packt

3RD EDITION

Unity 2022 Mobile Game Development

Build and publish engaging games for Android and iOS

JOHN P. DORAN

Unity 2022 Mobile Game Development

Third Edition

Build and publish engaging games for Android and iOS

John P. Doran

‹packt›

BIRMINGHAM—MUMBAI

Unity 2022 Mobile Game Development

Group Product Manager: Rohit Rajkumar
Publishing Product Manager: Nitin Nainani
Senior Editor: Mark D'Souza
Senior Content Development Editor: Feza Shaikh
Technical Editor: Simran Ali
Copy Editor: Safis Editing
Project Coordinator: Sonam Pandey
Proofreader: Safis Editing
Indexer: Manju Arasan
Production Designer: Vijay Kamble
Marketing Coordinator: Anamika Singh, Namita Velgekar, and Nivedita Pandey

First published: November 2017

Second edition: August 2020

Third edition: July 2023

Production reference:160623

Published by Packt Publishing Ltd.
Livery Place
35 Livery Street
Birmingham
B3 2PB, UK.

ISBN 978-1-80461-372-6

www.packtpub.com

To my wife, Hien, who, has always believed in me and has supported me every step of the way as we've traveled all around the world. And to my precious daughter, Johanna, who's inspired me with her boundless imagination and sense of wonder. This book is dedicated to you both with all my love and gratitude.

– John P. Doran

Contributors

About the author

John P. Doran is a passionate and seasoned technical game designer, software engineer, and author who is based in Songdo, South Korea. His passion for game development began at an early age. He later graduated from DigiPen Institute of Technology with a bachelor of science in game design and a master of science in computer science from Bradley University.

For over a decade, John has gained extensive hands-on expertise in game development, working in various roles ranging from game designer to lead user interface (UI) programmer, working in teams consisting of just himself to over 70 people in student, mod, and professional game projects, including working at LucasArts on *Star Wars: 1313*. Additionally, John has worked in game development education, teaching in Singapore, South Korea, and the US. To date, he has authored 17 books pertaining to game development and is a 2023 Unity Education Ambassador.

John is currently an instructor at George Mason University Korea. Prior to his present ventures, he was an award-winning videographer.

Learn more about John at `http://johnpdoran.com`.

I extend my deepest gratitude to the Packt Publishing team, including Mark D'Souza, Feza Shaikh, Sonam Pandey, and Nitin Nainani, for their invaluable support, expertise, and guidance in bringing this new edition of the book to life.

About the reviewers

Shubham Thakur is a full stack developer at Ceryx Digital in Pune. Proficient in JavaScript, PHP, and Flutter, he has worked on cutting-edge projects involving the **Internet of Things** (**IoT**), metaverse, **augmented reality** (**AR**), **virtual reality** (**VR**), and cloud computing using AWS. Shubham volunteers with Google Developer Groups Pune, has won various hackathons, and is learning Solidity for Web3. He's a team player, collaborator, and effective communicator who is committed to delivering high-quality solutions on time and within budget.

I am deeply grateful to Priya for the unwavering support, boundless love, and endless inspiration she brings daily. Yash, thank you for always being there. Amit Jain, thank you for your exceptional mentorship. Thanks to Packt Publishing for the reviewer opportunity. Special thanks to Urvi Sambhav Shah for onboarding me and to Sonam Pandey for her invaluable assistance and guidance during the reviewing process.

David Cantón Nadales is a software engineer from Seville, Spain, with more than 20 years of experience. He is currently a technical leader at Grupo Viajes El Corte Inglés, a leading travel company in Europe. He has done a multitude of projects and games with Unity, VR with Oculus/Meta Quest 2, Hololens, HTC Vive, DayDream, and LeapMotion. He was an ambassador of the Samsung community "Samsung Dev Spain," and organizer of "Google Developers Group Sevilla." He has led more than 100 projects throughout his career. As a social entrepreneur he created the app "Grita", a social network that emerged during the confinement of COVID-19 that allowed people to talk to other people and help each other psychologically. In 2022, he won the Top Developer Award organized by Samsung.

