Processing

An Introduction

Petra Isenberg
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Processing

What is it?

1. a web site
2. a programming environment for learning computational design.
3. a sketchbook for rapidly prototyping
4. 2D/3D graphics api & rendering engine for java
5. open project (by Casey Reas and Ben Fry)
6. an active community of a few thousand people

Source: http://acg.media.mit.edu/people/fry/
Processing

• designed to generate and modify images
  – vector/raster drawing,
  – image processing,
  – color models,
  – mouse and keyboard events,
  – network communication,
  – object-oriented programming,
  – Additional libraries...

www.processing.org
Examples

Similar Diversity
Philipp Steinweber & Andreas Koller
(http://similardiversity.net/)
Examples

Travel Time Tube Map
Tom Carden
Examples

Visualizing Haplotype
Ben Fry
(Nature Cover)
Getting Started

```java
void setup() {
    size(100, 100);
    noLoop();
}

void draw() {
    diagonals(40, 90);
    diagonals(60, 62);
    diagonals(20, 40);
}

void diagonals(int x, int y) {
    line(x, y, x+20, y-40);
    line(x+10, y, x+30, y-40);
    line(x+20, y, x+40, y-40);
}
```
Getting Started

• Sketch = Project
• Can contain several files
  – .pde or .java
• Export ➔ applets
Coordinates and Primitives

size(), point(), line(), triangle(), quad(), rect(), ellipse(), bezier()

background(), fill(), stroke(), noFill(), noStroke(), strokeWeight(), strokeCap(), strokeJoin(), smooth(), noSmooth(), ellipseMode(), rectMode()
• Open Processing (PDE)
  – Write the following code:
    line (10, 80, 30, 40);
    ellipse (50, 50, 30, 30);
  – Press Run
Some visual attributes

• Add the following code (top) and Run

```javascript
background(50); // Clear background gray
stroke(255); // Set line value to white
fill(255,255,0); // Set fill colour to yellow
strokeWeight(5); // Set line width to 5 pixels
smooth(); // Smooth line edges
```
Variables

• Data types similar to Java
  – int, float, boolean, char, byte
  – color (e.g. color c = #FF0000)

• Add two variables

```java
int x = 20;  // Set the horizontal position
int y = -15; // Set the vertical position

line (x + 10, y + 80, x + 30, y + 40);
ellipse(x + 50, y + 50, 30, 30);
```
Adding Structure

- `setup()` → initialization (runs once)
- `draw()` → continuous drawing function

```java
void setup() {
  size(100,100);
  [...initialize variables...]
}

void draw() {
  [...primitive drawing...]
  x = x + 1;
  if(x > 100) x = -40;
}
```
```java
class Circle{
    int x, y, r;
    int speed;

    Circle(int xpos, int ypos, int radius, int velocity){
        x = xpos;
        y = ypos;
        r = radius;
        speed = velocity;
    }

    void update()
    {
        stroke(255);
        ellipse(x, y, r * 2, r * 2);
        x += speed;
        if(x > 100) x = -100;
    }
}
```
Classes

class Circle {
  int x; // x-coordinate
  int y; // y-coordinate

  // Constructor
  Circle(int x, int y) {
    this.x = x;
    this.y = y;
  }

  // Method to draw the circle
  void draw() {
    ellipse(x, y, 50, 50); // Draw a circle with radius 25
  }

  // Method to check if point is inside the circle
  boolean isInside(int x, int y) {
    int dx = x - this.x;
    int dy = y - this.y;
    int distanceSquared = dx * dx + dy * dy;
    return distanceSquared < 100; // Radius squared is 25^2
  }
}
Classes

```java
int x = 20; // Set the horizontal position
int y = -15; // Set the vertical position
Circle c;

void setup()
{
   ..
    c = new Circle(x + 50, y + 50, 15, 2);
}

void draw()
{
    background(50); // clears the background in black
    line(x + 10, y + 80, x + 30, y + 40);
    c.update();
    x = x + 1;
    if(x > 100) x = -40;
}
```
Text Rendering

```java
void setup {
    stroke (1, 1); // Set line value to white
    strokeWeight (5); // Set line width to 5 pixels
}
```
Text Rendering

Copy the Name!
Text Rendering

Double check:

- font file should be in data folder
PFont font; //initialize font variable

void setup(){
   [..]
    font = loadFont("Humanist521BT-Roman-48.vlw");
textFont(font, 32);
}

void draw(){
    background(50); // clears the background in black
    text("move", 10, 50);
   [..]
}

Interaction - Mouse

Position

- Replace code & Run

Mouse Functions

void mousePressed() {
}

void mouseDragged() {
}

void mouseReleased() {
}

Buttons

if (mousePressed == true) ...

if (mouseButton == left) ...

text("move", mouseX, mouseY);
Interaction - Keyboard

- Events
  ```java
  if(keyPressed) {
    if(key >= 'A' && key <= 'z') {...}
  }
  ```

- Functions
  ```java
  void keyPressed() {...}
  ```
Wrap - up

• Enough for today
• Check out www.processing.org
  – References
  – Learning

• To come
  – How to think about trees (recursively) in code
  – Simple tree library
  – Simple layout