LEARNING iPad PROGRAMMING

A Hands-On Guide to Building iPad Apps

SECOND EDITION

KIRBY TURNER
TOM HARRINGTON

Foreword by Mark Dalrymple

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Praise for the First Edition of Learning iPad Programming

"This amazing, thorough book takes an interesting approach by working through the design and development of a simple, yet realistic, iPad app from start to finish. It is refreshing to see a technical book that explains how and why without inundating you with endless toy examples or throwing you into a sea of mind-numbing details. Particularly amazing is that it does this without assuming a large amount of experience at first. Yet it covers advanced topics at sufficient depth and in a logical order for all developers to get plenty of valuable information and insight. Kirby and Tom know this material and have done a great job of introducing the various frameworks and the reasoning behind how, why, and when you would use them. I highly recommend *Learning iPad Programming* to anyone interested in developing for this amazing platform."

—Julio Barros
E-String.com

"This is a great introduction to iPad programming with a well-done sample project built throughout. It's great for beginners as well as those familiar with iPhone development looking to learn the differences in developing for the larger screen."

—Patrick Burleson
Owner, BitBQ LLC (http://bitbq.com)

"Kirby Turner and Tom Harrington's *Learning iPad Programming* provides a comprehensive introduction to one of today's hottest topics. It's a great read for the aspiring iPad programmer."

—Robert Clair
Author, *Learning Objective-C 2.0*

"*Learning iPad Programming* is now my go-to reference when developing apps for the iPad. This book is an absolute treasure trove of useful information and tips for developing on the iPad. While it's easy to think of the iPad as just a bigger iPhone, there are specific topics that need to be treated differently on the iPad, such as making best use of the larger display. *Learning iPad Programming* provides an incredible amount of depth on all areas of iPad programming and takes you from design to fully functioning application—which for me is a killer feature of the book. This should be in everyone's reference library."

—Mike Daley
Author, *Learning iOS Game Programming*
Cofounder, 71Squared.com

"A truly well-rounded book with something for every iOS developer, be they aspirant or veteran. If you are new to iOS, there is a solid foundation provided in Part I that will walk you through Objective-C, the core Apple frameworks, provisioning profiles, and making the best of Xcode. If you've been around the block but want solid insight into iPad programming, Part II has you covered: Rather than just providing canned example code, Kirby and Tom give you real code that incrementally builds and improves a real app. And if you've been working with iOS for a while, but would benefit from a walk-through of the plethora of new features that have come our way with iOS 5 and Xcode 4, dive into the chapters on Storyboards, iCloud, and Core Image. Best of all, the book is well-written and conversational, making it a joy to read. This book is stellar."

—Alexis Goldstein
Coauthor, *HTML5 & CSS3 for the Real World*

"*Learning iPad Programming* is one of the most comprehensive resources on the planet for those developing for Apple's iPad platform. In addition to coverage of the language, frameworks, and tools, it dives into features new in iOS 5, like Automatic Reference Counting, Storyboarding, and connecting your applications with iCloud. But where this book really shines is in the tutorials and the application you will build as you read through this book. Rather than being a toy that employs only off-the-shelf iOS user interface components from Interface Builder, the PhotoWheel app demonstrates custom view programming and view controller containment, nonstandard gesture/user input handling, and provides insight into how a complex iOS project comprised of multiple subsystems is assembled into a shipping application. In other words, *Learning iPad Programming* shows how to deal with the challenges you'll face in real iPad development."

—Erik Price
Senior Software Engineer, Brightcove

"A thoroughly crafted guide for learning and writing iOS applications, from the humble beginnings in Xcode and Interface Builder to creating a full-featured iPad application. There are many books that try to cover the gamut of knowledge required to take a reader from zero to app; Kirby and Tom have actually done it in this book. It is a fun and comprehensive guide to the world of developing apps for Apple's magical device."

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"The iPad is changing the way we think about and use technology. *Learning iPad Programming* is one of the most in-depth and well-executed guides to get both new and seasoned developers up to speed on Apple's exciting new platform."

—Justin Williams
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Second Edition

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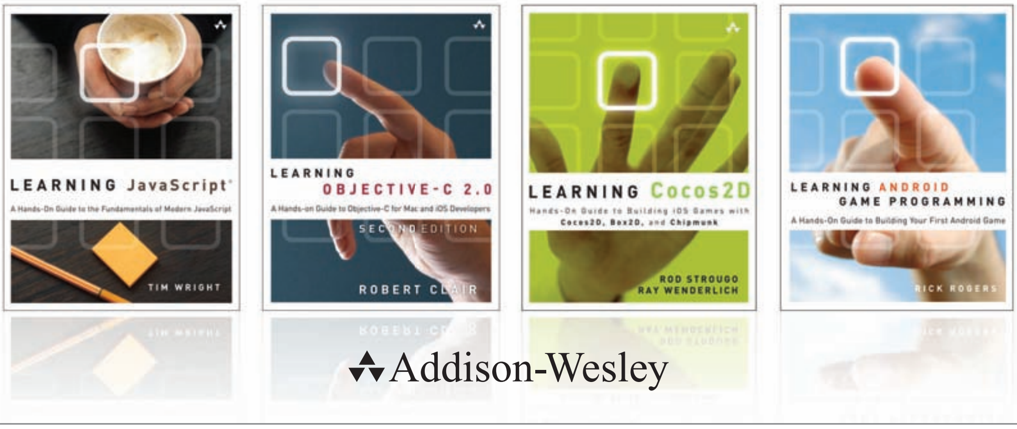
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A Hands-On Guide to Building iPad Apps

Second Edition

Kirby Turner

Tom Harrington

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To Steve Jobs, who saw further than most.
— Kirby Turner and Tom Harrington

To Melanie and Rowan, for their continuous love and support.
And to my mom, my personal hero.
—Kirby Turner

To Carey, who gave me the courage to pursue my dreams.
—Tom Harrington

❖

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Foreword

I love books. I really love books. Anyone who's known me for any amount of time knows I'm a total bookworm. Well-written books are one of the cheapest and fastest self-education tools. I can remember a number of books that were hugely significant in my personal and professional development—books like *Object Oriented Software Construction* by Bertrand Meyer, Scott Knaster and Stephen Chernicoff's early Mac programming books, Dave Mark's C programming books, Robert C. Martin's horribly titled (but full of wonderful a-ha! moments) *Designing Object Oriented C++ Applications Using the Booch Method*, and, of course, the late W. Richard Stevens' UNIX and Network programming books. I remember lessons learned from these tomes, even those I read many years ago.

Unfortunately, not all books are created equal. I've seen some real stinkers in my time. When I was making the transition from Mac programming to iOS programming, I got some really great books, but also some books that were terrible. Really, really terrible. In some of these volumes, it was almost as if someone had filed the serial numbers off of *Instant Visual Basic Programming Guide for Complete Dummies in 24 Hours*, sprinkled around some square brackets, and pasted in pictures of iPhones. I thumbed through one early iPad programming book that literally had an error on every page. Some were just typos. Some were subtle errors, understandable if you haven't already lived in the Cocoa universe for a couple of years. Some of it was downright bad advice, obviously from someone who did not know what he was doing. There is a certain expectation of trust when you drop your hard-earned currency on a book, and violating that trust is unforgivable.

So, this book—*Learning iPad Programming*. Is it worth the price? Does it fall in my first category of books (awesome), or the second (unequivocally lame)? Good question. Glad you asked!

First, a good book needs to cover its topic, and cover it well. *Learning iPad Programming, Second Edition*, judging just by its heft, contains a lot of material. Well, that's true, assuming you've got the printed version in hand; *War and Peace* weighs the same as *The Little Prince* in ebook form, so it's hard to tell them apart. Just skim through the table of contents—you can see the text covers a lot of stuff. A metric freakload of stuff. And this stuff is all relevant. It covers such basics as installing the development tools. Model-View-Controller. Master-Detail. Storyboards. Segues. Table views. `UIViewController`. Navigation views. Handling device rotation. There are also more advanced topics such as consuming Web services, the media library, touch gestures, data persistence, and the raw unpleasantness that is Apple's device provisioning. And there's some cutting-edge stuff, such as AirPrint, AirPlay, iCloud, and Core Image. Kirby and Tom have suffered the arrows in their backs dealing with months of flaky underdocumented prerelease software so you don't have to.

Very good books are timely, but not exploitative. I saw my first iPad programming book about three months after the device was announced. There was no way this book could convey the iPad gestalt to the reader, simply because the device hadn't been available to any author for a long enough period of time. The book was pumped out as fast as possible to hit the market, and it showed. *Learning iPad Programming* is a mature project, with years of work having gone into it. Good books take time to achieve high levels of awesomeness.

Great books transcend their subject matter. This book is called *Learning iPad Programming*. It'd be easy to assume that it just covers introductory iPad programming in a simplistic manner. "Views are cool!" "Yay! Tapping a button!" But it's more. Not many books have a single project that lives and evolves through the entire narrative. The reason not many books do this is because it is difficult to do well. Important toolkit features get shoehorned into weird places because the author didn't do enough upfront design time. This book, though, takes you from design to prototype to the Real Deal.

And then it goes further. Not many books talk about the inner game of design. This one does. Even fewer books talk about the inner game of debugging. Debugging is a fundamental part (if not *the* fundamental part) of the day-to-day life of a programmer, and few books devote more than a paragraph or two to it. *Learning iPad Programming* has an entire chapter on the topic, and it deals with much more than how to single-step with the debugger. As I was reading a preproduction version of this book, I emitted an audible "SQUEE" when I hit Chapter 26. I love debugging, and I love seeing such an important topic covered in detail in what is ostensibly a beginner's book. And as you can tell, I love learning stuff. I learned some stuff from Chapter 26, even after 23 years of programming professionally.

Finally, those who **create** the great books transcend the ordinary. The Mac and iPhone community is pretty small and well connected. You tend to learn quickly who the trusted players are. Many of the lame books I alluded to earlier were written by individuals I had never heard of before, and never heard from again. No blogs, no appearances at conferences, no footprint on the community. Get in, crank out something, exploit the community, and get out.

Kirby and Tom are different. They're known entities. They have blogs. Tom has his name on other books. They've shipped products. They've shipped the first edition of this book. They have happy customers. They answer questions online. They organize and speak at conferences. They're involved with CocoaHeads. They have invested a great deal of their time into the betterment of the community. It is why I am honored and humbled that they asked me to write this foreword.

As you can probably tell, I'm pretty excited about this book. There are many excellent introductory iOS programming books. I recommend reading all of them (at least the good ones) because iOS is such a huge topic that even Kirby and Tom can't cover everything you need to know in one volume. But if you're specifically targeting the iPad, this one is the one to get.

—Mark Dalrymple
Cofounder of CocoaHeads, the international Mac and iPhone programmer community
Author of *Advanced Mac OS X Programming: The Big Nerd Ranch Guide*
February 14, 2013

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Preface

In October 2011, Apple CEO Tim Cook shared some interesting facts about the iPad:

- Ninety-two percent of Fortune 500 companies are testing or deploying iPads.
- More than 80 percent of U.S.-based hospitals are testing or piloting the iPad.
- Every state in the United States has some type of iPad deployment program in place or in pilot.

Just a year later, in October 2012, Tim Cook announced that 100 million iPads had been sold. Think about that for a moment: 100 million iPads sold in just two and a half years! That is an amazing feat.

And the news about the iPad doesn't stop there. The FAA has approved the use of the iPad instead of paper charts for on-duty airline pilots. Without a doubt, the iPad is changing the way people think about (and use) computers today. And it continues to get better with the release of iOS 6, the latest operating system for iPad and iPhone devices.

