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# openFrameworks!





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**0.7.4** is the most recent release. It has a lot of new features, new interfaces, and probably some new bugs too. 0.7.4 is not 100% compatible with older projects. Please see the [changelog](#) to get an overview of the differences between versions.

To use openFrameworks you will need an IDE, and the setup guide for your platform can walk you through this. Please post any bugs on the [issues](#) page, and post to the [forum](#) if you have any other questions. openFrameworks is distributed under the [MIT License](#).

# What is openFrameworks?

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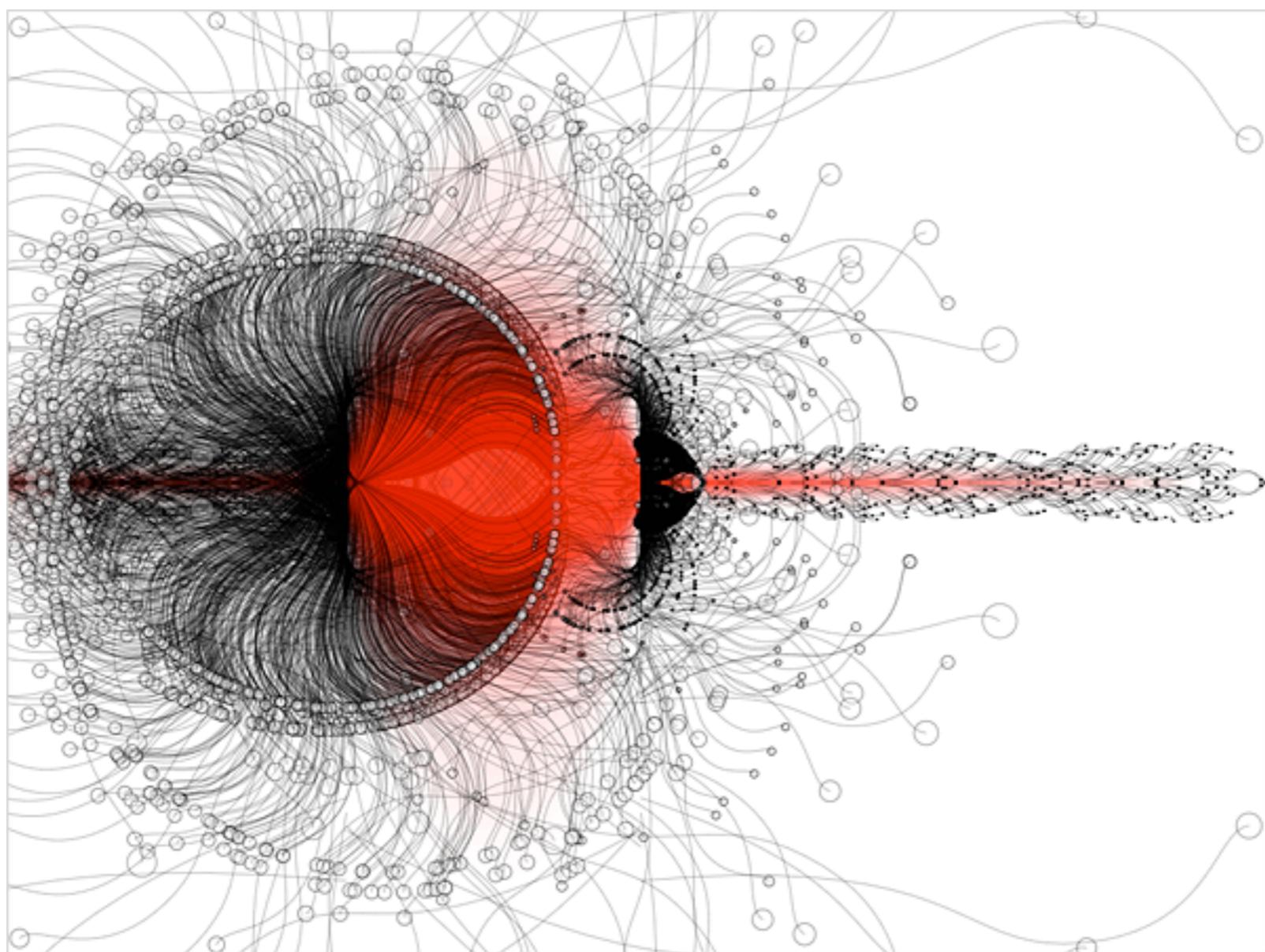
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# What is openFrameworks?

- oF is a software framework for C++
- Software framework: a prefab software infrastructure designed to provide low-level functionality

