



KODU for Kids



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James F. Kelly

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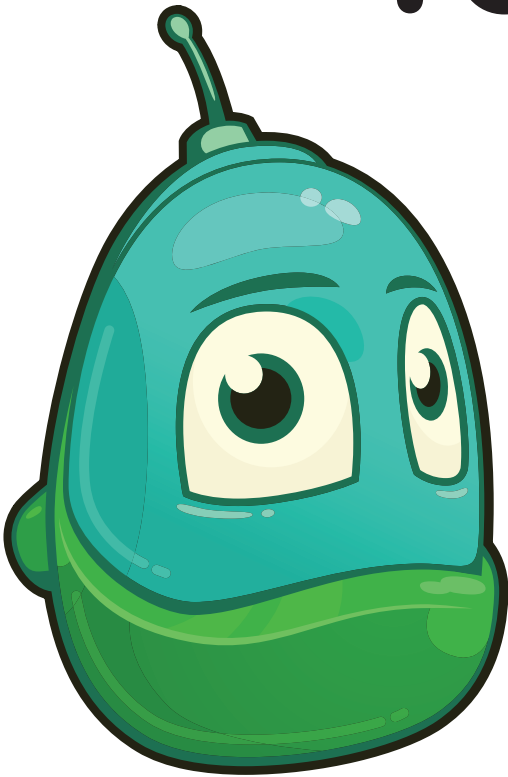


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KODU

for Kids

James Floyd Kelly



The Official Guide to Creating Your Own Video Games

Kodu for Kids

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Online Files

There are videos and other resources available for download with this book. In the back of this book, you will find instructions on how to register your book and download the files. Check back to the Downloads page in case new or updated material is posted for this book.

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Forewords

Perhaps the biggest barrier to teaching children to create programs has nothing to do with the child but rather with the preconceptions of adults and the relative dearth of people willing or able to teach children basic software skills. This is a shame, really, because the ability to program is the ability to create. If we could give our children those skills early in life, it would empower them to be not just participants in our digital society but also agents. It would give them both an understanding of how our increasingly technology-driven world works and the confidence of knowing they can change it if they so choose. It would also go a long way toward satisfying an increasing need for technical skills in our society that is calling out for people who can make our tools, gadgets, and services deliver more value and work better.

Despite the fact that we live in an increasingly technical world, the creation of software—one of the most fundamental skills of the information age—remains shrouded in mystery for most and at minimum is viewed as a difficult and perhaps arcane art. Society sees “programming” as something that, if you learn it at all, you learn in the later stages of high school or in college. If a younger child learns to program, we are more likely to think of that child as a prodigy (or at least as a special case).

The reality, though, is that there are actually very few true prerequisites to teaching a child the fundamentals of software creation. About all a child needs to know to begin learning about software engineering is basic reading and writing, very basic arithmetic, simple notions of logic (“true and true equal true,” “true and false equal false”) and basic notions of abstraction. Most children have those skills by the age of 6 or 7.

What excited me most when I first saw Kodu was the realization that it not only provided a fun “play” environment for children, but that it was an engaging and exciting way to teach young children how to create software. It is approachable enough that even young children can learn from it without needing an adult to help them, but at the same time it can give a child basic engineering skills in a way that is fun and unintimidating. It also provides an environment in which older children, young adults, and grown-ups can enjoy and create—a great introduction and first step into the skills needed in our digital society.

—Rick Rashid, Chief Research Officer, Microsoft

Our group in Microsoft Research, FUSE (Future Social Experiences) Labs, creates experiences that help people express themselves in rich, beautiful, and novel ways. The idea for Kodu began when we asked people this: “If you could make anything on the computer, what would you create?” So many people dream of making and sharing the kind of games they play but don’t know how to begin. We challenged ourselves to enable 6-year-olds who can’t yet type to create in 15 minutes a game or story that they can share with their friends or classmates.

We dream of deeply affecting education. We believe that students who know how to program and build the experiences they use online all day will have more life opportunities. We are disheartened by the fact that most high schools in the United States don’t even offer computer

science—and we are even more disheartened by the fact that by middle school many kids feel they aren't "technical." Using Kodu—a simple tool with big aspirations—we hope to inspire everyone to be creative, tell stories, share the creative work, and "get hooked" on (and be empowered by) programming.

One of the first experiments we ran more than 5 years ago was to have two middle school kids, Nicky and Julian Boss, write the first curriculum and teach the first Kodu class at a local elementary school. We learned so much from their criticism and teaching prowess. I remember them saying how slow the parents were in comparison to the kids, and how they incorporated turn-taking and helped the really excited kids think about what they were making before just jumping in. The "show" during the last class was so incredible: about 20 little kids, divided evenly between boys and girls, all telling us how they had coded their games. They were sitting around playing the games they had made, sharing stories about coding Kodu, and all the while talking about a maiden being rescued from a castle. Kids teaching kids! All this let us know that we were doing something right.

Since then, we've seen Kodu used by many different groups. Last summer, we went down to Los Angeles to help a local education group teach Kodu. This was absolutely my favorite photo, which pretty much sums up why we love working with kids. Hope you enjoy reading about Kodu and give it a try.



Here's a 5-year-old little rock star girl creating away!

—Lili Cheng, General Manager, FUSE Research

About the Author

James Floyd Kelly is a technology writer with degrees in English and Industrial Engineering. James has written on a wide variety of topics, including LEGO robotics, open-source software, and building 3D printers. James is a DIYer—a tinkerer and a maker who enjoys learning new skills whenever possible. He lives in Atlanta, Georgia, with his wife and two young boys.

Dedication

For Ashley—Thank you for always supporting me. XO

Acknowledgments

Writing this book was a real team effort. My name might be on the cover, but if you really want to know who's responsible for making this book a reality, I've got a long list of names for you.

My first big thank you must go to my wife and two children. Writing is time-consuming work, and there were days when I was hidden away in my office until the wee hours. I always appreciate the patience and understanding they give to me when deadlines loom. Thanks, Ashley. Thanks, boys.

Next, Laura Norman at Pearson deserves a big round of applause. She listened to my early pitch for the book and then proceeded to start opening doors that made this book a reality. She's always been supportive of my book proposals, but this one is special to me... and Laura saw the potential and gave me the chance to write it. Thanks, Laura.

I have to say I've absolutely enjoyed working with Scott Fintel and Stephen Coy of Microsoft. They offered up ideas, examples, corrections, and support, and this book would not have been possible without their help.

Jumping back to Pearson, I'd like to thank Keith Cline, Seth Kerney, and Jovana San Nicolas-Shirley for their hard work in taking my chapters and turning them into the final book you're holding in your hands. And please flip back a few pages and look at the list of Pearson folks who also had a hand in making this book—a big thank you to all of them!

Finally, Kodu Game Lab isn't a software tool that just magically appeared. There are a lot of folks who are responsible for giving us this great-looking and fun-to-use tool. Huge thanks go to each person in this list for all their work with Kodu Game Lab:

Saxs Persson, Senior Director, Microsoft Studios

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Rich Rashid, Chief Research Officer, Microsoft Research

John Scott Tynes, Senior Academic Evangelist, Microsoft

Kent Foster, Director, University Incubation, Microsoft

Mike Jacob, Group Program Manager, Microsoft Studios

Kodu Community, for creating great levels

We Want to Hear from You!

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.

We welcome your comments. You can email or write to let us know what you did or didn't like about this book—as well as what we can do to make our books better.

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Introduction

In This Introduction

- ☐ Yes, You Can Be a Game Designer
- ☐ Kodu Is Way Fun!
- ☐ Kodu Offers So Much
- ☐ Walk Before You Run
- ☐ How to Use This Book
- ☐ Introducing Two New Friends: Kodu and Rover
- ☐ Get in Touch

Yes, You Can Be a Game Designer

Have you ever played a game on your computer or gaming console and wondered how the game was actually made? And have you ever played a game and then wondered whether you could make something just as fun? I know I have.

But, like me, you might have heard something like this:

- ☐ Game design is difficult and can be tricky.
- ☐ Cool games (especially the really complex ones with lots of fancy graphics and complicated storylines) often take years to create before anyone ever plays them.
- ☐ Most games are created by teams working long hours (and that can cost a lot of money).
- ☐ Many of the games are created using complicated software that can take years to learn.

Years to make, lots of cash required to develop, and an understanding of complex software—these requirements make it sound like game design is beyond the reach of people like us, don't they?

Well, game design is *not* out of our reach.

What if you and I could make your own games and it didn't take years (or even months)? What if the software needed to make our own games was free for Windows users (or under \$6 for Xbox owners)? And what if that software were not only extremely simple to understand and use but also *fun*? Do you want to hear more?

Of course you do.

Kodu Is Way Fun!

I'm not going to keep you in suspense about the software needed to create your own games. (And you're holding this book in your hands with a title that says *Kodu for Kids*, which sort of gives away the big secret, anyway.) It's called Kodu Game Lab, and it is one of the most fun and easy ways to create your own games.

