Physical/Digital Development Workshop

Fall 2019 Studio Workshop

Instructor: Zach Pino (zach.pino@id.iit.edu)
Tuesdays 2:00pm to 5:00pm @ KI 227

Description

This recurring course teaches current and emerging electronics and programmatic prototyping tools, so that students are able to fluently develop their design ideas into interactive and responsive outcomes. Physical/Digital Development challenges students to explore how a combined knowledge of design research methods, contemporary technologies, and engineering prototyping tools can contribute to better and more informed designed outcomes. Each semester, the course takes on a specific topic and a new set of technologies, allowing students to retake the course and acquire new skills and exposure to other technological prototyping tools.

Under the theme of data-driven urban transformation, we will be looking at the topic of accessible transit infrastructure, paratransit, autonomous vehicle technologies, and urban-level transit policy. The first several weeks of the course will arm students with Raspberry Pi 3B+ and Python competencies, as well as the technical skills necessary to access and manipulate large datasets. After this tutorial period is finished, students will participate in an experimental, collaborative research project aiming to clarify, visualize, and evaluate design proposals for urban transit. Students in the course will construct a data-driven, physical model of Chicago's transit infrastructure, based on a combination of publicly-available data, research insights, and software-simulated determinations. This model, actuated by LEDs, speakers, screens, projected overlays, and (perhaps) motors, will be designed to enable experimentation in transit policy based on students' research insights. Users of the model will be able to prototype hypothetical infrastructural changes, municipal policy interventions, and vehicle routing algorithms predicated on existing transit data. The model itself will be built with digital fabrication tools, and students will have light exposure to 3D modeling geographic data with computational milling machines and other digital fabrication tools.

Format

Each class will be divided into an interactive tutorial focusing on a specific technical topic, followed by building time in which students will be presented with an assigned real-word challenge for their designs to conquer.

Weekly homework will task students with building circuits, writing code, and prototyping hardware.

Office Hours

These office hours are **always available**. Other times can be arranged as needed via email.

Thursdays 10pm-12pm, 2pm-4pm
??? To Be Discussed

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Learning Objectives

- Gain fluency with the Arduino, Raspberry Pi, and related prototyping platforms
- Find and implement open source code and libraries
- Write well-structured code in Python and Arduino-Flavored C++
- Develop perseverance through confronting technological limitations and failures
- Implement a wide variety of analog and digital sensors and synthesize the results into a computational understanding of the world
- Use mathematical, computational, and physics principles to address design problems

Requirements

- Command of Adobe Illustrator, InDesign, and Photoshop or equivalents
- Willingness to prototype many ideas quickly
- Comfortability with working in teams and providing honest critique

Tentative Course Outline

1. Introduction to Raspberry Pi, Electricity, and Functional Programming
2. Programmatic GPIO Control and PWM Signalling
3. Working with Datasets and APIs in Python
4. Digital and Physical Data Visualization
5. Drawing Data to the Screen
6. Creating Music and Sounds
7. Working with Geographic Data
8. Proximity Detection - RFID and NFC over i2c
9. Kinetics · DC Motors and Servos
10. LED Matrices and Strips
11. Project Worktime
12. Project Worktime
13. Project Worktime
14. Project Worktime

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Expectations

- Minimum 10 hours of outside-of-class idea development and execution time
- Weekly research and tutorial completion
- Weekly deliverables that may require excursions and/or materials sourcing
- Weekly uploads of code and circuit diagrams with questions for review

Grading

Students will be evaluated on the scope and ambition of their iteration and exploration, aesthetic quality of their work, participation and collaborative enthusiasm, and the clarity and legibility of their developed ideas.