Make no mistake, the iPad packs a punch. With its patented multi-touch interface, an onboard graphics chip, the powerful A6X processor, and 4G and Wi-Fi networking, the iPad is the benchmark in a post-PC world. More important, though, is how the iPad fits into the Mac/iOS ecosystem. Mac OS X and iOS users can use FaceTime for video chat from desktop to device. What's more, iOS iMessage enables users to text from their iPad to reach other iPad, iPhone, and Mac users. The iPad represents a unique marriage of hardware and technology, and it is the Gold Standard for tablets.

This book was written with iOS 6 in mind and is aimed at new developers who want to build apps for the iPad. The book will also appeal to iPhone developers who want to learn more about how to make their apps sing on the iPad. While some people look at the iPad as just a bigger iPhone, it really isn't. There is a lot more that you as a developer can do with the iPad from a user interface perspective that you just can't do on the iPhone.

While this book includes brief discussions of iPhone programming where appropriate, its primary focus is the iPad. *Learning iPad Programming* highlights those areas of the iOS SDK that are unique to the iPad, and it isn't a rehash of similar books targeting the iPhone. Additionally, the book covers new features in iOS, such as embedded segues, container view controllers, iCloud, and Core Image, as well as some of the great new features in Xcode 4, such as storyboarding. Apple has gone to great lengths to make it easier for you to develop for iOS and OS X, and the plan for this book is to make it even easier for you to get there.

What Will I Learn?

This book will teach you how to build apps specifically for the iPad, taking you step by step through the process of making a real app that is freely available in the App Store right now! The app you'll build in this book is called PhotoWheel.

> **Download the App!**
>
> You can download the PhotoWheel app from the App Store.[1] The app is freely available, so go ahead—download PhotoWheel, and start playing around with it.

PhotoWheel is a spin on the Photos app that comes on every iPad (pun intended). With PhotoWheel, you can organize your favorite photos into albums, share photos with family and friends via email, and view photos on your TV wirelessly using AirPlay.

Even more important than the app itself is what you will learn as you build it.

You will learn how to take advantage of the latest features in iOS and Xcode, including storyboarding, Automatic Reference Counting, iCloud, and Core Image. You will learn how to leverage other iOS features such as the Activity View Controller, AirPrint, AirPlay, and Grand Central Dispatch (GCD). And you will learn how to extend the boundaries of your app by communicating with Web services hosted on the Internet.

Think of this book as an epic-length tutorial, showing you how you can create a real iPad app from start to finish. You'll be coding along with the book, and we'll explain things step by step. By the time you have finished reading and working through this book, you'll have a fully functional version of PhotoWheel that you can proudly show off to friends and family (you can even share it with them, too). Best of all, you'll have confidence and the knowledge of what it takes to design, program, and distribute iPad apps of your own.

What Makes the iPad So Different?

While the iPad runs the same version of iOS that runs on the iPhone, iPod touch, and Apple TV, the iPad is significantly different from those other iOS-based devices. Each device is used differently, and iOS brings certain things to the table for each of them. For example, the version of iOS that runs in your Apple TV doesn't yet offer the same touch interface; in fact, the interface is totally different. Apple TV's user interface (UI) runs as a layer on top of iOS, providing a completely different user experience.

But the iPad is so different. It is not something you can hold in the palm of your hand—unless you have an iPad mini. The iPad is something you use with both hands. You swipe. You touch. You interact with it more than with most iPhone apps. It's easy to dismiss the iPad as "just a large iPhone," but it really isn't.

1. PhotoWheel: https://itunes.apple.com/app/photowheel/id424927196&mt=8

While the physical size is the obvious difference between the iPad and iPhone, the real difference—the difference that sets the iPad apart from the iPhone—is conceptual. The conceptual differences stem from how an iPad application is designed and how the user interacts with the application. And the conceptual differences start with the bigger display.

Bigger Display

The iPad's bigger screen provides more than double the screen real estate found on the iPhone. In turn, your application can display more information, giving you more space to work with for your user interface. A good example of this is WeatherBug.

WeatherBug HD has been designed to take full advantage of the iPad's larger screen. As you can see in Figure P.1, the iPad version of WeatherBug displays much

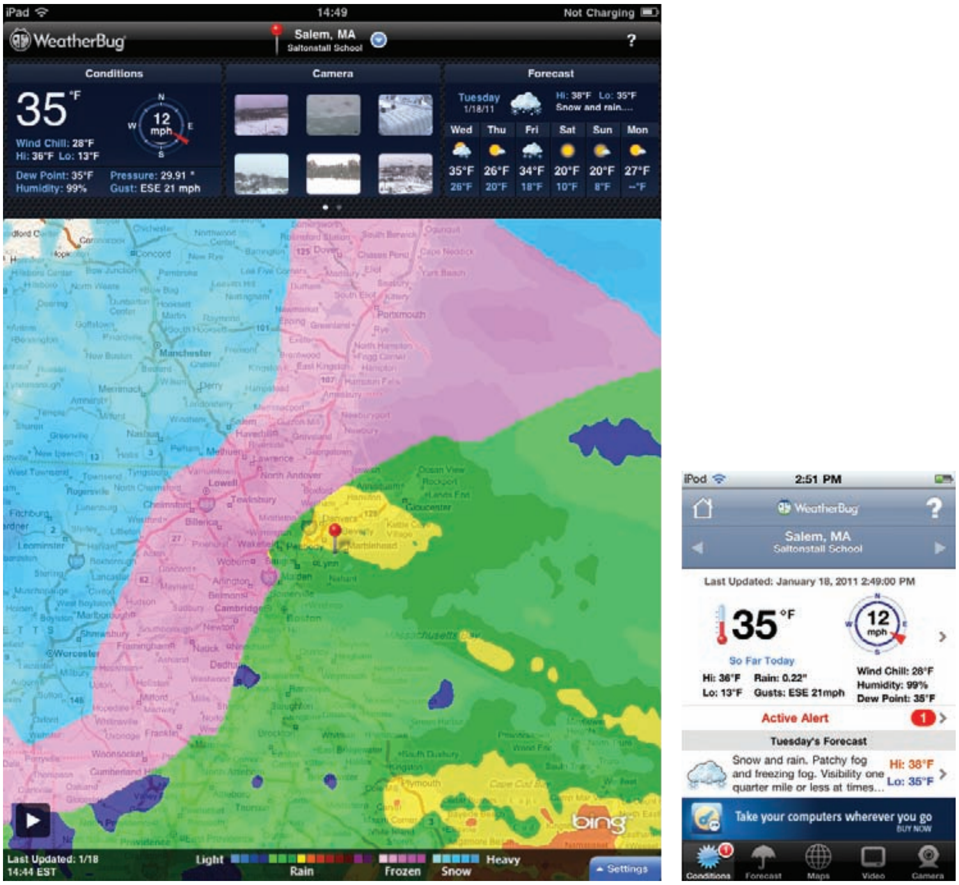


Figure P.1 On the left is the WeatherBug app displayed on the iPad. The screen shot on the right is the same WeatherBug app running on the iPhone. (Used with permission of Earth Networks.)

more weather-related information on a single screen than you can get on the iPhone version. Instead of your having to touch and swipe (and sometimes pray) to find additional weather information, WeatherBug HD on the iPad gives you everything you need to know right on the main screen—no additional touching or swiping needed. Of course, additional detail is still available at a touch.

Less Hierarchical

Because of the smaller screen, many iPhone applications tend to sport a hierarchical navigation system. You see this throughout many iPhone apps. The user taps an item and a new screen slides into view. Tap another item and another view slides in. To navigate back, you tap a back button, usually found in the upper-left corner of the screen.

The Dropbox app illustrates the hierarchical navigation system quite well. Dropbox, for those who may not know, is an online service that allows you to store your data files, documents, and images in the cloud. Stored files are then synced across all of your computers and devices that run the Dropbox client software. Suppose you are working on a text document from your laptop. You save the text document to your Dropbox folder. Later you need to review the text document, so you open the same text document on your iPhone. Dropbox makes this possible.

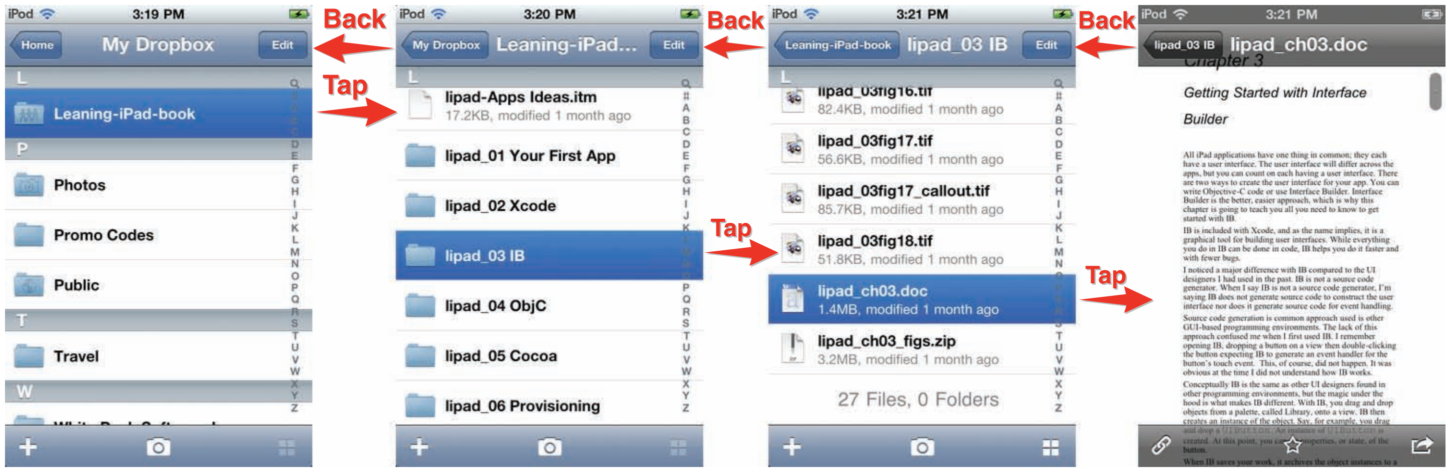
When you use the Dropbox app on your iPhone, you see a list of files and folders sorted alphabetically. Tapping a file or folder will open it, causing the new screen to slide into view. If you open a file, you see the contents of the file. If you open a folder, you see a new list of files and folders. Continue tapping folders to navigate farther down the hierarchy.

To move back up the hierarchy, tap the back button in the upper-left corner of the screen. The text label for this button can vary. Usually it displays the name of the previous item on the stack, but sometimes it displays the word *Back*. While the text label may vary, the style of the back button does not. The back button has a pointy left side. This almost arrow-like style conveys a sense of moving backward through the screens.

The forward and backward navigation through the hierarchy is illustrated in Figure P.2.

Dropbox is also available for the iPad. So how did the developers redesign an app that obviously requires hierarchical navigation to make it feel flatter, less hierarchical? They took advantage of an iOS object available only to the iPad called `UISplitViewController`, shown in Figure P.3.

The split view controller is a nonvisual object that controls the display of two side-by-side views. When you hold your iPad in landscape mode, the two views are displayed side by side. Rotate your iPad to portrait orientation, and the left-side view disappears. This allows the user to focus his attention on the main content displayed on the right side.



Chapter 3

Getting Started with Interface Builder

All iPad applications have one thing in common; they each have a user interface. The user interface will differ across the apps, but you can count on each having a user interface. There are two ways to create the user interface for your app. You can write Objective-C code or use Interface Builder. Interface Builder is the better, easier approach, which is why this chapter is going to teach you all you need to know to get started with IB.

