IML 404: Tangible and Spatial Computing
Spring 2019 | 4.0 Units
Monday | 4:00-6:50pm | SCA 214

Instructors:	**John Carpenter and Pete Hawkes**
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Office:	SCIL lobby / conference room
Office Hours:	Monday 3-4pm *by appointment*
Course Site:	https://github.com/johnbcarpenter/USC_IML404

COURSE DESCRIPTION
This course is an examination of existing and emergent media technologies, focusing on creative and critical tactics for empowering you to explore the full potentials of software and hardware in your work.

LEARNING OBJECTIVES
We will explore extended human computer interaction, including new forms of haptic, sonic and other sense modalities, through physical computing and spatial interfaces. Instruction will draw heavily from both our careers as artists, and our roles as designers at Oblong Industries (http://www.oblong.com)—an existing business designed to imagine workspaces of the near future. The projects will focus on opening up and reshaping the way we approach, think about, understand, and work with technology.

COURSE STRUCTURE
The course will be taught as a workshop with classes focussed on three different mediums of discourse and expression: Processing, Arduino, and g-speak (Oblong's spatial operating environment). We will also explore how other artists, designers, and engineers use software, sensors, light, pixels, space, gesture, and architecture in their work... and we'll invite several guests into the class for lectures and critiques.

During our work with g-speak, students will be invited (and required) to attend classes at the Oblong warehouse (downtown in the Arts District). There we will consider an array of new tools and topics for interaction design—including how to work with gesture and/or Arduino across a 40-foot media wall. Final projects will be presented at a reception at the Oblong warehouse.

TECHNOLOGICAL PROFICIENCY AND HARDWARE/SOFTWARE REQUIRED
This course assumes you have a basic understanding of programming and writing code (eg some experience in Processing, Arduino, Java, C#/Unity, C++, JavaScript or similar). Recommended preparation includes IML 102, IML 104, IML 201, and/or IML 288.

You won't be required to purchase any software. The software we'll be working with (Processing and Arduino) is free and runs on Windows and Linux; however, if you have access to a Mac for class work, it will probably make everyone's life a bit easier (we'll be demoing in MacOS).

You'll be required to buy an Arduino Starter Kit (~$35 from amazon)… please wait for a link to the specific kit we'd like you to purchase. The department has a few kits than can be borrowed, but this is a solid starter. There are many Arduino starter kits out there. This is the cheapest, safest option. Others might cause some serious headaches. Please check with us if you plan to use a different kit. If cost is an issue; we can help gather parts to keep you rolling.

REQUIRED READINGS AND SUPPLEMENTARY MATERIALS
Recommended Reading:
Getting Started with Processing: A Hands-On Introduction to Making Interactive Graphics. 2015
Getting Started with Arduino: The Open Source Electronics Prototyping Platform. 2014

Required Reading:
John Underkoffler. *The I/O Bulb and the Luminous Room*. 1991

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JCR Licklider. *Man Computer Symbiosis*. 1960
Roy Ascott. *The Construction of Change*. 1964
Nicholas Negroponte. *Soft Architecture Machines*. 1975
Myron Krueger. *Responsive Environments*. 1977
Heidegger. *The Question Concerning Technology*. 1977
Richard A. Bolt. *Put That There*. 1980
Foucault. *The Subject and Power*. 1982
Donna Haray. *A Cyborg Manifesto*. 1985
Ian Bogost. *Purposes of Persuasion*. 2007

GRADING BREAKDOWN

- processing project 30%
- cardboard prototype + blog 15%
- arduino project 30%
- g-speak project 20%
- participation 05%

DESCRIPTION AND ASSESSMENT OF EACH ASSIGNMENT
Your grade in this class is determined by the above four assignments (95%) + your participation score (5%).