Just how fun and how easy? Glad you asked.

It's fun because you control it all: You can design the rules of your games, the characters that players see, the environments in the background, the points system for scoring, and much more.

It's easy because everything you do is visual. You drag items around the screen to place them where you like, you tweak settings in your games using either the mouse or a game controller (and if you've got a tablet like the Surface that has a touchscreen, you can even use your finger), and you can immediately test your game at any point to see what works... and what might need a little more tweaking.

Does that sound fun and easy? Yeah? But wait... there's more.

You can share games you create with Kodu Game Lab with your family, your friends and classmates, even with other students on the other side of the world. Students from around the world are using Kodu Game Lab to create games. Just imagine how much fun it will be to create a game and get feedback on it from a student in Israel, Australia, or a dozen other countries? Kodu Game Lab is currently available in 13 languages: Arabic, German, Greek, English, Spanish, French, Hebrew, Icelandic, Italian, Dutch, Polish, Russian, and Portuguese.

Another super-cool thing about Kodu Game Lab is how easy it is to connect with other Kodu fans. Do you have a question and just cannot find an answer? There are safe and kid-friendly online resources where you can post your questions and get answers from other Kodu users. And you might even be able to answer questions from other Kodu users. After all, when you finish this book, you're going to be a Kodu guru.

Kodu Offers So Much

Is there anything else that Kodu Game Lab offers to budding game designers? Yes, there is.

Kodu Game Lab is an outstanding tool for helping with special projects at school. Did your teacher just assign you to do a presentation about how white blood cells attack foreign bodies in your

bloodstream? Don't reach for a sheet of boring posterboard. Use Kodu to draw a blood vessel (the terrain or environment), drop in some characters that represent the white blood cells and maybe a flu bug, and use the software to control their movements and use colorful animation to show just how white blood cells react. Even better? Turn it into a game where one player controls the flu bug and the other player controls a white blood cell—the flu bug players must run away, and the white blood cell players must try and catch the flu bug. (And because Kodu can support up to four players, you could really make it fun.) I'd give you an A for the presentation.

Kodu will also teach you some real-life skills that will help you throughout your education and into your future career. You see, the ability to create a game requires some logical and critical-thinking skills. Those might not sound important to you now, but to your parents and teachers, it's a big deal. Even if you don't know what you want to do when you "grow up," trust me, some of the skills you will learn as you develop your own games will never leave you and will benefit you no matter what career you choose later in life.

Kodu Game Lab is always changing. Updates are occasionally released that add new features, new characters, and much more. So, there will always be new features to figure out that can make your games even more crazy, advanced, and fun. You should never stop learning. Instead, always be on the lookout for new things to try out in your games. Think of Kodu as a toolbox. I want you to try out each and every tool inside it. You'll find your favorites, and you'll discover some tools that you might never use. But by learning them all, you'll have the maximum number of skills and features available to make your games the best they can be.

Walk Before You Run

Creating great games means starting at the beginning. You've probably heard the phrase "you need to learn to walk before you can run," and that's definitely true with Kodu Game Lab. You need to learn the basics of Kodu before you can start creating that dream game that's floating around in your head.

I know you're probably anxious to learn everything there is to know as fast as possible, but let me tell you why this isn't such a great idea. You need to let all this Kodu information sink in a bit. That means learning something new in one chapter, and then playing with Kodu Game Lab to try it out. You'll remember something if you read it and then use it. This means opening Kodu and actually performing the tasks that I put in front of you in the book's chapters.

Kodu has its own rules and expects you to do things in certain ways, but they're extremely easy to remember. You'll learn all about them in later chapters, but what I want you to know right now is that this book teaches you things in a very specific order. Don't skip ahead or jump around—you might miss something super-important.

NOTE

I cannot stress enough just how important it is to read and work through the book in the proper order. If you want to skip ahead to see what's coming, that's fine. But be sure to return to your original place in the book. Skipping ahead means you might miss a technique or skill in an earlier chapter that is required later in the book. You'll be confused, and the games you design might not work properly. Even worse, you might miss a topic on a cool feature that your future games will lack because you don't know it exists.

There's no rush here. Take your time and work through the chapters at your own pace. You'll be rewarded with an understanding of all the great features that Kodu offers, and that will make your games shine.

How to Use This Book

One of the things I hope you most enjoy about this book is the frequent use of screenshots. I took snapshots of the screen as I was working, which means that you can follow along in each chapter and use the figures to make certain that you're keeping pace with the game development.

Sometimes, however, a figure just isn't enough. In those instances, just refer back to the text for exact instructions on what to do. Because Kodu Game Lab is so simple to use, though, and because so much game design in Kodu is done onscreen, many tasks are covered with just a few sentences that explain what to do with your mouse or game controller and then refer you to a screenshot to see the final results.

Don't let this bother you if your preferred method of Kodu game design is using a game controller. After all, just about every Kodu feature can be accessed and every task performed using a game controller. I prefer the keyboard, but I'll do my best to ensure that you game controller fans are covered.

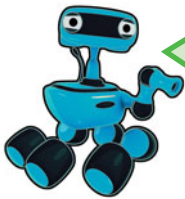
Finally, I've mentioned it earlier and I'll repeat it here: Follow along with the chapters and actually create the games. You'll become more familiar with all the buttons and tools, and the concepts will sink in and stick with you over time. This book is really more of a workbook. Your goal should be to tackle (*in order*) every page, every task, and every game so that you move quickly from Kodu novice to Kodu guru.

In addition to the instructions provided in this book, you can also access some narrated videos that demonstrate how to use Kodu Game Lab. Some of these videos show actual games from the book being programmed, and other videos show one or two short techniques to further explain a concept mentioned in the book. See the instructions in the back of this book for how to register and view these videos.

Introducing Two New Friends: Kodu and Rover

Throughout the book, you're going to enjoy learning about some additional features and fun things about Kodu from two of the creatables found in the Kodu software: Kodu and Rover.

Kodu is a cool little fellow—the software's named after him. He knows everything about the software. And that's a good thing, too, because Rover is fairly new and is still learning. Occasionally Rover has some questions, and you'll see conversations between Kodu and Rover in the various chapters. Their conversations are often about the current chapter's topics, but sometimes they're about other things related to Kodu.



Rover: Sorry to interrupt, but I've been listening in and have a question. How long has Kodu been around?

Kodu: I can answer that. Kodu began with Microsoft Research's FUSE Labs, a group at Microsoft that develops really cool software. The first version was released in 2010, and the most recent update was released in 2013.



Get in Touch

I've enjoyed writing this book for you! And I'd love to see and hear from you about the games you're creating with Kodu. If you'd like to email me, you can send your message to feedback@quepublishing.com, and my publisher will forward your message to me. I can't promise I'll be able to respond to every email, but I'll definitely take a look at your game, especially if you've shared it online.

And if you find any errors in the book, I'd like to know about those, as well. Although I've done my best to avoid mistakes, they sometimes manage to sneak by. Email me at the same address and I'll do my best to make sure the error is fixed. Any errors that are reported will have their corrections shared online at www.quepublishing.com/kodu.

And now, it's time to learn Kodu!

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6

Build Your Own World: Moving Mountains and Painting Terrain

In This Chapter

- It's Not All About the Objects
- The Ground Brush
- Mountains and Molehills
- Much More World Building to Come
- Moving On

It's Not All About the Objects

Kodu Game Lab has some fun and entertaining objects. There's Kodu to start with, and let's not forget Rover, the Cycle, and one of my favorite vehicles, Blimp. Plus you've already encountered nonmoving objects such as trees and rocks, but there are plenty more, such as coins, stars, castles, and factories. You'll find all these objects useful in your games as either playable characters, targets, or treasure (or something else). You'll be designing the games, so it will be up to you to assign roles to the objects in your games.

But one character in almost all games goes unrecognized. This character is easy to spot but almost always never makes any noise. This character is absolutely required for your game to be a good one, and thankfully it's also a character that you can program. Do you know what it is? Give up?

Okay, here's the answer: It's the world! Yes, it's the actual terrain that defines the boundaries of your game, provides obstacles for your players to move around or hide behind, and gives your game new and exciting places to visit. Without the capability to add and modify terrain, your game would exist on nothing but the initial flat square of land shown in Figure 6.1 and that appears whenever you select New World from the Home Menu.