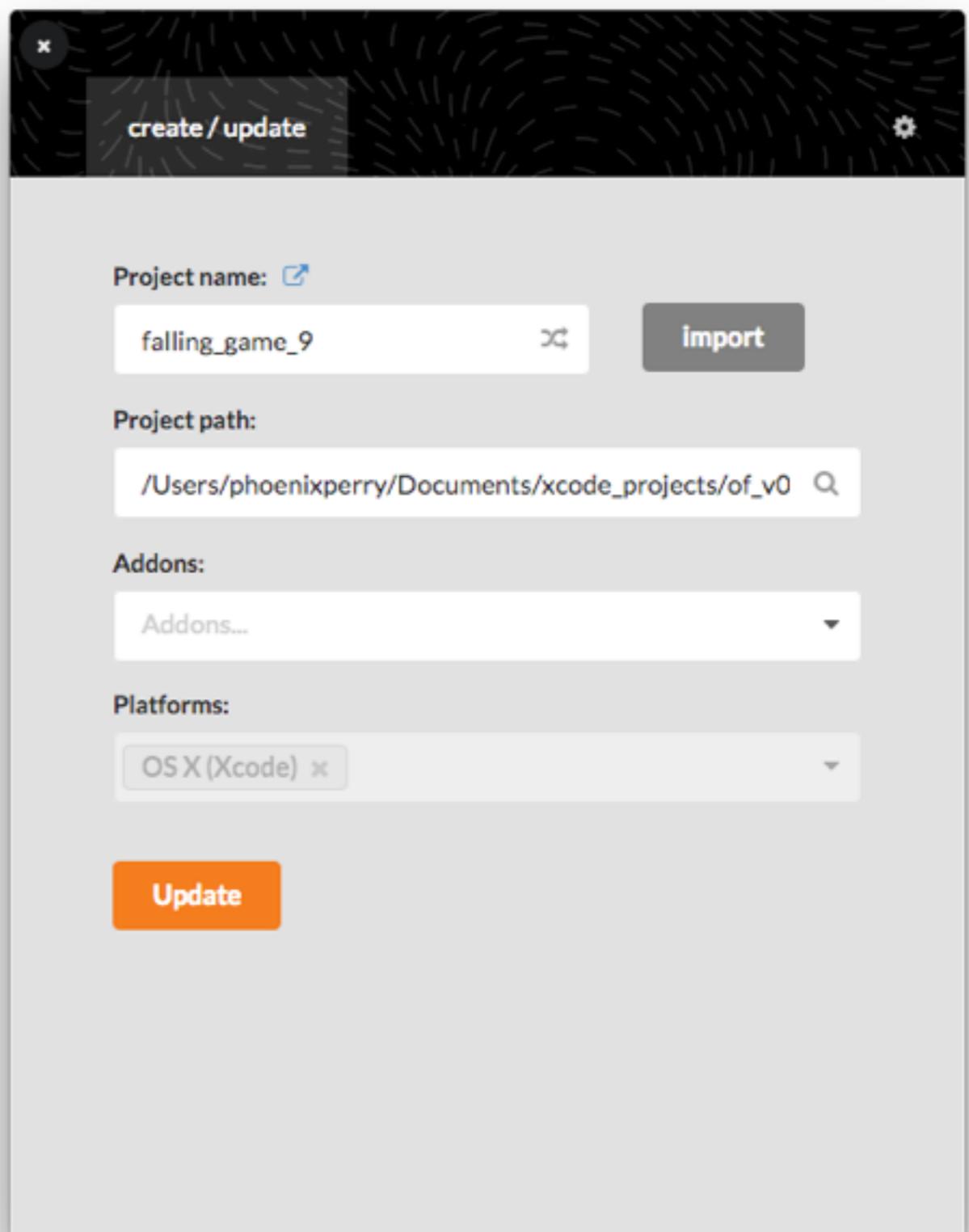
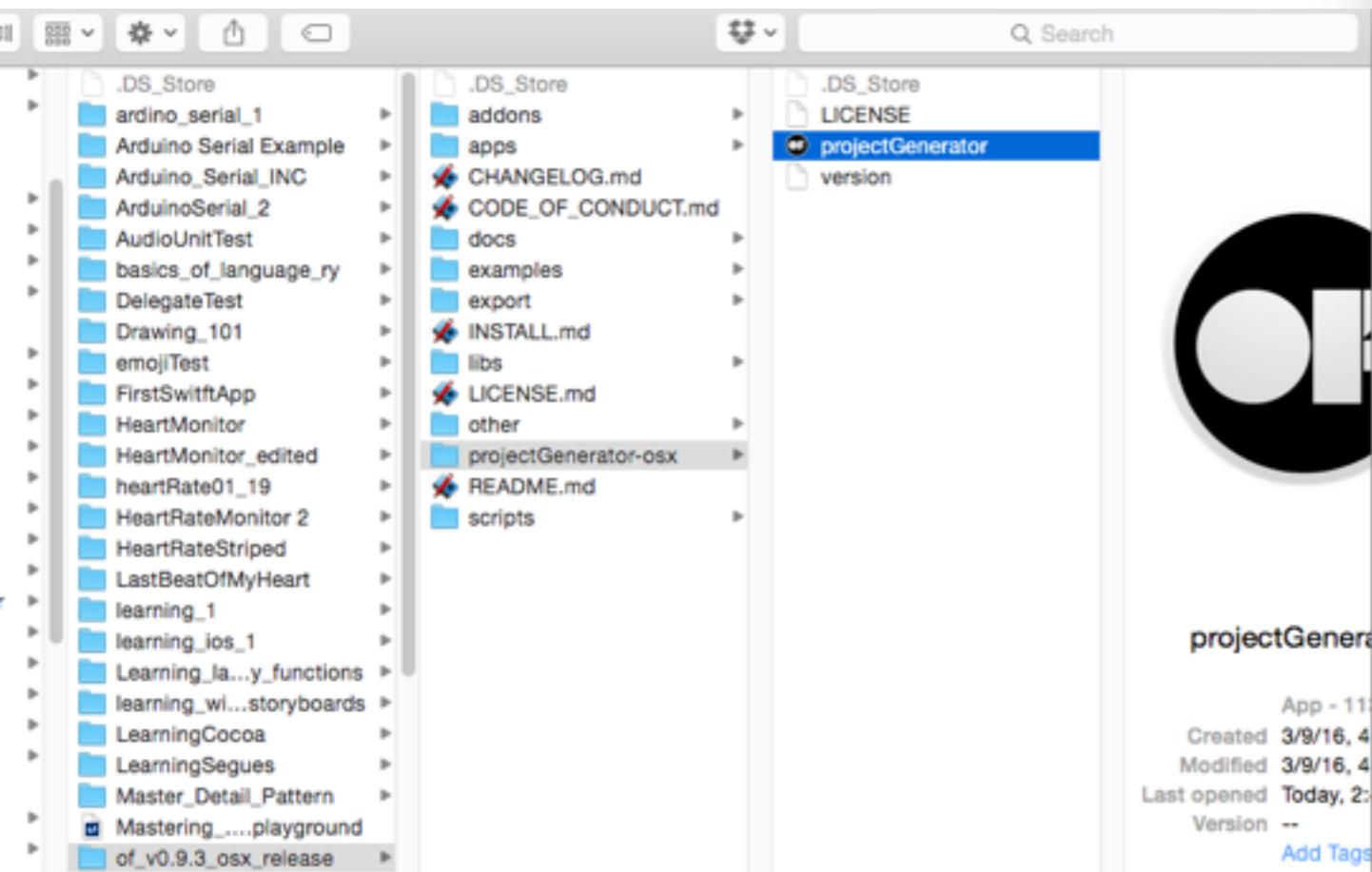


amazing project by Lia

<http://www.liaworks.com/blog/experiments-with-openframeworks/>

How do I make a new project?

