Processing is a programming language and environment designed for visual arts, design, and interactive media. It was created to make programming accessible to artists, designers, educators, and beginners — especially for creating visual and interactive work.

计算机图像处理(中韩合作）本科一年级 专业课
（11 月 10,17,24 日 12 月 1 日）计算机图像处理 -本科一年级（产 809）
13:20~14:40、15:00~16:20、16:35~17:55
（12 月 8,15 日）计算机图像处理 -本科一年级（产 809）13:20~14:40、15:00~16:20

Created by: Ben Fry and Casey Reas at the MIT Media Lab
Based on: Java (simplified syntax)
Development Environment: Comes with its own lightweight IDE (Processing IDE)
Goal: To make coding a creative tool for visual expression, animation, data visualization, and interactivity.

- Generative art and digital installations
- Interactive design and user experiences
- Data visualization and infographics
- Sound and music visualization
- Education — a friendly way to teach programming concepts
- Physical computing (e.g., connecting with Arduino)

Processing, P3D, OpenGL, Android, ...

Text
- Learning Processing: A Beginner's Guide to Programming Images, Animation, and Interaction, Daniel Shiffman. August 2008, Morgan Kaufmann.
- http://learningprocessing.com/

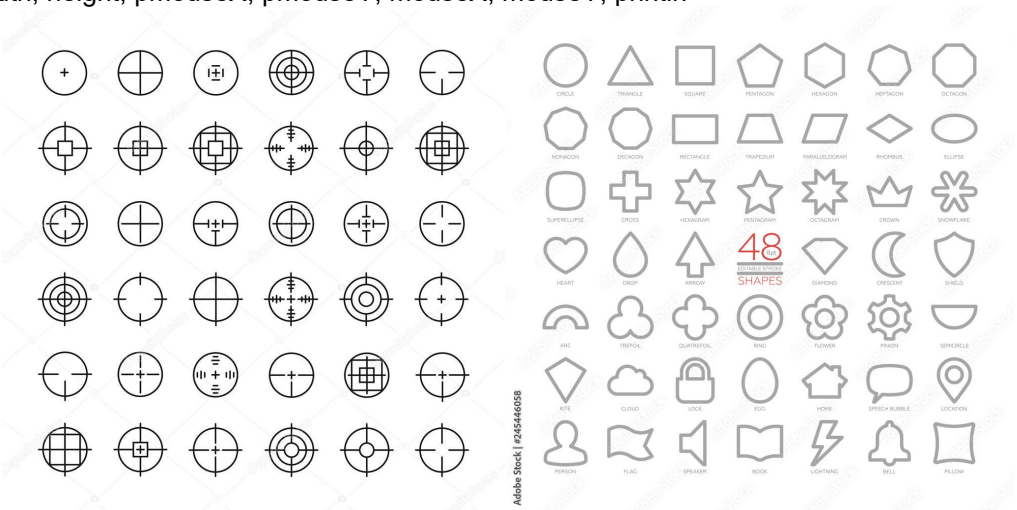
Reference Sites
- OpenProcessing

Work
- Self Introduction & Project Initial Proposal
- Middle Exam
- Project Middle Presentation
- Final Exam
- Project Final Presentation

https://leebyunggook.github.io/

[11.10] Learning Processing
Attendance Check
https://processing.org/ install processing
1. Pixels example 1-1~5
2. Processing example 2-1
3. Interaction example 3-1~7

Homework 1. draw a simple symbol with processing
. size, color, fill, stroke, strokeWeight,
. point, line, rect, ellipse, arc, triangle
. setup, draw, background, frameCount, frameRate
. width, height, pmouseX, pmouseY, mouseX, mouseY, println



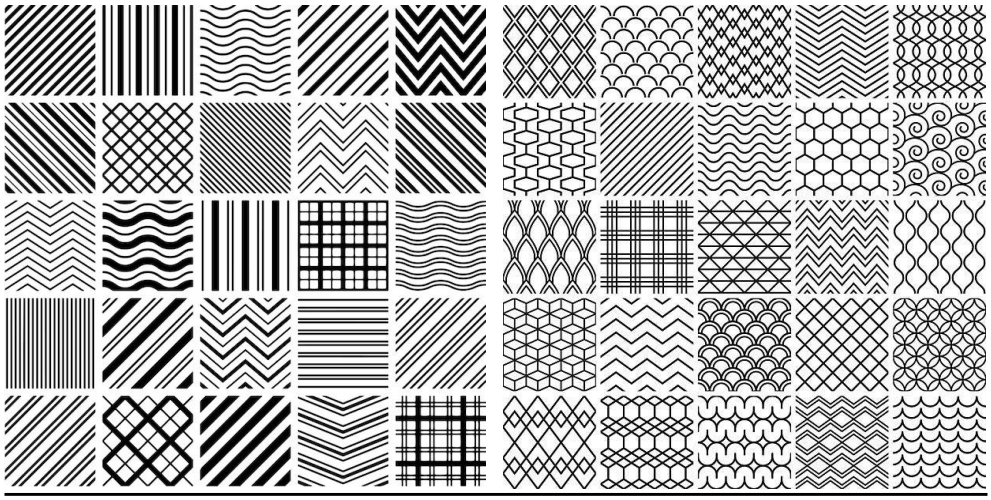
<simple symbol examples>

Join the Creative Coders on OpenProcessing
https://www.openprocessing.org/
OpenProcessing URL Registration