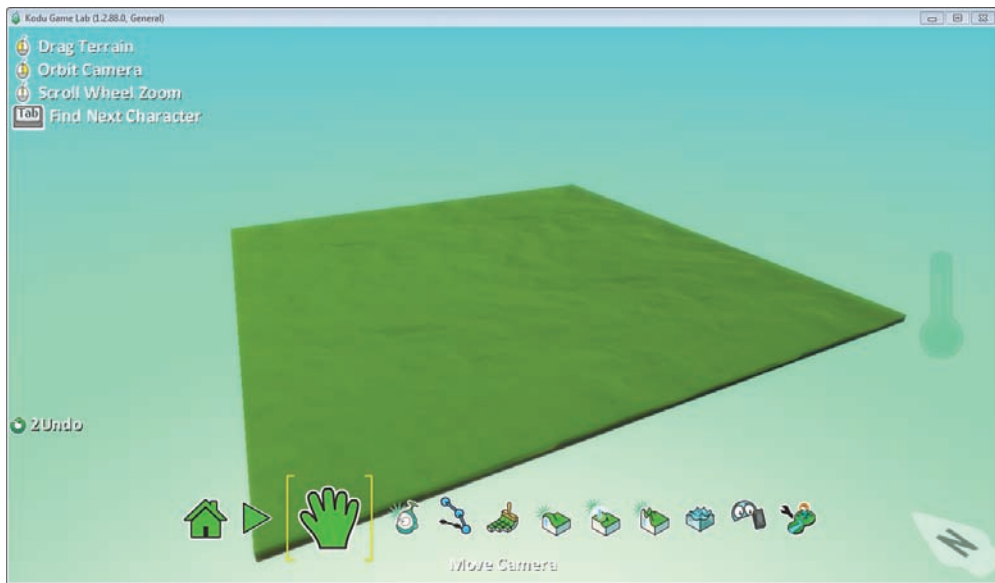


FIGURE 6.1 This small square of land is not enough for a great game.

Professional game designers often spend just as much time on the environment as they do on the in-game characters (and maybe more). One of the secrets to a good game is making certain the terrain (buildings, hills, rivers, and more) enhances the fun, provides players with a visually pleasing background, and is integrated into the design of the gameplay. That is, you can use the terrain to create rules that make a game more challenging. Imagine a game called *Stay Off the Grass*, for example, which penalizes players who wander off a path and onto the green grass. Or imagine another game called *Pothole City* that has holes scattered around that end the game if a player falls into one.

With most games, it's not the terrain that provides the primary objective; instead, the terrain adds complexity or dangers, or just fun visuals. And because interacting with the terrain is not usually the way to win a game (but it can sometimes end a game), the game relies on other aspects such as the programming of objects that you've been learning.

The key is to learn to manipulate and control the terrain so that it can add to the fun of your game, not take away. And that's what this chapter is all about: learning about the available tools that

enable you to add, modify, and take away terrain. If you've got a solid understanding of how to control your new world's terrain, you're well on your way to creating some impressive-looking games.

Let's take a look at the available tools and how to use them. Open up Kodu Game Lab and select New World so that you begin with that single square of terrain. You're going to be making some major changes to it in this chapter.

The Ground Brush

I want to start with the simplest of tools first: the Ground Brush. This is the tool selected in Figure 6.2 and is represented by the white square.

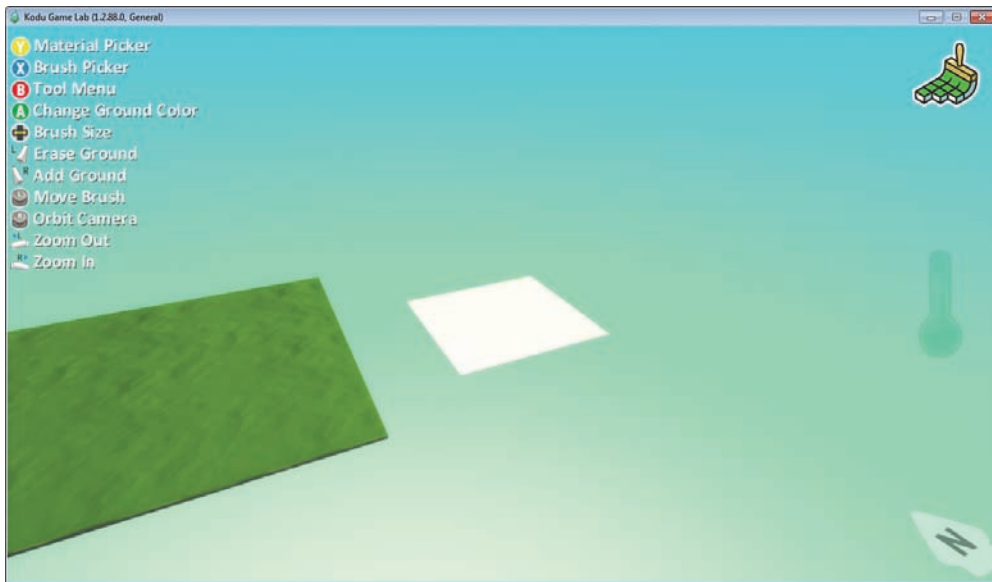


FIGURE 6.2 Select the Ground Brush to make basic additions and color changes.

You already learned about the terrain selection feature and the tool brush shapes in Chapter 3, “Take a Test Drive: Controlling Objects and Terrain,” but I want to go over them with a little more detail here. Before I show you all the ways the Ground Brush works, let me explain a few modifications that you can make while it is selected.

First, if you're using a keyboard and mouse, you can change the size of the brush by using the Left Arrow and Right Arrow keys. Notice in Figure 6.2 that the brush shape is square and that the size is about a quarter of the single block of green terrain. If I tap the Left Arrow key, the brush shape shrinks in size, as shown in Figure 6.3.

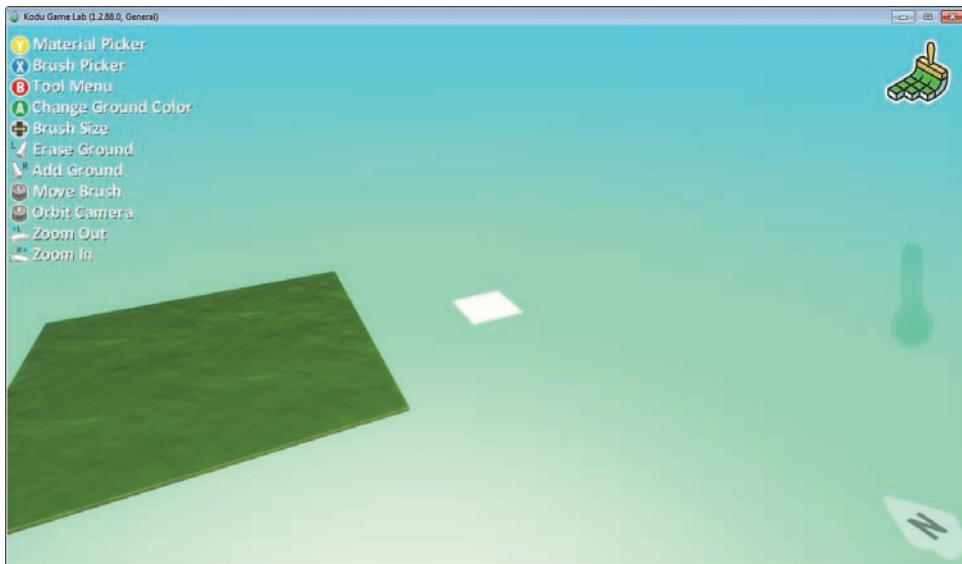


FIGURE 6.3 Shrink the Ground Brush by tapping the Left Arrow key.

Game controller users can shrink the Ground Brush by tapping Left or Right on the D-Pad.

To increase the size of the Ground Brush, tap the Right Arrow key on the keyboard or tap Right on the D-Pad. Notice in Figure 6.4 that I can make the Ground Brush size quite large, even larger than the original single square of green terrain.

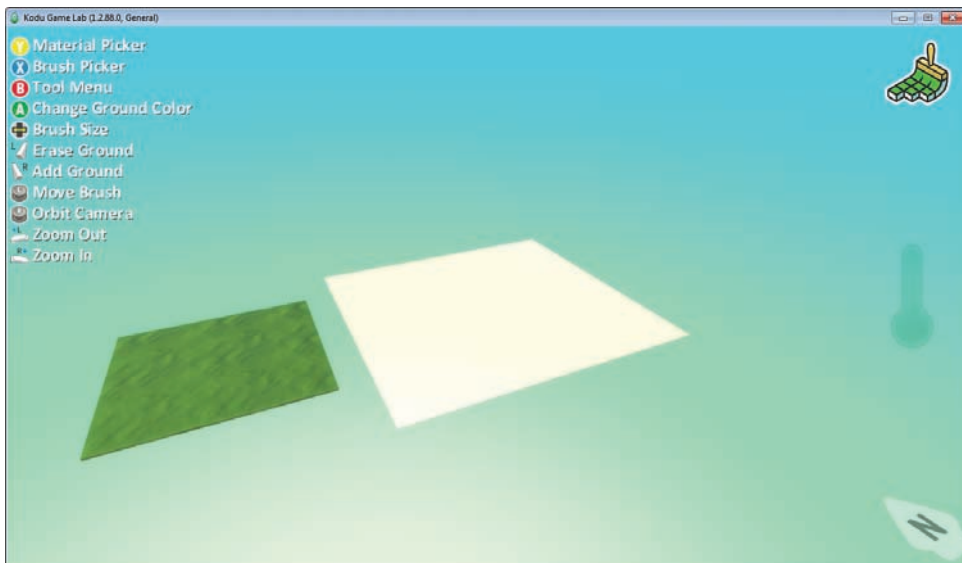


FIGURE 6.4 Increase the size of the Ground Brush.