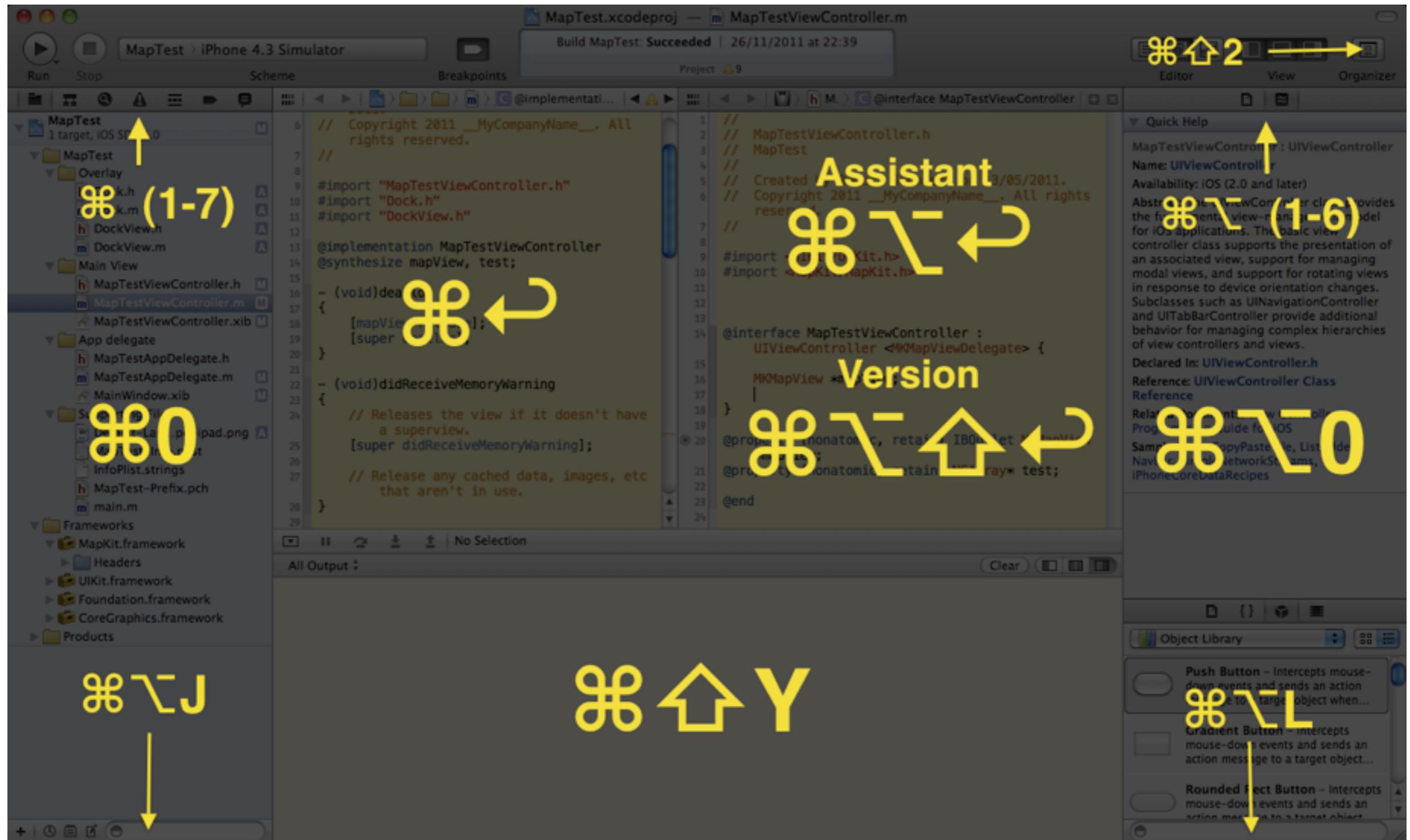
# The simple way? Use project generator



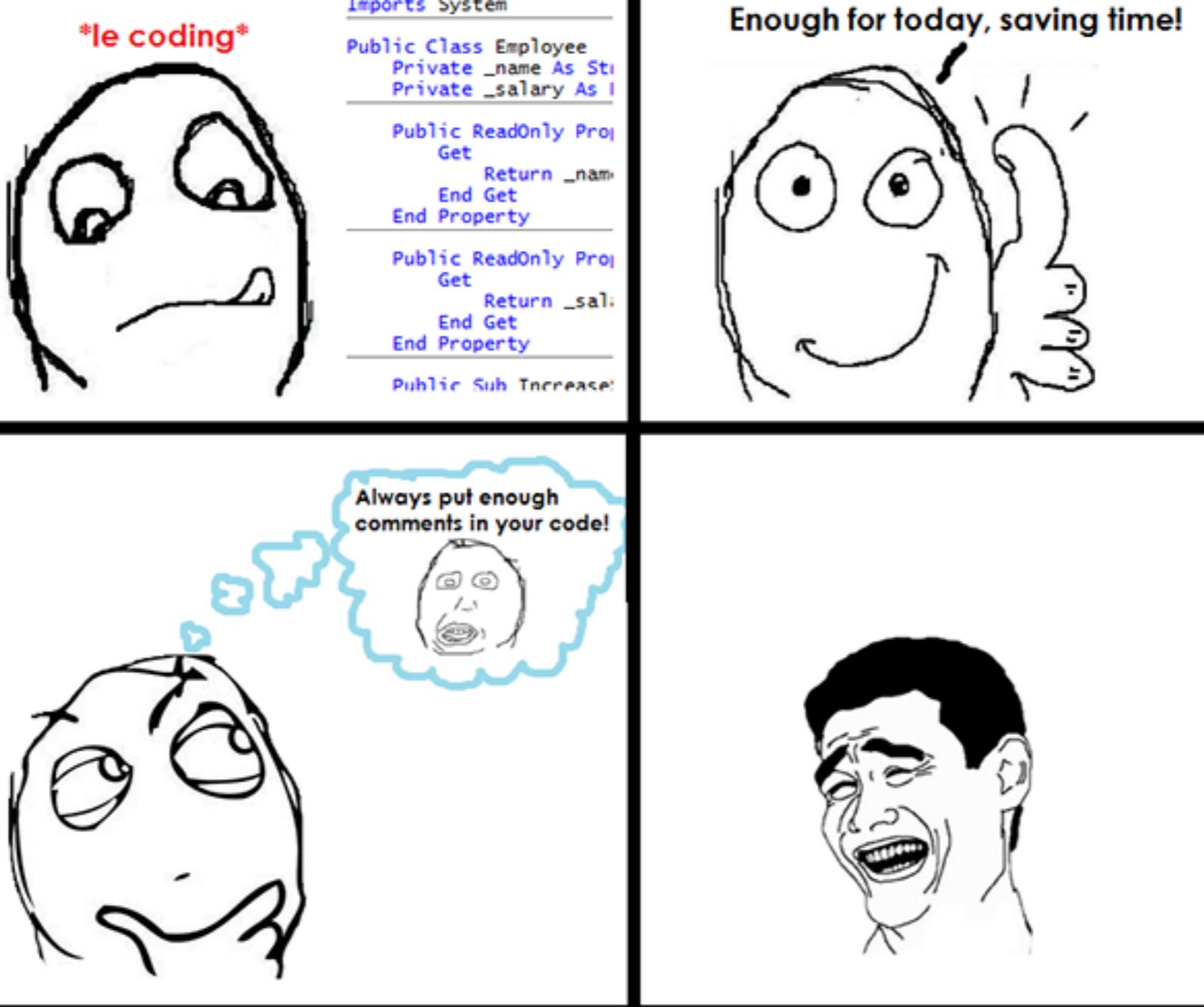
# open up the .xcodeproj file

The screenshot shows the Xcode IDE interface with the following details:

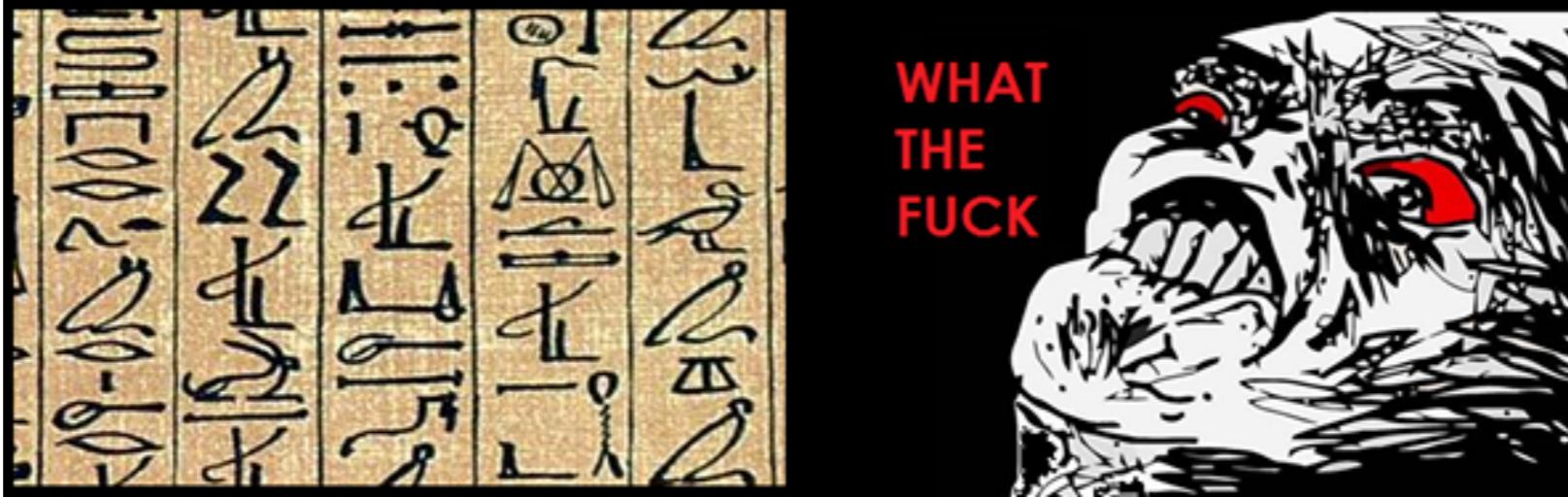
- Project Structure:** The left sidebar shows the project structure for "emptyExample". It includes files like "openFrameworks-Info.plist", "Project.xcconfig", and source files "main.cpp", "ofApp.cpp", and "ofApp.h" located in the "src" folder.
- Code Editor:** The main editor area displays the content of "ofApp.cpp". The code defines a class "ofApp" with methods for setup, update, draw, key pressed, and key released.
- Identity and Type:** The right panel shows the file's properties:
  - Name: ofApp.cpp
  - Type: C++ Source
  - Location: Relative to Project: src/ofApp.cpp
  - Full Path: /Users/phoenixerry/Documents/xcode\_projects/of\_v0.9.3\_osx\_release/apps/myApps/emptyExample/src/ofApp.cpp
- On Demand Resource Tags:** A section indicating "Only resources are taggable".
- Target Membership:** A checkbox for "emptyExample" is checked.
- Text Settings:** Text Encoding is set to Western (Mac OS Roman).
- Search Results:** A search bar at the bottom right shows "No Matches".



Can I take notes in my code?



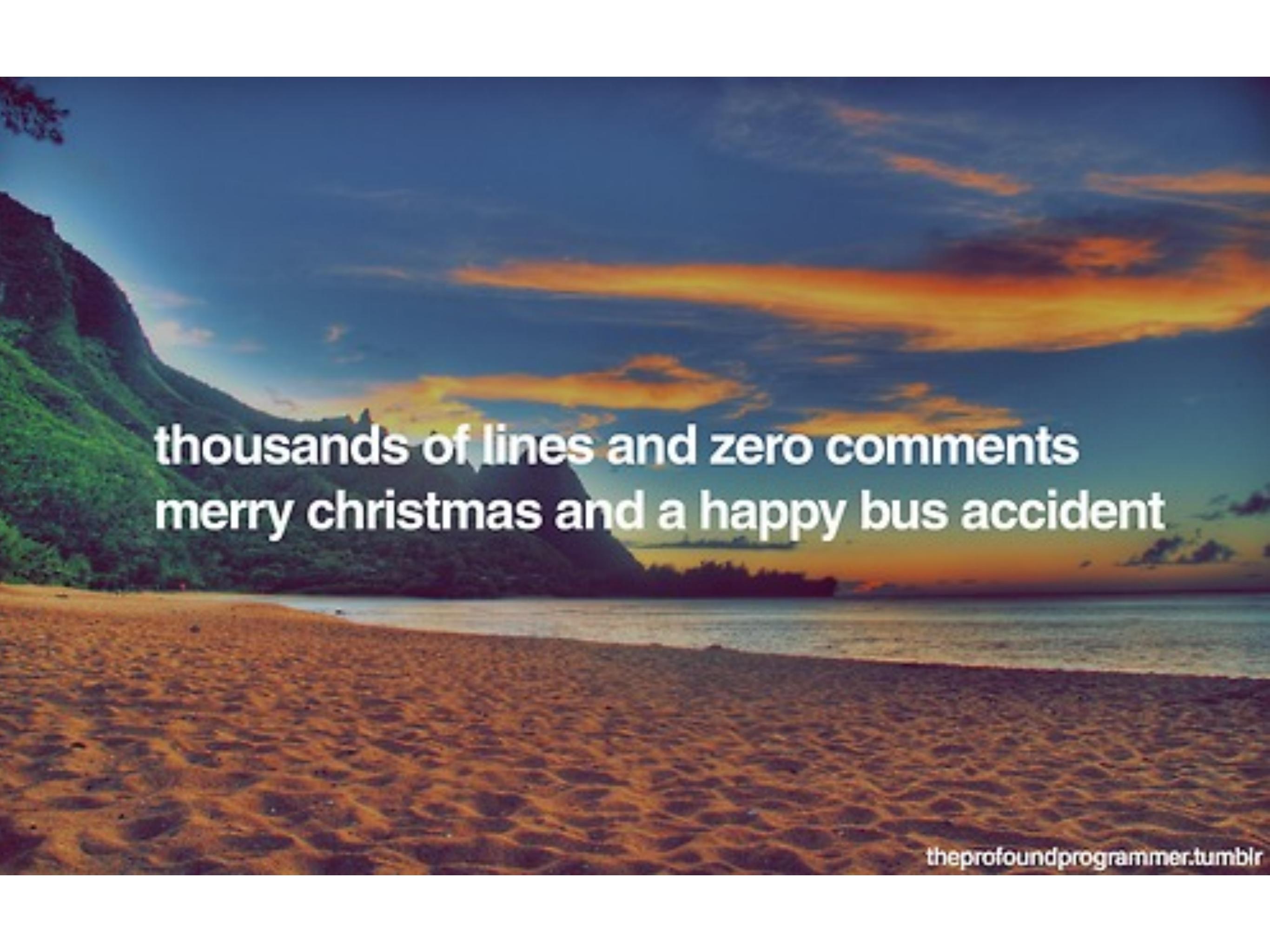
**Opening file 6 weeks later...**



```
// This is a one-line comment.  
  
/*  
   This comment can span multiple lines.  
   Check me out, taking up all the space.  
   Echo...  
      echo...  
         echo...  
            echo...  
               echo...  
                  echo...  
                     echo...  
*/|
```

# Commenting Code

- DO IT.
- Seriously, do it.
- Use two forward slashes `(//)` for a one-line comment.
- You can also do multi-line comments:
  - Preface your comment with slash-asterisk `(/*)`
  - End it with asterisk-slash `(* /)`

A wide-angle photograph of a tropical beach at sunset. The sky is filled with horizontal clouds, transitioning from deep blue to bright orange and yellow. A large, dark green mountain rises on the left side of the frame. The ocean in the foreground has small, golden reflections on its surface.

