Processing and Arduino (IA 5540.01, Spring 2014)

Class Details

Location: U208

Time: Thursday, 9:00 am - 3:00 pm

Instructor: Sam Sheffield

Office: BR312 (Hours by appointment)

Email: ssheffield@mica.edu

Class Website: http://samsheffield.com/pandas14

Course Description

This course will introduce graduate students to the principles and programming environments used with Processing and Arduino. Students will be introduced to the relevant technologies, histories, and materials of integrated digital art making. Students will create several projects over the semester, and develop a context for their work via lectures, presentations, and critiques.

Course Goals

"The real voyage of discovery consists not in seeking new landscapes but in having new eyes" - Marcel Proust

This semester, we will be working with the Processing and Arduino programming environments to explore a broad range of creative coding skills which can be applied to your own individual creative or artistic practice.

Learning Objectives

Upon completion of this course, you will...

- demonstrate an understanding of key concepts in programming.
- be able to identify the practical or technical limits of the code as an interactive component of your work.
- be capable of writing and interpreting programs with Processing and Arduino which are either responsive or interactive in nature.
- have developed a core vocabulary which will enable you to seek help or participate in Processing or Arduino-related discussion online.
- have experience working with external libraries of code to add sophisticated input and output to your work.

Important Dates

- Last day to drop class (no transcript record): February 18th
- Last day to withdraw from class (W on transcript): March 4th
- Last day of class: May 2nd

Required Materials

- Laptop (Mac or PC).
- Sketching materials (notebook/sketchbook, drawing/writing tools)
- External hard drive or cloud-based file backup (Dropbox, Google Drive, Github, BitBucket, etc.)
- Arduino Leonardo and Micro USB cable *
- Small breadboard (400 points) *
- Small storage container with dividers aka "tackle box" or "tool box" (for storing electronic components) *

    You will need these items in class after Spring Break. Please purchase them as soon as possible.

Where to Buy Arduino Related Items

- Amazon.com (Surprisingly good prices on this kind of stuff!)
- Adafruit.com (Great for sensors and basics. Located in NY.)
- Sparkfun.com (Great for sensors. Located in CO.)
- Elexp.com (Looks like a scam, but it is not. Good prices on basic components. Located in NJ.)

Suggested Reading

↳ *Processing: A Programming Handbook for Visual Designers and Artists* by Casey Reas and Ben Fry (Very solid reference book)
↳ *The Nature of Code: Simulating Natural Systems with Processing* by Daniel Shiffman (Incredible reference for coding complex behaviors)
↳ *Processing: Creative Coding and Generative Art in Processing 2* by Ira Greenberg, Dianna Xu and Deepak Kumar (Most up to date!)
↳ *Getting Started with Arduino* by Massimo Banzi (Small, gentle introduction)
↳ *Vehicles: Experiments in Synthetic Psychology* by Valentino Braitenberg
↳ *Abstracting Craft: The Practiced Digital Hand* by Malcolm McCullough
↳ *Code: The Hidden Language of Computer Hardware and Software* by Charles Petzold

Online Resources

↳ Official Processing Reference (http://processing.org/reference/) and Examples (http://processing.org/examples/)
↳ For Your Processing (http://fyprocessing.tumblr.com)
↳ OpenProcessing (http://www.openprocessing.org)
↳ Creative Applications (http://www.creativeapplications.net)
↳ Prosthetic Knowledge (http://prostheticknowledge.tumblr.com)
↳ TRIANGULATION BLOG (http://www.triangulationblog.com)

Grading

Grades are based on attendance, class participation, timely completion of assignments and their overall quality, and individual progress.

Final Grades

This course is PASS/FAIL, which can be interpreted in the following ways:

↳ PASS: Come to class, make an effort, meet deadlines, document your work, and smile.
↳ FAIL: Don't come to class, don't make any noticeable effort, miss deadlines, don't documentation your work, or have a bad attitude.

Grading Breakdown (Deliverables)

↳ 2 Projects - 40%
↳ 8 Homework Assignments - 40%
↳ Attitude and Participation - 20%

Your Responsibilities

Attendance

Attendance is mandatory for success in this course.

↳ If you miss a class you are still responsible for all of the material covered as well as any assigned homework.
↳ Please provide basic documentation of the classwork due on the day of your absence.
↳ 4 or more unexcused absences will automatically result in a failing grade.

Punctuality

Please arrive to class no later than 9:00am. We'll begin each class with brief homework presentations, so it is important to arrive prepared and on time. Being habitually late is disruptive and can have a negative impact on your final grade in this class.

Deadlines

All projects and homework are to be completed by the start of class on the assigned due date. Unfinished work will not be discussed in class, however, once completed, documentation of late work can be submitted directly to me with a penalty of a letter grade per week.

Classwork

Classwork related to concepts introduced in class will be assigned each week as homework. Whenever possible, you'll be given time in class to begin experimenting with these materials. This work will be loosely thematic, but feel free to approach it in any manner which feels personally exciting to you. The source code for all homework will be due no later than May 8th.

Projects

There will be 2 projects in this class, intended to give you an opportunity to further explore the concepts and materials in directions which are personally exciting or interesting to you. For these projects, you will be responsible for providing edited documentation for both projects, including images and/or video, as well as source code. Specific details regarding documentation formats will be provided when appropriate.