Changing the Brush Shape

If you want to change the Ground Brush shape, you can select from Square, Round, Linear Square Brush, Linear Round Brush, or the Magic Brush. The Square and Round brush shapes work the same, but simply apply terrain or change color using a round or square brush head.

The Linear brush shapes enable you to select a starting point and an ending point and then apply your terrain to all points in between. For example, in Figure 6.5, I've selected the Linear Round Brush and moved the brush head from one end to the other by holding down the left mouse button and moving the brush head to its end position. (You can do the same thing by using the game controller's left thumbstick.)



FIGURE 6.5 Move the Linear Brush from a starting point to an ending point.

With the mouse, the terrain is applied when I release the left mouse button, but with the game controller you press the R trigger. Figure 6.6 shows the final stretch of terrain I added with the Linear Round Brush.

If when you are adding new terrain the brush head moves over existing terrain, that terrain is replaced with whatever color/texture you currently have selected. For example, in Figure 6.7, I've placed a new square of terrain to the right of the current terrain. Notice they are not touching and are two different colors.



FIGURE 6.6 A new stretch of terrain added with a Linear brush.

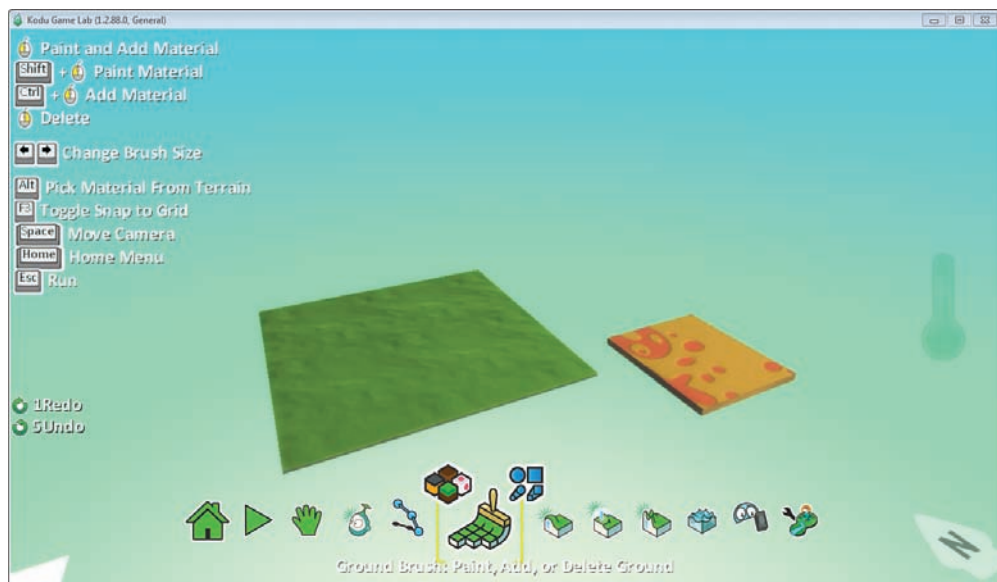
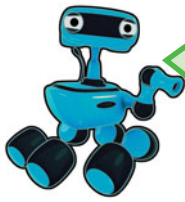
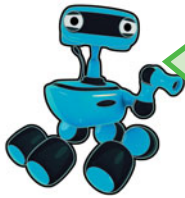


FIGURE 6.7 A new piece of terrain is added.



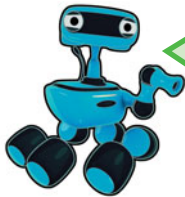
Rover: Just how many possible terrain colors and patterns are available?

Kodu: There are more than 100 different options.



Rover: That would be one amazing game that used all 100 colors, wouldn't it?

Kodu: Well, it might also be so difficult to look at that it would make playing the game almost impossible!



Rover: But you just know someone is going to try it.

Kodu: And they can call the game *Insane Rainbow*. Sounds fun, actually!



But watch what happens when I add another square of the new terrain in the space between large and small squares. Figure 6.8 shows that part of the larger (green) terrain has been replaced with the new color.

When you're using the Ground Brush, any movement of the Square, Round, or Linear brushes replaces old terrain with new when you drag over the old terrain. But there's a way to avoid that.

If you hold down the Control key on your keyboard while dragging the Ground Brush around, existing terrain will not be modified if the brush moves over it. Instead, the new terrain is placed anywhere terrain does not already exist. Figure 6.9 shows that I've painted a new terrain around the original green square while holding down the Control key. See how the original terrain is left unmodified?

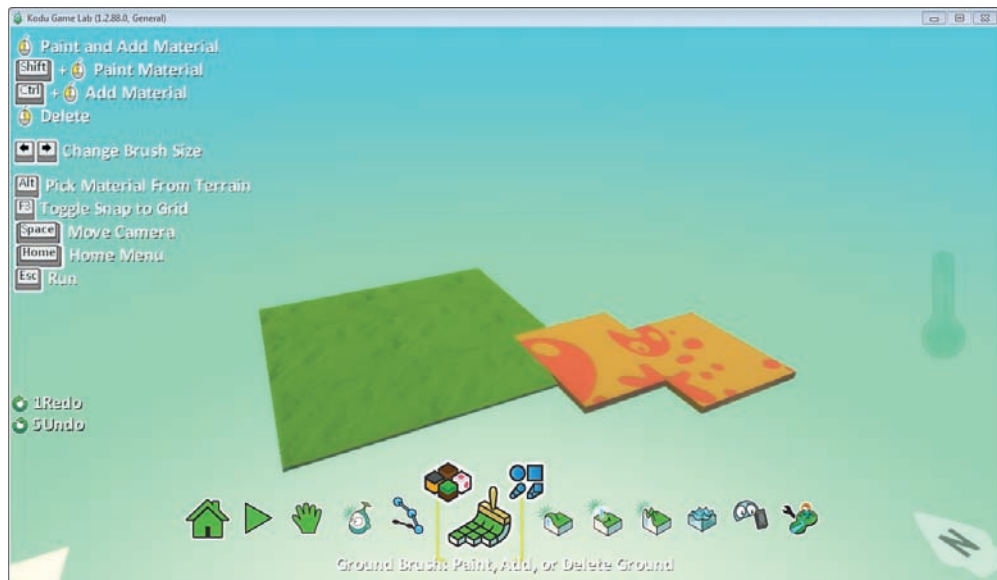


FIGURE 6.8 Old terrain is replaced with new terrain.

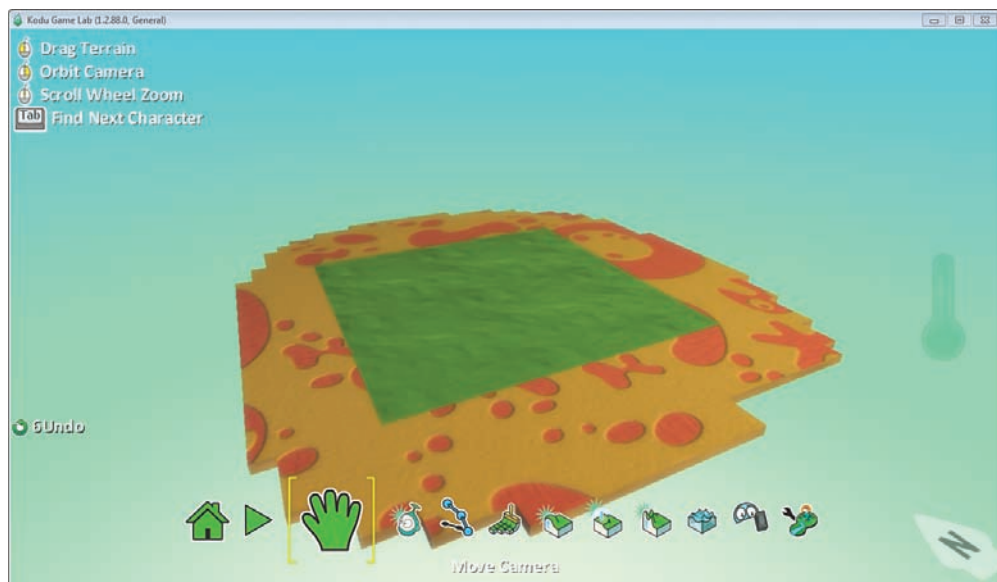


FIGURE 6.9 Use the Control key to keep existing terrain.

NOTE

If you look closely at Figure 6.9 near the bottom-left corner, you'll see 6Undo. Kodu Game Lab keeps track of the changes you make and can let you undo certain actions such as changing the color of terrain or growing a mountain. Tap the Undo option once to undo the last edit you made. In this instance, Kodu can undo the last six modifications you've made, but this number will sometimes be more... and sometimes less.