**thousands of lines and zero comments  
merry christmas and a happy bus accident**

A screenshot of the Xcode IDE. The title bar shows "empt...ebug > My Mac (64-bit) emptyExample: Ready | Today at 3:21 PM". The project navigator on the left shows a project named "emptyExample" with files like "openFrameworks-Info.plist", "Project.xcconfig", "src/main.cpp", "src/ofApp.cpp", "src/ofApp.h", "openFrameworks", "addons", "local\_addons", and "emptyExampleDebug.app". The "ofApp.cpp" file is selected in the list. The main editor area shows the following C++ code:

```
#include "ofApp.h"

//-----
void ofApp::setup(){
}

//-----
void ofApp::update(){

}

//-----
void ofApp::draw(){

}

//-----
void ofApp::keyReleased(int key){

}

//-----
void ofApp::mouseMoved(int x, int y){

}

//-----
void ofApp::mouseDragged(int x, int y, int button){

}
```

The right side of the interface contains the "Identity and Type" inspector, which shows the file is a "C++ Source" located at "src/ofApp.cpp" with a full path of "/Users/phoenixperry/Documents/xcode\_projects/of\_v0.9.3\_osx\_release/apps/myApps/emptyExample/src/ofApp.cpp". It also includes sections for "On Demand Resource Tags" (which is empty) and "Target Membership".

# What's going on in ofApp.cpp

A screenshot of the Xcode IDE showing the same "ofApp.cpp" file. A search results panel is open on the right, titled "No Matches", indicating that no matches were found for the current search query.

The code in the editor is identical to the one shown in the first screenshot:

```
#include "ofApp.h"

//-----
void ofApp::setup(){
}

//-----
void ofApp::update(){

}

//-----
void ofApp::draw(){

}

//-----
void ofApp::keyReleased(int key){

}

//-----
void ofApp::mouseMoved(int x, int y){

}

//-----
void ofApp::mouseDragged(int x, int y, int button){

}
```

# void ofApp::setup(){}

```
3 //-----  
4 void ofApp::setup(){  
5  
6 }  
7
```



```
//-----  
void ofApp::update(){  
}
```

# void ofApp::update(){}

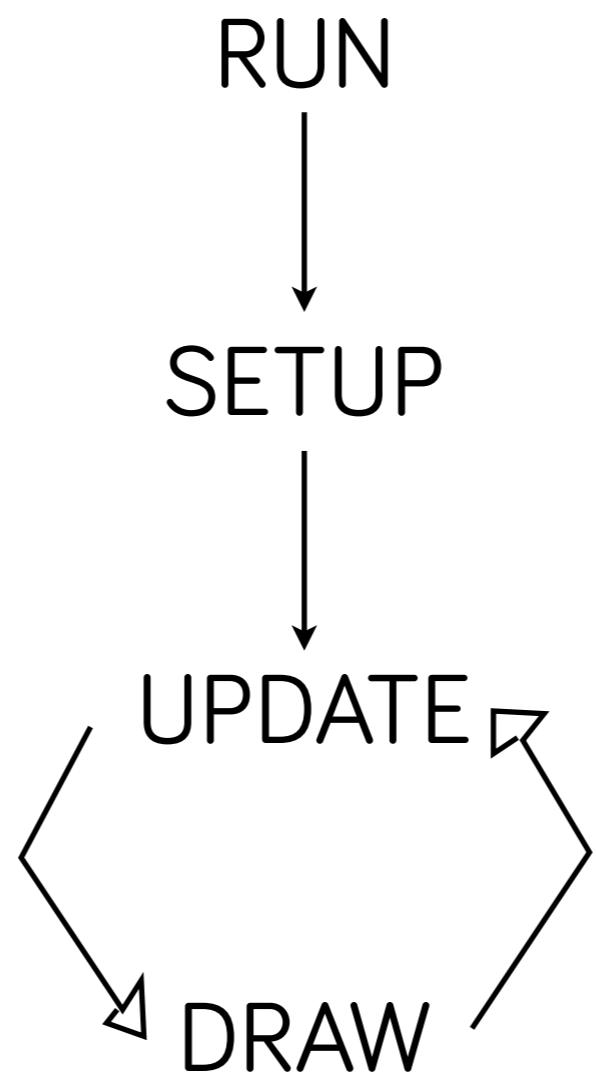


```
void ofApp::draw(){}
```

```
---
```

```
void ofApp::draw(){
```

```
}
```





# Main oF Functions

- `setup()`: runs just once when the app starts
  - Good place to set initial values for variables, e.g.  
`playerHealth = 100;`
- `update()`: runs once per frame, before `draw()`
  - Good place for number-crunching, e.g. `playerHealth -= 1;`
- `draw()`: runs once per frame, after `update()`
  - Where you should put all your drawing, e.g.  
`player.draw();`



Listeners

# Other of Functions

- oF will listen for certain events, and when they happen, it will run whatever code is in the corresponding event
- E.g. keyPressed() runs at the moment that a key is pressed (not held!)

How do I draw stuff?



# Functions

- **Function:** a named section of a program that does a specific task
- Wraps up code in an easy-to-reference way
- **Parameter:** additional information you can give the function to change the output

Bake me a chocolate cake!

Baking a cake:  
the action

Chocolate:  
additional info  
that affects  
the action

Wait, that doesn't answer my  
question about drawing stuff!

# Drawing Shapes

```
ofSetColor(0, 0, 100);
ofDrawLine(0, 0, 100, 0); //x&y start of line, x&y end of line

ofDrawCircle(100, 100, 300); //width and height and radius of circle

ofDrawRectangle(40, 40, 40, 40); //x &y start of box then end of box

ofDrawTriangle(0, 30, 60, 0, 30, 90); //points for x & y of the
triangle|
```

# Coloring Shapes

Function	Notes
<code>ofFill();</code>	Fill all following shapes with a color.
<code>ofNoFill();</code>	Don't fill the following shapes.
<code>ofSetColor(r, g, b);</code>	Sets the color to be used on all following shapes. Each value goes from 0-255.

Exercise:  
Try drawing some stuff!

(Where would you put this code?)

# How does positioning work?



$x=0$

$y=0$

$x=WIDTH$

(3,2)

$y=HEIGHT$

# Coordinate Plane

- X: horizontal axis, gets larger as you go right
- Y: vertical axis, gets larger as you go down

Question:  
How would you draw a circle at x-position 9,  
y-position 15?

If you drew another circle at y-position 25, would it be  
higher or lower than the first circle?

Hint: if you don't know, try drawing it!

How can I incorporate  
interactivity?

# Function Structure

```
bake_me_a_cake(chocolate);
```

- Name of the function
- Parentheses: delineate that it's a function, hold arguments
- Semicolon: end of line, move onto the next thing

# Mouse Positions

---

- **Variable:** a symbol used to stand in for a value
- **mouseX:** returns the current x pixel position of the mouse
- **mouseY:** returns the current y pixel position of the mouse

Exercise:  
Try drawing a circle at mouseX and mouseY!