[11.7] Learning Processing
Attendance Check

4. Variable example 4-1~8
5. Conditions example 5-1~10
6. Loop example 6-1~11,

Homework 2. draw a simple pattern with processing
. float, int, **random**, **map**
. text, **noise**, **key**, **keyCode**, keyPressed
. mouseButton, mousePressed, mouseMoved, mouseDragged, **mouseReleased**



<simple pattern examples>

[11.#] Learning Processing

Attendance Check
7. Functions
8. Objects - object oriented programming

Homework 3. MovingRect or MovingCircle
https://processing.org/reference/rotate_.html
https://processing.org/reference/noise_.html
https://openprocessing.org/sketch/760863

[11.#] Learning Processing
Attendance Check
9. Arrays - variable, array, arraylist

```
MovingMark mk1, mk2;

MovingMark[] mks = new MovingMark[20];

ArrayList<MovingMark> mks;
mks= new ArrayList<MovingMark>();
mks.add(new MovingMark());
MovingMark mk = mks.get(i);
```

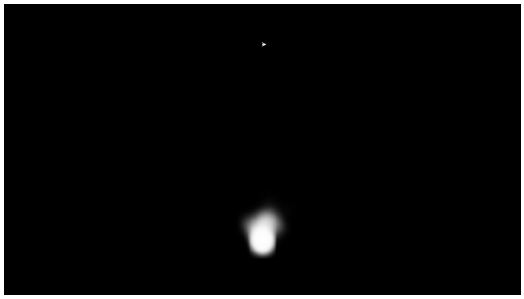
[11.#] Learning Processing
Attendance Check
10. Algorithms - intersection, timer
13. Mathematics - random, noise, recursion

Recursion Examples - Topics - Fractals and L-Systems - Tree
http://learningprocessing.com/examples/chp13/example-13-08-recursion
https://processing.org/examples/tree.html
https://www.openprocessing.org/sketch/1758/
https://www.openprocessing.org/sketch/693786

[11.#] Learning Processing
Attendance Check
Contributed Examples - The Nature of Code - chap08_fractals
https://matthewjamestaylor.com/create-fractals-with-recursive-drawing
https://natureofcode.com/ https://natureofcode.com/fractals/
https://github.com/nature-of-code/noc-examples-processing

bezier - Affine Combination (lab01, glut, ship)
https://en.wikipedia.org/wiki/B%C3%A9zier_curve
https://en.wikipedia.org/wiki/De_Casteljau%27s_algorithm
https://openprocessing.org/sketch/877273

Homework 4. add moving symbols with arraylist
noise2d, arc, pvector
https://processing.org/tutorials/pvector/
https://processing.org/examples/simpleparticlesystem.html
https://processing.org/examples/multipleparticlesystems.html
https://processing.org/examples/smokeparticlesystem.html



[11.#] Learning Processing
Attendance Check
Learning Processing
http://learningprocessing.com/examples/
object-oriented programming (OOP) works in Processing
https://processing.org/tutorials/objects/
https://processing.org/reference/class.html
object oriented program

Variable
```
MovingMark mk1, mk2, mk3;
mk1 = new MovingMark();
mk2 = new MovingMark(100, 300, 120, 50);
mk1.draw();
mk2.draw();
```

Array
```
MovingMark[] mks = new MovingMark[20];
for(int i=0; i<mks.length; i++) {
  mks[i] = new MovingMark();
}
for(int i=0; i<mks.length; i++) {
  mks[i].draw();
}
```

ArrayList
```
ArrayList<MovingMark> mks;
mks= new ArrayList<MovingMark>();
mks.add(new MovingMark());
for(i=0; i<mks.size(); i++) {
  MovingMark mk = mks.get(i);
  mk.draw();
}
void mousePressed() {
  mks.add(new MovingMark(mouseX, mouseY, random(360), random(50,100)));
}
```

[4.28 월요일 오전 11:00~11:50] 중간고사 UIT #407
Learning Processing 1~10,13
Object Oriented Program, Variable, Array, Arraylist
HW 1,2,3,4 - final check

