

Design Garage  
Purdue Honors College/Electronic and Time-Based Art Program  
Prof. Fabian Winkler  
Spring 2015

## Multimedia Computer Programming for Art and Design Projects with Processing

*This is another workshop in the Purdue Honors College Design Garage series, conceived and started by Dr. Shannon McMullen in Fall 2014. Design Garage explores hands-on interdisciplinary topics at the intersection of computer code, art& design, electronics, humanities and culture.*

Today we'll create images, animations and multimedia content with computer code. This workshop is a basic introduction to both computer graphics programming in the Processing software sketching environment and fundamental visual design elements and strategies.

The goal, with all of these small experiments is not to create realistic-looking compositions (i.e. trying to make something look like a house, a car, etc...) but to explore the expressive potential of more abstract images and their possible meanings and to develop an emergent literacy in both visual arts and computer programming.

I am starting out with a very basic introduction to the Processing programming environment which is closely modeled after Daniel Shiffman's one hour of code *hello Processing* tutorial. If you would like to review any of the Processing programming steps in this introduction you can do so by watching Daniel Shiffman's interactive video at: <http://hello.processing.org>

I will try to balance programming examples with art and design foundation principles to link form and code.

### 1 Introduction

What is Processing? Processing is an open-source programming environment for people who want to program images, animation, and interactions. It is free, cross-platform compatible and robust enough to support a large variety of artistic and scientific applications. <https://processing.org/>

### 1 Hello

What can you do with Processing? Examples:

- Casey Reas, *Process* series: <http://reas.com/>
- Scott Snibbe, *REWORK*: <http://www.snibbe.com>
- Benedikt Groß: *Avena+ Test Bed*: [http://benedikt-gross.de/log/2013/06/avena-test-bed\\_agricultural-printing-and-altered-landscapes/](http://benedikt-gross.de/log/2013/06/avena-test-bed_agricultural-printing-and-altered-landscapes/)

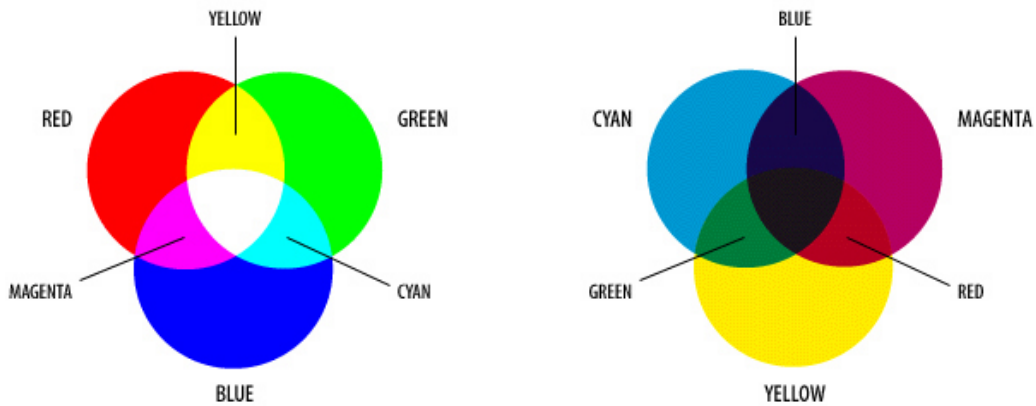
### 2 Shapes

- screen/canvas
- x, y coordinates and pixels
- functions: **line()**, **rect()** and **ellipse()**
- importance of order of lines of code, top-down execution

