Responsive Surfaces
The design challenge of ambient information

Position

Provocation: Hybrids of the digital and physical create new design opportunities and challenges. The ability to improvise, prototype, fabricate, tune, and repurpose technological components has increasingly become a vital aspect of education. For alas otherwise, digital technology seems ever more centralized and authoritarian of late. So it has become important to ask who is in control of the media you are working in. It is important to grow new communities of practice around digital artisanry and improvisation.

Technique: This workshop course should help you understand and begin to take part in the maker culture of situated information. Here you will get a chance not only to review recent theory and works, but also to build some hands-on skills. It might change how you see technology. This course allows participants who bring different experiences and interests to exchange and develop their skillsets in physical computing and response surface prototyping. Although making tangible information artifacts isn’t for everyone (alas many people who have grown up on virtual entertainments lack the intuitive physics for it; besides, realizing full scale installations takes budgets and teams; and coding remains foreign to most designers) with each year the technological hurdles have become very much lower, and the work much more fun.

Movement: Digital crafts, integrative design, and electronic “maker” culture are now in full swing. Physical computing studios are by now widespread in schools of art and media studies; and the time is right to translate this work into architecture. The embedding of sensors, actuators, tags, and memory into the built environment has accelerated in recent years. In the process, the means for artists and non-programmers to experiment in this field have become much more affordable and usable.

Discipline: What is the relationship of architecture to interaction design? Interaction design has become to the age of ambient information what industrial design was to the age of the mass-market machine. Both disciplines study how people deal with technology. Both care about interfaces. Increasingly the interface arts comprise not just mechanical usability but also cultural intent, not just data streams but also tangible situation. Notions of psychological affordance, social convenience, and the bias of media this become more prominent. Cultural positions become more important. A culture of criticism becomes necessary.
Course Organization

Format: This is an open workshop course. Much of our session time will be devoted to helping one another with projects. Participants will work to bring one another up to speed on recent works, available technologies, and worthwhile applications. Tutorials will explain basic principles of electronics, sensing, and scripting, and will demonstrate practical technologies. A research & criticism will be useful toward developing a cultural stance. Weekly sessions will mix all of these.

Requirements: (Each weighted equally toward semester grade)

1) **Exercises**: A set of four shared exercises, with the last of these in effect a quick midterm project. Five exercises will be issued. For full credit, each exercise must be demonstrated at the following session, and documented in the course journal. Late or undocumented exercises count half. Due to the vagaries of winter, everyone may skip one exercise, but not the last of them.

2) **Journal**: Your own course tumblr, documenting your process and experimentation, including commentary on discussion group themes and inquiries into prior art. (See page below about this.) This will receive a progress grade at midsemester.

3) **Project**: An ambitious, unusual final project installation.

Technology: The course will use the popular open-source electronic arts prototyping technology Arduino. At the heart of this is an output controller board that can work with your computer or stand alone. You can load a script onto it, embed it into an installation, and reuse it afterward. Since Arduino has become the standard in for coursework in physical computing, there are abundant learning resources online. The open source community provides advice, examples, scripts, and supply chains. The course will study and share some scripts of its own, as for the exercises. Yet no canned labs make sense in course such as this one. Everyone quickly finds their own pace. You can own these kits, acquire additional hard and soft components on demand, and build with them as you wish.

Groups: The course will organize four study groups. In class, each study group will have its own table for discussions, demonstrations, and technique sharing. Outside class, each group will have its own email list that should be the second stop for tech help and questions (for of course Google is the first step, as there are almost always ample tutorial resources findable online.) Besides sharing lore, you group may also elect to share tools, cultural themes, and more. Think of this as four concurrent seminars.
Calendar

Week 1  **Introduction** (12 January)

Week 2  (19 January)  No class; MLK holiday and symposia.

Weeks 3–7  **Core skillset** (26 January – 23 February)
demo:  Open to any exploratory sketches done since week 1.
discussion:  Selected themes for weekly discussion group
technology:  Arduino fundamentals, as approached through short exercises
exercises:  1) Sensor: “blink loops”–input sensor calibration
2) Actuator: “motion to motion”–servomotor output
3) Algorithm: “walk-up”–generative graphics
4) Data: “monitor”–ambient output of remote input data
5) Mechanism: “simple machine”–transfer of motion

presentation:  Exercise 5 demonstration (week 7)

Week 8  **Critique** (9 March)
discussion:  Update and survey session on terms, criteria, and prior art. Progress review of course journals.

Weeks 10–15  **Individual Projects** (9 March – 20 April)
work:  Final project journal and installation
laboratory:  Occasional group focus on techniques arising in multiple projects
consultation:  Class time devoted to project-based learning
journal:  You are expected to keep a tumblr of your progress
installation:  Your project should be able to run unattended (showing week 15)

Week 15  **Exhibit, Presentation, and Discussion** (21 April)
Journal

Responsive works of art and architecture deserve a cultural response of their own. But what do we talk about when we talk about responsive surfaces? How can small exercises, experiments, and prototypes suggest larger insights into well-received recent work? How to get beyond “cool, how did they do that?” If the work is “against interpretation” and you really have to be there, what about all these youtube clips?

