CISC 1600 Lecture 8
Interactivity in Processing

Topics:

Processing syntax

Read processing demos

Interactivity

Animation

Processing's `if` statements are the same as JavaScript's

- Processing implements the imperative paradigm
- The syntax of its `if` statement is identical to JavaScript's

```
if (mouseX < 150 && mouseY >= 150) {
    // mouseX is less than 150
    // AND mouseY is greater than or equal to 150
} else if (mouseX < 150) {
    // What can we say about mouseY here?
} else {
    // What can we say about mouseX here?
}
```

Processing's `for` loops are the same as JavaScript's

- For loops are good when the number of iterations is known in advance

```
for (int i=0; i<5; i++) {
    rect(0, 60*i, 40, 40);
}
```

- The three statements in the parentheses are
  - Initialization: run once before loop
  - Continuation: loop continues until this is not true
  - Increment: update counter, run before each iteration

Processing's `while` loops are the same as JavaScript's

- While loops are good when you don't know the number of iterations in advance
- Repeat a set of statements while a condition holds

```
while (y < height - 60) {
    rect(0, y, 40, 40);
    y = y + 60;
}
```

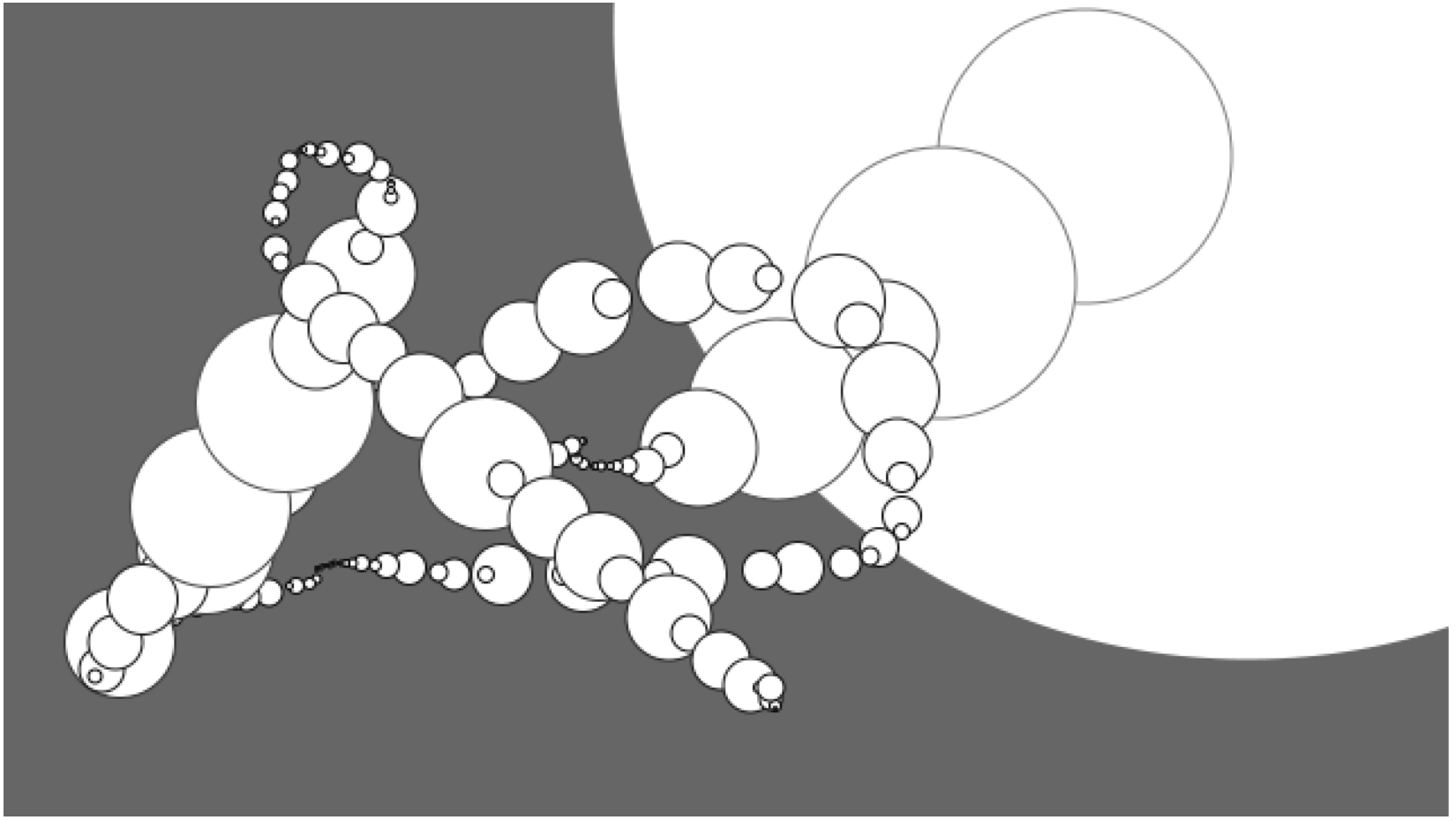
Processing uses typed variables, unlike JavaScript