[5.12] 14. Transformations and 3D Transformations
Attendance Check

Self Introduction Registration (with google slide)
자기소개, 앞으로 진로, CG 에서 관심있는 분야, 콘텐츠

The Graphics Pipeline and OpenGL I : Overview and Transformation
Rotation, translation, scaling, modelview matrix, projection matrix

Homework 5. rotate symbols in P3D with mouse events

Generating Random Points in a Sphere
https://karthikkaranth.me/blog/generating-random-points-in-a-sphere/

```
float rotx = PI/4;
float roty = PI/4;

translate(width/2, height/2);
rotateX(rotx);
rotateY(roty);

void mouseDragged() {
  float rate = 0.01;
  rotx += (pmouseY-mouseY) * rate;
  roty += (mouseX-pmouseX) * rate;
}
```

[5.19] Learning Processing :
Attendance Check
15. Images and Pixels
Images and Pixels by lbg@dongseo.ac.kr
http://learningprocessing.com/examples/chp15/example-15-01-drawimage
https://processing.org/tutorials/pixels/
https://processing.org/tutorials/p3d/

[5.26] Learning Processing :
Attendance Check
chap 16. Video

NyARToolKit by lbg@dongseo.ac.kr
https://nyatla.jp/nyartoolkit/wp/ *** 3.5.3 version 사용하세요 ***
cam=new Capture(this, 640, 480, "pipeline:autovideosrc");
nyar4psg.zip

Multi Level Visualization AR, LOOKEDU Video, CubeAR
Magical Sketchpad, Pictomation, ShallWeDance

chap 17. Text, Typography, Strings and Drawing Text

chap 20. Sound, tutorial
FourierTransform by lbg@dongseo.ac.kr

https://openprocessing.org/sketch/2548489

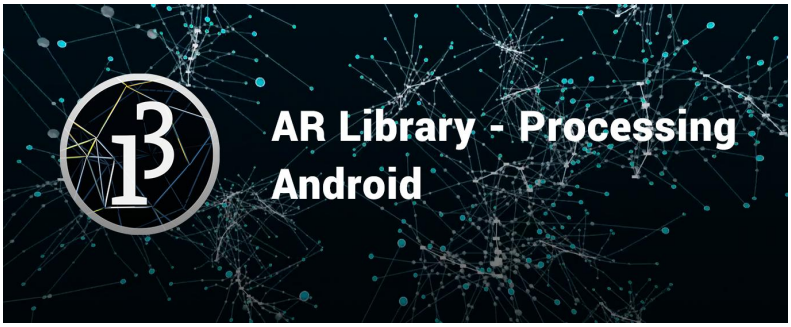
[6.2] PBox2D
Attendance Check

Lights, Perspective, Camera
https://processing.org/tutorials/p3d/
http://creative-co.de/better_looking_processing/

Texture Mapping by lbg@dongseo.ac.kr
https://processing.org/reference/texture_.html
https://processing.org/reference/textureMode_.html
https://processing.org/reference/textureWrap_.html
RotateTriangleAD.zip RollHexagonAD.zip RollRectAD.zip

PBox2D
http://box2d.org/
http://box2d-js.sourceforge.net/
http://www.iforce2d.net/b2dtut/
http://www.mrdoob.com/projects/chromeexperiments/google-gravity/
http://www.creativeapplications.net/processing/kinect-physics-tutorial-for-processing/
https://www.youtube.com/watch?v=W8bukirivpU
https://github.com/shiffman/Box2D-for-Processing
The Nature of Code : Simulating Natural Systems with Processing(pdf)
https://github.com/diwi/LiquidFunProcessing

[6.9] Processing for Android PPT - Build Your Own HMD
Attendance Check
https://developer.android.com/studio
Android Phone Debug Mode Setting
http://android.processing.org/tutorials/vr_intro/index.html
https://android.processing.org/gallery/index.html
https://en.wikipedia.org/wiki/Visual_system
https://github.com/codeanticode/processing-android-tutorials
https://github.com/SyamSundarKirubakaran/processing-ar



[6.16 월요일] Final Exam 11:00am UIT#310

Transformations

https://processing.org/tutorials/pvector/
https://processing.org/examples/simpleparticlesystem.html
https://processing.org/examples/multipleparticlesystems.html

https://processing.org/reference/texture_.html
https://processing.org/reference/textureMode_.html
https://processing.org/reference/textureWrap_.html

https://processing.org/reference/perspective_.html
https://processing.org/reference/ortho_.html

https://processing.org/examples/orthographic.html

https://processing.org/reference/lights_.html
https://processing.org/reference/ambientLight_.html
https://processing.org/reference/directionalLight_.html
https://processing.org/reference/spotLight_.html