Community Experience Distilled

Raspberry Pi Projects for Kids

Second Edition

Leverage the power of programming to use the Raspberry Pi to create awesome games

Daniel Bates

[PACKT] PUBLISHING open source* community experience distilled

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About the Author

Daniel Bates is a computer science researcher at the University of Cambridge. His day job involves inventing designs for future mobile phone processors and when he gets home, he likes playing games or working on one of his coding projects (or both!). Daniel has been a volunteer for the Raspberry Pi Foundation since 2011 and is enthusiastic about introducing new people to computing. He has previously written *Instant Minecraft: Pi Edition Coding How-to* and *Raspberry Pi Projects for Kids* (First Edition), both published by Packt Publishing.

About the Reviewers

Ed Baker graduated with a BSc in physics from Imperial College, London, in 2007 and somehow ended up working in the Entomology Department of the Natural History Museum shortly after. His work focuses on how technology, both hardware and software, can improve the way research is performed, from field data collection to final publication. Outside the technology world, he is a specialist on stick insects, cockroaches, and grasshoppers.

Recently, his work has focused on automated acoustic and environmental monitoring, protocols for sensor networks, and starting the biodiversity technology company `http://www.infocology.co.uk`.

Ed's first book, provisionally titled *Arduino for Biologists*, will be published in 2015 with Pelagic Publishing.

I would like to thank Philippa for believing that the writing and 'tinkering' would bring reward in the end.

Colin Deady's career in IT started in the late 1990s, when he discovered software testing ("they want me to break it?"), having previously fallen in love with computers when his parents brought him and his brother a ZX81 and ZX Spectrum+ in the 1980s and later an Amiga 1200 in the early 1990s. With over 15 years of experience in testing, he works as a Technical Test Manager, emphasizing the benefits of test automation and extolling the virtues of agile using Kanban and Behavior-Driven Development to great effect: define behaviors, then test early, test often. He combines BDD with a fix early, fix often approach that he terms Zero Known Defects.

Colin was one of the technical reviewers for Tim Cox's excellent *Raspberry Pi Cookbook for Python Programmers*, by Packt Publishing, and has written several articles for The MagPi, a community magazine for the Raspberry Pi. He has also reviewed and edited many more, building up extensive knowledge on this tiny platform.

He currently runs a blog related to all things Raspberry Pi, which can be found at `www.rasptut.co.uk`.

Ian McAlpine was first introduced to computers when he used his school's Research Machines RML 380Z and his physics teacher's Compukit UK101. This was followed by a Sinclair ZX81 and then a BBC Micro Model A, which he still has to this day. The interest he has in computers resulted in an MEng degree in electronic systems engineering from Aston University and an MSc in information technology from the University of Liverpool. Ian is currently a product expert in the Business Intelligence and Analytics Competence Center at SAP Labs in Vancouver, Canada.

The introduction of the Raspberry Pi rekindled his desire to "tinker" but also provided him with an opportunity to give back to the community. Ian is also a very active volunteer, who works for The MagPi, a monthly magazine for the Raspberry Pi community, which you can read online or download for free from `www.themagpi.com`. He also holds an amateur radio license (callsign VE7FTO) and is a communications volunteer for his local community emergency management office. He was a technical reviewer for *Raspberry Pi Cookbook for Python Programmers*, by *Packt Publishing*.

I would like to thank my darling wife, Louise, and my awesome kids, Emily and Molly, who've allowed me to disappear into my office and have, consequently, trained our dog to fetch me!

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Preface

The Raspberry Pi is a credit card-sized computer designed to make computing accessible to all. With the trend towards making computers easier and easier to use, the art of programming has been in decline. Programming is a powerful tool that lets us tell the computer exactly what we want to do. In much the same way as we use a hammer or screwdriver to help us with a physical task, we can use programming to help us with a mental task. The Raspberry Pi exposes programming software to make it as easy as possible to get started.

After introducing the Raspberry Pi computer and showing you how to set it up, this book will guide you through six separate mini-projects. Each project is fun, visual, and has plenty of scope for personalization. By the end of this book, you will understand and be able to use three different programming languages, and will be able to use them to build creative programs of your own.

What this book covers

Chapter 1, *Getting Started with Raspberry Pi*, shows you what Raspberry Pi is and how you can get one set up and ready to use.

Chapter 2, *Animating with Scratch*, introduces the Scratch programming language and uses it to create simple (and not-so-simple) animations.

Chapter 3, *Making Your Own Angry Birds Game*, teaches you how to make your very own computer game using the Scratch programming language.

Chapter 4, *Creating Random Insults*, explores how random funny phrases can be generated using the Python programming language.

Chapter 5, *Testing Your Speed*, helps you to connect electronic components to your Raspberry Pi to create a physical game controlled by your computer code written in Python.

Chapter 6, *Making an Interactive Map of Your City*, teaches you more about Python and shows you how to access Google Maps to create a personal map of your area.

Chapter 7, *Building Beats with Sonic Pi*, introduces the Sonic Pi application and shows you how the programming concepts learned so far can be applied to the creation of music.

What you need for this book

All the projects in this book require Raspberry Pi and all the necessary peripherals (listed at the beginning of *Chapter 1*, *Getting Started with Raspberry Pi*). *Chapter 5*, *Testing Your Speed*, adds simple electronic components, listed at the beginning of that chapter. *Chapter 7*, *Building Beats with Sonic Pi*, requires headphones or speakers.

Who this book is for

This book is designed to help adults and children jump into creative coding using the Raspberry Pi. You will need patience, a sense of adventure, and a vivid imagination!

Conventions

In this book, you will find a number of text styles that distinguish between different kinds of information. Here are some examples of these styles and an explanation of their meaning.

Code words in text are shown as follows: "Be very careful when using the `sudo` command."

A block of code is set as follows:

```
def count(maximum):
    value = 0
    while value < maximum:
        value = value + 1
        print "value =", value
```

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

```
def count(maximum):
    value = 0
    while value < maximum:
        value = value + 1
        print "value =", value
```