IB is included with Xcode, and as the name implies, it is a graphical tool for building user interfaces. While everything you do in IB can be done in code, IB helps you do it faster and with fewer bugs.

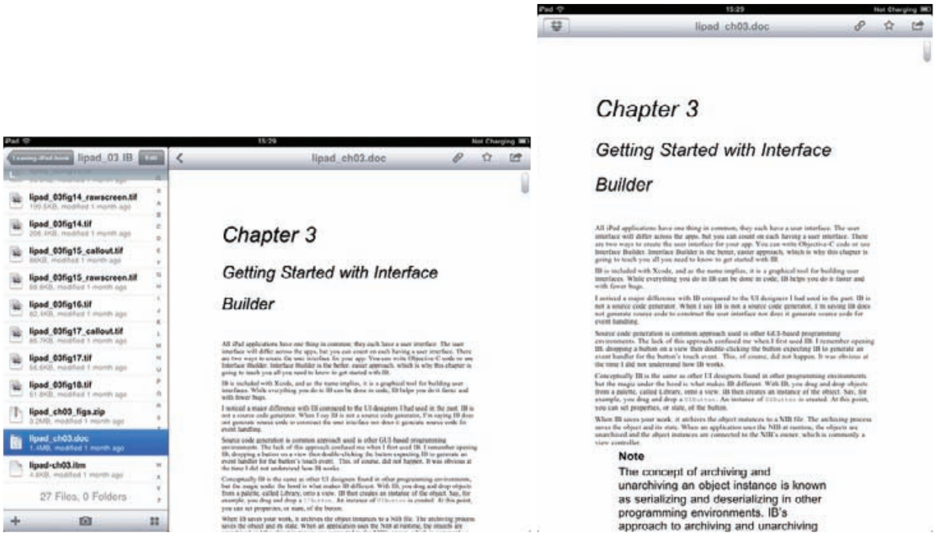
I noticed a major difference with IB compared to the UI designers I had used in the past. IB is not a source code generator. When I say IB is not a source code generator, I'm saying IB does not generate source code to construct the user interface nor does it generate source code for event handling.

Source code generation is common approach used is other GUI-based programming environments. The lack of this approach confused me when I first used IB. I remember opening IB, dropping a button on a view then double-clicking the button expecting IB to generate an event handler for the button's touch event. This, of course, did not happen. It was obvious at the time I did not understand how IB works.

Conceptually IB is the same as other UI designers found in other programming environments, but the magic under the hood is what makes IB different. With IB, you drag and drop objects from a palette, called Library, onto a view. IB then creates an instance of the object. Say, for example, you drag and drop a UIButton. An instance of UIButton is created. At this point, you can [illegible] properties, or state, of the button.

When IB saves your work, it archives the object instances to a

Figure P.2 Example of navigating the hierarchy of folders and files using the Dropbox app on the iPhone. You tap to move forward, or drill down, to more content, and you tap the back button to move backward.



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When IB saves your work, it archives the object instances to a NIB file. The archiving process saves the object and its state. When an application uses the NIB at runtime, the objects are unarchived and the object instances are connected to the NIB's owner, which is commonly a view controller.

Note
The concept of archiving and unarchiving an object instance is known as serializing and deserializing in other programming environments. IB's approach to archiving and unarchiving

Figure P.3 Screen shots of Dropbox running on the iPad. Notice how the navigation is displayed in the left-side view when the device is held in a landscape orientation, but is hidden when the iPad is rotated to portrait.

Note

You get hands-on experience writing a split-view-based application in Chapter 8, "Creating a Master-Detail App."

This view pattern, in which the master view is displayed on the left side and the detail view is displayed on the right side, is often called "master-detail." The master view is used to navigate the hierarchy of data, or in the case of Dropbox, the master view is used to navigate the list of files and folders. When you find the file you want to view, tap it in the master view and the file contents are displayed on the right in the detail view. Rotate your iPad to a portrait position to focus your attention on the file's content, hiding the master view.

Orientation Matters

Most iPhone applications support only a single orientation. Many iPhone games are played in landscape mode, while many other iPhone apps are displayed in portrait mode. Like the iPad, the iPhone does support rotation and changes in orientation, but the small size of the device makes supporting different orientations unnecessary. Most users hold their iPhones in portrait mode with the Home button at the bottom when using applications, rotating to landscape orientation only to play a game.

The iPad is different. With the iPad, users grab the device and turn it on without regard to a certain orientation. This is even truer when the iPad is not in a case. Try this little experiment . . .

Place your iPhone, or iPod touch, on your desk or table with the Home button pointing at 10 o'clock. Walk away or turn around. Come back to the device and pick it up. Take a look at the device as you hold it in your hand. There's a good chance that as you picked up the device, you rotated it so that the Home button is at the bottom. You did this rotation even before turning on the device. It is an almost natural instinct to hold your iPhone with the Home button at the bottom.

Now try the same experiment, but this time use your iPad. Place it on your desk or table. Make sure the Home button is positioned away from you—say, at 10 o'clock—and then walk away. Come back and pick up your iPad. Chances are good you did not rotate the device. Instead, you are likely holding your iPad in the same orientation it was in before you picked it up.

Multi-Touch Amped Up

Did you know that the iPad and the iPhone support the same multi-touch interface? They do. As a matter of fact, the iOS multi-touch interface supports up to 11 simultaneous touches. This means that you can use all your fingers—and maybe one or two more if you have a friend nearby—to interact with an application.

The iPad, with its larger screen, makes multi-touch use more feasible. While two-handed gestures have limited use on the iPhone, they can become a natural part of interacting with an iPad application. Take, for example, Apple's own Keynote app for the iPad. It takes advantage of the multi-touch interface to provide features once reserved for the point-and-click world of the desktop. Selecting multiple slides and moving them is just one example of how Keynote on the iPad maximizes the user experience with multi-touch.

So you already know that the multi-touch interface supports up to 11 simultaneous touches, but how can you confirm this? Write an iPad app that counts the number of simultaneous touches. That is exactly what Matt Legend Gemmell did. He wrote a really neat iPad app, shown in Figure P.4, that shows the number of simultaneous touches. But Matt went beyond just showing the touch count. He made the app sci-fi-looking, which also makes it fun to play with.

You can read more about Matt's iPad multi-touch sample and download the source code from his blog posting.[2]

Another way to explore the iPad multi-touch interface is to play with Uzu for iPad, only $1.99 in the App Store.[3] Uzu is a "kinetic multi-touch particle visualizer" and it's highly addictive. (Figure P.5 doesn't do the app justice; you should really download and play around with Uzu if you want to see some clever use of multi-touch.)

2. Multi-touch sample: http://mattgemmell.com/2010/05/09/ipad-multi-touch/
3. Uzu: https://itunes.apple.com/app/uzu/id376551723?mt=8

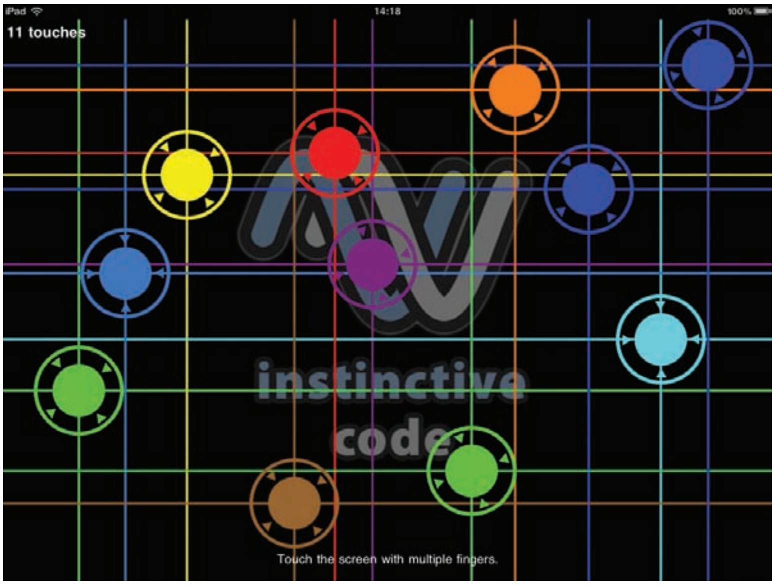

Figure P.4 Matt Legend Gemmell's multi-touch sample app for the iPad illustrating 11 touches

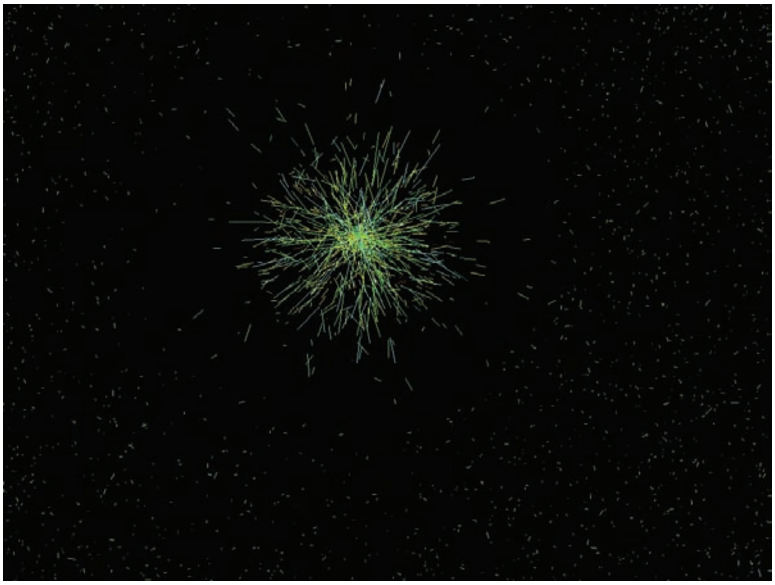

Figure P.5 Uzu, the particle visualizer for the iPad

The iPad Bridges the Gap between the Phone and the Computer

So, everyone agrees that the iPad is not an oversize iPhone. Great, glad to have you on the same page here. Now on to the larger question: Is the iPad a replacement for a laptop or desktop? No, not yet, but it's pretty darn close.

For many users, the iPad represents a mobile device bridging the gap between the smartphone and a full-fledged computer, whether a laptop or desktop computer. While many individuals use the iPad for content consumption, the iPad is also used to perform a good number of tasks previously left to the desktop or laptop computer. This causes iOS developers to rethink how to implement software concepts that have been around for eons. Word-processing software is one such concept that is seeing new life on the iPad.

The iPad opens the door to a wide range of applications not feasible on the small form factor of the iPhone. Word processing, again, is one such application that comes to mind.

While the iPhone is great for capturing quick notes, it is not ideal for writing lengthy documents. And while it is technically possible to implement a full-featured word processor on the iPhone, why would you? The screen is too small, and even in landscape mode, typing two-thumbed on a tiny screen would be less than productive. The iPhone is ideal for performing simple, quick tasks—writing a note, scheduling an event, marking a to-do item as complete—but it is less than ideal for lengthier tasks such as writing a book.

Enter the iPad

The iPad provides an experience similar to a small laptop. And when combined with a wireless keyboard, your iPad becomes a nice setup for writing long documents. I'm speaking from experience. A lot of the text in this book was originally written on an iPad. I can't imagine what writing a book on an iPhone would be like, but I know what it is like on the iPad, and it is a joy. Best of all, the iPad allows you to concentrate on a single task. This eliminates distractions and gives you better focus on the task at hand.

Organization of This Book

This book provides you with a hands-on guide for, as the book's title states, learning iPad programming. It walks you through every stage of the process—from downloading and installing the iOS SDK to submitting the first application to Apple for review.

