.iwai@sys.es.osaka-u.ac.jp

Cautions for Students

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