- JavaScript uses untyped variables
  - All variables are declared using the `var` keyword
  - The same variable can hold a string and then a number
- Processing (like Java) uses typed variables
  - Variables must be declared to be a specific type
  - `int, float, double, boolean, String, etc.`
  - You cannot assign a value of one type to a variable of another type
  - Create your own types using the `class` keyword

Outline of a Processing sketch

```
/* Comment describing sketch */
// Global variables
int x, y;
// Setup function is called once before everything
void setup() {
    // Do things that need to be done once
}
// Draw function is called once for every frame
void draw() {
    // Draw to canvas
}
// Event handler functions
// ...
// User-defined helper functions
// ...
```

Read the code of demo sketches



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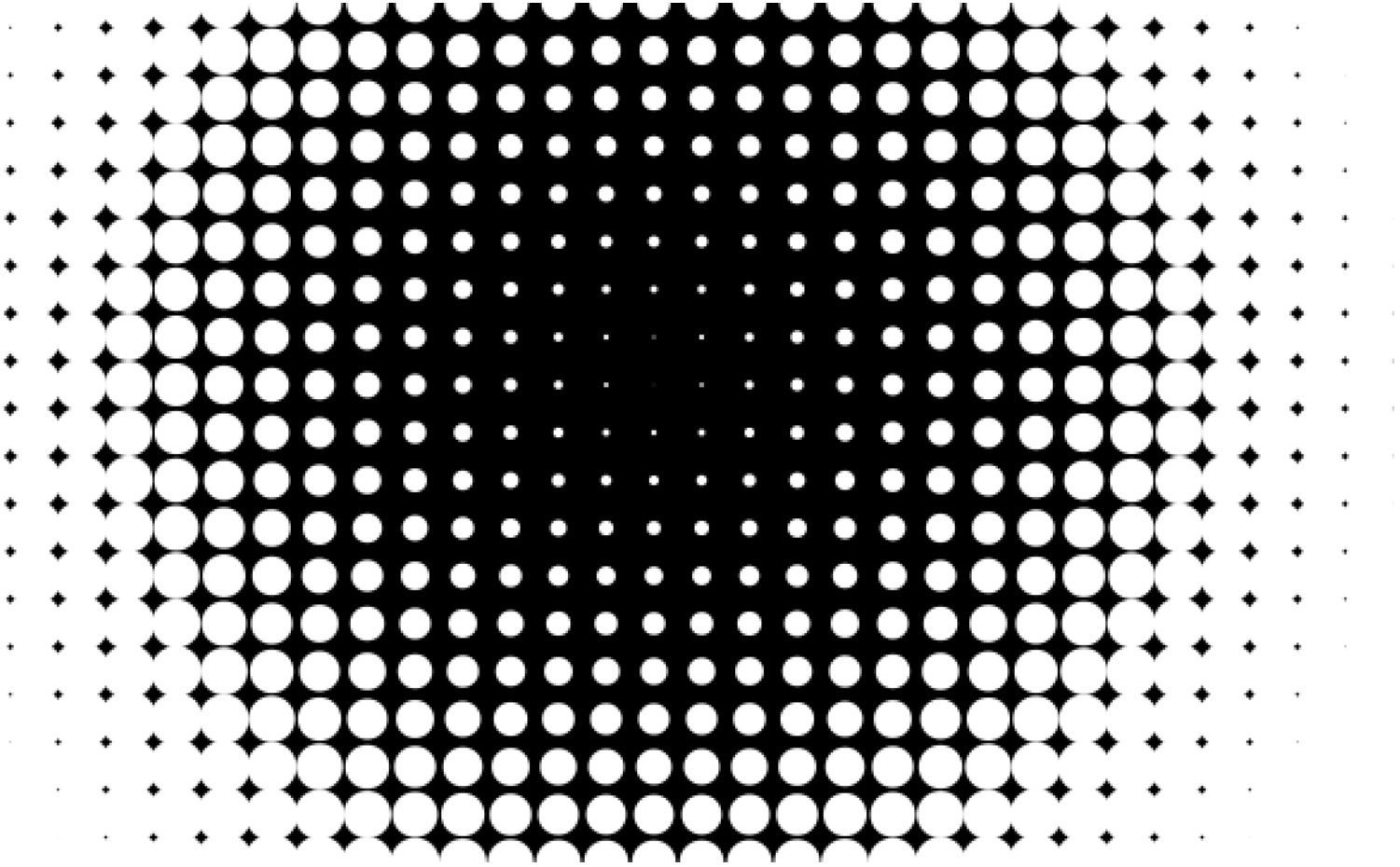