There are 28 chapters and one appendix in the book, as follows:

- Part I, "Getting Started"

  Part I introduces you to the tools of the trade. Here you learn about developer tools such as Xcode and Interface Builder. You learn how to write code using

Objective-C and the Cocoa framework. And you learn what it takes to provision your iPad as a development device.

- Chapter 1, "Your First App"

  This chapter immediately immerses you in creating your first application. It provides a step-by-step guide to creating a simple, but functional, iPad application that runs in the iPad Simulator. You'll use Xcode to create the application, which means there is also some light coding to be done, but knowledge of Objective-C is not required at this point in the book. The goal of this chapter is for you to immediately get your hands on the tools and the code you'll use to create iPad apps.
- Chapter 2, "Getting Started with Xcode"

  Xcode is the developer's integrated development environment (IDE) used to write Objective-C code for iPad applications. This chapter highlights key features of Xcode, including recommended preference settings, commonly used shortcut keys, and descriptions of the various windows you will see when using Xcode.
- Chapter 3, "Getting Started with Interface Builder"

  In this chapter, you explore Interface Builder (IB). Interface Builder is the tool used to create an application UI with no programming required. This chapter explains how to use IB and many of its useful features. In addition, the chapter warns you about common mistakes made when using IB, such as forgetting to associate an event with an `IBAction`.
- Chapter 4, "Getting Started with Objective-C"

  This chapter introduces Objective-C by providing a brief overview of the programming language of choice for iPad programming. It is not intended to be a comprehensive review of the programming language, but instead to provide enough information to get you started in writing your first real iPad app.
- Chapter 5, "Getting Started with Cocoa"

  A programming language is only as powerful as the frameworks that support it, and Cocoa provides an impressive stack of frameworks and a library that make it possible for you to build your iPad app in less time.
- Chapter 6, "Provisioning Your iPad"

  Walking down the yellow brick road to the wonderful world of iPad development can have its own set of scary moments. One of the scariest is dealing with provisioning profiles, certificates, and registering a device for testing. Xcode 4 provides improvements in this area, but it is still far from perfect. This chapter guides you through the ominous forest of provisioning profiles, certificates, and device registration.

- Chapter 7, "App Design"

  You can't build an app if you don't know what you're building. This chapter shares tips on designing an application before the first line of code is ever written.

- Part II, "Building PhotoWheel"

  Part II is the heart of the book—where you get hands-on practice with building a real iPad app. The app you build is no simple "Hello, World" app. Rather, it is PhotoWheel, a full-featured photo app. In Part II, you learn about everything from creating custom animations for view transitions to iCloud syncing to viewing your photos on TV.

  - Chapter 8, "Creating a Master-Detail App"

    You start building PhotoWheel by first building a prototype of it. While building the prototype, you have a chance to learn about the splitview controller used in master-detail apps.

  - Chapter 9, "Using Table Views"

    In this chapter, you learn the basics of displaying data using table views. You also learn how to reorder, delete, and even edit data displayed in a table view.

  - Chapter 10, "Using Collection and Custom Views"

    In this chapter, you dive into the world of views. Here you learn how to use the collection view introduced in iOS 6, and create a custom wheel view for displaying photos.

  - Chapter 11, "Using Touch Gestures"

    This chapter teaches you how to take advantage of the iPad's multi-touch screen. You learn to use touch gestures so that users can interact with your app.

  - Chapter 12, "Adding Photos"

    PhotoWheel deals with photos, so it is only natural that you need to learn how to add photos to the app. In this chapter, you discover how to retrieve photos from the Photos app library and how to take new photos using the device's built-in camera.

  - Chapter 13, "Data Persistence"

    PhotoWheel won't be very useful if people can't save their work. In this chapter, you explore Core Data, and you learn how to use it to persist data in your application.

  - Chapter 14, "Storyboarding in Xcode"

    A storyboard is an exciting new way to design an app's user interface. In this chapter, you get hands-on practice with storyboarding, and you learn how you can do more with less code by using Interface Builder.

- Chapter 15, "View Controllers and Segues"

  A storyboard can take you only so far. At some point in time, you must write code to make your app really shine. In this chapter, you learn how to take advantage of view controllers to do more, and you learn how to create segues that transition between view controllers.
- Chapter 16, "Building the Main Screen"

  In this chapter, you dive into PhotoWheel. Prototyping is over and you have the basic UI in place with a storyboard. Now it's time to build the main screen, and that's exactly what you do in this chapter. You also learn how to use container view controllers, and you build a custom grid view that can be used in other projects.
- Chapter 17, "Creating a Photo Browser"

  In this chapter, you learn how to use a scroll view to create a full-screen photo browser. You also learn how to use a pinch gesture to zoom in and out on a photo.
- Chapter 18, "Supporting Device Rotation"

  Users expect iPad apps to display properly regardless of how the device is being held. A user may hold his iPad with the Home button on the left or right, or maybe on the top or bottom. As a developer, it is your job to ensure that your app displays properly regardless of the device's orientation. That is what you learn in this chapter: how to support device rotation. You also learn how to leverage Cocoa Auto Layout for supporting rotation of your user interface.
- Chapter 19, "Printing with AirPrint"

  This chapter gets straight to the point and teaches you how to print from your app using AirPrint.
- Chapter 20, "Sharing with Others"

  Virtually everyone has an email account these days, and everyone loves looking at photos. So it only makes sense that PhotoWheel users will want to share photos with family and friends using email. In this chapter, you learn how to send email from your app. But the chapter doesn't stop there—you also learn how to use the Activity View Controller for sharing photos through social networks such as Facebook and Twitter.
- Chapter 21, "Web Services"

  Adding photos already found on your iPad to PhotoWheel is a nice exercise, but many people keep their photos stored elsewhere. In this chapter, you learn how to make an iPad app communicate with a Web server so that you can search for and download photos from Flickr.

- Chapter 22, "Syncing with iCloud"

  Many people have multiple iOS devices, and it would be great if they could use PhotoWheel with the same data on all of them. Syncing can be a challenge, but with iCloud it becomes a lot easier. In this chapter, we add online syncing of photos and albums.
- Chapter 23, "Producing a Slideshow with AirPlay"

  The iPad has a great screen, but you might want to show photos to a group, and it's awkward to gather everyone around a hand-held device. In this chapter, you see how to make use of external wireless displays—a large TV set, maybe—from an iPad app. You'll use AirPlay for this purpose, so you don't need to run cables across the room.
- Chapter 24, "Visual Effects with Core Image"

  Core Image is an amazingly cool framework for analyzing and changing images. As if color effects and automatic photo enhancement weren't enough, you can also use Core Data Image to locate the faces of any people in the picture. You add all of these capabilities to PhotoWheel in a convenient user interface that allows people to preview effects before committing to them.
- Chapter 25, "Going Universal"

  Part II wraps up with a discussion of turning your iPad app into a universal app. A universal app takes full advantage of the device it's running on, and it extends the target audience for your iPad app to include iPhone users.

- Part III, "The Finishing Touches"

  In the final part of the book, you learn tips on debugging your app. Even more important, you learn how to distribute your app to others.

  - Chapter 26, "Debugging"

    At this point you know how to create an iPad application, but what happens when a problem occurs? This chapter is devoted to application debugging. It explores the LLDB. and shows you how to turn breakpoints on and off, and how to use sounds to debug your app. The chapter also introduces you to more advanced debugging techniques such as using Instruments to track down memory leaks.
  - Chapter 27, "Distributing Your App"

    At this point, the application has been written, debugged, and tested. The next step is to get the application into the hands of users. This chapter explores the options for distributing iPad applications, focusing on the two most commonly used distribution methods: Ad Hoc and App Store.
  - Chapter 28, "The Final Word"

    The book ends with some final words of encouragement for the new iPad programmer.

- Appendix A, "Installing the Developer Tools"

  This appendix walks you through the steps needed to start programming for the iPad. These measures include setting up an iOS developer account, downloading the iOS SDK, and installing the developer tools on your Mac.

Learning iPad Programming takes you from app design to the App Store. Along the way, you learn about the developer tools, the programming language, and the frameworks. But more important, you learn how to build a full-featured iPad app that you can show off to family and friends.

Audience for This Book

This book is intended for programmers who are new to the iOS platform and want to learn how to write applications that target the iPad. The book assumes that you are new to iPad programming and have little to no experience with Xcode and the Objective-C programming language. At the same time, it assumes that you have some prior programming experience with other tools and programming languages. *Learning iPad Programming* is not intended for individuals with absolutely no prior programming experience.

This book is targeted to programmers who want to learn how to develop sophisticated applications for the iPad using iOS 6. You are expected to have a Mac on which you can create programs using Xcode and Interface Builder, as well as an iOS developer account and an iPad. Some programming experience is helpful, particularly knowledge of the C programming language, although there is a chapter on object-oriented programming with Objective-C to give you a head start in this area.

Learning iPad Programming will also appeal to experienced iOS developers—people who have programmed and submitted apps to the App Store for the iPhone and iPod touch. If you are an experienced reader, you can skip over the basics, if you so choose, and quickly get to work on the example projects used throughout the book.

Getting the Source Code for PhotoWheel

The source code from each chapter as well as the source code for PhotoWheel as presented in this book is available from the book's Web site.[4] Work on PhotoWheel doesn't stop at the end of this book, either. There is so much more to do with the app and so much more to learn. The most up-to-date source code is available on github.[5]

4. PhotoWheel source code: http://www.learningipadprogramming.com/source-code/
5. PhotoWheel on github: https://github.com/kirbyt/PhotoWheel

You will also find more how-to articles and tips for improving PhotoWheel at the book's blog site.[6]

Should you have additional questions, or want to report a bug or contribute a new feature to PhotoWheel, feel free to send email to **kirby@whitepeaksoftware.com** or **tph@atomicbird.com**, or send a message to **@kirbyt** or **@atomicbird** on Twitter and App.net.

There is plenty of code to review throughout the book, along with exercises for you to try, so it is assumed that you have access to the Apple developer tools such as Xcode and the iOS SDK. Both of these toolkits can be downloaded from the Mac App Store as part of the Xcode download.[7]

Artwork Provided by

Matt McCray is the swell guy who provided the artwork in PhotoWheel. Reach out to Matt if you're looking for a designer for your next app. He can be reached at matt@elucidata.net and his Web site is at **www.elucidata.net**.

6. Book's blog site: http://www.learningipadprogramming.com/blog/
7. Xcode download: https://itunes.apple.com/us/app/xcode/id497799835?mt=12

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Acknowledgments

As for any book that gets written, there's an entire cast and crew who remain hidden from the limelight; please take a moment to hear us out as we thank the supporting cast. . . .

Acknowledgments from Kirby Turner

I want to first thank my wife, Melanie, and my son, Rowan, for their support and patience while I focused on completing this book, and their understanding when I said I want to write a second edition. I want to thank Tom for agreeing to co-author this book. I want to give a huge THANKS to Chuck Toporek for convincing me to write, and Trina MacDonald for being an outstanding and patient editor. I also want to thank the production team for their hard work making this book look good. And, of course, I want to say thanks to the technical reviewers, Andrew, Michael, and Patrick. Your feedback is invaluable.

Lastly, I want to thank the amazing team of engineers at Apple for bringing the fun back to programming for me. And I want to thank the Mac and iOS developer community. None of this would be possible if not for the passion and spirit of this unique community.