What if you want to replace some existing terrain with a new color while avoiding adding any new land to your world? In that case, hold down the Shift key while dragging the Ground Brush over existing terrain. As you can see in Figure 6.10, the original (green) square of terrain now has a completely new color.

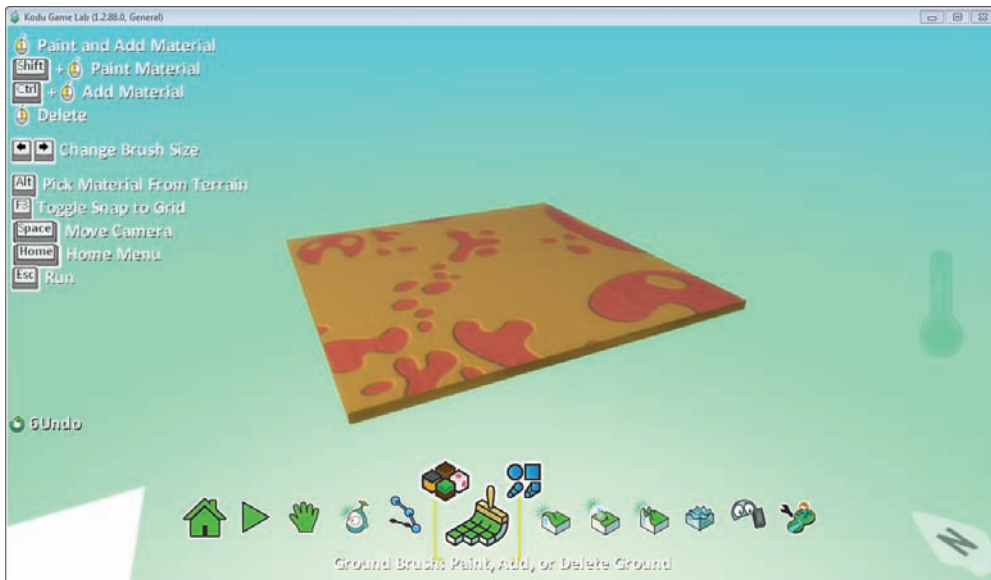


FIGURE 6.10 Replace an existing piece of terrain with a new color only.

When you have a Square or Round brush selected, right-click with the mouse and drag over some terrain to erase it; you can use the Left Arrow or Right Arrow keys on a keyboard to increase or decrease the size of the brush head to control how much terrain you erase. In Figure 6.11, I've decreased the brush head to a small square and then erased some terrain from the center.

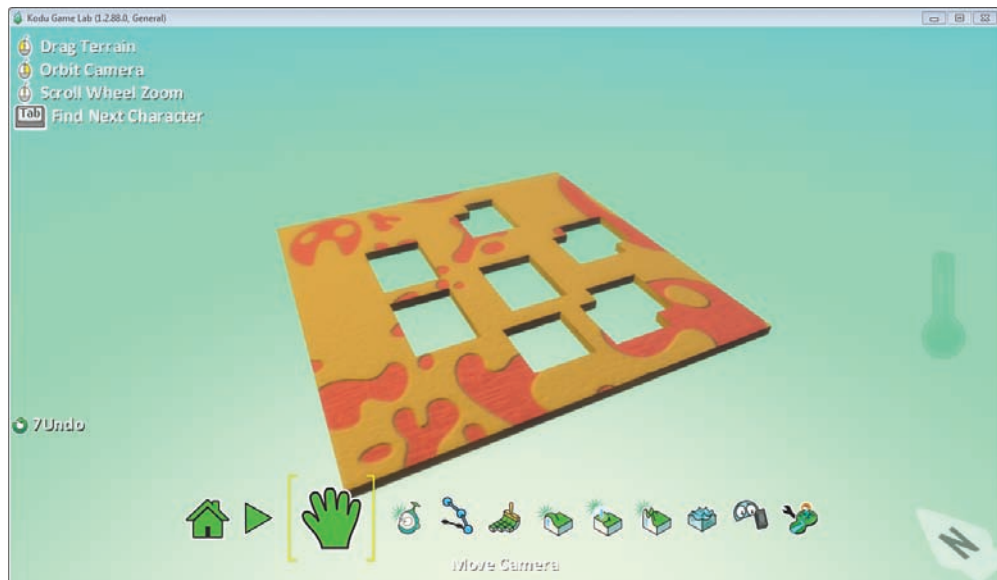


FIGURE 6.11 Right-click to erase with the Ground Brush.

I can fill those holes easily enough by selecting a new terrain and then holding down the Control key while dragging the brush over those holes. Figure 6.12 shows the new look of the terrain.



FIGURE 6.12 Fill in holes with new terrain using the Control key.

The Magic Brush

Before I move on to a different tool, I want to show you how the Magic Brush works. Before you select the Magic Brush, click the Ground Brush and select a different terrain. I've selected a dark red painted terrain, but you can pick anything that you're not already using.

Next, select the Magic Brush (it's the last one to the right, just beyond the Linear Round Brush) and move it over any bit of existing terrain.

It's a bit difficult to tell in Figure 6.13, but whatever terrain you have selected will glow and fade repeatedly while you are using the Magic Brush. You can then modify whatever terrain is glowing by using the tools you've already learned about; you selected a new terrain color, so tap the left mouse button and that color will be applied to any flashing terrain. Notice in Figure 6.14 that I changed the overall color of the terrain with the Magic Brush but that the smaller squares were not modified.

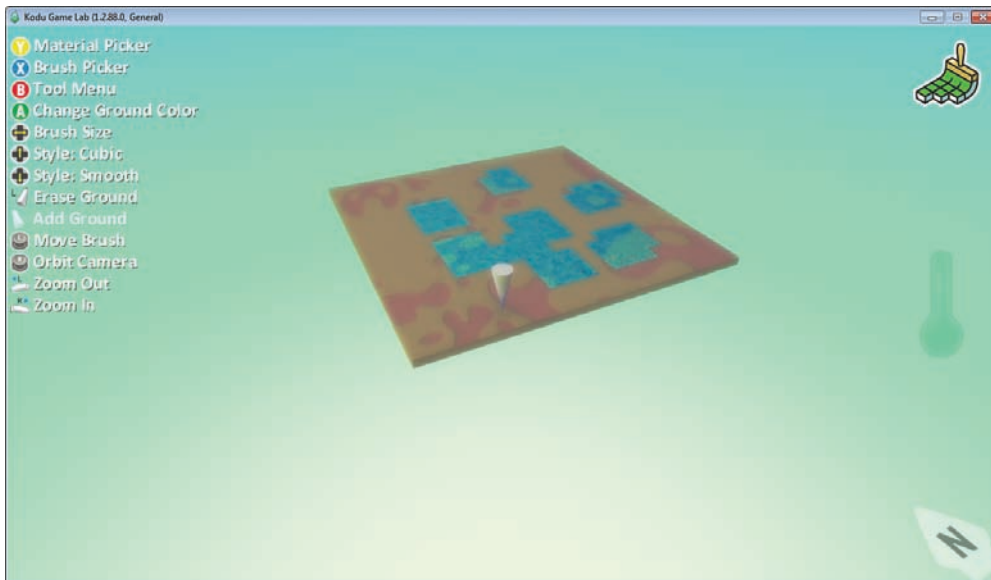


FIGURE 6.13 Use the Magic Brush to make large changes to terrain.

I showed you earlier how to use the Control key while using the Square or Round brush to change the color of existing terrain. If you had done this over the large square of terrain, however, it would have also changed the small squares. Using the Magic Brush, I was able to select just the color of the larger square and change it without changing the smaller squares.

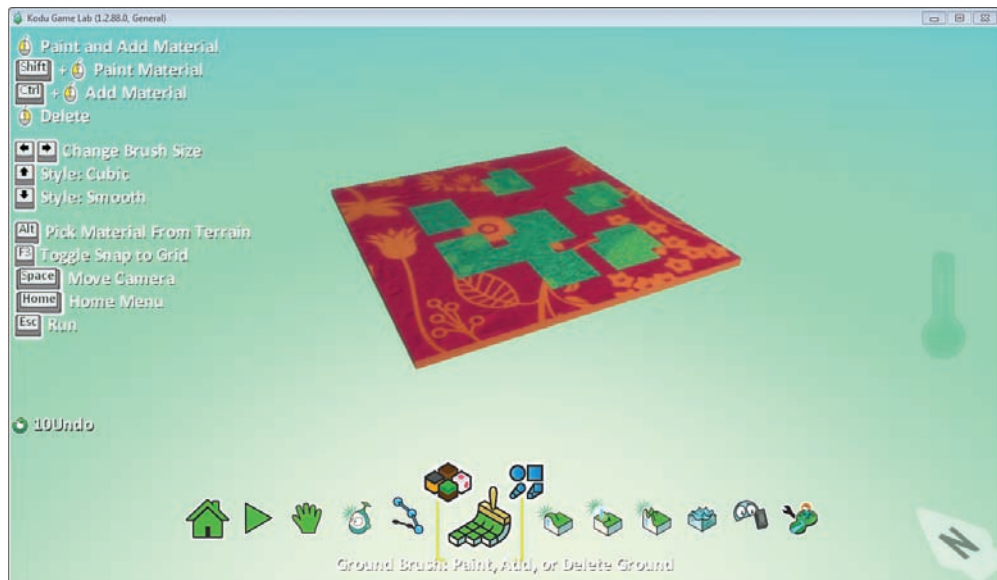
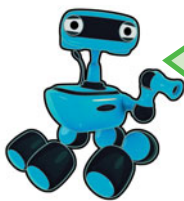
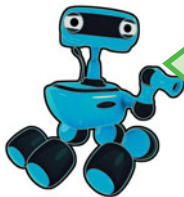
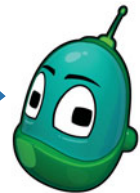


FIGURE 6.14 Magic Brush can apply colors selectively.