# Variables

- Variables are useful for storing data that **may change** throughout the course of your app (e.g. your player's health)
- To create a variable, you have to tell the computer:
  - What kind of data you're storing (a number? a word?)
  - The name you're going to refer to it by

# Some Variable Types

- **Float:** a decimal number (“I’m 5.4 feet tall.”)
- **Integer:** a whole number (“I’m 25 years old.”)
- **Boolean:** a true/false condition (“I’m not from California.”)
- **String:** text (“My name is Jane.”)
- **Char:** a single letter (“You all get an A in programming!”)

float jane\_height;

the type of data  
(datatype)

the variable's name

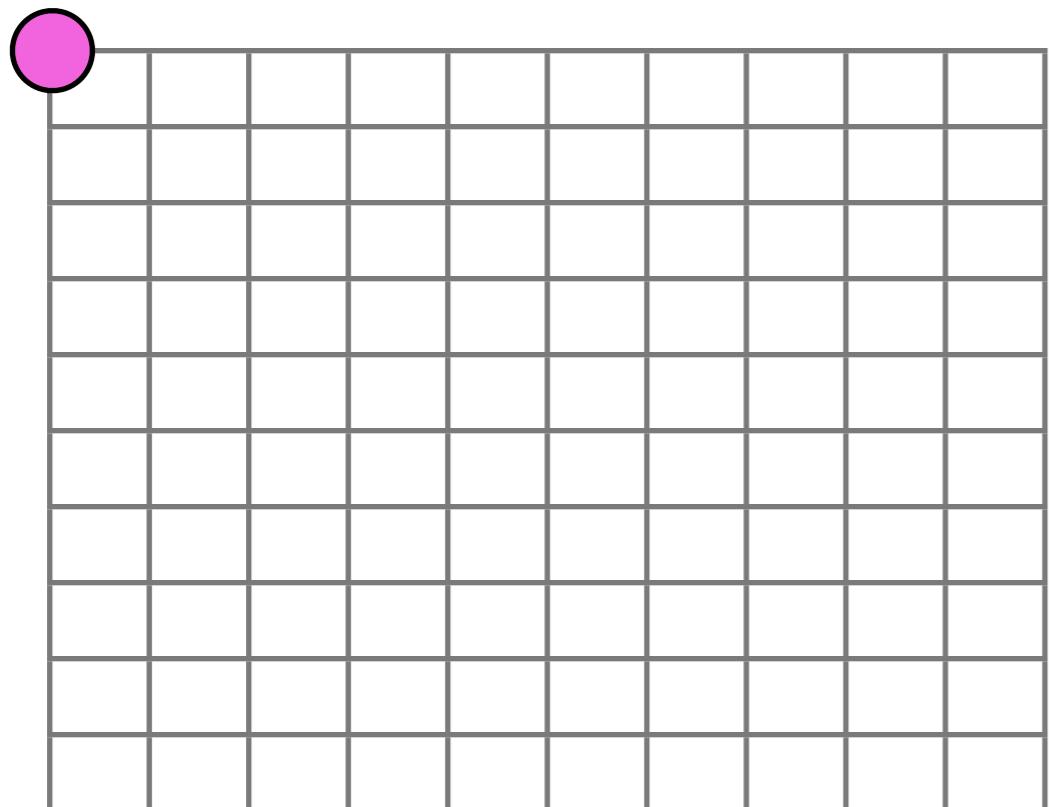
jane\_height = 5.4;

the variable's name

the value of that variable

How can I make stuff move on its  
own?

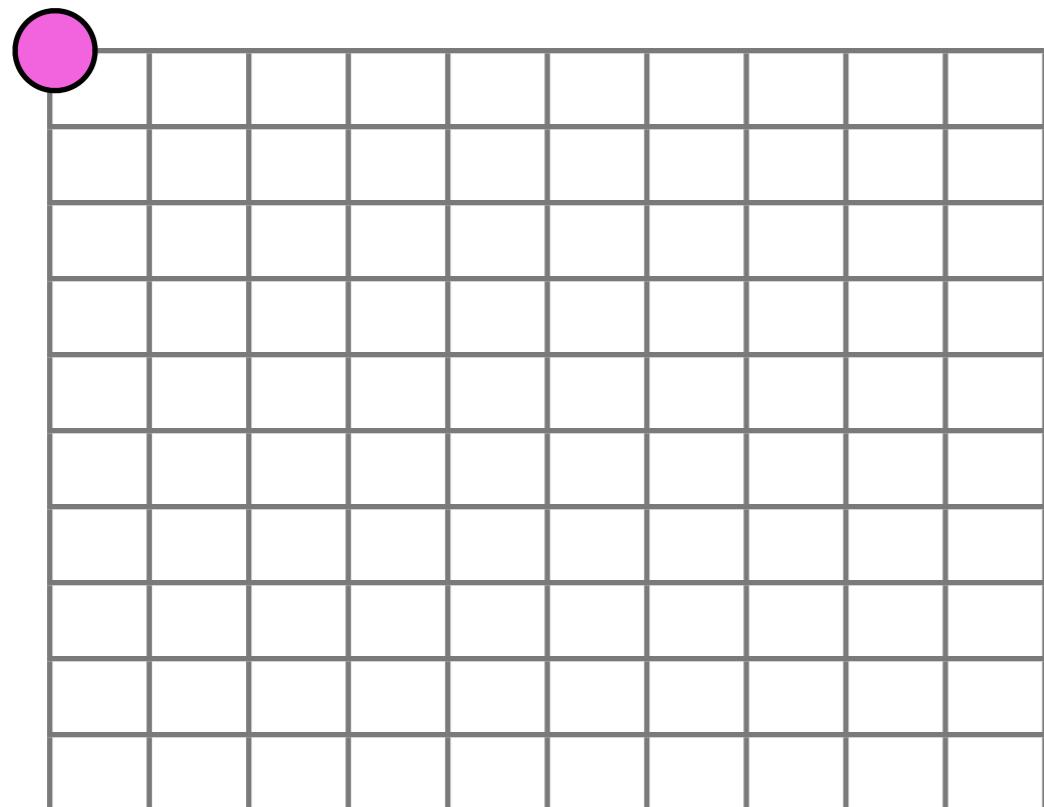
# Movement



if our object starts at  $x=0$ ,  
at  $\text{time}=0$ , and moves at a  
speed equal to 1 frame/  
sec, what will  $x$  equal at  
 $\text{time}=1$ ?

How do you know?