This course asks you to maintain a miniblog on Tumblr. Meanwhile one shared Tumblr (writable by all) will link to your own. This will provide a log of the work in the course. Although you will get to demonstrate and discuss anything you make, you should also document that here. This is also the place to tie in reactions to prior art, ideas about project prototyping, and techniques to share with the group. You can include anything you think might be of interest, but you are asked to include at least the following...

1. A opening statement of your motives and goals for the course.
2. An opening statement of work you admire. Include three or four designers, at least half not from our often-cited list. Include an image or two, and a line or two of comment for each.
3. Documentation of each of the short shared exercises. For each, provide a pair of photos, or a very short (5–10 sec) clip, and a sentence or two about your aims.
4. Independent project ideas. Never go two weeks without writing down something, and perhaps pasting in some diagrams, sketches, or images, about where you might be headed.
5. Prior Art. Take just two or three works, and write a page of comparative critique – about their provocation, significance, cultural positioning, or genre-building. Do not simply describe what they are and what they do. Play art critic. Do this in the first half of the semester. On the first day back from break, we will discuss the whole lot of these.
6. Independent project development. Whenever you have worked for a few hours, document what you attempted.
7. Independent project results. Think carefully about how this entry also serves as a portfolio entry.
Policies

grading: Letter grades for the semester are according to standard college criteria: “A=Excellent, B=Good, C=Adequate, D=Poor, E=Inadequate, I=Incomplete.” Please see Requirements section above, about the three equal components of the grade: the exercises, the journal, and the completed independent project.

attendance: At this point in your career, learning to manage your own time is more important than compliance with external rules for attendance. Nevertheless in a course that meets just once a week, it is unwise to miss consecutive sessions. If you know you will be doing so, it is a simple courtesy to email the instructor. Also, please don’t miss class just because it is first thing Monday morning.

plagiarism: Because this course will be aggregating found components, and often doing so with open source tools, it will be important to acknowledge sources and to distinguish your own synthesis. The standard policy is this: “Plagiarism is knowingly presenting another person's ideas, findings, images or written work as one’s own by copying or reproducing without acknowledgement of the source. It is intellectual theft that violates basic academic standards. In order to uphold an equal evaluation for all work submitted, cases of plagiarism will be reviewed by the individual faculty member and/or the Program Chair. Punitive measures will range from failure of an assignment to expulsion from the University.”

sharing: Reuse and copyduty practices underlie many online communities, especially for learning. If you come up with something good, pass it along. If you find and use something made by others, credit them. If you modify a found resource, comment it appropriately.

disability: “If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Services for Students with Disabilities (SSD) office to help us determine appropriate academic accommodations. SSD (734-763-3000; http://ssd.umich.edu) typically recommends accommodations through a Verified Individualize Services and Accommodations (VISA) form. Any information you provide is private and confidential and will be treated as such.”

College policies: As ever, you are expected to be familiar with and abide by the policies of Taubman College and the University of Michigan, on such matters as academic integrity, conduct, and use of the building and other resources:
http://taubmancollege.umich.edu/students/academic_policies/general/
Resources

Instructor: Malcolm McCullough  mmmc@umich.edu  www.umich.edu/~mmmc/  Please include [responsive surfaces] prefix in subject line of any email sent about this course. Office hours TBA according to calendars of all concerned.

Group: responsivesurfaces@umich.edu reaches everyone in the course. please use appropriately, and please do use.

Microblog: https://www.tumblr.com/blog/responsivesurfaces-umich15
This will link to your own course miniblog. Do not use your tumblr main blog for that. Even if you never otherwise use tumblr, make a secondary blog for this course. That will be your journal. It will be linked from this shared tumblr. You can post other things to share here too.

Community: http://www.arduino.cc/
Model course: http://tigoe.net/pcomp/
Index: http://www.freeduino.org/

UM faculty: be aware of John Marshall (A&D), Tawanna Dillahunt (SI), Geoff Thün (Arch.)

Designers: Jason Bruges, Future Cites Lab, Usman Haque, Ned Kahn, Rafael Lozano-Hemmer, rad (U.Toronto), rAndom International, Realities::United, Dan Roosegarde, RVTR, Tangible Media (MIT), Meijing Yoon. (These are the 12 most cited in the last two years of this course).

Texts: This is not the best topic for books, but here are four good ones:
Kastia Kwastek, Aesthetics of Interaction in Digital Art. MIT Press (2013). Getting beyond “cool, how did they do that?”


Gear: There is no fixed lab kit for the course, but you may want to pool some orders to the suppliers above. All else being equal, a good start is the Arduino Starter Kit plus a rangefinder such as the the Maxbotics EZIO or the Parallax Ping. You may also want to share a toolbox, with the likes of spare wire, assorted resistors, soldering iron, wire strippers, voltage meter, clamps, and such. You will need to download the Arduino and Processing software, both free.