Acknowledgments from Tom Harrington

I'd like to thank Kirby for inviting me to be part of this book. I'd also like to thank our technical reviewers and the rest of the production team for all their hard work making me look good in print. Apple continues to advance its software and tools at a breakneck pace, which makes it a challenge to write a book and get it into print while it's still current. Everyone involved has done a great job dealing with the challenges of writing a book on a topic that's constantly in flux.

On a closely related note, thanks to everyone at Apple for their hard work on iOS and the iPad. Without them we wouldn't have such a cool topic to write about.

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About the Authors

This book is brought to you by. . . .

Kirby Turner is an independent software developer and Chief Code Monkey at White Peak Software Inc., where he focuses on iOS and Mac programming. When Kirby is not sitting behind the keyboard, he can be found hanging out with his wife and son, hiking the mountains of New England, kayaking the waters in and around Salem, Massachusetts, and snowboarding down mountains in search of magic powder. Follow Kirby on Twitter and App.net: @kirbyt.

Tom Harrington is an independent iOS and Mac software developer and is available for contract work, technical conferences, and parties. He also organizes iOS developer events in Colorado. Follow Tom on Twitter and App.net: @atomicbird.

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As the reader of this book, you are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

You can email or write me directly to let use know what you did or didn't like about this book—as well as what we can do to make our books stronger.

Please note that we cannot help you with technical problems related to the topic of this book, and that due to the high volume of mail we receive, we might not be able to reply to every message.

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1
Your First App

There is no better way to learn than by actually doing something, so let's dive in by writing a really simple iPad app. The first application you will write is a Hello World app. Yes, the Hello World sample application is overdone, but don't worry—you will be building more sophisticated applications later in this book. For now, it's important to get your hands dirty with some code and the tools.

The goal for this chapter is to give you a sneak peek at the tools you will be using to build your iPad applications. If you are already familiar with Xcode, you may wish to skip ahead to Chapter 4, "Getting Started with Objective-C," or Chapter 6, "Provisioning Your iPad." If you are new to Xcode, please continue reading.

The rest of this chapter will guide you through the steps needed to create your first iPad application. The chapter does not go into detail about Xcode. Instead, those details are covered in the following chapters: Chapter 2, "Getting Started with Xcode," and Chapter 3, "Getting Started with Interface Builder."

> **Note**
>
> Before you begin, you must have Xcode and the iOS SDK installed on your Mac computer. If you do not have these installed, jump to Appendix A, "Installing the Developer Tools," for instructions on how to set up your Mac for iPad programming. This book assumes you are using Xcode 4.5 or newer. And yes, a Mac computer is required.

Creating the Hello World Project

Let's begin by launching Xcode. If you are running Mountain Lion (Mac OS X 10.8) and you downloaded Xcode from the Mac App Store, it is available in Launchpad, shown in Figure 1.1; otherwise, you can find it in your Applications folder. Click the Xcode icon to launch it.

> **Note**
>
> You may find having Xcode on the Dock more convenient than using Launchpad. Adding Xcode to the Dock is simple. First, launch Xcode from Launchpad. While Xcode is running, right-click (or **Control-click**) on the Xcode icon that appears in the Dock and select **Options > Keep in Dock.** This will keep the Xcode icon in the Dock even when the program is not running, making it easier to launch Xcode the next time you need it.

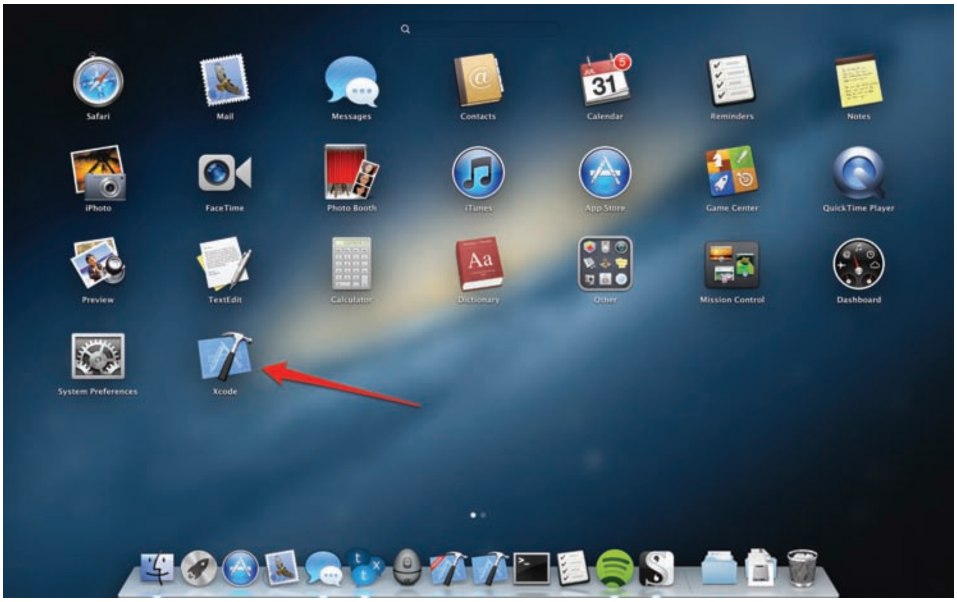


Figure 1.1 The Xcode icon as seen in Launchpad

The first window you see after launching Xcode is the Welcome to Xcode screen, shown in Figure 1.2. You can do a number of things from this window, including creating a new project, connecting to a source code repository, going to the *Xcode 4 User Guide* (a tutorial on using Xcode), or visiting Apple's Developer site.[1] If you have created or opened Xcode projects in the past, you will also see a list of recent projects on the right side of this screen. You can open a recent project by selecting it from the list and clicking **Open**.

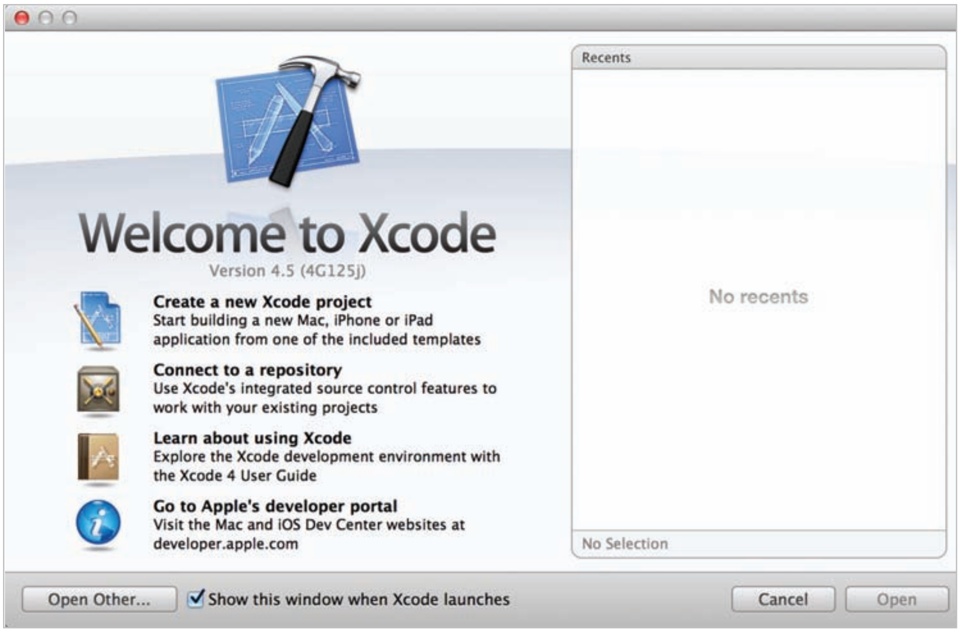
Tucked away in the lower-left corner is the **Open Other...** button. You can click this button to open an existing Xcode project found on the file system. Next to this button is a check box indicating whether the Welcome to Xcode window is displayed when Xcode launches.

Note

If you are new to Xcode, you should take the time to read through the *Xcode 4 User Guide*, which provides complete coverage of the entire Xcode tool set. You will learn about Xcode in this book; however, reading the official guides from Apple is always a good thing.

You want to create a new iPad application, so click the **Create a new Xcode project** button. This opens the new project window, as shown in Figure 1.3. Let's

1. Apple Developer site: http://developer.apple.com



Create a new Xcode project
Start building a new Mac, iPhone or iPad application from one of the included templates

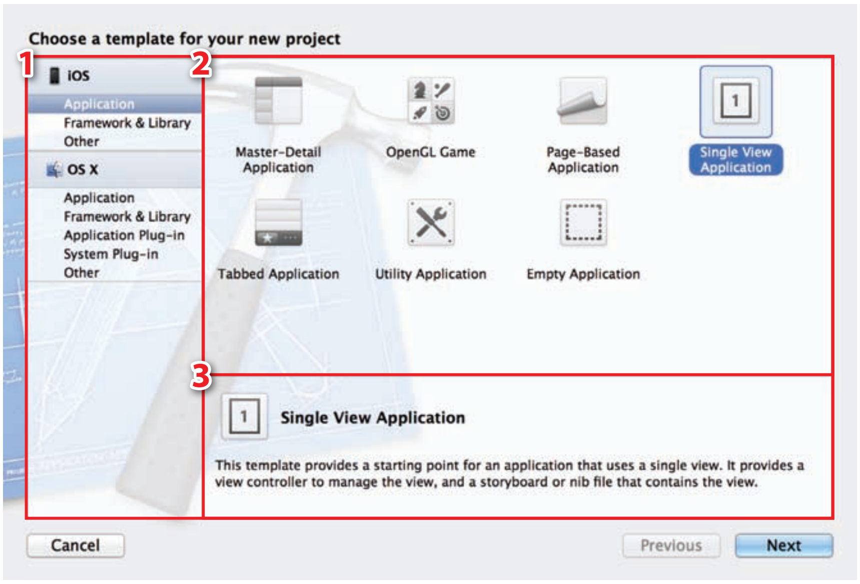
Connect to a repository
Use Xcode's integrated source control features to work with your existing projects

Learn about using Xcode
Explore the Xcode development environment with the Xcode 4 User Guide

Go to Apple's developer portal
Visit the Mac and iOS Dev Center websites at developer.apple.com

[✓] Show this window when Xcode launches

Figure 1.2 Welcome to Xcode window



Single View Application

This template provides a starting point for an application that uses a single view. It provides a view controller to manage the view, and a storyboard or nib file that contains the view.

Figure 1.3 The new project window in Xcode, with callouts on sections of Xcode's user interface (1: target type; 2: project template; 3: template detail)

explore this window for a moment before continuing. As you can see in the figure, the new project has three main sections:

1. Target type
2. Project template
3. Template detail

In section 1, you select the target type: iOS or Mac OS X. iPad applications run on iOS, so you can ignore the Mac OS X target type for now. Under iOS you can build two types of targets: Application and Framework & Library. The Application type is exactly what the name implies; you use it to build iPhone and iPad applications. The Library target type is for building reusable static libraries, which you can also ignore for now.

The Hello World application you are building is just that, an application. Thus, in section 1 under iOS, you select Application. When you do so, you'll notice that the content in section 2 changes. Section 2 now displays the list of available templates for the selected target type. A template is used to generate the initial files needed for an Xcode project.

If you have spent time playing with your iPad, you may have noticed that there are some common application types, or styles. The templates listed in section 2 help speed the process of creating an application of a particular style. For example, if you wanted to create an application that looks similar to the Mail app on the iPad, you would select Master–Detail Application.