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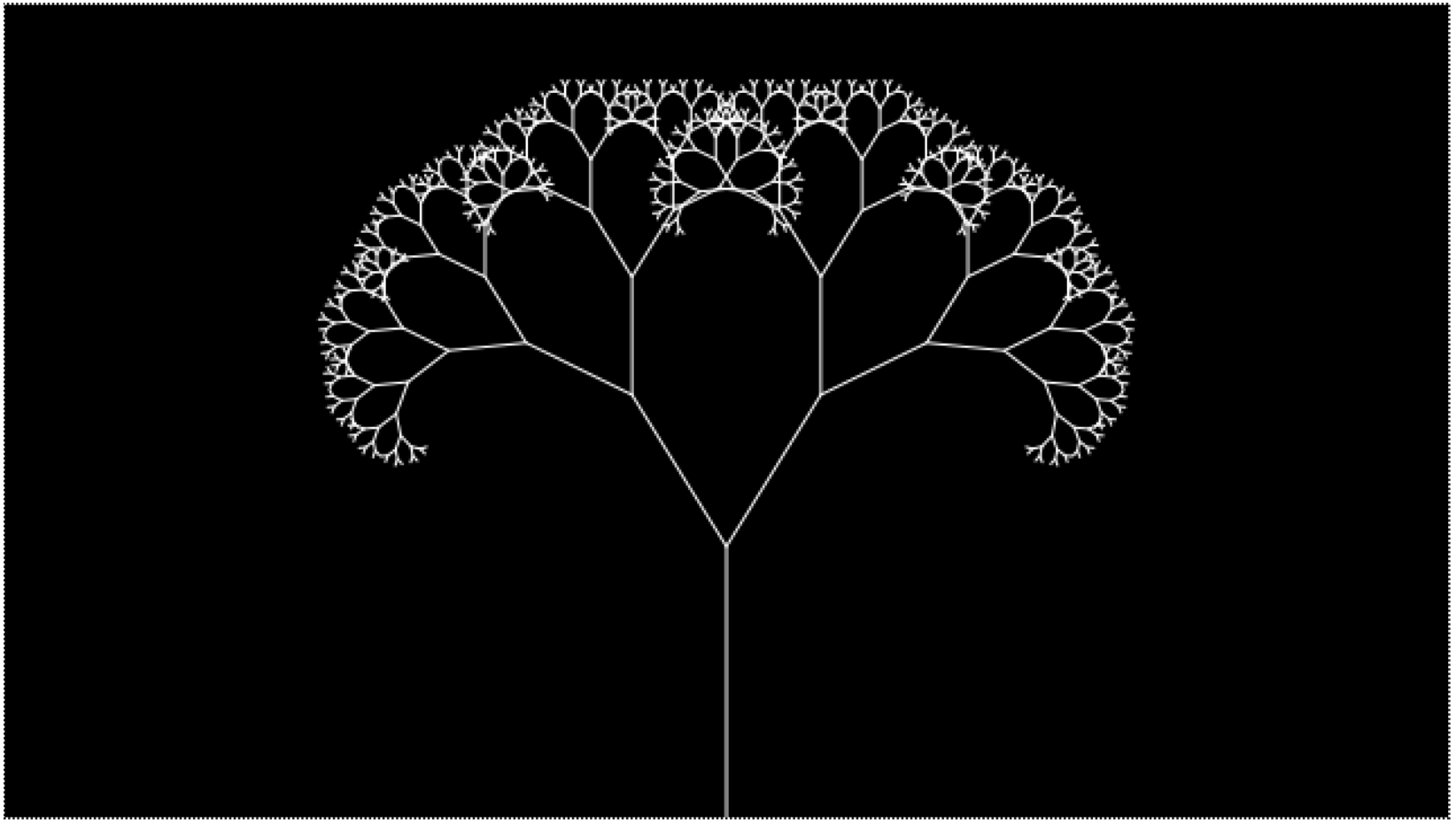
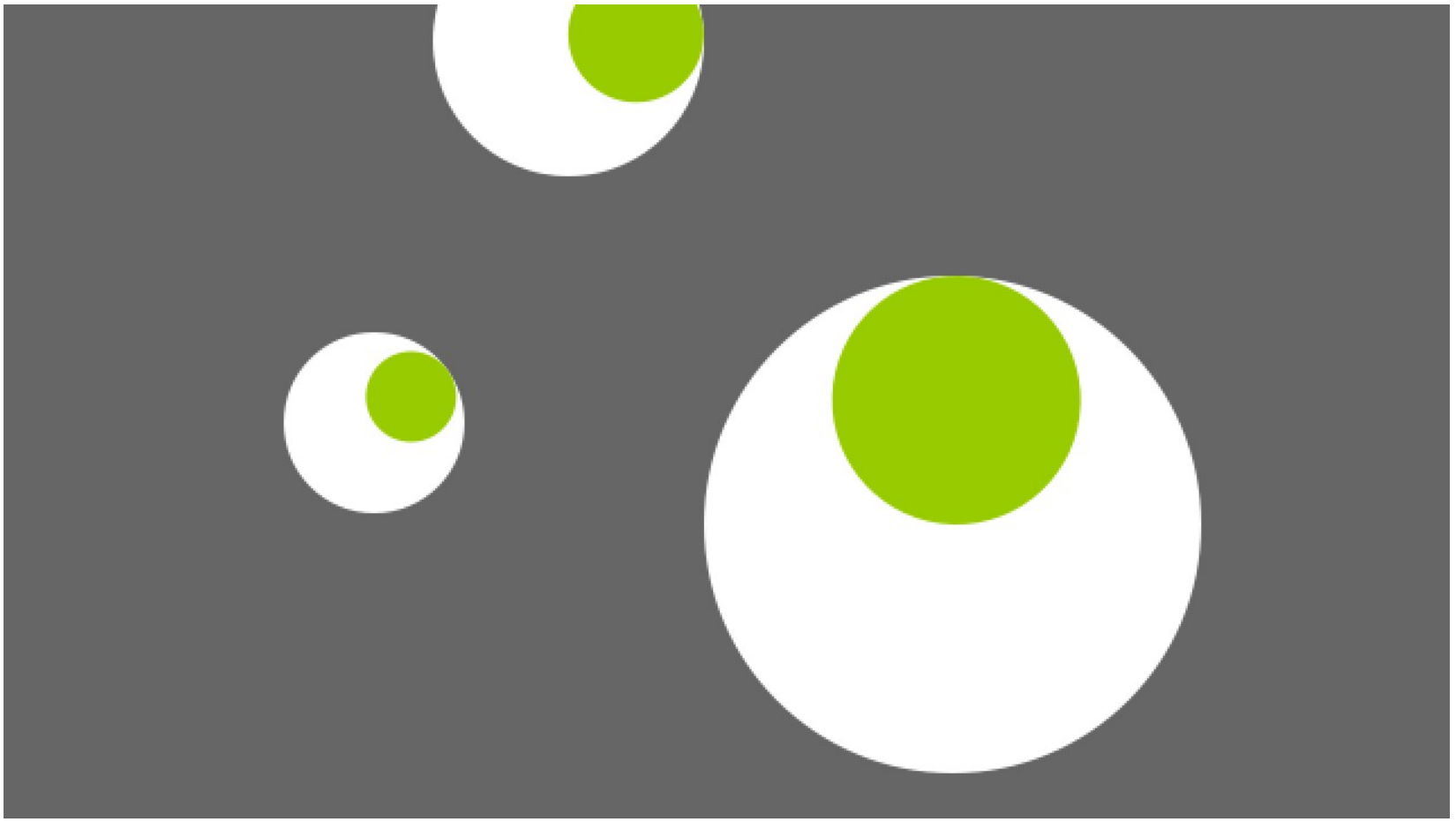