Presentations & Critiques
In the past, I've had experience with students who have not completed their projects deciding to skip, or come particularly late, on the day of critiques. I consider this kind of behavior particularly disrespectful and self destructive. Critiques not only provide valuable feedback on your own work, they help establish a dialogue which defines standards and expectations for good work in this class. If you find yourself in this situation, which I sincerely hope will not be the case, you will still be able to contribute to the class discussion by being present.

Backing Up Your Work
It is your responsibility to backup and archive your work throughout the semester. Be sure to save often and make multiple copies of your in-progress projects during the semester. Dropbox and online version control systems like Github or Bitbucket are great for this!

Participation
As a citizen of the classroom, you are expected to actively participate in class exercises, discussions, and critiques. In addition, this class is intended to function as a *peer learning* environment. I encourage you to support and talk to one another during class, particularly if you are experiencing any difficulty.

Collaboration
Collaboration on projects is welcomed! However, each team member must carry their own weight in the development and documentation of a project. Afterwards, each collaborator will fill out a brief Peer Review form, which will allow you to discretely provide feedback on your collaborators. Grades will be given individually, and this feedback will be taken into account when factoring grades.

Help me!
"Anyone who has never made a mistake has never tried anything new." - Albert Einstein

We'll be covering a lot of material this semester which may be completely new to you. Please keep in mind that acquiring any new skill can be slow and difficult process. If you think you need help outside of class, please let me know as soon as possible, so we can set up a time to meet.

Last Minute Requests
Naturally, I want everyone to feel successful in this course. However, it's unrealistic for me to provide any real help with any big problems you might be experiencing late on Wednesday night or early on Thursday morning.

MICA Policies

Americans with Disabilities Act
Any student who may need an accommodation based on the potential impact of a disability should contact the Learning Resource Center at 410-225-2416, in Bunting 458, to establish eligibility and coordinate reasonable accommodations.

Environmental Health and Safety (EHS)
It is the responsibility of faculty and students to follow health and safety guidelines relevant to their individual activities, processes, and to review MICA's Emergency Action Plan and attend EHS training. It is each faculty member's responsibility to coordinate with the EHS Office to ensure that all risks associated with their class activities are identified and to assure that their respective classroom procedures mirror the EHS and Academic Department guidelines. Each of these policies and procedures must be followed by all students and faculty. Most importantly, faculty are to act in accordance with all safety compliance, state and federal, as employees of this college and are expected to act as examples of how to create art in a way to minimize risk, and reduce harm to themselves and the environment. Faculty must identify and require appropriate personal protective equipment for each art making process, for each student, in all of their classes, when applicable. Students are required to purchase personal protection equipment appropriate for their major. Those students who do not have the proper personal protection equipment will not be permitted to attend class until safe measures and personal protection are in place.

Plagiarism
Each discipline within the arts has specific and appropriate means for students to cite or acknowledge sources and the ideas and material of others used in their own work. Students have the responsibility to become familiar with such processes and to carefully follow their use in developing original work.

Policy

MICA will not tolerate plagiarism, which is defined as claiming authorship of, or using someone else's ideas or work without proper acknowledgment. Without proper attribution, a student may NOT replicate another's work, paraphrase another's ideas, or appropriate images in a manner that violates the specific rules against plagiarism in the student's department. In addition, students may not submit the same work for credit in more than one course without the explicit approval of the all of the instructors of the courses involved.

Consequences

When an instructor has evidence that a student has plagiarized work submitted for course credit, the instructor will confront the student and impose penalties that may include failing the course. In the case of a serious violation or repeated infractions from the same student, the instructor will report the infractions to the department chair. Depending on the circumstances of the case, the department chair may then report the student to the Office of Academic Affairs, which may choose to impose further penalties, including suspension or expulsion.

Class Schedule (tentative):

The schedule has been left intentionally loose in order to give us room to reshape the class based on your personal and collective needs.

Part I (Weeks 1-8):

The first part of the semester will be devoted to getting your feet wet with screen-based programming via Processing. We'll discuss what code is, how to have our will to be expressed by a machine, and the nuts-and-bolts/grammar aspects specific to the Processing programming language.

You'll learn to:
- draw to the screen using the language's built in shape primitive functions
- work with imported bitmap image files
- import and work with text
- manipulate and move things on the screen
- create conditional behavior which add a level of autonomy or responsiveness
- add a layer of interactivity using the mouse and keyboard as input
- create your own functions
- use arrays and for loops to store and iterate through data
- trigger pre-recorded audio
- incorporate prerecorded or live video
- export still images which can be further edited or manipulated in other software

Project I (Weeks 7-8):

You will have two weeks to create a small self-directed project using Processing. Projects will be presented and discussed on Week 8.

Part II (Weeks 10-16):

During the second part of the semester, we'll focus on the Arduino microcontroller and basic electronics; experimenting with offscreen modes of input and output, and creating physical-digital hybrids utilizing both the Arduino and Processing.

You'll learn to:
- prototype basic electronic circuits
- use the Arduino's digital input and output with LEDs, buttons, switches, etc.
- use the Arduino's analog input and output to achieve better sensing and feedback
- make things move with small motors
- incorporate sensors which allow you to create more complex physical interactions
- communicate between Processing and the Arduino

Project II (Weeks 14-16):

You will have three weeks to create a small self-directed project using a combination of both Processing and the Arduino. Weeks 14 and 15 will both be work sessions. Final presentations will be on week 16 (May 8th).