Lituz.com

Table of Contents

Preface xiii

Part 1: Gameplay/Development Setup

1

Building Your Game 3

Technical requirements 4
Setting up the project 4
Creating the player 6
Moving the player through a C# script 8
Improving our scripts with attributes and XML comments 12
Using attributes 12
XML comments 15
Update function versus FixedUpdate function 17
Putting it all together 18
Having the camera following our player 19
Creating a basic tile 21
Making it endless 26
Creating obstacles 32
Summary 43

2

Project Setup for Android and iOS Development 45

Technical requirements 46
Introducing the Build Settings menu 47
Building a project for a PC 49
Exporting a project for Android 51
Installing Android Build Support for Unity 52
Updating build and player settings for Android projects 54
Running the Android APK with an emulator 59
Putting the project on your Android device 62

Unity for iOS setup and Xcode installation 73
Building a project for iOS 78
Running the project via the iOS simulator 85
Summary 87

Part 2: Mobile-Specific Features

3

Mobile Input/Touch Controls 91

Technical requirements 92
Using mouse input 92
Screen space versus world space 94
Moving using touch controls 96
Using Unity Remote 101
Android setup For Unity Remote 101
Enabling developer mode and debugging 107
Unity Remote setup for iOS 114
Implementing a gesture 118
Scaling the player using pinches 123
Using the accelerometer 127
Detecting touch on game objects 130
Summary 140

4

Resolution-Independent UI 141

Technical requirements 142
Creating a title screen 142
The Rect Transform component 146
Adjusting and resizing the title text 150
Selecting different aspect ratios 156
Working with buttons 159
Adding a pause menu 167
Pausing the game 177
Summary 179

5

Advanced Mobile UI 181

Technical requirements 181
Adding a pause screen button 182
Implementing an on-screen joystick 187
Adapting GUIs for notch devices 193
Summary 200

6

Implementing In-App Purchases 201

Technical requirements 202
Setting up Unity IAP 202
Creating our first purchase 204
Adding a button to restore purchases 213
Configuring purchases for the stores of your choice 216
Summary 217

7

Advertising Using Unity Ads 219

Technical requirements 220
Setting up Unity Ads 220
Displaying a simple ad 224
Utilizing ad callback methods 227
Opt-in advertisements with rewards 231
Adding in a cooldown timer 241
Summary 246

8

Integrating Social Media into Our Project 249

Technical requirements 250
Adding a scoring system 250
Sharing high scores via Twitter 256
Downloading and installing Facebook's SDK 260
Logging in to our game via Facebook 269
Displaying a Facebook name and profile picture 277
Summary 284

Part 3: Game Feel/Polish

9

Keeping Players Involved with Notifications 287

Technical requirements 287
Setting up notifications 288
Scheduling notifications ahead of time 293

Customizing notifications 298
Canceling notifications 303
Summary 305

10

Using Unity Analytics 307

Technical requirements 308
Setting up Analytics 308
Tracking custom events 313
Sending basic CustomEvents 313
Sending custom events with properties 319
Working with funnels 329
Summary 331

11

Remote Config 333

Technical requirements 333
Remote Config setup 334
Creating key-value pairs 336
Integrating Game Overrides into gameplay 339
Summary 343

12

Improving Game Feel 345

Technical requirements 346
Animation using LeanTween 346
LeanTween setup 346
Creating a simple tween 349
Adding tweens to the pause menu 354
Working with materials 357
Using postprocessing effects 360
Adding particle effects 366
Summary 369

13

Building a Release Copy of Our Game 371

Technical requirements 371
Generating release builds for app stores 372
Summary 382

14

Submitting Games to App Stores 383

Technical requirements 383
Putting your game on the Google Play Store 384
Setting up the Google Play Console 384
Publishing an app on Google Play 386
Putting your game on the Apple iOS App Store 397
Apple Developer setup and creating a provisioning profile 397
Adding an app to App Store Connect 408
Summary 427

15

Augmented Reality 429

Technical requirements 429
Setting up a project for AR 430
Basic setup 434
Interacting with the AR environment 439
Spawning objects in AR 444
Summary 447

Index 449

Other Books You May Enjoy 456

Lituz.com

Preface

As a game developer, your goal is to reach your customers where they are, and with more and more people purchasing mobile devices every year, mobile is a crucial platform to consider. Luckily, Unity offers cross-platform capabilities, allowing you to write your game once and then port it to other consoles with minimal changes. However, developing for mobile devices also requires specific considerations and features, which is where *Unity 2022 Mobile Game Development* comes in.

In this book, we'll guide you through the process of using Unity to create and deploy a mobile game to both iOS and Android. We'll cover essential topics such as adding input for mobile devices, designing interfaces that adapt to various screen sizes, and exploring ways to monetize your game with Unity's **In-App Purchase** (**IAP**) and advertisement systems. We'll also discuss the importance of using notifications to retain users and share your game with the world using Twitter and Facebook's SDKs.

Additionally, we'll delve into Unity's analytics system to optimize your game's performance and provide insights into user behavior. You'll also learn how to polish your game in various ways before publishing it on the Google Play and iOS app stores.