Official Processing 2D transformations tutorial

Read the code of demo sketches



Official Processing object tutorial

Interactivity: mouse variables

- Processing populates some variables automatically describing the current state of the mouse
- `float mouseX`: current x coordinate of mouse
- `float mouseY`: current y coordinate of mouse
- `boolean mousePressed`: true if a mouse button is currently pressed
- `int mouseButton`: the identity of the mouse button that is pressed (`LEFT, RIGHT, CENTER`)

Interactivity: keyboard variables

- Processing populates some variables automatically describing the current state of the keyboard
- `boolean keyPressed`: true if any key is currently pressed
- `int key`: number specifying which key is pressed
- `int keyCode`: number specifying which special key is pressed (if `key == CODED`)

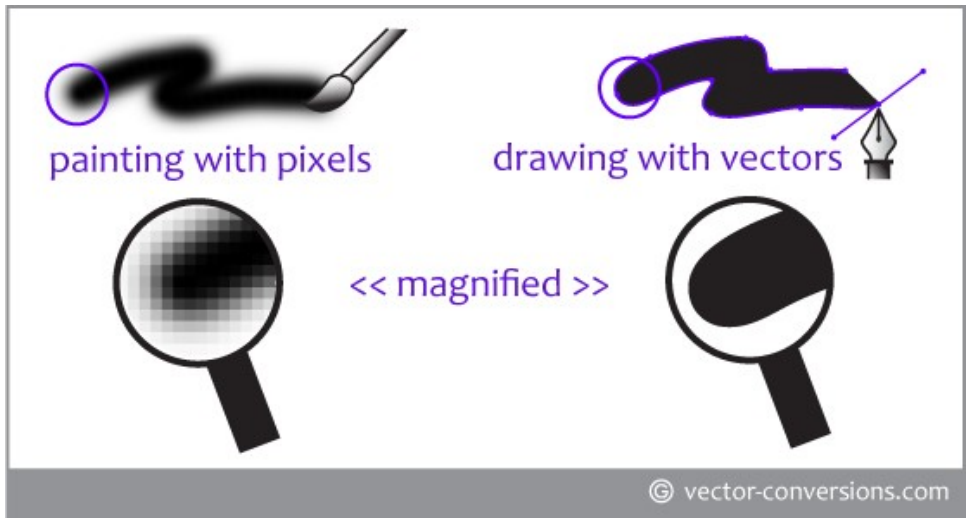
Interactivity: mouse events

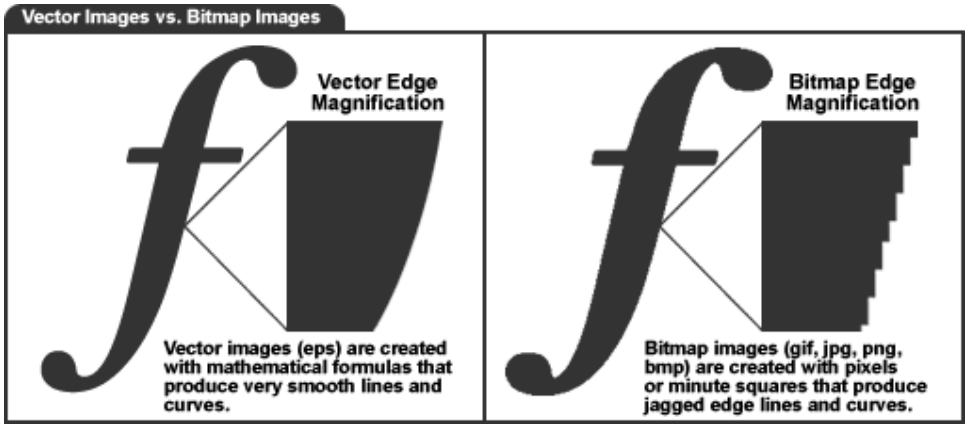
- Processing will call certain functions with special names when particular events happen
- `mousePressed()`: a mouse button is pressed
- `mouseReleased()`: a mouse button is released
- `mouseMoved()`: the mouse is moved without a button being pressed
- `mouseDragged()`: the mouse is moved while a button is pressed