Application Templates

The application templates you'll encounter in Xcode after selecting iOS as your target include the following types:

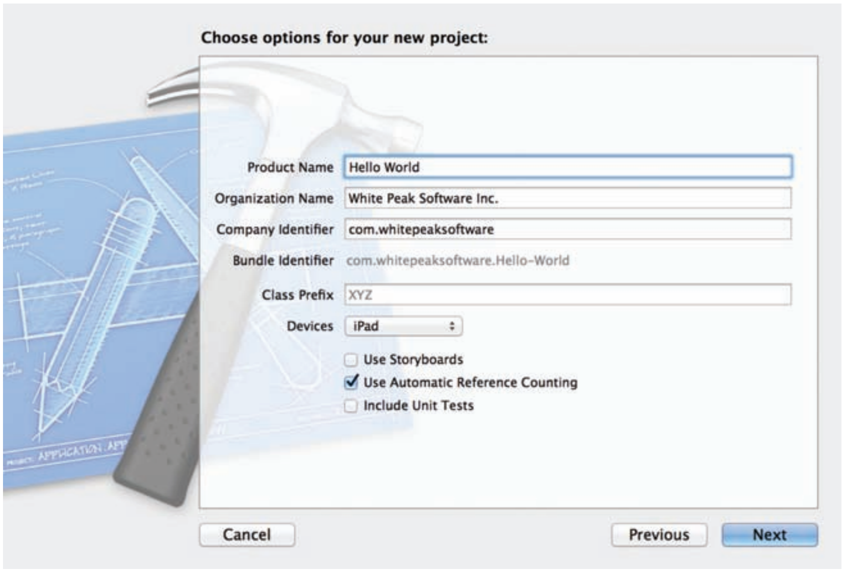
- **Master-Detail Application**: Select this template when you have a master-detail style of application and wish to leverage the split view controller for display.
- **OpenGL Game**: Select this template when you want to create a game using OpenGL ES. This template provides a view with an OpenGL scene and timer to animate the view.
- **Page-Based Application**: Select this template to create a book- or magazine-style app that uses the page view controller.
- **Single View Application**: Select this template for applications that use a single view.
- **Tabbed Application**: Select this template for applications that have separate areas defined by tabs. This template provides a tab bar controller and view controllers for two tabs.
- **Utility Application**: Select this template for applications that have a main view and an alternate view.
- **Empty Application**: This template provides a starting point for any type of application. Select this template when you want to start with a bare-bones project shell.

The Hello World application will consist of a single view, so select Single View Application from the list of templates. When you do so, notice that the content of the template detail section changes. This section shows a brief description of the template selected in the project template section.

Clicking the **Next** button takes you to the project options screen, shown in Figure 1.4. Project options vary slightly based on the template. Each template has options for the Product Name, Organization Name, Company Identifier, Bundler Identifier (which is completed for you based on the Company Identifier and Product Name), Class Prefix, and Device Family. Additional options that may be found on an application template include Use Storyboard, Use Automatic Reference Counting, Use Core Data, and Include Unit Tests. The application template you select determines which additional options are made available.

For the Hello World app you are building, enter "Hello World" for the Product Name. The Organization Name can be any value you like, as it is used only in the copyright message included in the comment section that is added to the top of each *.h* and *.m* file created by Xcode for the project.

For the Company Identifier, enter your name or company name using the reverse domain name format. (For example, com.kirbyturner is my individual name and com.whitepeaksoftware is my company name.) Chapter 6, "Provisioning Your iPad," explains the relationship between the company and bundle identifiers and describes how they are used to form the App ID.


Choose options for your new project:

Product Name: Hello World
Organization Name: White Peak Software Inc.
Company Identifier: com.whitepeaksoftware
Bundle Identifier: com.whitepeaksoftware.Hello-World
Class Prefix: XYZ
Devices: iPad

[ ] Use Storyboards
[✓] Use Automatic Reference Counting
[ ] Include Unit Tests

Figure 1.4 Project options for the Single View Application template

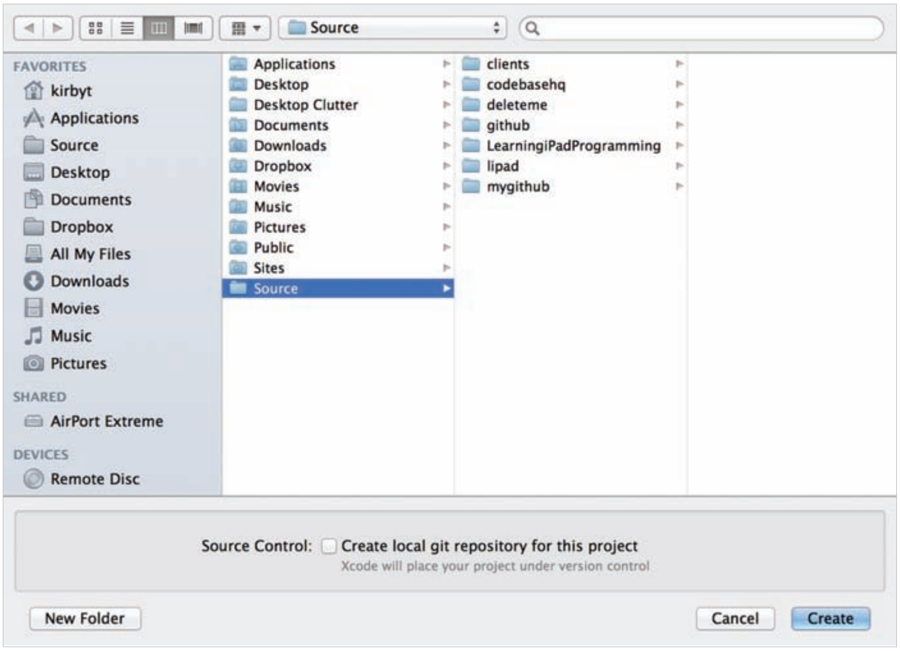
The Class Prefix can be used to append a string value to the beginning of each class generated by the application template. For the purpose of simplicity, you can leave the Class Prefix blank for this app.

Next, select iPad as the Device Family. There are three device family types in iOS: iPad, iPhone, and Universal. The device family iPad indicates that the app is designed for and runs on the iPad only. The iPhone device family indicates that the app is designed for the iPhone, and Universal says that the app is designed for and runs on both the iPad and the iPhone.

You do not need storyboard and unit tests in this Hello World app, so leave those options unselected. (Storyboarding is covered in Chapter 14, "Storyboarding in Xcode.") But do select the Use Automatic Reference Counting option—it determines how memory of an object is managed, and is explained in the Memory Management section of Chapter 4, "Getting Started with Objective-C." Click the **Next** button, choose a storage location for the Xcode project, and then click the **Create** button (shown in Figure 1.5).

Note

I like to keep all my source code together in a single location, so I created a *Source* directory within my home directory. I place all my Xcode projects under *Source* so I can easily locate them in the future.



Source Control: Create local git repository for this project
Xcode will place your project under version control

Figure 1.5 Choose the location where your Xcode project is stored.

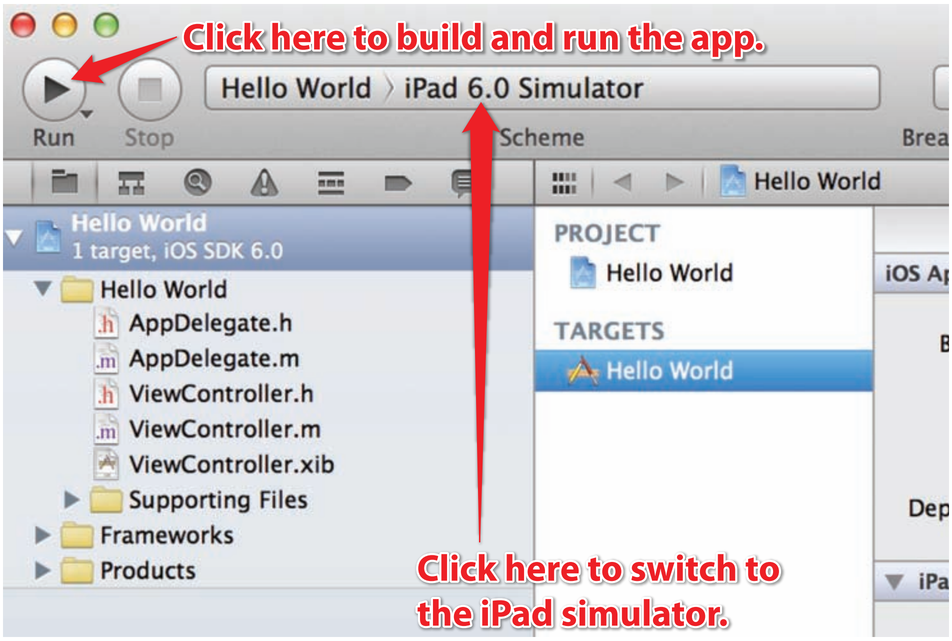


Figure 1.6 Xcode project window for the Hello World app

Congratulations! You just created your first iPad application. You don't believe it? Click the **Run** button (shown in Figure 1.6), or press **Command-R**. Be sure the active schema is set to the iPad Simulator. If it is not, click it and change it to the simulator.

Universal App

iPhone apps can run on the iPad, but they run in an iPhone emulator. Because they do not take advantage of the iPad's full screen, this behavior leads to a less than ideal user experience. A universal app, in contrast, is designed to take full advantage of the screen real estate provided by both the iPhone and the iPad. When a universal app is run on an iPhone, it looks as if it was designed for the iPhone. Conversely, when a universal app is run on an iPad, it looks like an iPad app, not an iPhone app.

A universal app gives the user the best of both worlds—a single app that looks great on both devices. However, this comes at a cost to you, the developer. Developing a universal app, in many ways, is like developing two separate apps, one for the iPad and one for the iPhone, and packaging them into a single app binary.

Universal apps are designed to target both the iPad and the iPhone. The focus of this book, however, is on writing iPad applications. To keep you focused, and to avoid the additional complexities of writing universal apps as you start your journey toward becoming an iOS developer, universal apps are not covered until the end of Part II in this book.

