

FingerPainter

Lesson 3

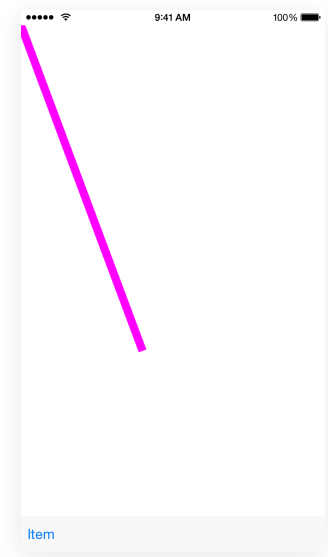


Description

Capture point coordinates within the touch event handlers, and inspect the x and y components of the touch coordinates using custom breakpoints.

Learning Outcomes

- Recognize how touch events can send multiple `UITouch` objects to event handlers.
- Discover how to obtain point coordinates from `UITouch` objects.
- Observe the use of the Swift forced type cast operator.
- Practice creating custom breakpoint actions to print console messages.



Vocabulary

event	set (data structure)	<code>Set<NSObject></code>
<code>UITouch</code>	<code>CGPoint</code>	type cast operator
breakpoint		

Materials

- **FingerPainter Lesson 3** Xcode project

Opening

How can we use the touch events to obtain coordinates for drawing?

Agenda

- Explain that, because iOS can respond to multiple touches (with multiple fingers), a Set of UITouch objects is passed to touchesBegan:withEvent: and touchesMoved:withEvent:.
- Update the implementation of touchesBegan:withEvent:.

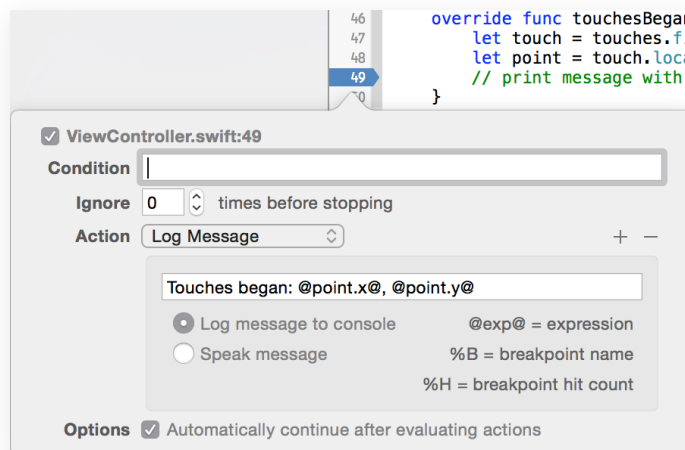
```
override func touchesBegan(touches: Set<NSObject>,  
    withEvent event: UIEvent) {  
    let touch = touches.first as! UITouch  
    let point = touch.locationInView(view)  
    // print message with breakpoint here  
}
```

- Using the Xcode Documentation and API Reference (⇧⌘0) explore the UITouch class reference, drawing attention to the locationInView: method.
- Explain that touchesBegan:withEvent: is passed a Set of objects, touches, and how we call first upon touches to retrieve the first object in the Set.
- Explain that, because the touches set has a placeholder type of NSObject, the code uses the Swift forced type cast as! operator to convert the first object in the touches set to a UITouch object.
- Discuss how all ViewController objects have an inherited view property, and how the touchesBegan:withEvent: method obtains a CGPoint, representing a coordinate within the view, from the UITouch object.
- Using the Xcode Documentation and API Reference (⇧⌘0), explore the CGPoint structure.
- Update the implementation of touchesMoved:withEvent:.

```
override func touchesMoved(touches: Set<NSObject>,  
    withEvent event: UIEvent) {  
    let touch = touches.first as! UITouch  
    let point = touch.locationInView(view)  
    // print message with breakpoint here  
}
```

- Discuss how touchesMoved:withEvent: will be called multiple times while the finger drags across the screen, and how the CGPoint obtained from the touch events can be used to draw a line from point to point as the finger moves.

- Add custom breakpoints to the bodies of both the `touchesBegan:withEvent:` and `touchesMoved:withEvent:` methods that use a **Log Message** action to print the x and y components of the `CGPoint`, and automatically continue.



- Run the app (⌘R), click the screen to simulate a touch, and observe the coordinates printed on the console (⇧⌘C). Click and drag on the screen to simulate a finger moving across the screen, and observe the coordinates printed on the console (⇧⌘C) by `touchesMoved:withEvent:`.

Closing

Since we are only simulating a single touch, the `touches` set only contains one `UITouch` object. What do you think happens to the set when we touch the screen with multiple fingers?

Modifications And Extensions

- Investigate the `UIEvent` class reference, and add the time of the touches to the breakpoint log messages.
- Investigate how to detect multiple touches (multiple fingers) on the screen, and print the locations of each touch on the console.

Resources

Event Handling Guide for iOS <http://developer.apple.com/library/ios/documentation/EventHandling/Conceptual/EventHandlingiPhoneOS/Introduction/Introduction.html>

Setting Breakpoint Actions and Options http://developer.apple.com/library/ios/recipes/xcode_help-breakpoint_navigator/articles/setting_breakpoint_actions_and_options.html

UIResponder Class Reference https://developer.apple.com/library/ios/documentation/UIKit/Reference/UIResponder_Class/index.html

The Swift Programming Language: Collection Types https://developer.apple.com/library/ios/documentation/Swift/Conceptual/Swift_Programming_Language/CollectionTypes.html

UITouch Class Reference https://developer.apple.com/library/ios/documentation/UIKit/Reference/UITouch_Class/index.html

CGGeometry Reference <https://developer.apple.com/library/prerelease/ios/documentation/GraphicsImaging/Reference/CGGeometry/index.html>