Lastly, we'll cover the use of Unity's AR Foundation framework, which enables you to create **Augmented Reality** (**AR**) apps that are future-proof and compatible with multiple devices.

By the end of this book, you'll have a solid understanding of how to use Unity for mobile game development, including crucial features unique to mobile devices.

Who this book is for

If you're a Unity game developer interested in building mobile games for iOS and Android, then this book is an ideal resource for you. Although prior knowledge of C# is helpful, it is not required. Whether you're a seasoned developer or just starting out, the step-by-step guidance provided in this book will help you understand the unique features and considerations necessary for mobile game development using Unity.

What this book covers

Chapter 1, *Building Your Game*, introduces the basics of Unity game development by creating a simple project that will be modified throughout the book to incorporate mobile-specific features.

Chapter 2, *Project Setup for Android and iOS Development*, explains the process of configuring your development environment for deploying your game to both Android and iOS mobile devices.

Chapter 3, *Mobile Input/Touch Controls*, teaches you the fundamentals of mobile input, covering touch and gesture recognition, using the accelerometer, and accessing device information through the `Touch` class.

Chapter 4, *Resolution-Independent UI*, focuses on how to build resolution-independent UI elements, which are useful for all game projects that utilize different aspect ratios and resolutions.

Chapter 5, *Advanced Mobile UI*, builds upon the knowledge from the previous chapter, expanding to include mobile-specific aspects of working on a UI, such as requiring on-screen controls and adapting the UI to fit devices with notches.

Chapter 6, *Implementing In-App Purchases*, explains how to integrate Unity's IAP system into our project, including the creation of both consumable and non-consumable IAPs.

Chapter 7, *Advertising Using Unity Ads*, covers the integration of Unity's ad framework into our project and explores the creation of both simple and complex advertisements.

Chapter 8, *Integrating Social Media into Our Project*, shows how to integrate social media into your game by incorporating features such as sharing high scores on Twitter and using the Facebook SDK to log in and display a player's name and profile picture.

Chapter 9, *Keeping Players Involved with Notifications*, demonstrates the integration of notifications into your game, including their setup, creating basic notifications, and customizing how they are presented.

Chapter 10, *Using Unity Analytics*, covers integrating Unity's analytics tools into your game, including tracking custom events and using remote settings to modify gameplay without requiring players to redownload the game.

Chapter 11, *Remote Config*, will show just how easy it is to set up Unity's Remote Config system, and how we can utilize it for a simple example by changing the difficulty of our game by changing the speed at which the player moves.

Chapter 12, *Improving Game Feel*, introduces the concept of "game feel" in game design and explores how to integrate tweening animations, materials, postprocessing effects, and particle effects to enhance the player experience.

Chapter 13, *Building a Release Copy of Our Game*, walks you through the steps required to build a release copy of your game for both iOS and Android devices.

Chapter 14, *Submitting Games to App Stores*, provides tips and tricks for submitting your game to the Google Play and iOS app stores.

Chapter 15, *Augmented Reality*, covers the process of adding AR to your game, including the setup, installation, and configuration of ARCore, ARKit, and AR Foundation, detecting surfaces in the real world, and interacting with the environment through spawning objects.

To get the most out of this book

Throughout this book, we will work within the Unity 3D game engine, which you can download from `https://unity.com/download`. The projects were created using Unity 2022.1.0b16, but minimal changes should be required if you're using future versions of the engine. If there is a new version out and you would like to download the exact version used in this book, you can visit Unity's download archive at `https://unity3d.com/get-unity/download/archive`. You can also find the system requirements for Unity at `https://docs.unity3d.com/2022.1/Documentation/Manual/system-requirements.html` in the Unity Editor system requirements section. To deploy your project, you will need an Android or iOS device.

For the sake of simplicity, we will assume that you are working on a Windows-powered computer when developing for Android and a Macintosh computer when developing for iOS.

Software/hardware covered in the book	Operating system requirements
Unity 2022.1.0b16	Windows, macOS, or Linux
Unity Hub 3.3.1	Windows, macOS, or Linux

If you are using the digital version of this book, we advise you to type the code yourself or access the code from the book's GitHub repository (a link is available in the next section). Doing so will help you avoid any potential errors related to the copying and pasting of code.

Download the example code files

You can download the example code files for this book from GitHub at `https://github.com/PacktPublishing/Unity-2022-Mobile-Game-Development-3rd-Edition`. If there's an update to the code, it will be updated in the GitHub repository.

We also have other code bundles from our rich catalog of books and videos available at `https://github.com/PacktPublishing/`. Check them out!

