Design Experience Workshop  
- Augmented, Immersive and Mobile Kyoto 京都 -

First class meeting: 7pm, Tuesday, February 5, Room 3-329

Homepage: http://cat2.mit.edu/4.570

Have you ever been to Japan’s ancient capital, Kyoto?
Is there a good way to represent or enhance the experience of important locations by using contemporary digital technologies such as mobile apps, or virtual and augmented reality?

This workshop is a revised sequel to the six previous Digital Heritage subjects in the spring of 2013-18, in which students conducted fieldwork using on-site digital recording/3D captures and developed AR, VR and other digital representation prototypes, while studying historic architectural places and urban designs. Following up the last year’s expedition, the class this year will visit Kyoto again where Japan’s ancient culture and built forms coexists with modern buildings and contemporary lives of the citizens. It is one of a few large cities in the country which escaped the bombardment during the wartime and preserved much of its valuable heritage. We will see historic streets of Gion, former Imperial Palace, 16th century temple villas, and walkways hidden in the bamboo forest scattered among the modern and contemporary developments designed by architects such as Fumihiko Maki and Tadao Ando. Students will study, sense, and record the built, natural and social environment during the trip.

The workshop will combine digital technology, history and architecture for design pedagogy and exploratory research, and provide opportunities to develop online/offline prototypes representing the place, community and its history for visitors, through applications of recent digital methods. They include photogrammetric modeling, panoramic video, game engine, drone, Kinect, HMD, AR, VR, and mobile application. The class is run by collaborating architects, historians, and technology experts from MIT as well as Kyoto Institute of Technology, which will host our visit during the spring break. It is open to all motivated students, graduate and undergraduate, in Architectural and Urban Design, Computer Science, History, Media Arts,Anthropology and other relevant fields.

Our goal is to rethink architecture, and to redesign its experience.
Class information
Weekly Lecture/Review: Mon 11:00-2:00, Room 8-205 (subject to change)  
Lab and Seminar: Tue 7:00-8:30pm, Room 3-329 (subject to change)  
Enrollment: limited to 5-8 students  
Field trip: Students are required to participate in the sponsored trip to Kyoto, Japan and nearby area during the spring break (March 23-30).

Examples of project topics
- Mobile application: augmented reality on site or in museum for visualization of demolished, incomplete or remote buildings  
- Construction and interface design of multi-disciplinary database of text, artifact, texture, drawing, photography, and video  
- Use of drone/photogrammetry/RGBd tools on-site for digitally capturing built forms and texture, or movement of people  
- Interactive educational tool that uses game engine and helps museum visitors to learn the history and architecture of the heritage  
- 3D panoramic/stereographic delivery of immersive, VR experience in built/un-built spatial design  
- Mining big data for analysis and visualization of the heritage as it exists in the mind of people

Prerequisites
There is no specific prerequisite, but students are expected to have a background in computation, architectural history, spatial design, or media arts, and familiar with basic 3D modeling software. Knowledge of programming/scripting skill would be an advantage but is not necessary.

Kyoto Institute of Technology
This class collaborates with the Kyoto Institute of Technology. During the field trip, Prof. Naka’s laboratory will host us in their international scholar’s facility in Kyoto, and we will team up with their students to study the city and sample materials for prototype development. During the second half of the course, we seek their continued engagement remotely, and invite them back to our final review.

Sponsors
Kyoto Institute of Technology, D-Lab  
MIT Department of Architecture  
SUTD-IDC Research Grant  
Gift from Daniel Tsai  
Gift from Evelynn Doone

Field Trip and Cost
The class will visit Kyoto, Japan, and near-by area during the spring break on a sponsored trip. Tickets will be arranged so that we will leave and come back in a group during the spring break. Those who will not be able to participate in this trip should not take this class. The cost of standard flight, local transportation for the class activities, and accommodation is covered by the sponsors of the class, but each student is responsible for food during the trip.  
The first part of the trip will be used for group activities including communal data collection and visit to major historic sites, and the remainder will be used by each team to serve the need of a respective research project proposed, such as scanning, interview, visual recording, and audio sampling.
Expected activity locations:
1. City of Kyoto (Arashiyama district, Higashiyama district, Karasuma district)
2. Miidera Temple (National Heritage Site, Shiga prefecture)
3. Locations proposed by each group will be evaluated and selectively added.

