Design and Technology, AMT, Parsons School of Design
PGTE 5566 - D
CRN: 6710

Creative Coding with openFrameworks

Fall 2018, Friday 15:50 - 18:30
Location: R1002, 6 East 16th Street (Building D)

Faculty: Qinzi Tan
Email: qinzi.tan@newschool.edu (Office hours by appointment/email)

Course Description

In this course students will be learning how to create generative graphics and interactive experience with openFrameworks. Different computational techniques and mathematical principles will be presented and it's up to you to gradually incorporate them into your artistic sketches.
We'll be start by reviewing the fundamentals of coding and Object Oriented Programming with C++. This will be the foundation of the computer paradigm we will use to code our simulations and interactive apps. We will also cover trigonometric principles to understand the foundations of physics simulations. Then we will move towards more complex simulations using multiple forces (attraction, repulsion, field forces, noise, etc). We will see how collective patterns can emerge from individual behavior.
In the second half of the semester, we'll be focus on topics relating to image processing, computer vision, 3D, GPU and building interactive systems with 3rd party addons and external devices.
Students will complete weekly homework assignments in addition to presenting both a midterm and final project, applying learned concepts to create computer programs.

Course Outline

Week 1 - Week 5
Object Oriented Programming
Generative Graphics, Physics Simulation

Week 6 - Week 7
Image Processing & Computer Vision

Week 8 - Week 9
Midterm

Week 10 - Week 12
3D rendering, Communication

Week 14 - Week 16
Final

WEEK	**DATE**	**TOPIC**
Week 1	Aug 31	Intro
Week 2	Sept 7	Basics, OOP, Drawing
Week 3	Sept 14	Vector Math Movement Sine & Cosine
Week 4	Sept 21	Particle System I
Week 5	Sept 28	Particle System II (attractor, repel, path, flocking, vector field)
Week 6	Oct 5	Image Processing
Week 7	Oct 12	Computer Vision
Week 8	Oct 19	Midterm
Week 9	Oct 26	
Week 10	Nov 2	3D
Week 11	Nov 9	Intro to Shader
Week 12	Nov 16	Communication
Week 13	Nov 23	**NO CLASS! **eat turkey****
Week 14	Nov 30	Final Project Workshop
Week 15	Dec 7	Final Project Workshop
Week 16	Dec 14	Final Presentation

Learning Outcomes

1. *Actually* understand what Object Oriented Programming means
2. Be familiar with basic C++ syntax, file structure, classes, and methods
3. Understand how real world physics translates to computer simulations.
4. Create procedurally-generated static & dynamic artwork
5. Create interactive applications with openFrameworks
6. Be comfortable presenting projects and works in front of people
7. Be confident and comfortable learning other programming languages and frameworks afterwards by themselves

Evaluation & Final Grade Calculation

5% Participation
10% Attendance
20% Homework
30% Midterm
35% Final

Materials and Supplies

This course will be based on openFrameworks C++ toolkit and will use GitHub as the online platform to share code, research notes and papers and deliver homework. (Please read and follow the setup document BEFORE coming to class.)

You may find additional help and inspiration in the examples contained in the following repositories and links:

(1) Algo2012 by Zach Lieberman
(2) Sims2014 by Patricio Gonzalez Vivo
(3) Animation by Code 2015 by Bernardo Schorr
(4) Creative Coding 2015 by Conor Russomanno
(5) AlgoSims2016 by Regina Flores Mir
(6) ccof by Jeff Crouse
(7) creativeapplications.net

C++ and OF

Because we will code in C++, the sooner you get comfortable with it the better. There is A LOT of helpful extra material:

(1) ofBook

(2) Stanford University - CS107 - Programming Paradigms by Jerry Cain
(3) Effective C++ by Scott Meyers

As regular consulting material you will probably want to have the following links pre-bookmarked on your browser:

(1) OpenFrameworks Forum
(2) OpenFrameworks IRC Channel
(3) StackOverFlow C++, CodeBlocks & Xcode (There is an openFrameworks tag, but is better if you use the OF-forum for questions.)