Download the color images

We also provide a PDF file that has color images of the screenshots and diagrams used in this book. You can download it here: `https://packt.link/6M4wR`.

Conventions used

There are a number of text conventions used throughout this book.

`Code in text`: Indicates code words in text, database table names, folder names, filenames, file extensions, pathnames, dummy URLs, user input, and Twitter handles. Here is an example: "This gives us the code needed – in particular, the `GameNotificationManager` class – to be added to our script."

A block of code is set as follows:

```
public void ShowNotification(string title, string body,
                                DateTime deliveryTime)
{
    IGameNotification notification =
    notificationsManager.CreateNotification();

    if (notification != null)
    {
        notification.Title = title;
        notification.Body = body;
        notification.DeliveryTime = deliveryTime;
        notification.SmallIcon = "icon_0";
        notification.LargeIcon = "icon_1";


        notificationsManager.ScheduleNotification(notification);
    }
}
```

When we wish to draw your attention to a particular part of a code block, the relevant lines or items are set in bold:

```
ShowNotification("Endless Runner", notifText, notifTime);

        // Example of cancelling a notification
        var id = ShowNotification("Test", "Should Not Happen",
            notifTime);

        if(id.HasValue)
        {
            notificationsManager.CancelNotification(id.Value);
        }
```

```
        /* Cannot be added again until the user quits game */
        addedReminder = true;
    }

}
```

Any command-line input or output is written as follows:

```
$ mkdir css
$ cd css
```

Bold: Indicates a new term, an important word, or words that you see onscreen. For instance, words in menus or dialog boxes appear in **bold**. Here is an example: "Open the **Project Settings** menu by going to **Edit** | **Project Settings**."

> **Tips or important notes**
> Appear like this.

Get in touch

Feedback from our readers is always welcome.

General feedback: If you have questions about any aspect of this book, email us at `customercare@packtpub.com` and mention the book title in the subject of your message.

Errata: Although we have taken every care to ensure the accuracy of our content, mistakes do happen. If you have found a mistake in this book, we would be grateful if you would report this to us. Please visit `www.packtpub.com/support/errata` and fill in the form.

Piracy: If you come across any illegal copies of our works in any form on the internet, we would be grateful if you would provide us with the location address or website name. Please contact us at `copyright@packt.com` with a link to the material.

If you are interested in becoming an author: If there is a topic that you have expertise in and you are interested in either writing or contributing to a book, please visit `authors.packtpub.com`.

Share Your Thoughts

Once you've read *Unity 2022 Mobile Game Development*, we'd love to hear your thoughts! Please `click here to go straight to the Amazon review page` for this book and share your feedback.

Your review is important to us and the tech community and will help us make sure we're delivering excellent quality content.

Lituz.com

Part 1: Gameplay/Development Setup

In this part of the book, we will be exploring the foundational elements of Unity game development, specifically with a focus on preparation for creating mobile games. The chapters in this part will provide you with the necessary knowledge and skills to set up your development environment, as well as guide you through the process of building a game project and deploying it to a mobile device.

By the end of this part, you will have a solid foundation of knowledge about Unity game development and will be ready to move on to the more advanced topics covered in subsequent parts of the book.

This part has the following chapters:

- *Chapter 1*, *Building Your Game*
- *Chapter 2*, *Project Setup for Android and iOS Development*

1
Building Your Game

As we start on our journey of building mobile games using the Unity game engine, it's important that you are familiar with the engine itself before we dive into the specifics of building things for mobile platforms. Although there is a chance that you've already built a game and want to transition it to mobile, there will also be those of you who haven't touched **Unity** before or may not have used it in a long time. This chapter will act as an introduction to newcomers and a refresher for those coming back, and it will provide some best practices for those who are already familiar with Unity. While you may skip this chapter if you're already familiar with Unity, I think it's also a good idea to go through the project so that you know the thought processes behind why the project is made in the way that it is, so that you can keep it in mind for your own future titles.

In this chapter, we will build a 3D endless runner game in the same vein as *Imangi Studios LLC's Temple Run* series. In our case, we will have a player who will run continuously in a certain direction and dodge the obstacles that are in their way. We can also add additional features to the game easily, as the game will endlessly have new things added to it.

This chapter will be split into several topics. It will contain simple, step-by-step processes for you to follow. Here is an outline of our tasks:

- Setting up the project
- Creating the player
- Moving the player through a C# script
- Improving scripts using attributes and XML comments
- Update function versus FixedUpdate function
- Having the camera follow our player
- Creating a basic tile
- Making the game endless
- Creating obstacles