Interactive Illustrations on HTML5 Canvas

A Creative Introduction to Computer Programming

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ABSTRACT

In the first assignment of a class entitled "Creative Coding", students are asked to convert a pre-existing 2D illustration into an interactive digital interpretation, as an introduction to the general elements of coding and computer graphics in 2D environments. The majority of students taking this class have never coded in their lives, turning this assignment into an ideal introduction to principles of computer programming. Javascript, a very accessible and forgiving scripting language, is used to study the visual properties of real time graphic development on the HTML5 Canvas Object on any capable browser. Using a basic coding shell and any text editor, students learn about variables, coordinates, elemental shapes, quadratic and Bézier curves, RGB color definitions, linear and radial gradients, random elements, etc., in a new approach to drawing through code, that questions and challenges traditional analog illustration paradigms.

CCS CONCEPTS

• **Computing methodologies -> Computer graphics -> Animation**; • **Computing methodologies -> Computer graphics -> Image manipulation**; • **Software and its engineering -> Software notations and tools -> General programming languages**;

KEYWORDS

HTML5 Canvas, Javascript, Digital Drawing, Digital Illustration, Creative Coding, Introduction to Programming, Groovy Graphics

1 INTRODUCTION

FMX 210 Digital Media and FMX 310 Creative Coding (see Table 1) are two required courses in the undergraduate BFAs in Animation and New Media in the Film, Animation and New Media Department at the University of Tampa. Regular Fall and Spring semesters are taught over the courses of 16 weeks, and count towards 4 credits in majors, minors, and electives for other programs at the university.

The classes have a limit of 18 students maximum, coming from majors including, but not limited to, Film, Animation, Graphic Design, New Media, Marketing, Communications and Advertising. 95% of those students have NEVER coded in their lives, and the Interactive Illustration assignment is a perfect opportunity to break the ice and get them familiarized with basic notions of computer programming, with an emphasis on visual results. The foundational assignment becomes an introduction to the creation of computer-generated graphics in two- dimensional coordinates system. The instructor chose Javascript and the HTML5 Canvas object as the ideal support for the assignment for a few practical reasons. First, students can use any text editor and any HTML5 capable browser on any platform to produce their projects. Second, because of the pervasive nature of Javascript, students are not stuck in rigid programming structures, allowing them to experiment with this scripting language in ways that are more intuitive and forgiving than when using more established and traditional languages (such as C++, Java or Python). This flexibility is key when you want to allow students to experiment without major frustrations at the beginning of their intro to coding component. In order to streamline the process, and allow for immediate results, the instructor provides a generic HTML5 shell with a pre-existing set of Javascript commands, functions and variables, that allows students to start writing code immediately. The shell can be downloaded from a public web site (see Table 2) allowing students to copy, paste, and modify it in their text editors (Adobe Dreamweaver is included in their lab fees but some of them prefer Visual Studio Code). Because it is also revealing the general structure of an html document, students can integrate their canvas projects into larger web developments.

2 SUMMARY

The Interactive HTML5 Illustrations Groovy Assignment explores the properties of Digital 2D Drawings introducing basic elements of computer programming and Interactivity using the HTML5 Canvas Object.

2.1 Metadata

2.2 Materials and Resources

2.2.1 Sample Figure. Figure 1 is a side-by-side comparison of results produced in class during the first assignment. In this selected example, the student, an Animation Major, had never coded before in their life.