Rover: Will the Right and Left Arrow keys also change the size of the Brush?

Kodu: Absolutely! Shrink it down to a thin line and you could draw or write words on the terrain that would be easy to read.



Rover: And I'm guessing that it would be helpful in creating outlines of shapes.

Kodu: Yep! Imagine drawing the outline of a castle's outer walls using the thin line. Then you could use the Up/Down tool to raise the outline and create a three dimensional castle instantly.



You'll definitely want to experiment with all five brushes (Square, Round, Linear Square, Linear Round, and Magic Brush) until you're good and comfortable with them. The Ground Brush is the primary tool you'll use to create larger worlds, such as the battle ring I've created and shown in Figure 6.15.

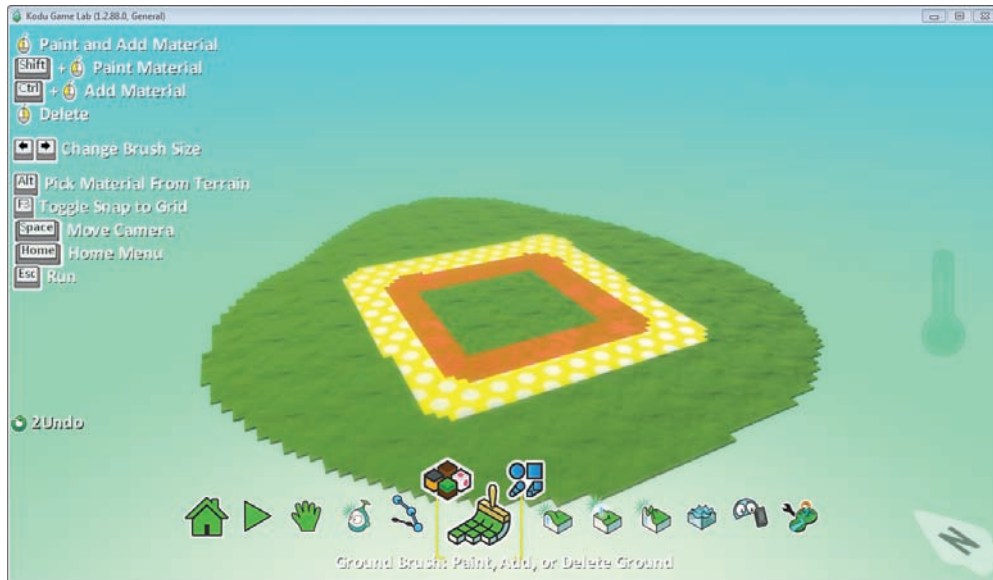


FIGURE 6.15 A battle ring for a fighting robot game, perhaps?

Mountains and Molehills

Look at Figure 6.15 again. Notice that although the terrain is colorful, it's also quite flat. Flat isn't always bad, though. Sometimes a game needs to exist on a flat surface; the rules of the game or maybe how you've programmed the objects in it might not be suitable for a world of hills and mountains and lakes. But if you want them, it's really easy to add them to your new world.

The tool to the right of the Ground Brush is called the Up/Down tool, and it lets you add hills and valleys. As with the Ground Brush, you can increase or decrease the size of the tool with the Left Arrow and Right Arrow keys on the keyboard (or by pressing Left or Right on the D-Pad).

Now it's easy to create hills or mountains, as follows:

1. Select the Up/Down tool and its brush size.
2. Move your cursor over an existing bit of terrain and hold down the left mouse button.
3. Maintain your left mouse button press until you achieve your desired hill or mountain height.
4. Move the cursor, as desired, to widen or narrow your hill/mountain.
5. Release the left mouse button press when you're happy with the look of your terrain.

Figure 6.16 shows that I've added a small hill right in the center of my terrain. Notice that the hill/mountain gets its coloration from the terrain that it affects.

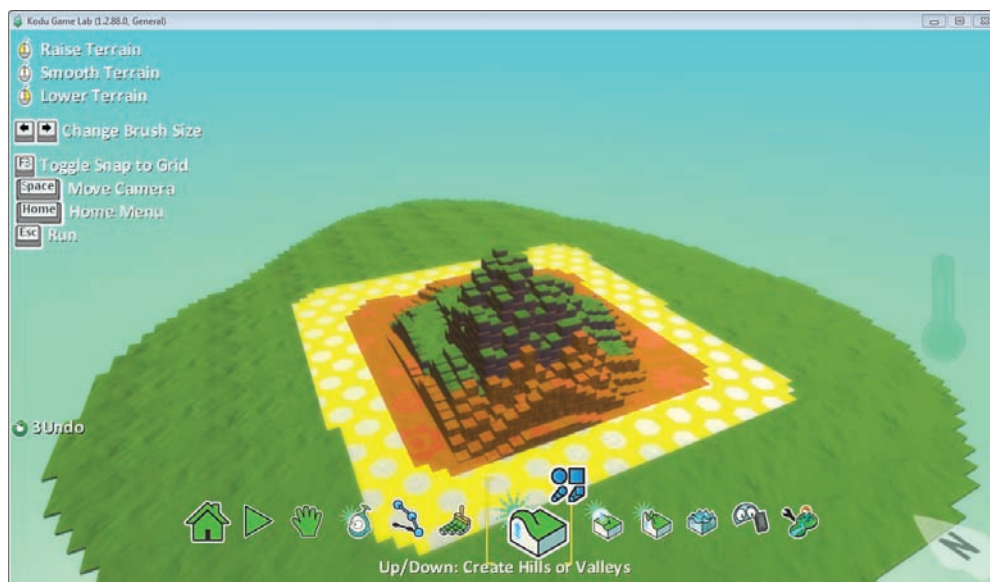


FIGURE 6.16 A small hill in the center of my new world.

If you don't like a hill/mountain you have created, just get rid of it by pressing and holding down the right mouse button and moving the cursor over the hill until the hill is reduced in size (or completely gone), as shown in Figure 6.17.

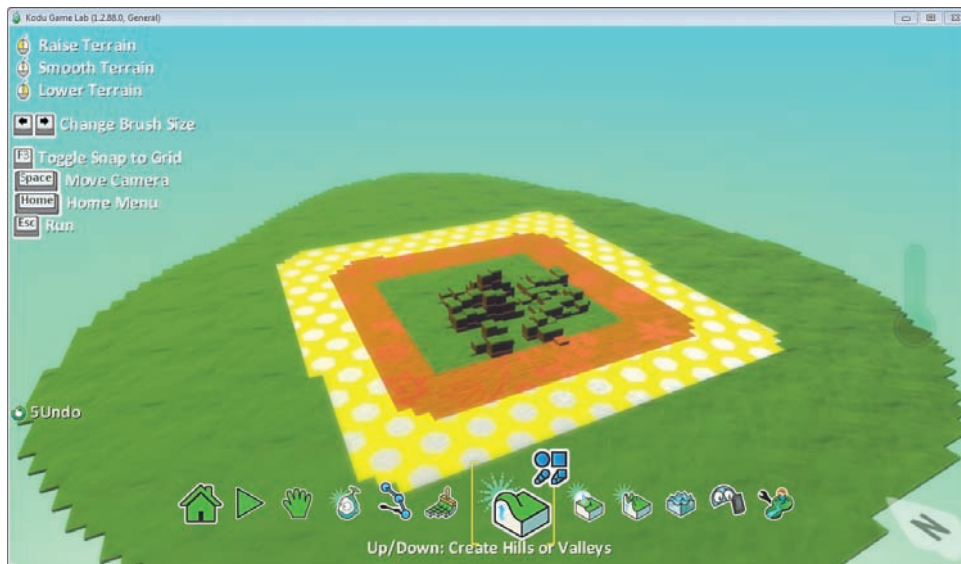


FIGURE 6.17 Reverse the direction of a hill with the right mouse button.

Brush Shape Options

You can change the shape of the Up/Down tool just as you did with the Ground Brush, but this tool has some different options, as shown in Figure 6.18.