Project and Grading
There will be a series of short exercises of 1 to 2 weeks at the beginning of the semester, in which each student will become familiar with the city of Kyoto, its historical/geographic context, and application of contemporary technology such as Photogrammetry, panoramic video, game engine, HMD, drone, VR, AR and mobile application. Data sampled during the previous expedition by Nagakura’s research team in Kyoto will also be made available for those interested. The main requirement of the class is to develop a research project individually or by team and to present it in the final review session. While each student or team formulates the research framework, the instructors will present a selection of recommended research topics. A variety of explorations are possible within each suggested subject area, and students may propose other topics to explore, subject to instructor approval. Students introduced to digital survey and photography/video tools are also expected to participate in the communal data collection activities on sites. Limited funding will be available for hardware, software, or materials, if necessary, to support the development and testing of prototyping and development.

**The final review of the class will be held during the final exam week of the semester.** Grading is based on the following distribution.

- Class participation: 10%
- Short exercises (4 assignments): 24%
- Communal activities: 16%
- Project Development: 20%
- Mid-term review: 5%
- Final review: 25% (Participation is required.)

Reference and Resource
See the list posted in the Reference section page of the class website. This page is password protected as below.

Account name: 4.570    Password: (Get this from Takehiko during the class.)
Weekly Schedule (Subject to change)

Week 01  Mon, Feb. 04
         Tue, Feb. 05, 7pm  Lab/ex0: Introduction and Q/A, Student Selection if over-subscribed

Week 02  Mon, Feb. 11, 11am  Project ideas, Past Work Examples
         Tue, Feb. 12, 7pm  Lab/ex1: Panoramic Photo/Video (Oculus, Google Cardboard)

Airline tickets for field-trip will be purchased this week.

Week 03  Mon, Feb. 18, no class  Presidents Day Holiday (All Monday classes shift to Tuesday)
         Tue, Feb. 19, 11am  Lab/ex2: Photogrammetric Modeling (Recap/Photoscan)

Week 04  Mon, Feb. 25  Lab/ex3: Ethnographic Study of Heritage Places and Architecture in Museums
         Lab  Tue, Feb. 26  Brainstorming of Student Projects (Title, Initial Idea)

Week 05  Mon, Mar. 4  Lab/ex4: Project Proposals (method, deliverable, resource needed, and precedents)
         Lab  Tue, Mar. 5  TBA

Week 06  Mon, Mar. 11  Lab: Drone, Game Engine (Unity3D), AR (Vuforia), VR (with HMD)
         Lab  Tue, Mar. 12  Review of Proposals

Week 07  Mon, Mar. 18  Review of proposed field-trip activity
         Lab  Tue, Mar. 19  Field-work gear preparation

Week 08  Mar 23 – March 30  Field Trip to Kyoto, Japan during the spring break

Week 09  Mon, April. 01  Data retrieval, Report on the trip outcome (Screening recorded video/photo/model)

Week 10  Mon, Apr. 08  Project Re-calibration

Week 11  Mon, Apr. 15  Patriots Day Holiday (including Tue, Apr. 16)

Week 12  Mon, Apr. 22  Mid-term Review

Week 13  Mon, Apr. 29  Guest Talk (Tourism)/Workshop

Week 14  Mon, May  6  TBA/Workshop

Week 15  Mon, May 13  Mock-up preview of final presentation
         Thurs, May 16  Last day of class
         May 20-24  Final Review during exam week