Algorithms and Simulation

There are a huge number of papers, books and examples online about algorithms and simulation. Not all of them are in C++, but hopefully you will train yourself to interpret and translate them. Here are some friendly approaches:

(1) Nature of Code by Daniel Shiffman
(2) Familiarity with basic C++ syntax, file structure, classes, and methods
(3) FORM+CODE by Casey Reas
(4) Generative Design by Hartmut Bohnacker, Benedikt Gross, Julia Laub and Claudius Lazzeroni
(5) The Computational Beauty of Nature by Gary William Flake (here are the code examples from the book)
(6) The Algorithmic Beauty of Plants by Przemyslaw Prusinkiewicz and Aristid Lindenmayer
(7) Golan's class notes of Generative Art

GLSL Shader

We will speak briefly about shaders and their implementation in OF. Here are some resources:

(1) The Book of Shaders by Patricio Gonzalez Vivo
(2) Shader Studio 2015 by Patricio Gonzalez Vivo
(3) Shader Toy

Grading Standards

A student's final grades and GPA are calculated using a 4.0 scale. Please note that while both are listed here, the 4.0 scale does not align mathematically with the numeric scale based on percentages of 100 points.

A [4.0; 95 – 100%]

Work of exceptional quality, which often goes beyond the stated goals of the course

A- [3.7; 90 – <95%]
Work of very high quality

B+ [3.3; 87 – <90%]
Work of high quality that indicates higher than average abilities

B [3.0; 83 – <87%]
Very good work that satisfies the goals of the course

B- [2.7; 80 – <83%]
Good work

C+ [2.3; 77 – <80%]
Above-average work

C [2.0; 73 – <77%]
Average work that indicates an understanding of the course material; passable
Satisfactory completion of a course is considered to be a grade of C or higher.

C- [1.7; 70 – <73%]
Passing work but below good academic standing

D [1.0; 60 – <70%]
Below-average work that indicates a student does not fully understand the assignments; Probation level though passing for credit

F [0.0; 0 – <60%]
Failure, no credit

Grade of W

The grade of W may be issued by the Office of the Registrar to a student who officially withdraws from a course within the applicable deadline. There is no academic penalty, but the grade will appear on the student transcript. A grade of W may also be issued by an instructor to a graduate student (except at Parsons and Mannes) who has not completed course requirements nor arranged for an Incomplete.

Grade of Z

The grade of Z is issued by an instructor to a student who has not attended or not completed all required work in a course but did not officially withdraw before the withdrawal deadline. It differs from an "F," which would indicate that the student technically completed requirements but that the level of work did not qualify for a passing grade.

Grades of Incomplete

The grade of I, or temporary incomplete, may be granted to a student under unusual and extenuating circumstances, such as when the student's academic life is interrupted by a medical or personal emergency. This mark is not given automatically but only upon the student's request and at the discretion of the instructor. A Request for Incomplete form must be completed and signed by student and instructor. The time allowed for completion of the work and removal of the "I" mark will be set by the instructor with the following limitations: [You should include one the following standards, depending on the level of your course].

> **Undergraduate students:** Work must be completed no later than the seventh week of the following fall semester for spring or summer term incompletes and no later than the seventh week of the following spring semester for fall term incompletes. Grades of "I" not revised in the prescribed time will be recorded as a final grade of "F" by the Office of the Registrar.

School Resources

The university provides many resources to help students achieve academic and artistic excellence. These resources include:

- The University (and associated) Libraries: http://library.newschool.edu
- The University Learning Center: http://www.newschool.edu/learning-center
- University Disabilities Service: www.newschool.edu/student-disability-services/

In keeping with the university's policy of providing equal access for students with disabilities, any student with a disability who needs academic accommodations is welcome to meet with me privately. All conversations will be kept confidential. Students requesting any accommodations will also need to contact Student Disability Service (SDS). SDS will conduct an intake and, if appropriate, the Director will provide an academic accommodation notification letter for you to bring to me. At that point, I will review the letter with you and discuss these accommodations in relation to this course.

