Description: The relationship of material artefacts is changing with the ubiquity of computation. Mechanical solutions relying on analog computation are increasingly replaced with algorithmic feedback and control systems and even learned control strategies. Although ubiquitous, the impact of these changes is largely found in the realm of engineering and product design. In consumer electronics it has lead mostly to the disappearance of purpose built physical designed artifacts now incorporated into apps used on touch screen surfaces. The course is focused on developing designs that reclaim the physical nature of embodied computation and the spatial relations that computational-physical hybrids can develop with people in architecture. Edward T. Hall (Hall 1969) introduced the term Proxemics to describe the effect of human use of space and Birdwhistell (Birdwhistell 1970) the term Kinesics or also commonly referred to as body language meaning the nonverbal communication of the body and the face. The hypothesis is that with a shift in design from focusing on form towards behavior the human-architecture relationship can be redefined as one of each having equal agency. New challenges arise from this in how to develop non-verbal forms of architectural articulation to embrace emerging autonomy at architectural scale. This is also to be understood as a direct juxtaposition to current trends towards formal primitivism and superficial anti-tech motions in design by exploring the expanded conceptual design canon rather than getting stuck in stylistic camouflage. A sequence of assignments will develop prototypes that are framed around questions of human occupation of computational constructs and the shift from material form towards behavioral entities.
Assignment summaries

Assignment 1
Create a physical object driven by an agenda of your choice and engages with the human body in space. Develop a parametrically defined form and fabricate a physical prototype to test and document it.
What is the role of the object in defining a person’s relationship to space?
Define the objects agenda and how your physical form enforces it.

Assignment 2
Develop your concept further by replacing one fixed formal feature with an actuated one to create an adaptive physical object in such a way that it has a substantial impact on the character of the piece and possibly expands its agenda. It maybe how it is perceived, or how it functions, or it engages with a person in space. Consider its architectural potential and think of it more as a character than a building component. It must be a singular standalone installation, conceptually complete as built. How does it actuate, where does it derive its energy from, how do you setup and exploit the singular degree of freedom for change?

Assignment 3
Further develop your project with the addition of sensing and its careful integration into the physical setup of your arrangement – How did you capture the presence and action of people from your object arrangement? Is it through visual cues, through direct or indirect measures of matter like vibration or changes in the distribution of forces or temperature? Is it a boolean type sensing or a gradient? How do you define the threshold for triggering the actuated state change? How does the sensing range enable the object to include space beyond its physical reach - and how does it affect its physical form?

Assignment 4
For the final assignment rebuild your physical installation to integrate the previous additions conceptually and add a layer of autonomy to allow a simple decision making process that embodies an agenda for your object over time – does it welcome people or try to send them away, does it collect things or have a destructive nature, is it influencing people’s behavior?

Final Paper
Final technical paper write up the project development

Schedule draft:

2/5 Intro embodied computation - lab Form - handout assignment 1
2/12 interactivity - presentation assignment 1 - handout assignment 2
2/19 proposal presentation assignment 2 - Lab Arduino electronics
2/26 update presentation assignment 2 - Lab actuation
3/4 presentation assignment 2 - handout assignment 3
3/11 proposal assignment 3 - lab sensing
3/18 update assignment 3 - lab networking
3/25 Spring Break
4/1 Presentation assignment 3 - handout assignment 4
4/8 proposal assignment 4 - lab programming in processing
4/15 lab - Programming
4/22 update presentation assignment 2 lab - state machines/memory
4/29 lab - Larger scale prototypes
5/6 workshop technical paper writing
5/13 No Class – Studio Review Week
5/(20) Final Review - date determined by institute | Final Paper option
References:


Duffy, Brian R., 2003, “Anthropomorphism and the social robot”, robotics and autonomous systems 42


Fox, Michael, Kemp, Miles, “Interactive Architecture”, 2010, Princeton Architectural Press


Hall, Edward T. (Edward Twitchell), 1914-2009 "Beyond culture"