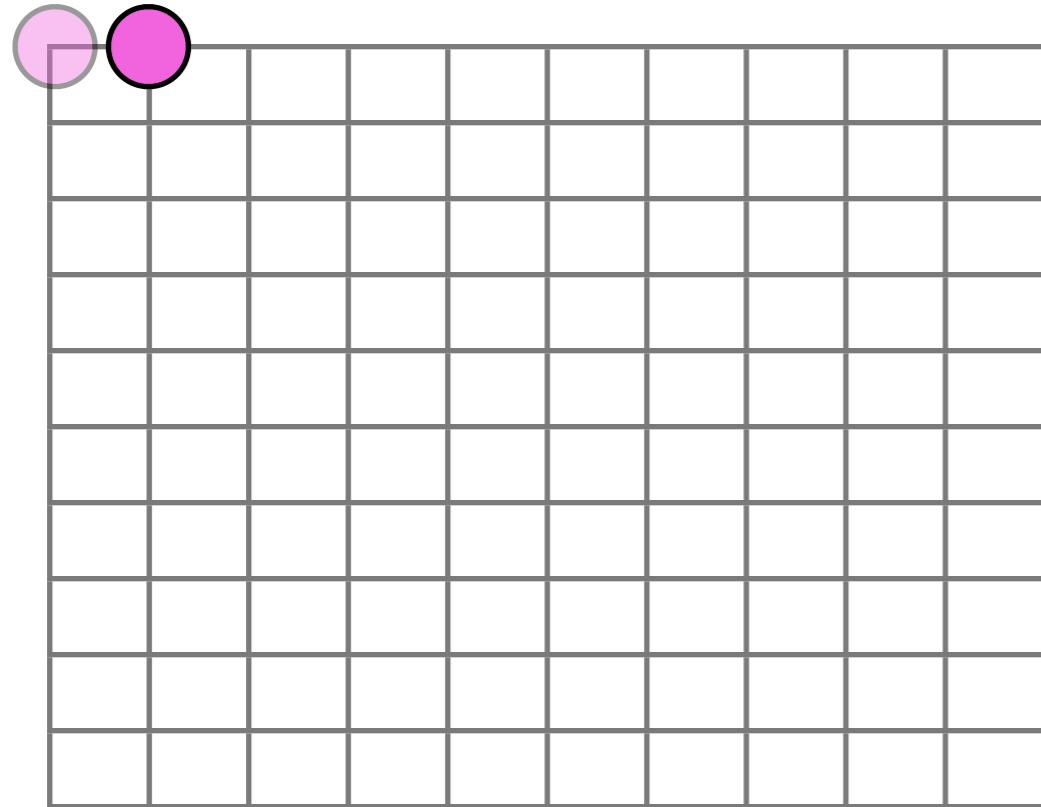
# Movement



$x$  will equal 1!

Its current position (0)  
+ the total distance it will go over  
one frame (1)  
 $= 1!$

# Movement



New position = old position + speed

Exercise:

Try drawing a circle that moves vertically down the screen.

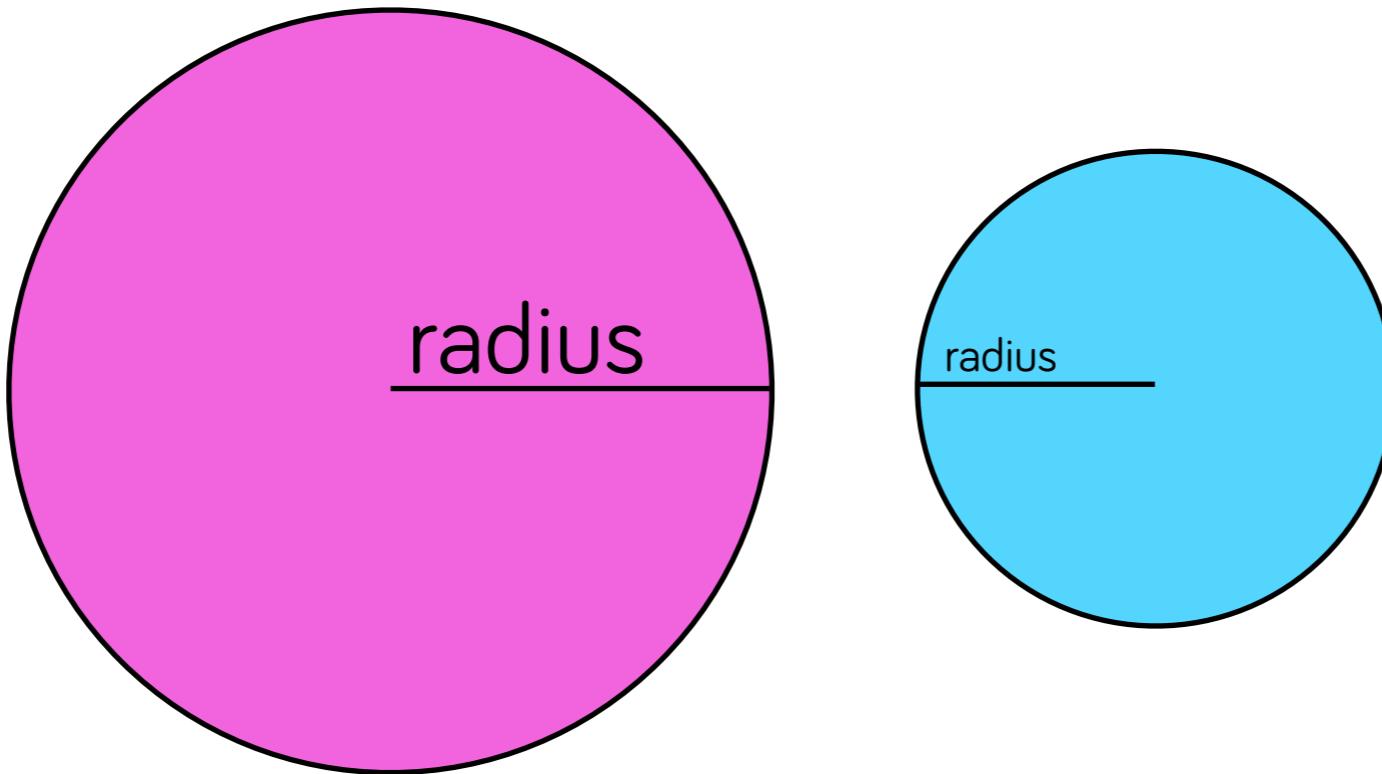
Hint: you'll want a variable to hold the circle's position.  
(Why?)

How can I test for collisions?