FIGURE 6.18 The tool has its own options for adding and removing hills.

- **Square and Round Brushes:** The Square and Round brushes apply the raising and lowering effect equally across the entire area of the brush shape. With the Medium Round Brush or Soft Round Brush, however, the raising or lowering effect is subtle on the outer edges of the tool. Figure 6.19 shows that I've added another hill, but this time the brown terrain (surrounding the inner green terrain) is smoother and less "blocky" looking.

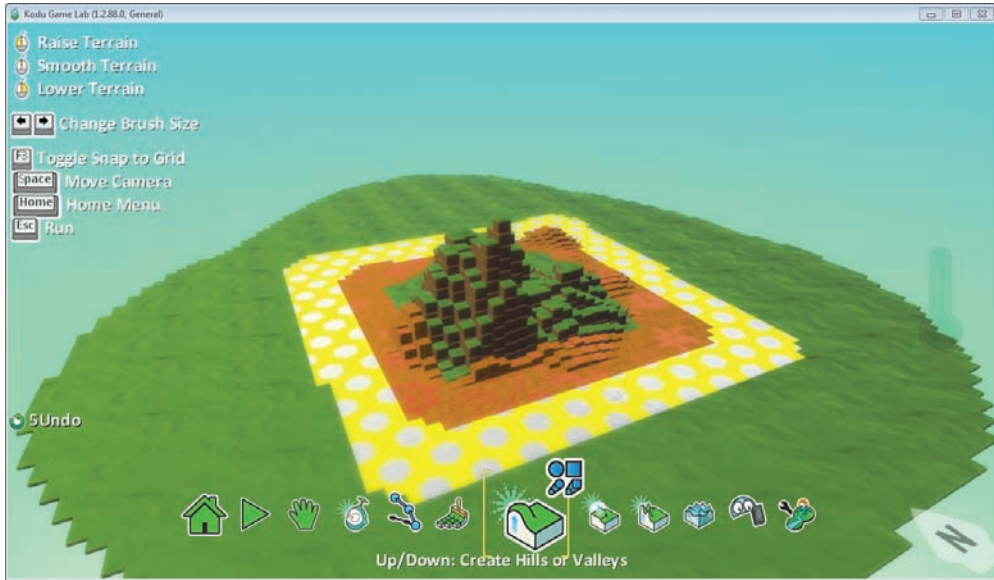


FIGURE 6.19 You can obtain softer terrain with the Medium or Soft Round Brushes.

- **The Mottled Brush:** The Mottled Brush (second selection from the right, just next to the Magic Brush) enables you to raise the terrain in a more random fashion. Think about a hill or lake or other natural terrain; there's a randomness to it, with no straight edges or 90 degree bends. The Mottled Brush allows you to give your terrain that same natural look and making it more realistic looking.
- **The Magic Brush:** With the Magic Brush, you can pick one type of terrain (such as the dotted patch of terrain surrounding the inner green and brown terrain) and then raise or lower only the selected terrain.

Figure 6.20 shows that I've used the Magic Brush to raise the terrain only on the yellow dotted terrain going around the inner green and brown terrain. Notice that unlike the randomness of a growing hill or mountain, the terrain is grown up at a consistent rate, enabling me to make a fence around the inner area.

Right-clicking with the Magic Brush enables me to lower the fence or completely remove it. Figure 6.21 shows that I've used the Magic Brush to create a "birthday cake" effect with the three terrain types on my world.

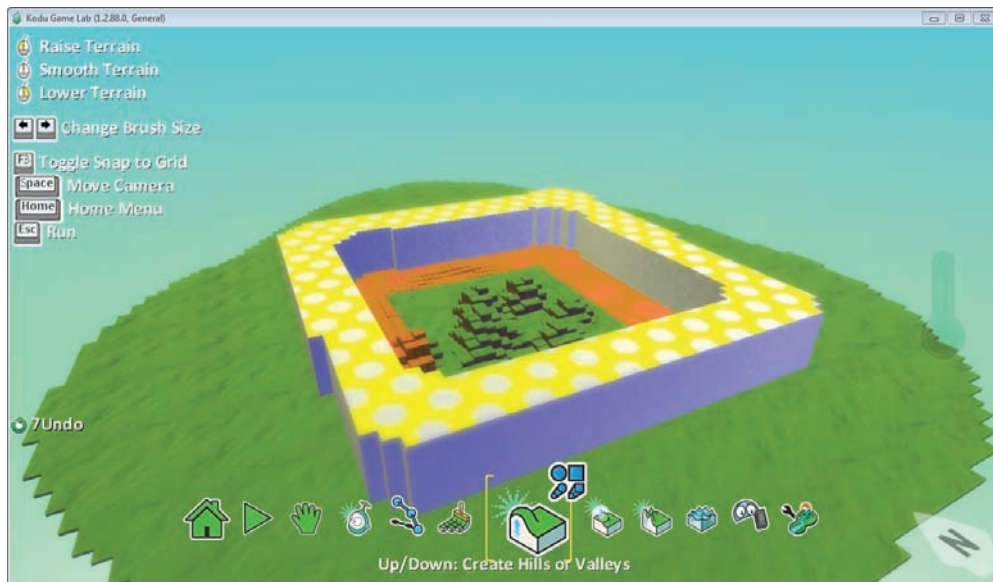


FIGURE 6.20 Use the Magic Brush to raise and lower terrain at a constant rate.

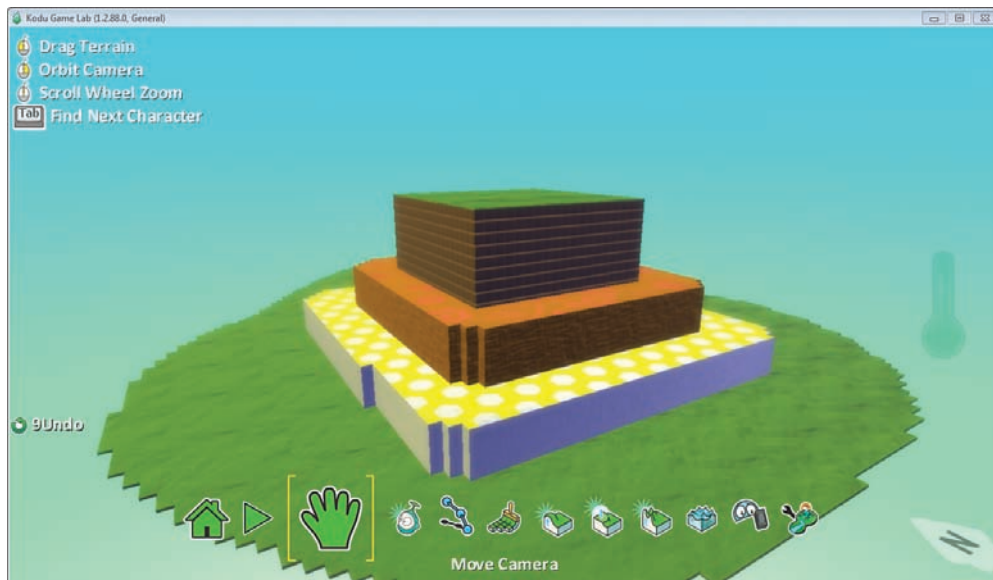


FIGURE 6.21 Three levels of playing field are created (four if you count the surrounding terrain).

Smoothing or Roughing Terrain

If you are using a mouse with a scroll wheel in the center, press and hold the scroll wheel while moving it over terrain to apply a smoothing effect to any raised terrain. It's subtle and sometimes difficult to see with some terrain, but I've applied the smoothing effect to the top of the rough mountain back in Figure 6.19. Figure 6.22 shows a smoother mountaintop thanks to my use of the center scroll wheel.

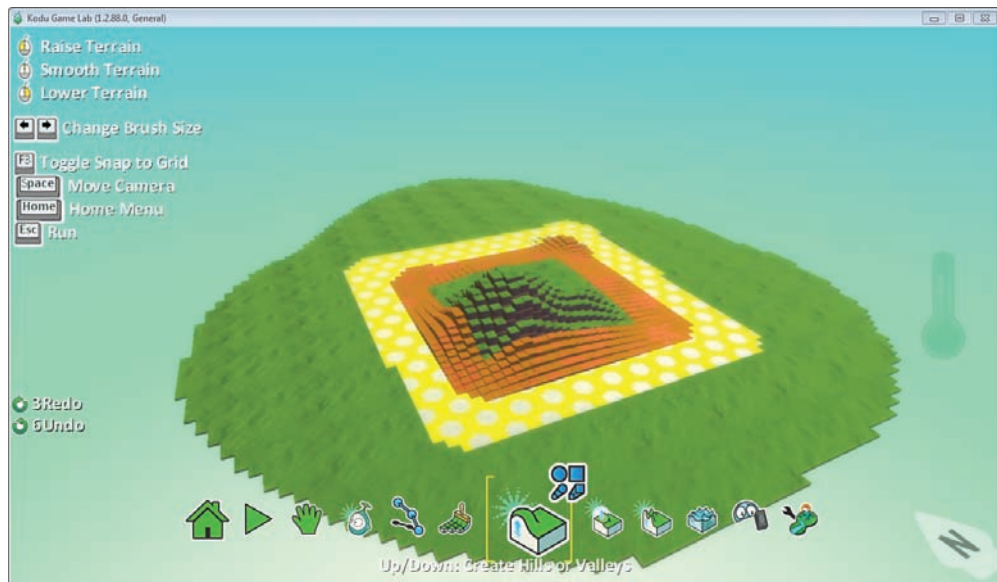


FIGURE 6.22 Use the center scroll wheel to smooth terrain.

