Preview Revision Subject to Revision

Urban Sensing and Data Workshop

Developing Urban Technologies to Support Design (+ Justice)

Tuesday, 11:00am – 1:00pm
BUILDINGNAME
Columbia Graduate School of Architecture, Planning and Preservation

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In recent years, interest in "public life"—people's daily interactions within the built environment (Gehl 2011)—has been renewed as urban spaces are being transformed into areas for recreation, socializing, and human activity. However, many commonly-accepted theories in environmental psychology and planning were generated from limited observations—limited by time and space. This course asks how sensing technologies can validate or challenge these theories of public space and social interaction through the measurement of urban environmental stimuli, and how we intersect them with aspects of environmental quality and justice, sustainability, equity, and overall general well-being.

We will use the university context as a living laboratory to test and reevaluate the commonly-accepted theories of public life while engaging in critical conversations that balance the positive aspects of better-informed design and policy with the challenges concerning data ethics, surveillance, and privacy

Participants in this hands-on workshop will design and implement prototypes for the creation of data on human activity, and environmental conditions and quality. You will write code, evaluate and implement sensors and wire circuits on the Arduino platform. Students will also learn methodologies to analyze and present the data, and consider interventions based on these findings. There are no prerequisites in coding or electronics, but a desire to learn and engage hands-on is an absolute must–you're the maker, designer, and creator!

tl;dr: Design and build circuits. Enumerate the use of public space. Think about how data can support agendas in spatial and environmental justice and urban design and development.

Course Mechanics

Learning Objectives

In this class, students will not only discuss how sensing technologies, as proxies for smart cities technologies, may or may not support larger design and justice objectives, students will also engage in hands-on development and testing of sensor prototypes to support their inquiries into these topics. As such, objectives for this class widely range from hardware development to theoretical understandings of the ethics involved in these technologies within a democratic society. Largely, we can think of the data within the framework of ***technical*** (from "technos", meaning "art, skill, the cunning of hand" as it pertains to the science of craft) and ***theoretical*** (as a set of knowledge and philosophically-based outcomes):

Technical: Ability to design and implement basic hardware prototypes; Ability to create and process machine data; Understanding of how sensing technologies work; Understand how to implement sensors to support planning objectives

Theoretical: Understand of the potentials and limitations of smart cities technologies; Understand the critical aspects of sensing and privacy, ethics and surveillance; Ability to discuss environmental and social justice differences across the fabric of the city using data; Ability to measure behavioral phenomena. Think critically about human-computer interfaces, including questions of empathy and reciprocity.

Ultimately, the objectives of this class are to learn by doing while being reflective practitioners as we question the application and use of these tools and discussions to the creation and promotion of better environments.

Instruction

This class marries several instructional formats to facilitate both an interrogation of these methods from a critical distance and actively learning the methods through use. In the first approach, seminar-styled, student-driven discussions and presentations will consider various approaches and techniques, as well as their opportunities, limitations, and implications on research, design, and planning. In a practical approach, a physical prototyping project will form the cornerstone by which we can engage in these conversations actively, using the work as an anchor to the conversations surrounding these techniques and datasets. While certain class meeting sessions are planned for project development and discussion of research design and methods, students are expected to use their projects as additional discussion material throughout the semester.

Prerequisites

Due to the wide variation in skill sets, the general mantra for the class is that course participants are required, at a minimum, to approach the activities and lectures with enthusiasm, grit, and/or perseverance.

There is no other requirement, although some coding familiarity is highly recommended. (To note, we'll be coding in Java, so this becomes a great equalizer.)

Equipment + Costs

While there are no required texts for purchase, material costs are associated with the class. Students will be building their own physical prototypes for deployment. Students should also purchase an ELEGOO UNO Project Super Starter Kit (~$45 at the time of writing), built from the open-sourced specs for an Arduino UNO R3, which is the microcontroller we will use in this course. Based on the project, you may need to purchase any sensors or equipment they may require. Students will also learn how to use the GSAPP and Columbia Makerspaces, and may incur costs associated with the materials and making of their choice.

Assignments and Grading

The class is organized as a series of sprints—that organize the class toward implementing your final project. While these sprints are meant to frame sets of knowledge and skills, they should be thought of as discrete sections, but merely organizational stages in our learning.

Precedents and Critique: Building Knowledge

To support a wider set of information gathering, the first half of the class has students collecting, collating, and presenting case study precedent projects and readings to frame the state of understanding as we debate the potential relationships that digital information and the built environment have together. As groups, students will frame conversations for their peers to engage with these ideas and projects.

Technical Workshops

How do we translate activities and phenomena in the built environment using sensors? In this module of the class, everyone works together to create a common resource of sensor types and how they work—what they measure, and how. This is in two parts: instructor-led and peer-led workshops. Some of these may happen outside of the classroom. As a class, we will share this information with each other in presentational, hands-on, and archived manners to share this information that frames our prototyping and final project…

Final Project

The last third of the course is dedicated to a final group project, with an agenda of your choosing and may draw from any/all of the lessons from the course. Here, you will implement a prototype that measures aspects of the use, interactions, quality and/or other metrics of the built environment and the people who occupy that space, and validate or disclaim those planning and design claims. You should implement the hardware with enough time to implement the sensors and to process the data.

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Grading

Attendance and Participation 10%
Prelim. Assignments 40%

Final Project

Prototype Implementation 20%
Final Project Deliverables 30%

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Tentative Schedule

	Class		Due	
	Module 1	Module 2	Assignment	Project Due
17 Jan	Introduction	Situated Technologies	A0. Purchase Sensor Kit + Setup	
24 Jan	Measuring Urbanism	Digital/Physical Interfaces	A1: Digital/Physical Interfaces	
31 Jan	Environmental Justice	Intro to Sensors + Makerspace		Website Profile
7 Feb	Ethics and Protocols	Theory Presentation 1		
14 Feb	Arduino Hands-On	Theory Presentation 2	CITI Training Due	
21 Feb	Project Pitch			Written Brief + Presentation
28 Feb	Technical Presentation 1	Reviewing Protocols		Protocols
7 Mar	Technical Presentation 2	Rhino/3d Printing		Refined Brief
14 Mar	Spring Break			
21 Mar	Design Review			Website; Design + Tech Sketch (w/ Precedents)
28 Mar	Build Week 1 - All Hands			
04 Apr	Build Week 2 - All Hands			... Implementations this week!
11 Apr	Analytical "Pin Up"			Data Cleaning + Visualization Draft
18 Apr	Individual Meetings			Findings and Conclusions
25 Apr[1]	Final Presentations			Presentations
02 May				Deliverables Submitted