IJAC - Architectural Robotics: Catalyzing New Design Opportunities. Guest editors: Michael Fox, Aaron Sprecher, Doug Noble, Mike Christenson, Anton Harfmann, Aaron Temkin, Nancy Cheng

http://multi-science.atypon.com/toc/ijac/10/3


Radhika Nagpal, Programmable Self-Assembly Using Biologically-Inspired Multiagent Control, AAMA, 02, Bologna Italy

Learning Objectives:
The course consists of four assignments expanding the concept of embodied computation from matter to behavior. Students should be able to engage with an increasing level of design research through iterative prototypes and move fluidly between different modes and scales of operation. At the core of the course is the Experimentation with different physical and electronic media to develop design prototypes and to reflect critically on its implications for design. A technical final paper is expected in documenting the final outcome and semester progress.

Completion Requirements:
Completion of each of the assignments, rigor in process and clarity in representation, as well as the overall progress of the semester (including attendance) will be fundamental to completing the course.

Evaluation Criteria and Grading:
The following criteria will be used for the evaluation of student's work, both in terms of helping their progress and in final grading. (01) Thesis: How clearly is the student articulating the conceptual intentions? (02) Translation of Thesis: How well is the student using their thesis to develop a design response to given problems? (03) Representation Appropriateness: How well matched is their choice of representational means to their intentions? (04) Prototyping Quality: How accomplished are they with drawing, modeling, digital representation, and prototyping? (05) Oral Presentation Skills: How clearly are they presenting their ideas orally, whether at their desk, in class discussions, or to a more formal jury? (06) Participation in Discussions: How actively and how constructively are they involved in class discussions, both formally and informally? (07) Response to Criticism: How do they effectively take advantage of criticism from instructors, classmates and outside jurors? (08) Auto-Critical Skills: To what extent are they able to critique their own work regularly and effectively? (09) Attendance – attendance to all classes is mandatory, please email beforehand for excused absence. (10) Group work – contributing to the group dynamic and willingness to collaborate

A: Excellent - Project surpasses expectations in terms of inventiveness, appropriateness, verbal and visual ability, conceptual rigor, craft, and personal development. Student pursues concepts and techniques above and beyond what is discussed in class.
B: Above Average - Project is thorough, well researched, diligently pursued, and successfully completed. Student pursues ideas and suggestions presented in class and puts in effort to resolve required projects. Project is complete on all levels and demonstrates potential for excellence.
C: Average - Project meets the minimum requirements. Suggestions made in class are not pursued with dedication or rigor. Project is incomplete in one or more areas.
D: Poor - Project is incomplete. Basic skills including graphic skills, model-making skills, verbal clarity or logic of presentation are not level-appropriate. Student does not demonstrate the required design skill and knowledge base.
F: Failure - Project is unresolved. Minimum objectives are not met. Performance is not acceptable. This grade will be assigned when you have excessive unexcused absences.

Writing Center
The WCC at MIT (Writing and Communication Center) offers free one-on-one professional advice from communication experts. The WCC is staffed completely by MIT lecturers. All have advanced degrees. All are experienced college classroom teachers of communication. All are all are published scholars and writers. Not counting the WCC's director's years (he started the WCC in 1982), the WCC lecturers have a combined 133 years’ worth of teaching here at MIT (ranging from 4 to 24 years). The WCC works with undergraduate, graduate students, post-docs, faculty, staff, alums, and spouses. The WCC helps you strategize about all types of academic and professional writing as well as about all aspects of oral presentations (including practicing classroom presentations & conference talks as well as designing slides). No matter what department or discipline you are in, the WCC helps you think your way more deeply into your topic, helps you see new implications in your data, research, and ideas. The WCC also helps with all English as Second Language issues, from writing and grammar to pronunciation and conversation practice.
The WCC is located in E18-233, 50 Ames Street. To guarantee yourself a time, see the WCC's page About Appointments where you can then schedule an appointment online.

Academic integrity
MIT's expectations and policies regarding academic integrity should be read carefully and adhered to diligently: http://integrity.mit.edu/.