2.2.2 Publicly Accessible Examples on WWW.

- Bernardini, Gina; Animation / Mathematical Programming Major, Fall 2019

Table 1: Metadata in Tabular Format

Metadata	Content
Learning Outcomes	Students are able to understand 1) logical structure of Javascript commands 2) drawing in 2D coordinates systems, using geometric elements such as lines, rectangles, arcs, quadratic and Bézier curves 3) the nature of layers in digital drawings 4) RGBA color theory and definitions, linear and radial gradients, fill and stroke styles 5) random elements 6) basic variables 7) basic animation 8) user centered interaction 9) a new approach to drawing on digital formats
Classifications	Fundamentals; Computer Graphics; Image Manipulation; Graphics Systems and Interfaces; Animation
Audience	Sophomore and Junior undergraduate students
Dependencies	For this specific assignment students do not require any prior knowledge in programming or computer graphics
Prerequisites	The course requires FMX 210 Digital Media as the sole prerequisite: an introduction to 2D graphic tools, including Animation, Video and Sound
Strengths	Excellent portfolio pieces, extremely rewarding results, new approaches to drawing digitally, utilizes examples produced in previous semesters that motivate students to raise the bar.
Weaknesses	Time consuming, tiresome, repetitive, challenging, frustrating
Variants	As inspiration, students may use their own illustrations, original photos, analog drawings, or totally abstract sources, depending on their own strengths and backgrounds
Assessment	Group critique of individual projects analyzing the code structure, implemented solutions, and public access to all current and archived projects produced previously in the same class, going back to 2012

Table 2: Course Materials and Resources

| Resources	Content
Public Link	https://fmx310.santiago.bz/illustration/
HTML5 Shell	https://santiago.bz/canvas/canvas_anim.html
Keywords	HTML 5 introduction, CANVAS object, geometric properties, lines, colors, fills, strokes, gradients, quadratic and Beźier curves, complex shapes
Tutorials	https://www.santiago.bz/html5/
Archives	https://fmx310.santiago.bz/FMX310
Course Description	FMX 310 Creative Coding is a studio/production-oriented course. It is a continued exploration of Interactive Media, Software and Programming with emphasis on the creative and experimental use of available tools. Interactive time-based media will be the focus of the class. We will use the HTML5 canvas object and Javascript, referencing to the Mozilla developers site focusing on the canvas object / to define interactivity, and the basics of advanced programming, as well as experiment with digital time-based tools.
Assignment Description	Using any text editor, create a complex landscape or a portrait, involving the HTML5 CANVAS. It must contain AT LEAST 10 shapes, including Bézier and quadratic curves. MUST have an interactive component. Must use linear and radial gradients. At least 800x600px. The HTML5 shell provided by the instructor gives you a safe area to post your code, clearly indicated in the comments. At this point in the semester, you can alter the width and height of the canvas, the title of the document, and your personal credits. I will provide the code to insert temporarily the reference image so you can trace the curves, study the tangents, and locate the anchor points. You are more than welcome to use tools such as Adobe Photoshop to create the grid to sample the source with more precision, and to use the eye dropper to acquire the exact RGB color values in the illustration you are using for inspiration.
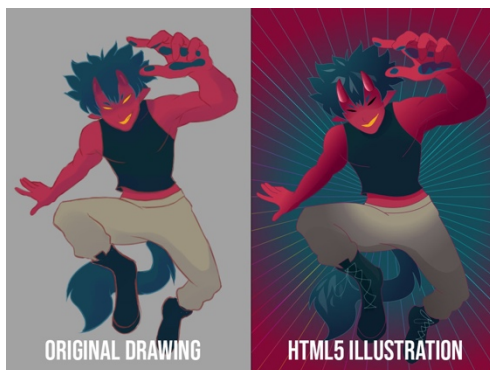
Figure 1: Fenri, 2019. Illustration and HTML5 Canvas image by Amber Morales [as part of the publicly accessible samples for the class], via professor's personal archival site. (https://fmx310.santiago.bz/FMX310/fa19/morales/01_Illustration/Fenri23.html.

https://fmx310.santiago.bz/FMX310/sp19/gbernardini/01_illustration/SpiderMan_78.html

- Brickeen, Katarina; Animation Major, Fall 2020

https://fmx310.santiago.bz/FMX310/fa20/brickeen/01_ILLUSTRATION/katarinabrickeen_illustration.html

- Bono, Stephanie; Digital Arts Major, Fall 2015

https://fmx310.santiago.bz/FMX310/fa15/bono/sb_illustration_koifish/koifix.html

- Nordhagen, Dylan; New Media Major, Fall 2020

https://fmx310.santiago.bz/FMX310/fa20/nordhagen/01_ILLUSTRATION/illustration_02.html

- Denardo, Sophia; New Media Production Major, Fall 2015

https://fmx310.santiago.bz/FMX310/fa15/denardo/ILLUSTRATION/IllustrationFinal.html

- Platteter, Brook; New Media Major, Spring 2019
  https://fmx310.santiago.bz/FMX310/sp19/bplatteter/01_illustration/oliverillust.html