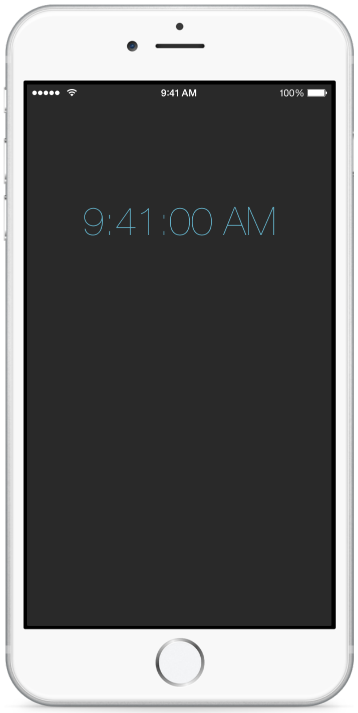
Clock
Lesson 5

Description

Use `NSTimer` to execute a method repeatedly, to keep the currently displayed time correct. Deprecate the use of notifications and observers for this feature.



Learning Outcomes

- Define what a feature requirement is.
- Assimilate user expectations and feature requirements.
- Interpret what threads and run loops are, and relate them to `NSTimer`.
- Use `NSTimer` to execute a method repeatedly without blocking the main run loop.
- Apply forced unwrapping to unwrap an optional property value.

Vocabulary

feature requirement	user experience	run loop
thread	blocking	`NSTimer`
class method	optional	optional binding
timer invalidation		

Materials

- **Clock Lesson 5** Xcode project
- **Run Loops and NSTimer** presentation

Opening

How often do we want the displayed time to update, and how might we continuously update the displayed time?

Agenda

- Discuss how a person would use the Clock app and what the experience should be. Discuss the main flaw in the app: time is only updated when bringing the app into the foreground, and the displayed time does not continuously change while the app is running.
- Present the concept of run loops, threads and the `NSTimer` class.
- Add a new controller property for an `NSTimer`.

```
var timer: NSTimer?
```

- Discuss how the timer property is declared as an optional, because the `ViewController` initializer will not initialize the property.
- Using the Xcode Documentation and API Reference (⇧⌘0), explore the `NSTimer` class reference and its `scheduledTimerWithTimeInterval:target:selector:userInfo:repeats:` class method.
- Replace the observer registration in `viewDidLoad` with the creation of an `NSTimer` that will call `updateTimeLabel` every second.

```
override func viewDidLoad() {
   super.viewDidLoad()
   timer = NSTimer.scheduledTimerWithTimeInterval(1.0, target: self,
      selector: "updateTimeLabel", userInfo: nil, repeats: true)
}
```

- Discuss the meaning of the arguments passed to `scheduledTimerWithTimeInterval:target:selector:userInfo:repeats:`.
- Modify the `updateTimeLabel` method's format of the displayed time, such that it displays seconds.

```
func updateTimeLabel() {
   let formatter = NSDateFormatter()
   formatter.timeStyle = .MediumStyle
   timeLabel.text = formatter.stringFromDate(clock.currentTime)
}
```

- Replace the observer removal in the deinitializer with an invalidation of the timer.

```
deinit {
   if let timer = self.timer {
      timer.invalidate()
   }
}
```

- Explain the best practice of invalidating a scheduled timer in a deinitializer, and how the optional binding of the `timer` property ensures that its value is not `nil` before calling `invalidate`.
- Run the app (⌘**R**) and observe that it continuously displays the current time.

Closing

What happens when we rotate the app (⌘→) in the Simulator?

Modifications and Extensions

- Consider how the updating of time is a model concern, and refactor the updating of the model's time as a property that is continuously updated with an `NSTimer` internal to the model. Use key-value observing to then update the label when the model's time changes.

Resources

iOS App Programming Guide: The Main Run Loop https://developer.apple.com/library/ios/documentation/iPhone/Conceptual/iPhoneOSProgrammingGuide/TheAppLifeCycle/TheAppLifeCycle.html#//apple_ref/doc/uid/TP40007072-CH2-SW14

Start Developing iOS Apps Today: Finding Information https://developer.apple.com/library/ios/referencelibrary/GettingStarted/RoadMapiOS/FindingInformation.html

NSTimer Class Reference https://developer.apple.com/library/ios/documentation/Cocoa/Reference/Foundation/Classes/NSTimer_Class/index.html

Threading Programming Guide: Run Loops https://developer.apple.com/library/ios/documentation/Cocoa/Conceptual/Multithreading/RunLoopManagement/RunLoopManagement.html

Timer Programming Topics https://developer.apple.com/library/ios/documentation/Cocoa/Conceptual/Timers/

The Swift Programming Language: Optional Binding https://developer.apple.com/library/ios/documentation/Swift/Conceptual/Swift_Programming_Language/TheBasics.html#//apple_ref/doc/uid/TP40014097-CH5-ID333