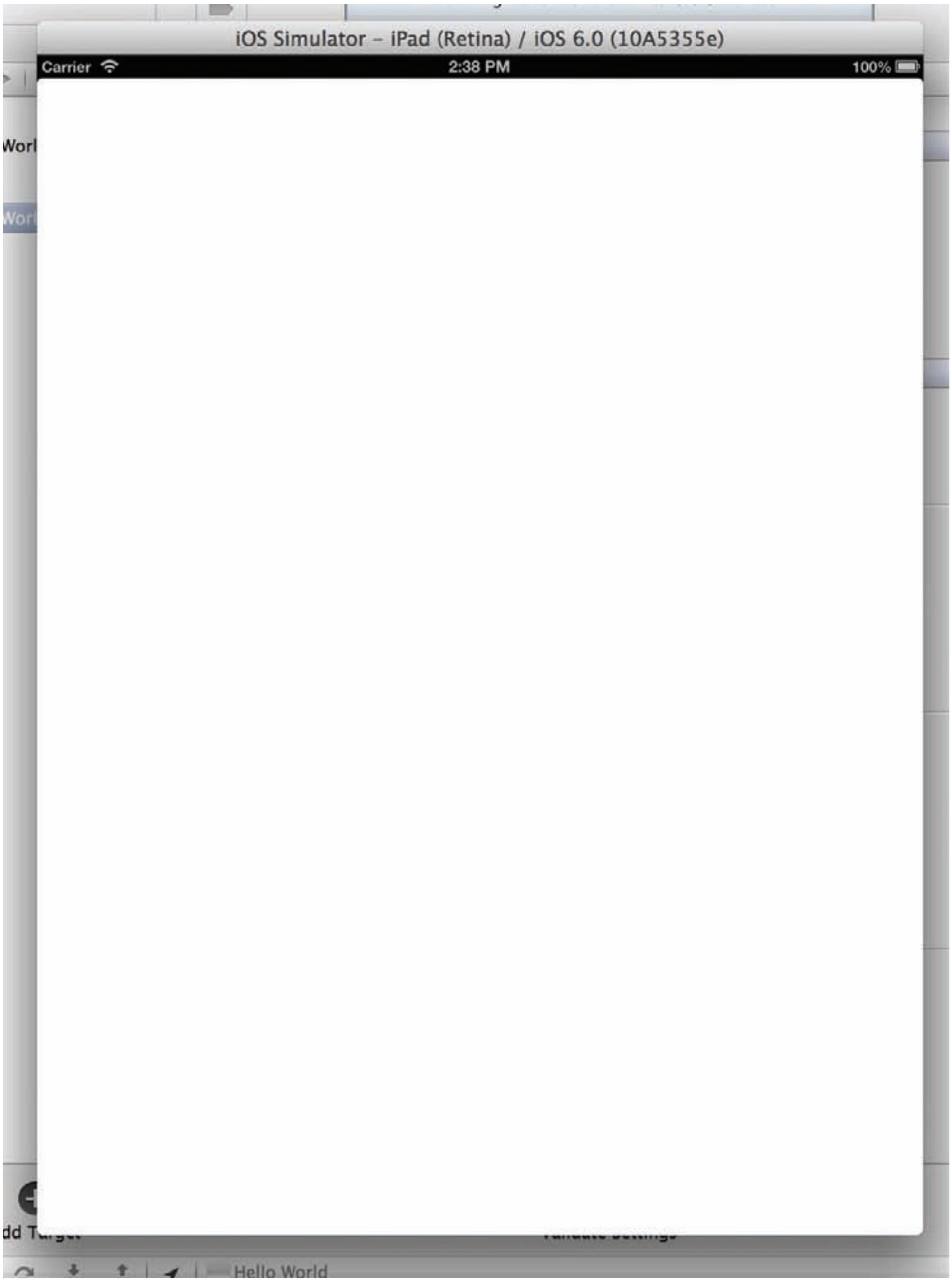


Figure 1.7 A “blank” single view app running in the iPad Simulator

When you click **Run**, Xcode compiles the project, builds an application package, installs the application on the iPad Simulator, and finally launches the application inside the simulator. As you can see in Figure 1.7, the application is nothing more than a white screen. Guess what? You just built your first flashlight app for the iPad!

> **Note**
>
> Sometimes you will notice a delay between the time the simulator is launched and the time your app launches within the simulator. When this delay happens, you see nothing but a black screen within the simulator. This is normal, and it usually happens only the first time you launch your app in the simulator.

You can take your newly created flashlight application and submit it to Apple for review. However, there is a high level of certainty that Apple will reject your masterpiece because of its lack of functionality. Besides, you are not done with this app. You want to build a Hello World application, and, as you can see, "Hello World" does not appear when this application is run. So let's continue working on it.

First, stop the app, which is running in the simulator. You can do so by clicking the **Stop** button at the upper-left side of Xcode or by pressing **Command-.** in Xcode (not in the simulator). Now you're ready to start modifying the app.

> **Note**
>
> When you use a project template, Xcode gives you a valid, runnable iPad application without your having to write a single line of code. Perhaps it is because I still have memories of being a teenager building apps 30 years ago, but I always get a little warm, fuzzy feeling when I see a new application run for the first time. As a matter of fact, the first thing I do when I create a new Xcode project is to build and run it. Seeing the application run for the first time gives me a little jolt of excitement.

Getting Text on the Screen

This is a Hello World app, so it should display "Hello World" somewhere on the screen. This can be accomplished by writing some code, but the easiest approach is to use Interface Builder. Interface Builder, or IB as it is often called, is the visual user interface designer built into Xcode. You'll learn more about IB in Chapter 3, "Getting Started with Interface Builder," but for now steps are provided to guide you through turning this blank application into a not-so-useful Hello World app.

To add "Hello World" to the display, you'll edit the file *ViewController.xib*. A *.xib* file, pronounced "zib," is an XML representation of a NIB file. A NIB file, or *.nib*, is the binary predecessor of the *.xib* file. Being text based, a *.xib* file has the benefit of working better with version-control systems when compared to the earlier binary *.nib* version. That said, *.xib* files are still compiled down to *.nib* files when you build the application.

What is a NIB file? It is a file created by Interface Builder to archive interface objects and their relationships. Put another way, a NIB represents the objects that make up the visual display of a screen. You create and edit NIB files using IB, and your application uses the NIB files at run time to display the user interface of the app.

Note

iOS developers often refer to a *.xib* file as a NIB file because it is, after all, just a text-based representation of a NIB file.

History

The *N* in NIB is a carryover from the NeXTSTEP days when it was used to indicate the NeXT-style property list file. The *IB* indicates that the file is an Interface Builder file.

Begin by opening the file *ViewController.xib*, available in the Project navigator. This changes the contents of the Editor area. It displays the NIB file using the IB designer, as shown in Figure 1.8.

Note

Chapter 3, "Getting Started with Interface Builder," covers all the utilities available with IB.

IB has a set of available utilities for working with a NIB file. Press **Control-Option-Command-3** to display the Object library. The Object library contains a list of visual and nonvisual components that are used to construct the user interface. In the filter bar at the bottom, type "Label" without the quotes. This will filter the object list, displaying only label-type objects.

Drag and drop the label object onto the view's canvas area. This creates a new `UILabel` instance, which is the type of object representing a label. Next, open the Attributes inspector (**Option-Command-4**). At the top of the Attributes inspector is a property named Text. Change the default value "Label" to "Hello World." Xcode should now look similar to Figure 1.8.

You may need to resize the label to view the entire "Hello World" content. To resize it, move the mouse cursor to the right edge of the label object. The cursor will change to the resize indicator. Click and drag the mouse to the right to increase the width of the label.

Build and run the app in the iPad Simulator. Congratulations! You have written your first Hello World app for the iPad.

Note

Don't worry if none of this is making sense yet. Remember—the goal of this chapter is to give you a sneak peek into iPad programming by way of a step-by-step guide. This discussion is intended to give you a sense of what it is like to program for the iPad. Later chapters will explain all you need to know in detail, and before you know it, the steps for creating iPad applications will be second nature to you.

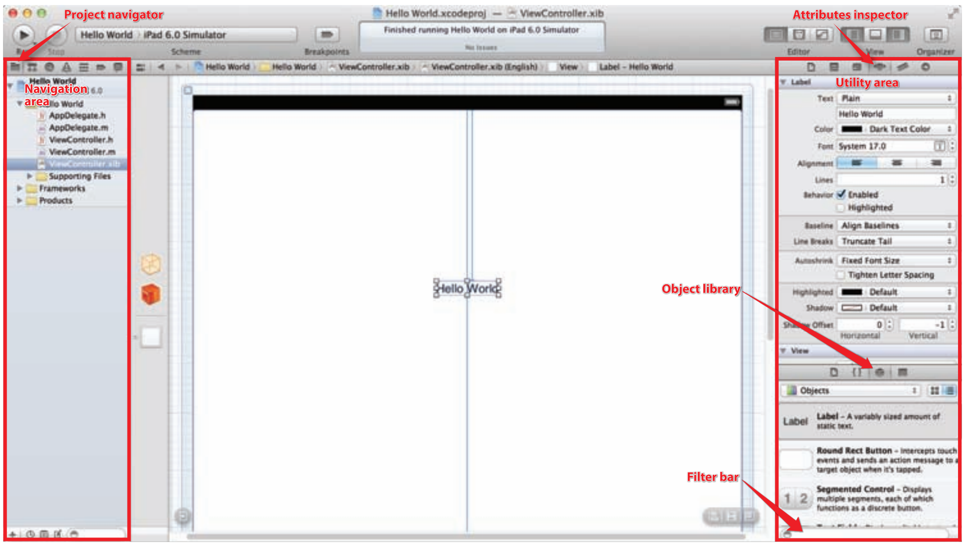


Figure 1.8 Adding “Hello World” to the main view of the app

Say Hello

Now that the excitement of creating your first application for the iPad has worn off, let’s extend the application by adding some functionality to it. Instead of having it always display “Hello World,” let’s change the app to first ask for a name, then display a “Hello” message in response to the name entered. This exercise is more involved and requires you to write some Objective-C code. Do not worry if you have never seen Objective-C code before. You will be told exactly what to type, and you will explore Objective-C in more detail in Chapter 4, “Getting Started with Objective-C.”

In life there is often more than one way to accomplish a task. The beauty of iPad programming is that there are many different ways to do something. It is this flexibility in the development tools that makes many programmers prefer Xcode to other development tools. But it does take time to learn all the ins and outs, which can be frustrating for programmers new to Xcode.

One of the goals of this book is to show you the different ways a task can be accomplished. Armed with this knowledge, you can decide which approaches work best for you. For example, it is possible to use IB to generate Objective-C code that declares objects and actions defined in a *.xib* file. However, this discussion is saved for a later chapter. Instead, you’re going to write the Objective-C code yourself to extend functionality in the Hello World app.

Two screen elements are needed: one that accepts user input for the name and the other to display “Hello.” A third element, a button, is also needed to tell the app when to display the “Hello” message. The NIB file defines the objects that make up the user interface, but there is no automatic connection between the objects and the source code. Instead, you must make the connection.

Start by opening the file *ViewController.h*. You can find this file in the Project navigator. When you click it, the Editor area will display the contents of the file. Modify the file's contents so that the source code looks exactly as it does in Listing 1.1.

Listing 1.1 **Modified Version of *ViewController.h***

```
#import <UIKit/UIKit.h>

@interface ViewController : UIViewController

@property (nonatomic, weak) IBOutlet UILabel *helloLabel;
@property (nonatomic, weak) IBOutlet UITextField *nameField;

- (IBAction)displayHelloName:(id)sender;

@end
```

Next, open the file *ViewController.m*. Replace the generated source code found in the file with the source code in Listing 1.2.

Listing 1.2 **Modified Version of *ViewController.m***

```
#import "ViewController.h"

@implementation ViewController

@synthesize helloLabel;
@synthesize nameField;

- (IBAction)displayHelloName:(id)sender
{
   NSString *hello = [NSString stringWithFormat:@"Hello %@", [nameField text]];
   [helloLabel setText:hello];
}

@end
```

The code in Listing 1.1 does a number of things. First, two properties are added to the class `ViewController`. These properties are marked with `IBOutlet`, which is a hint to IB that the class contains a reference to an object. Next, the method `-displayHelloName:` is declared. It is marked with `IBAction`, another hint to IB, this time telling IB that an action exists in the class definition. At this point, the interface for the class `ViewController` has been defined.

What Are `IBOutlet` and `IBAction`?

`IBOutlet` and `IBAction` are special indicators for Interface Builder—hence the IB prefix. Interface Builder uses these indicators to connect objects and actions to elements in the user interface.

An `IBOutlet` is used to connect an object reference defined in Objective-C code to the object instance used in Interface Builder. For example, earlier in this chapter you placed a label on the view. That label is actually a `UILabel`. (`UILabel` is the class name for the label.) To access the label in code, you must have a reference to the instance of the `UILabel`. You will see later in this chapter how you connect the reference declared in code to the instance displayed in IB.

An `IBAction` is used to connect an event sent by an object to a method defined in code. For example, a button has an event that is fired when a user lifts her finger. This action can be connected to the `IBAction` defined in the Objective-C class.