The projects and prototype will be graded according to the following criteria:
- Conceptual Core: Is the work's thesis clearly articulated? Is the project productively aligned with the current topics of discussion? Does the project effectively engage with the primary issues presented in the assignment?
- Research Competence: Does the project display evidence of research and thoughtful engagement with its subject?
- Form and Content: Do structural and formal elements of the work (code) reinforce the conceptual core in a productive way? Is the effectiveness of the project compromised by technical problems?
- Creative Realization: Does the project approach its subject in creative or innovative ways? Does the project use media and design principles effectively? Does the project use code in an interesting way (not applicable to the cardboard prototype)?

Your class participation grade will be evaluated by your contributions to critiques and class discussions. In short, we're looking forward hearing your thoughts about the material we'll be covering in class — the more voices that are involved, the better the conversation will be. Technology is changing quickly, and it's difficult to stay up to date with everything that's going on, so please feel free to contribute related material that we haven't mentioned — this can also act to help us tailor the course work to the class' interests. We're dealing with challenging, novel material in this course. Please ask lots of questions — generally, if you have a question, at least one other student does as well.

Peer Review. Peer review is an important aspect of class since it not only sharpens your skill at critical analysis while it also gives you more awareness of how others receive your work. Each project will be discussed and reviewed (by the professors and other students) in light of the following:

- the idea that informs the project
- the extent to which the project followed the assignment
- the technical efficacy of the project
- the textual rationale that accompanies the project

You will be evaluated on the quality of your review (though your review will not impact your colleagues' project grade).

ASSIGNMENT SUBMISSION POLICY
Late projects are up to -10% off the project grade (aka your final grade).

GRADING TIMELINE
You will receive grade feedback in week 08 or 09 after we complete the processing + cardboard prototype portions of the class.

ABSENCE POLICY
MA+P classes depend on group work and in-class critique, which makes attendance crucial. You are expected to be present for every scheduled class session. If you must miss a class, please be sure to get any notes and assignments from a classmate so you do not fall behind.

There is no distinction between excused and unexcused absences. Tardiness or leaving class early for (0 to 15 minutes) will be considered ½ an absence. Missing more than 30 minutes of a class is considered an absence. **After your second absence, each additional absence will lower your final grade by 5%.**

Please note that the grading policy makes it nearly impossible to pass the course should you miss more than three classes in a semester. If you anticipate attendance issues, please notify your professor immediately.

GRADING SCALE
Course final grades will be determined using the following scale:

A	95-100	
A-	90-94	
B+	87-89	
B	83-86	
B-	80-82	
C+	77-79	
C	**73-76**	**MINIMUM PASSING GRADE FOR MEDIA ARTS + PRACTICE MAJORS**
C-	70-72	
D+	67-69	
D	63-66	
D-	**60-62**	**MINIMUM PASSING GRADE FOR USC**
F	59 and below	

ACADEMIC POLICIES

Diversity Statement:
Diversity and Inclusion are foundational to the SCA community. We are committed to fostering a welcoming and supportive environment where students of all identities and backgrounds can flourish. The classroom should be a space for open discussion of ideas and self- expression; however, SCA will not tolerate verbal or written abuse, threats, harassment, intimidation or violence against person or property. If students are concerned about these matters in the classroom setting they are encouraged to contact their SCA Diversity and Inclusion Liaison, http://cinema.usc.edu/about/diversity.cfm; e-mail diversity@cinema.usc.edu. You can also report discrimination based on a protected class here https://equity.usc.edu/harassment-or-discrimination/

Academic Conduct:
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Statement on Fair Use:
Fair use is a legal principle that defines certain limitations on the exclusive rights of copyright holders. MA+P projects are produced with fair use doctrines in mind using its four pillars: (1) the

purpose and character of use, (2) the nature of the copyrighted work, (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole, and (4) the effect of the use upon the potential market for or value of the copyrighted work. Generally speaking, this means you must only use as much of a copyrighted work as is necessary to make your point, and you must cite your sources accordingly.