**Collision:** when one point is less than a certain distance from another point.

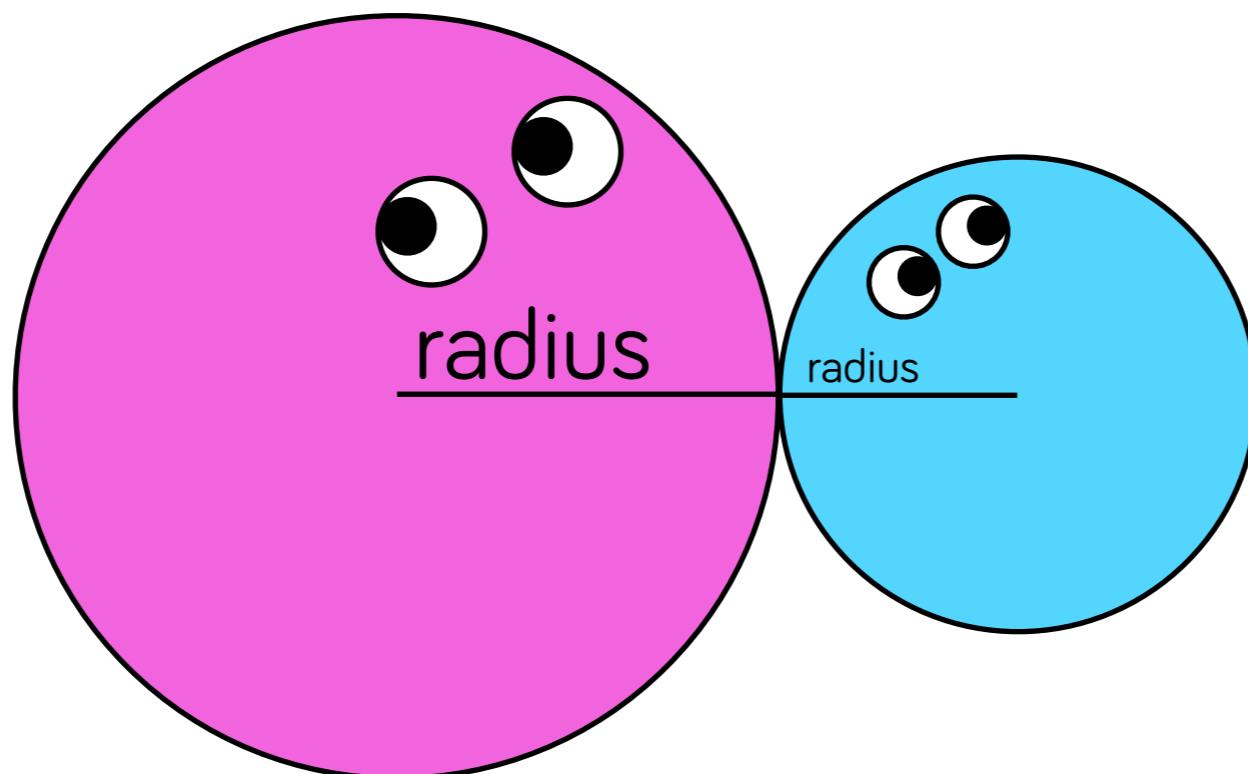


Have these circles collided yet?



# Circle Collision

- If the distance between the center-points of the circles is less than or equal to the sum of their radii, they have collided!
- You can calculate distance in openFrameworks with `ofDist(x1, y1, x2, y2)`.





# Emergency kittens

How can I check whether  
something is true?



If I'm hungry, then I'll eat.

# If-statements

- Consist of a condition and an action to take.
- Can have alternatives (if-else) and can put if-statements inside of if-statements, too!

General syntax:

```
if (condition) {  
    action to take  
}
```

If I'm hungry, then I'll eat.

```
if (hungry) {  
    eat();  
}
```

# If-statements

- Consist of a condition and an action to take.
- Can have alternatives (if-else) and can put if-statements inside of if-statements, too!

If I'm hungry, then I'll eat.

```
if (hungry) {  
    eat();  
}
```

If I'm hungry, then I'll eat.  
Otherwise, I'll dance!

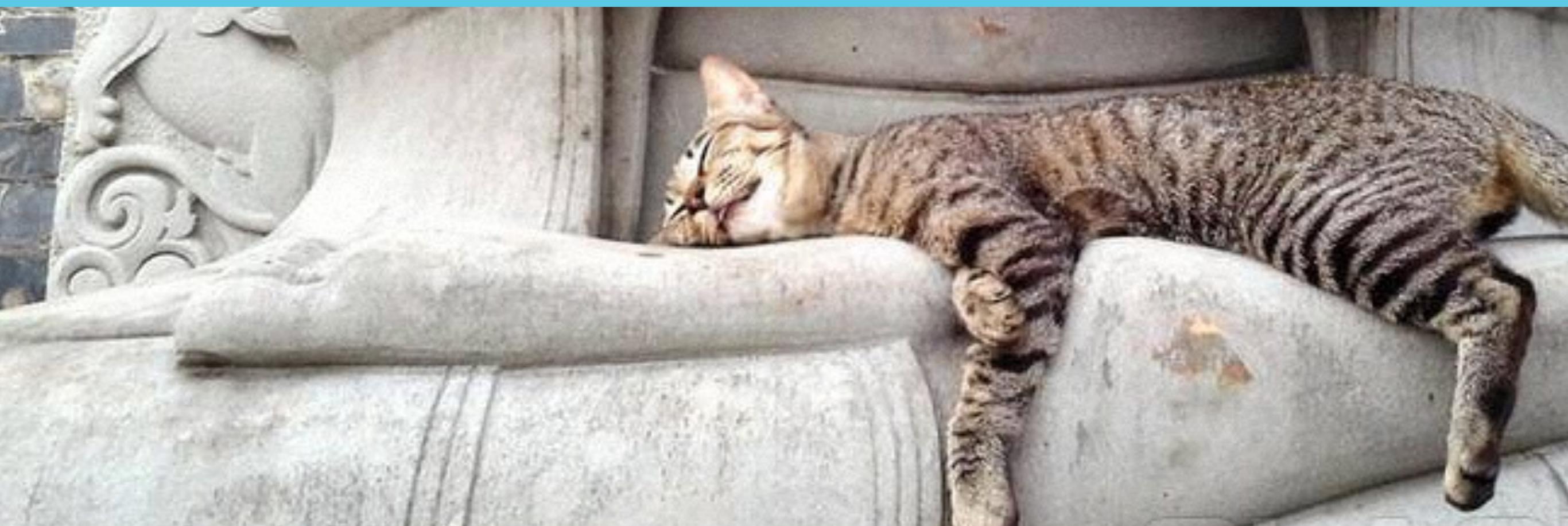
```
if (hungry) {  
    eat();  
} else {  
    dance();  
}
```

If I'm hungry, then I'll eat.  
If I'm hungry and in the  
mood for pizza, I'll get  
pizza.  
Otherwise, I'll dance!

```
if (hungry) {  
    if (want_pizza) {  
        eat(pizza);  
    } else {  
        eat(something_else);  
    }  
} else {  
    dance();  
}
```



How can I incorporate images, fonts & sounds



# Images

- `ofImage`: a built-in object that handles the loading and drawing of images
- **Must** put the file inside “data” folder of project!
- Three steps:
  - Create your image variable: `ofImage image;`
  - Load your image file: `image.loadImage("image.png");`
  - Draw your image: `image.draw(x, y);`

# Fonts

- `ofTrueTypeFont`: a built-in object that handles the loading and drawing of fonts
- **Must** put the file inside “data” folder of project!
- Three steps:
  - Create your font variable: `ofTrueTypeFont font;`
  - Load your image file: `font.loadFont("font.ttf", size);`
  - Draw your words: `font.drawString(string, x, y);`

# Sounds

- `ofSoundPlayer`: a built-in object that handles the loading and playing of sounds
- **Must** put the file inside “data” folder of project!
- Three steps:
  - Create your font variable: `ofSoundPlayer sound;`
  - Load your image file: `sound.loadSound("sound.mp3");`
  - Play your sound: `sound.play();`

“It’s better to apologize than seek permission”

-Grace Hopper