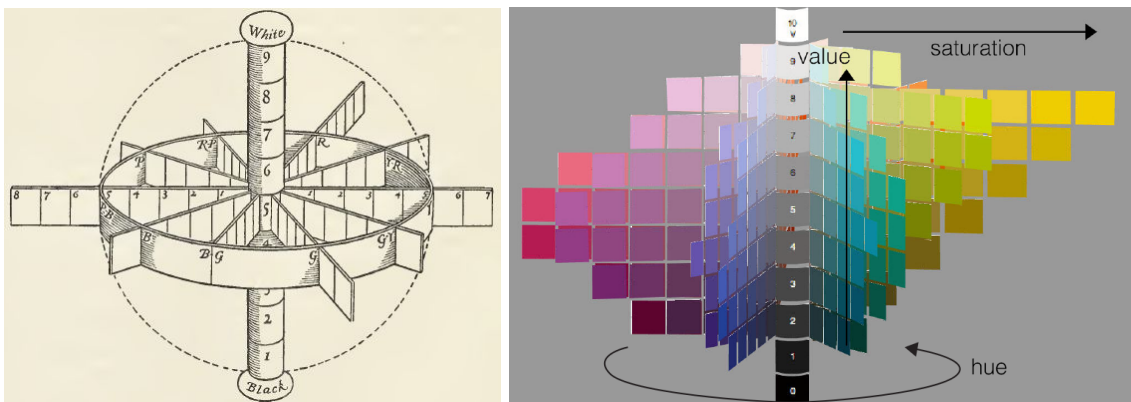
### 3 Color

- more functions: **stroke()**, **fill()**, **noFill()**
- grayscale and RGB color systems
- Tools > Color Selector
- additive/subtractive color mixing
- function: **background()**

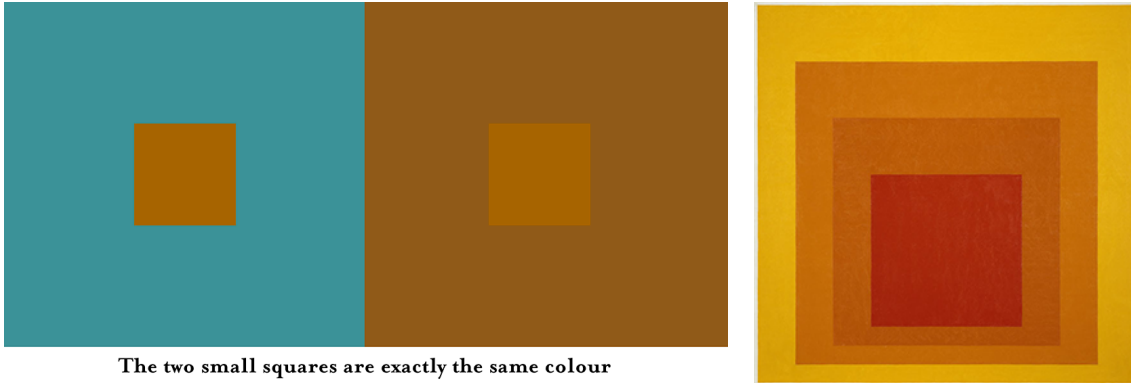
Additive colors (RGB, left) vs. subtractive colors (CMYK, right)



Munsell Color Tree: hue, saturation and value:



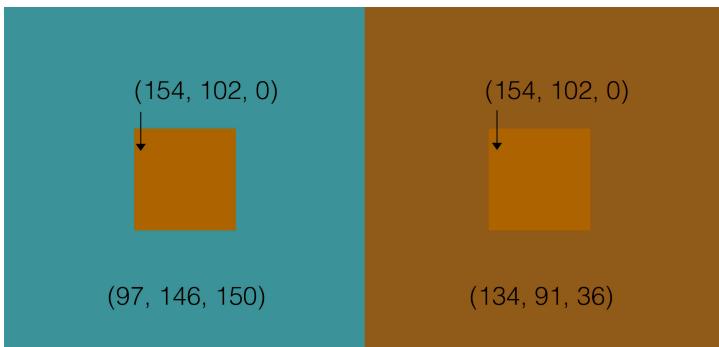
Josef Albers, Interaction of color (left), *Hommage to the Square*, 1949–76 (right):



The two small squares are exactly the same colour

**Elements of Art:** lines, shapes, space and color (see also Getty: Elements of Art: [https://www.getty.edu/education/teachers/building\\_lessons/elements\\_art.pdf](https://www.getty.edu/education/teachers/building_lessons/elements_art.pdf))  
*Experiment:* Use line and shapes to recreate one of Josef Albers Interaction of Color examples: make one color look like two, or more advanced: make two colors look like one.

Here is Josef Albers Interaction of Color example again with the corresponding RGB values as a starting point. Also take a look at color values, hues and complementing colors to experiment with this effect.