The Making Center

The Making Center is a constellation of shops, labs, and open workspaces that are situated across the New School to help students express their ideas in a variety of materials and methods. We have resources to help support woodworking, metalworking, ceramics and pottery work, photography and film, textiles, printmaking, 3D printing, manual and CNC machining, and more. A staff of technicians and student workers provide expertise and maintain the different shops and labs. Safety is a primary concern, so each area has policies for access, training, and etiquette that students and faculty should be familiar with. Many areas require specific orientations or trainings before access is granted. Detailed information about the resources available, as well as schedules, trainings, and policies can be found at resources.parsons.edu.

Divisional, Program and Class Policies

- Responsibility

Students are responsible for all assignments, even if they are absent. Late assignments, failure to complete the assignments for class discussion and/or critique, and lack of preparedness for in-class discussions, presentations and/or critiques will jeopardize your successful completion of this course.

- Participation

Class participation is an essential part of class and includes: keeping up with reading, assignments, projects, contributing meaningfully to class discussions, active participation in group work, and coming to class regularly and on time.

- Attendance

Parsons' attendance guidelines were developed to encourage students' success in all aspects of their academic programs. Full participation is essential to the successful completion of coursework and enhances the quality of the educational experience for all, particularly in courses where group work is integral; thus, Parsons promotes high levels of attendance. Students are expected to attend classes regularly and promptly and in compliance with the standards stated in this course syllabus.

While attendance is just one aspect of active participation, absence from a significant portion of class time may prevent the successful attainment of course objectives. A significant portion of class time is generally defined as the equivalent of three weeks, or 20%, of class time. Lateness or early departure from class may be recorded as one full absence. Students may be asked to withdraw from a course if habitual absenteeism or tardiness has a negative impact on the class environment.

Whether the course is a lecture, seminar or studio, faculty will assess each student's performance against all of the assessment criteria in determining the student's final grade.

● Canvas

Use of Canvas may be an important resource for this class. Students should check it for announcements before coming to class each week.

● Delays

In rare instances, I may be delayed arriving to class. If I have not arrived by the time class is scheduled to start, you must wait a minimum of thirty minutes for my arrival. In the event that I will miss class entirely, a sign will be posted at the classroom indicating your assignment for the next class meeting.

● Electronic Devices

The use of electronic devices (phones, tablets, laptops, cameras, etc.) is permitted when the device is being used in relation to the course's work. All other uses are prohibited in the classroom and devices should be turned off before class starts.

● Academic Honesty and Integrity

Compromising your academic integrity may lead to serious consequences, including (but not limited to) one or more of the following: failure of the assignment, failure of the course, academic warning, disciplinary probation, suspension from the university, or dismissal from the university.

Students are responsible for understanding the University's policy on academic honesty and integrity and must make use of proper citations of sources for writing papers, creating, presenting, and performing their work, taking examinations, and doing research. It is the responsibility of students to learn the procedures specific to their discipline for correctly and appropriately differentiating their own work from that of others. The full text of the policy, including adjudication procedures, is found at http://www.newschool.edu/policies/# Resources regarding what plagiarism is and how to avoid it can be found on the Learning Center's website: http://www.newschool.edu/university-learning-center/student-resources/

The New School views "academic honesty and integrity" as the duty of every member of an academic community to claim authorship for his or her own work and only for that work, and to recognize the contributions of others accurately and completely. This obligation is fundamental to the integrity of intellectual debate, and creative and academic pursuits. Academic honesty

and integrity includes accurate use of quotations, as well as appropriate and explicit citation of sources in instances of paraphrasing and describing ideas, or reporting on research findings or any aspect of the work of others (including that of faculty members and other students). Academic dishonesty results from infractions of this “accurate use”. The standards of academic honesty and integrity, and citation of sources, apply to all forms of academic work, including submissions of drafts of final papers or projects. All members of the University community are expected to conduct themselves in accord with the standards of academic honesty and integrity. Please see the complete policy in the Parsons Catalog.

- Intellectual Property Rights: http://www.newschool.edu/policies/#