If you don't have a center scroll wheel, you can select the Flatten tool to the right of the Up/Down tool to get the same results. The only difference with using the Flatten tool is that you can select the shape of the brush: Square, Round, or Magic Brush. Once again, Square and Round apply the flattening effect somewhat equally across the size of the brush, whereas the Magic Brush enables you to select an entire terrain type (that's also connected) and then apply a consistent flattening effect all at once.

To give hills and valleys a smoother and more natural look, use the Flatten tool slowly and methodically. Figure 6.23 shows how I've used it to give my center hill a rounded and more gradual incline.

Finally, the Roughen tool (to the right of the Flatten tool) is used to grow terrain in faster and spikier manner. It grows the terrain faster and gives a random forest or urban look (depending on the terrain you've selected). Figure 6.24 shows how I've added a wild forest area to the outer ring surrounding my hill.

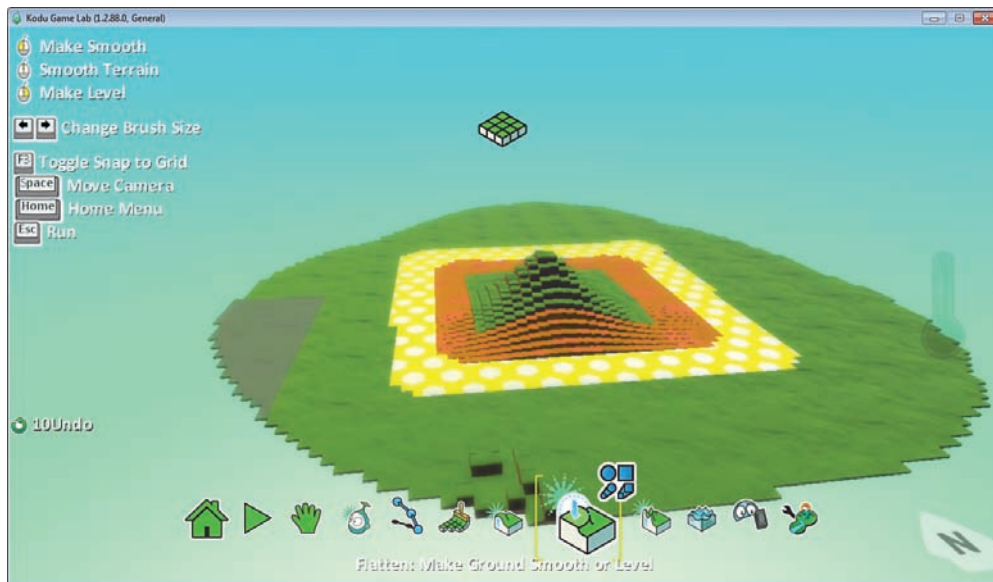


FIGURE 6.23 The Flatten tool is more of a polishing tool for rough terrain.

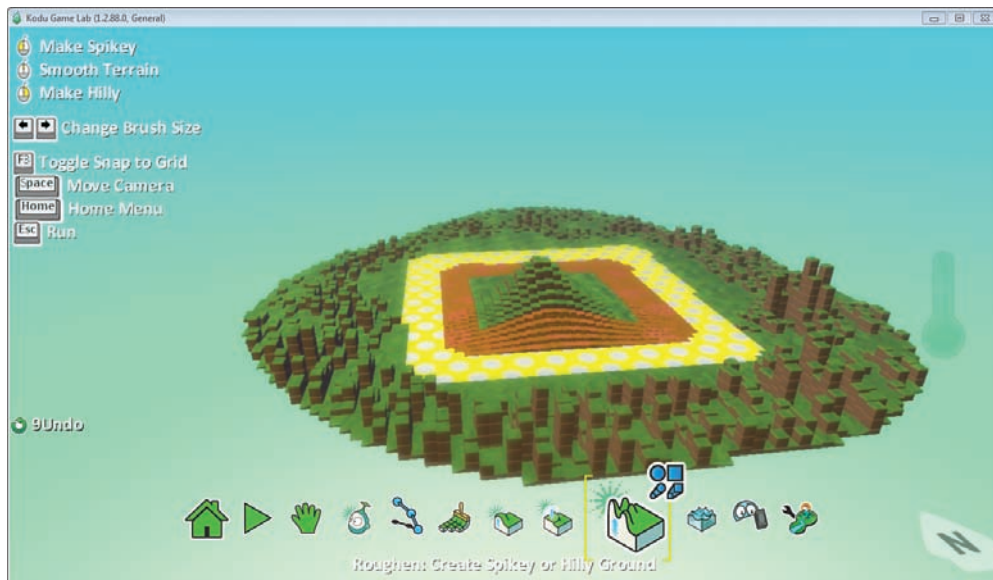


FIGURE 6.24 Give your world a rougher and spikier look with the Roughen tool.

CAUTION

Rough terrain can be difficult or even impossible for players to navigate. This is why it is so important to constantly test your games. When you're creating terrain, drop in Kodu and add some basic movement controls and then drive him all over the game world. Look for areas where he cannot move or access such as between thin walls or up a steep cliff. You'll have to modify these areas if you want players to be able to access those areas.

Much More World Building to Come

I'm one of those people who likes to push buttons and click features just to see what they do, so I'm not going to tell you to stop poking around Kodu Game Lab's other tools. Feel free! But I will be covering the topics of water and roads in a later chapter. For now, you should have enough hands-on experience with the basic Ground Brush and terrain-modifying tools to start creating some wild and crazy worlds of your own.

And that's a good thing, because as I said earlier in this chapter, a good game is more than just throwing some objects on the screen and programming them to shoot at one another. If you've got a great game idea growing in your head, you absolutely cannot forget to include the look and feel of the terrain in your plans.

The world that your game exists in needs to be eye-catching, of course, but it also needs to make sense in terms of the rules of the game. If you've put pits everywhere that look good but that frustrate your players because they keep falling in, that's not a good thing (well, unless the point of the game is to avoid the pits). Instead, the pits should be used sparingly, a few here and there, to make a game more exciting, not frustrating. Your players should be focused on the main goals of the game (such as collecting coins or shooting flying enemies), and the terrain and obstacles you've created should be adding to the fun, not taking away from it.

A good balance of goals, game rules, and world design is what makes a game great. And you'll get better at it over time, I promise.

Moving On

Let's create a short list of your Kodu Game Lab skills to this point. You know how to add objects to a world, including objects controlled by players and objects that simply sit still and make good targets. Speaking of targets, you've learned how to program player objects to shoot missiles or other projectiles, and you've learned how to create a simple scoring system. You know how to change colors and sizes of objects, and how to make multiple copies of objects that you've programmed.

As for the terrain, you now know how to add, modify, and remove terrain as needed. You know how to select different colors/styles of terrain that can best be used in certain types of games you

might have planned, and you've gotten quite good at using the Move Camera tool (the Hand) to rotate your world and zoom in and out.

If I'm correct, you are ready to create a game—maybe not the most advanced Kodu game ever made, but certainly something that is fun and can provide some entertainment to you and your friends. (And I have to add, you're also ready to design a game that will impress your family, your teachers, pretty much anyone you want to show off your game to.)

So, in anticipation of the upcoming chapters in which you'll learn more advanced programming features that give your games even more punch and power, I want you give you a few extra tasks to try and perform before moving on, okay?

Here's what I want you to do before moving on to Chapter 7, "Difficult Targets to Hit: Increasing Game Difficulty and Path Following":

1. Use the Ground Brush and similar tools and create a big world. Make it round or rectangular-shaped, but give it four or five different terrain types—maybe a grassy inner terrain surrounded by a more urban cement-and-steel look. You decide, but give yourself some time to experiment with the world design tools until you're confident with adding, removing, and editing terrain.
2. After you've created a new world, drop in Kodu or Rover and add basic programming to steer it around your new world. Take your object for a spin, zoom in a bit, and roll around your terrain. Did you add any hills or mountains that prevent Kodu or Rover from moving on or over? If not, do so now. Try to find out just how steep of a hill you can add before Kodu or Rover are blocked and cannot roll up.

When you finish this homework, click the Home Menu button and save your newly created world before selecting Exit to Main Menu. From the Main Menu, select Quit Kodu to close down Kodu Game Lab.

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