The two small squares are exactly the same colour

**Principles of Design:** these principles describe how the elements of art are used to create a composition, they include: balance, emphasis, repetition, proportion, variety, rhythm. (see also Getty: Elements of Art: [https://www.getty.edu/education/teachers/building\\_lessons/principles\\_design.pdf](https://www.getty.edu/education/teachers/building_lessons/principles_design.pdf)) and <http://www.johnlovet.com/test.htm>

*Experiment: make a static composition in Processing using one of the principles of design – what does the composition express? Why did you choose this specific principle?*

#### 4 Interact

- introduction to programs that run continuously
- **void setup()** (executed only once) and **void draw()** (executed continuously) functions
- function: **size()**
- variables: words that stand in for numbers or hold values: e.g. **mouseX** and **mouseY**
- variables can be used to control any shape, location, color, etc. and they can be modified in runtime.

#### 5 Questions

- conditional statements **if/else**
- **mousePressed()**
- displaying images **image()**

You can find in depth explanations of the elements of the Processing language (highlighted in bold in the sections above) in the Processing reference:

<http://processing.org/reference/>

*Experiment: use movement and/or interaction with your visual components to express an idea or to create a visual composition. What does the element of movement/interaction add?*

#### Next steps

- Continue with more Processing examples introducing intermediate programming concepts in Fabian Winkler's AD32600 Physical Computing course workshops: [http://web.ics.purdue.edu/~fwinkler/AD32600\\_F14/](http://web.ics.purdue.edu/~fwinkler/AD32600_F14/)
  - Workshop 01: lines, for-loops, randomization
  - Workshop 02: angles, curves, sine function, arrays, graphics buffer
  - Workshop 03: tracking mouse position, interpolation, mousePressed, mouseReleased, keyPressed, measuring time
  - Workshop 04: writing functions, trigonometry, object oriented programming
  - Workshop 05: Processing and Arduino: controlling images, sounds and movies with sensors
  - Workshop 06: basic computer vision
- Learn more Processing concepts (basic, intermediate to advanced) by going through the Processing online tutorials: <https://processing.org/tutorials/>
- Explore what you can do with Processing by looking at the examples and code of other creative minds: <http://www.openprocessing.org/> or by looking at the examples in the Processing program: File > Examples...

## Further Resources

- **Color**

Albers, Josef. *Interaction of color*. New Haven and London: Yale University Press, 1963. Purdue libraries location: Archives & Special Collections Bruce Rogers Collection (Oversized Book) (808.861 AL14i)

Albers, Josef. *Interaction of color*. New Haven: Yale University Press, 1975. Purdue libraries location: HSSE – 3rd floor (701.85 AL14i 1975)

A Grammar of Color: Introduction to the Munsell Color System

<http://munsell.com/color-blog/grammar-of-color-munsell-intro-color-sphere/>

- **Foundations of Digital Visual Design (based on the Bauhaus Basic Course):**

burrough, xtine and Mandiberg, Michael. *Digital Foundations*. San Francisco, CA: New Riders/Peachpit, 2008.

Free online version of the book: [http://wiki.digital-foundations.net/index.php?title=Table\\_of\\_Contents\\_CS6](http://wiki.digital-foundations.net/index.php?title=Table_of_Contents_CS6)

- **Interactivity**

Rokeby, David. *Transforming Mirrors – Subjectivity and Control in Interactive Media*. <http://www.davidrokeby.com/mirrorsintro.html>

- **Processing Books**

Fry, Ben and Casey Reas. *Processing: A Programming Handbook for Visual Designers*. Cambridge, MA; MIT Press, 2014. Online access through Purdue libraries.

Shiffman Daniel. *A Beginner's Guide to Programming Images, Animation, and Interaction*. Burlington, MA: Morgan Kaufman, 2008.

Online Examples: <http://www.learningprocessing.com/examples/>

Shiffman, Daniel. *The Nature of Code*. Online access:

<http://natureofcode.com/book/>

Please send feedback, comments and suggestions to the author at: [fwinkler@purdue.edu](mailto:fwinkler@purdue.edu). More information about the area of Electronic and Time-based Art at Purdue University is available at: <http://www.cla.purdue.edu/vpa/etb/> More information about Purdue University's Honors College is available at: <https://honors.purdue.edu/> The topics of previous Design Garage workshops are archived at: <https://honors.purdue.edu/events/program-highlights/design-garage>