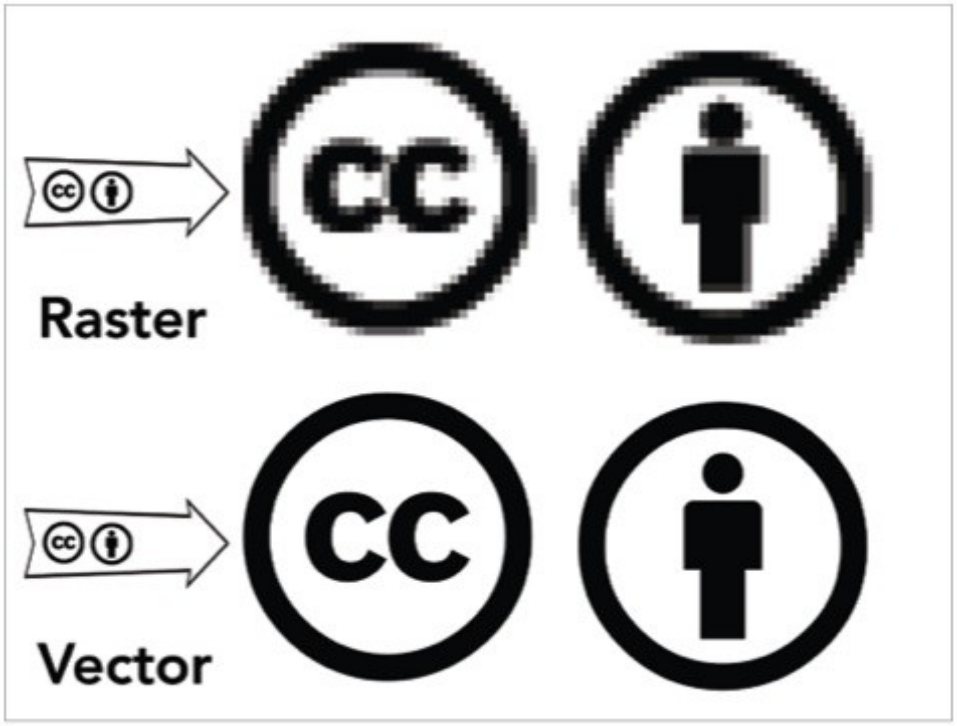
Interactivity: keyboard event listeners

- Processing treats the keyboard as a set of buttons
- Use these functions in combination with the keyboard variables we just learned about
- `keyPressed()`: any key (including special keys) is pressed down
- `keyReleased()`: any key is released
- `keyTyped()`: any key is first pressed then released
- Listener functions are called less often than `draw()`
  - It might be more efficient to update certain things when they change as opposed to recalculating the same value every frame

Graphics: vector vs bitmap/raster

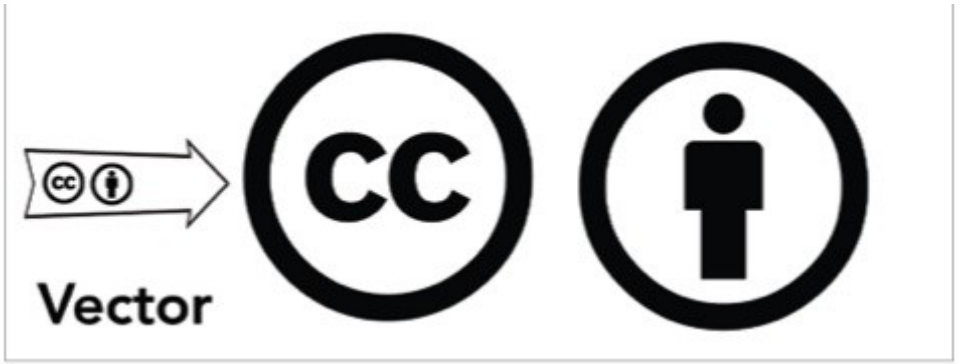






Animation with vector graphics

- Provide set of instructions for drawing scene
- Complex scenes take longer to draw
- Scenes still look sharp after being transformed
  - Zooming, rotating, stretching
- Better for drawings, non-realistic scenes
- For animation, move individual lines / shapes



Animation with bitmap graphics

- Provide the color at each pint on a grid
- All scenes take the same amount of time to draw
- Artifacts are visible after large transformations
  - Zooming, rotating, stretching
- Better for realistic scenes, photographs
- For animation, switch photos quickly