The code in Listing 1.2 represents the implementation for the class `ViewController`. This implementation begins by synthesizing the two properties declared in the class interface, `helloLabel` and `nameField`. Property synthesis is an Objective-C compiler feature that generates the accessor methods for these properties at compile time. You'll learn more about this feature in Chapter 4, "Getting Started with Objective-C."

The property synthesis is followed by the implementation for the method `-displayHelloName:`. This method is the action that is called when the user interacts with the app—specifically, when the user taps a button—which you will provide momentarily. The implementation of this method creates a local string variable containing the name entered by the user with the prefix "Hello." This string is then displayed on the screen as the text value for the `helloLabel`.

If you were to run the app at this point, you would see no difference from the earlier version. While the code has been updated to do what you want it to do, the user interface has not been updated and the connections for the outlets and actions have not been made.

Note

This decoupling of the source code—in this particular case, the controller—and the user interface (also known as the view) is representative of the Model-View-Controller design pattern, which is discussed in Chapter 5, "Getting Started with Cocoa."

To complete the app, you need to update the user interface and connect the UI objects to the properties defined in the controller class. Once again, open the file *ViewController.xib*. Double-click the "Hello World" label and change its text value to "What is your name?" Resize the label as needed to display the entire text.

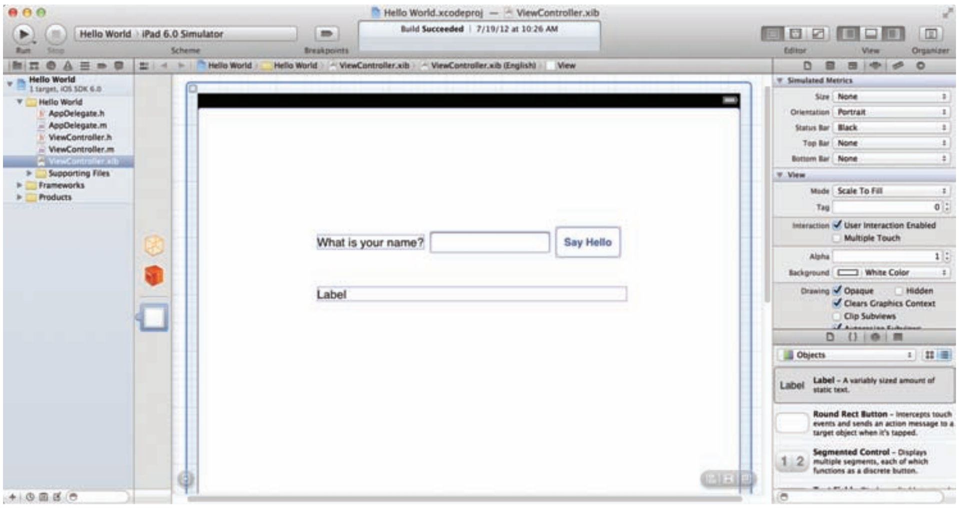
Search through the Object library in the Utilities area for the Text Field object. Alternatively, you can filter the object list by typing "text field" in the filter bar. Drag and drop a text field to the right of the "What is your name?" label.

Now search through the Object library for the Round Rect Button. Drag and drop an instance of this button to the right of the text field. In the Attributes inspector, change the Title property to "Say Hello."

Finally, search the Object library for Label, and drag and drop a new label onto the canvas, placing it under the other objects. Be sure to increase the width of the label to accommodate the string value created in the method `-displayHelloName:`. The view should look similar to Figure 1.9.

Now it's time to connect the objects and events defined in the NIB with the outlets and actions defined in the view controller source code. One way to connect objects to outlets and actions is to **Control-click** an object, and then drag the mouse cursor to another object. When the mouse button is released, IB will display a Heads-Up Display (HUD) of the connection options. For example, when you **Control-click** the *File's Owner* object (the translucent cube displayed in the left sidebar in the Editor area) and drag it to the text field (shown in Figure 1.10), a HUD is displayed, allowing you to connect the text field to the properties `nameField` and `view`. Select `nameField` to connect the text field to the property defined in *ViewController.h*.

Do the same thing to connect the label to the property `helloLabel`. **Control-click** the *File's Owner* cube and drag to the label where the output of the `-displayHelloName:` will be displayed.



Size: None
Orientation: Portrait
Status Bar: Black
Top Bar: None
Bottom Bar: None
Mode: Scale To Fill
Tag: 0
Interaction: ✓ User Interaction Enabled; Multiple Touch
Alpha: 1
Background: White Color
Drawing: ✓ Opaque; Hidden; ✓ Clears Graphics Context; Clip Subviews

Label – A variably sized amount of static text.
Round Rect Button – Intercepts touch events and sends an action message to a target object when it's tapped.
Segmented Control – Displays multiple segments, each of which functions as a discrete button.

Figure 1.9 The modified user interface file *ViewController.xib*

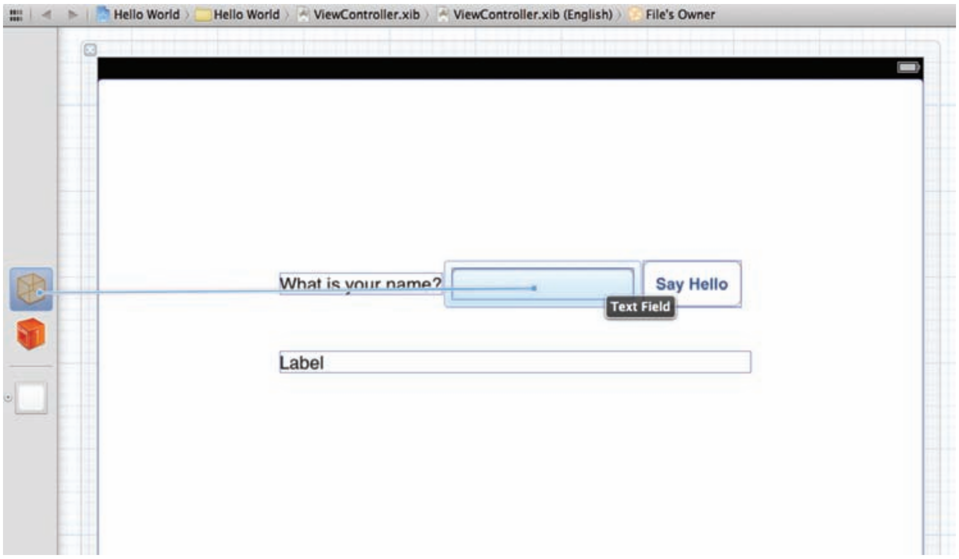


Figure 1.10 Connect the `nameField` property to the text field defined in the NIB file.

To connect the action to the **Say Hello** button, you **Control-click** the button and drag to the *File's Owner* cube. This will assign the action `-displayHelloName:` to the button event *Touch Up Inside*.

With the connections in place, the Hello World app is now functional. Build and run the app in the simulator. Tap the name field in the simulator to enter a value, and then tap the **Say Hello** button to dissplay the "Hello" message. The final app should look similar to Figure 1.11.

You might be wondering how IB is able to identify the correct Objective-C header file. It's simple: The file's owner is defined as being of type `ViewController`. This tells IB which source file to look at for outlets and actions. You can see this by clicking the *File's Owner* cube, and then typing **Option-Command-3**. The class name is set to `ViewController`. This is how an object defined in IB knows its type.

> **Note**
>
> A common mistake made in Interface Builder is forgetting to associate your outlets and actions. If you run the application and notice that the display does not update after the **Say Hello** button is touched, chances are good that the *Touch Up Inside* event for the `UIButton` is not associated with the `-displayHelloName:` action.

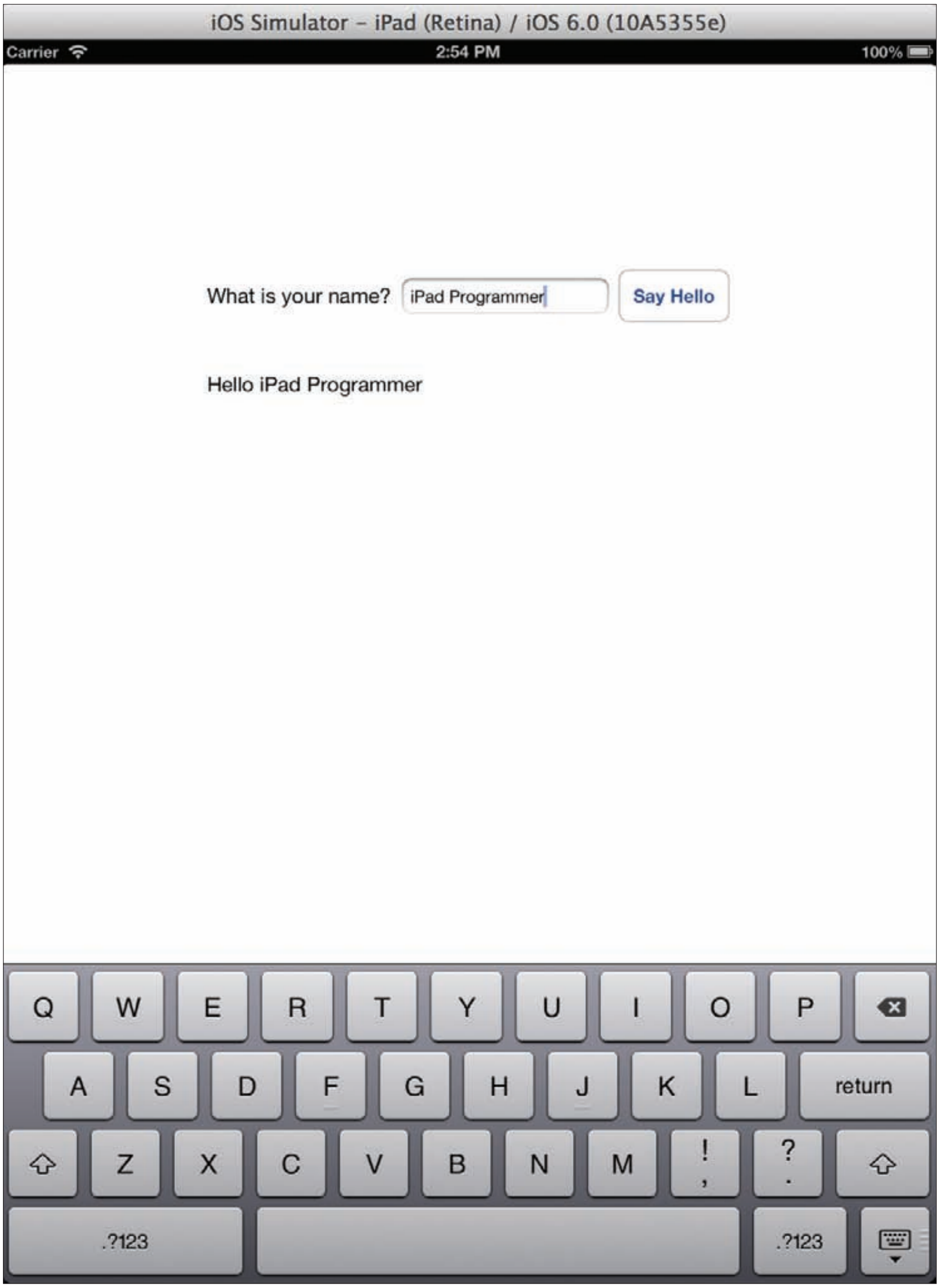


Figure 1.11 The new and improved Hello World app

Summary

Congratulations! You have completed your first iPad application—and you just got a sneak peek into iPad programming. This chapter should leave you itching to learn more. Before you dive into the meat of iPad programming, however, you need to learn more about the tools and programming language you will use. Let's begin by taking a closer look at Xcode in the next chapter.

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