## **Table of Contents**

Preface	vii
1. Introduction What Is Virtual Reality? Stereoscopic Displays Motion Tracking Hardware Input Devices Computing Platforms Virtual Reality Applications Chapter Summary	1 2 3 5 5 6 8 9
2. Virtual Reality Hardware.  Oculus Rift The DK1 The DK2 The CV1 Setting Up Your Oculus Rift Other High-End Head-Mounted Displays Samsung Gear VR: Deluxe, Portable Virtual Reality The Oculus Mobile SDK Google Cardboard: Low-Cost VR for Smartphones Stereo Rendering and Head Tracking with Cardboard VR Cardboard VR Input Developing for Google Cardboard	11 11 12 13 14 16 17 18 20 20 22 22 22 23
VR Input Devices Chapter Summary	23 25

3.	Going Native: Developing for Oculus Rift on the Desktop	27
	3D Graphics Basics	28
	3D Coordinate Systems	28
	Meshes, Polygons, and Vertices	29
	Materials, Textures, and Lights	30
	Transforms and Matrices	31
	Cameras, Perspective, Viewports, and Projections	32
	Stereoscopic Rendering	34
	Unity3D: The Game Engine for the Common Man	34
	Setting Up the Oculus SDK	37
	Setting Up Your Unity Environment for Oculus Development	38
	Building Your First VR Example	39
	Building and Running the Application	41
	Walking Through the Code	43
	Chapter Summary	46
4.	Going Mobile: Developing for Gear VR	49
	The Gear VR User Interface and Oculus Home	50
	Using the Oculus Mobile SDK	51
	Setting Up the Android SDK	52
	Generating an Oculus Signature File	52
	Setting Up Your Device for USB Debugging	52
	Developing for Gear VR Using Unity3D	53
	Setting Up Your Unity3D Environment	53
	A Simple Unity3D Sample	54
	Handling Touchpad Events	59
	Deploying Applications for Gear VR	62
	Chapter Summary	62
5.	WebVR: Browser-Based Virtual Reality in HTML5	63
	The Story of WebVR	65
	The WebVR API	66
	Supported Browsers and Devices	67
	Querying for VR Displays	68
	Presenting Content to the VR Display	69
	Refreshing the VR Display	70
	Head Tracking	72
	Creating a WebVR Application	73
	Three.js: A JavaScript 3D Engine	73
	A Full Example	74
	Tools and Techniques for Creating Web VR	85
	WebVR Engines and Development Tools	85

	Using Unity3D and Unreal for WebVR Development	87
	Open Source Libraries and Frameworks	88
	WebVR and the Future of Web Browsing	89
	Chapter Summary	90
6.	VR Everywhere: Google Cardboard for Low-Cost Mobile Virtual Reality	. 93
	Cardboard Basics	95
	Supported Devices and Operating Systems	95
	Headset Manufacturers	95
	Cardboard Applications	97
	Input Devices for Cardboard	99
	Cardboard Stereo Rendering and Head Tracking	100
	Developing with the Google VR SDK for Android	101
	Setting Up the Environment	102
	Walking Through the Code	103
	Developing with the Google VR SDK for Unity	107
	Setting Up the SDK	108
	Building Treasure Hunt for Unity	109
	A Walkthrough of the Unity Code	111
	Developing Cardboard Applications Using HTML5 and a Mobile Browser	114
	Setting Up the WebVR Project	114
	The JavaScript Cardboard Code	115
	Chapter Summary	118
7.	Your First VR Application	119
	About 360-Degree Panoramas	120
	Setting Up the Project	121
	Getting the Software, Hardware, and Sample Code	121
	Creating the Unity Scene and Project	122
	Adding Cardboard VR Support	128
	Creating a Gaze-and-Tap User Interface	131
	Creating a 2D Plane	132
	Adding Input Support to the Project	132
	Creating an Event Handler Script	134
	Handling Switch Events	136
	Creating the Functioning User Interface	137
	Where to Take the Project from Here	138
	Chapter Summary	139
A.	Resources	141
Ind	lex	149