Citation Guidelines:
We assert that work produced in our classes is covered under the Doctrine of Fair Use. In order to make this claim, however, all projects must include academically appropriate citations in the form of a References section, which covers all sources, in order to receive a passing grade. The References section is either included in the project itself or as a separate document, as appropriate. We follow the Kairos Journal of Rhetoric, Technology and Pedagogy style guide for citation purposes; Kairos uses a modified APA format, whose general guidelines and specific examples may be found here: http://kairos.technorhetoric.net/styleguide.html#apa

Computer Code:
Computer code is often shared and reused. This is appropriate in a MA+P course unless otherwise directed by the assignment. If you do use code, you should attribute it. Please follow these protocols from MIT which call for placing a comment in one's code with a URL to the original source, a note if it was adapted, and the date of retrieval: https://integrity.mit.edu/handbook/writing-code

Disruptive Student Behavior:
Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office of Student Judicial Affairs for disciplinary action.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

Student Health Leave Coordinator – 213-821-4710
Located in the USC Support and Advocacy office, the Health Leave Coordinator processes requests for health leaves of absence and advocates for students taking such leaves when needed.
https://policy.usc.edu/student-health-leave-absence/

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu
Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity,

gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support
Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710
studentaffairs.usc.edu/ssa
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Trojan Food Pantry
https://campusactivities.usc.edu/trojan-food-pantry/
Any currently enrolled USC student who does not have a dining hall meal plan or whose plan's swipes have been fully used and is experiencing a food emergency/food insecurity qualify for the services of the Trojan Food Pantry.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.

PLEASE NOTE:
FOOD AND DRINKS (OTHER THAN WATER) ARE NOT PERMITTED IN ANY INSTRUCTIONAL SPACES IN THE CINEMATIC ARTS COMPLEX

WEEKLY SCHEDULE

The following weekly schedule is subject to change. Please consult the course GitHub page for the most current information, assignments and due dates.

```
class Processing () {
  Week 01. 01/07/2019 <teacher intros // computer vision>
    - rgb camera, filters, openCV
    - optical flow

  Week 02. 01/14/2019 <processing: kinect>
    - optical flow + agent-based systems
    - kinect and point clouds
    - discuss processing project proposals / working session

  Week 03. 01/21/2019 >>>MLK day<<<
    - there will be an alternative class day
    - machine learning and visual recognition

  Week 04. 01/28/2019 <working session>
    - working in class, project discussions

  Week 05. 02/04/2019 <processing: project* reviews>
    - in-class critique (with guest reviewer)
    - cardboard prototype project introduction
}


class Prototype () {
  Week 06. 02/11/2019
   - cardboard prototype working session
   - blog post documentation intro

  Week 07. 02/18/2019 >>>President's Day<<<
   - cardboard prototype meetings in office hours
}


class Arduino () {
  Week 08. 02/25/2019 <arduino intro>
    - <cardboard prototype project* crit + blog post due>
    - talk: electronics for art and design <arduino intro>
    - microcontrollers / leds / knobs / pots

  Week 09. 03/04/2019 <arduino>
    - sensors / actuators
    - photocells / servos

  // Week 10. Spring Recess 03/10 - 03/17/2019

  Week 11. 03/18/2019 <arduino>
    - buttons / piezo / debounce
    - proposals discussion / working session

  Week 12. 03/25/2019 <arduino>
    - working session

  Week 13. 04/01/2019 <arduino project* reviews>
    - in-class critique (with guest reviewer)
    - required readings assignment
}
```

```
class g-speak () {
  Week 14. 04/08/2019 <g-speak: intro>
    - guest lecture @the warehouse
    - <tactical media discussions / readings>
    - g-speak project requirements

  Week 15. 04/15/2019 <g-speak>
    - working session @the warehouse

  Week 16. 04/22/2019 <g-speak>
    - working session @the warehouse

  // Study Days: 04/27 - 04/30/2019 (no class)

  FINAL EXHIBIT. 05/06/2019 4:30-6:30 p.m. <g-speak project* reviews>
    - @the warehouse
}

* class work due
```