Make:
Family Projects for Smart Objects

Tabletop Projects That Respond to Your World

John Keefe

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To Kristin, Kaia
and Natalie

About the Author

John Keefe is a maker, journalist, and professional beginner based in New York City. This book emerged from a year he spent trying to make something every week, posting each one on his blog at http://johnkeefe.net.

As you use this book, you can find updated information, code, corrections and links to parts at http://keefe.cc/family-projects.

You can email the author at familyprojects@johnkeefe.net and follow him on Twitter at @jkeefe.

About the Illustrations

All circuit diagrams in this book were made using Fritzing from http://fritzing.org.

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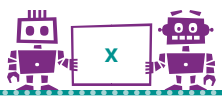

Welcome to the World of Smart Objects

The internet of things is a buzzphrase that's become almost meaningless. Is it a toaster that texts? Is it a fitness band on your wrist? Is it a wireless camera in an infant's room? Sure, it's all of those things and more.

These days, it's not much of a surprise that objects can sense things and communicate. You very likely have an uber-sophisticated sensor and communications system in your pocket or purse—capable of tracking your steps, capturing an image, and ordering your groceries. (I hear some people even use them to make phone calls!)

What might be surprising, is that it's not hard or expensive to make a sensing, communicating object yourself. And making smart objects can be rewarding, fun and even useful.

This book will give you the basics for building such things. The projects here are sometimes useful and sometimes just playful. With luck, they'll spark new ideas for how you might imagine, and build, your own useful and playful objects. Enjoy!

Acknowledgements

I couldn't have created "Family Projects for Smart Objects" without the love, support, and patience of Kristin, Kaia, and Natalie Keefe. Thank you from my heart. This was a family project made by you, too.

My thanks also to Team Blinky co-conspirators Liza Stark and Alex Goldmark for their boundless energy and maker-spirit, to Quinn Heraty for the encouragement and guidance I needed to become an author, to Eva Scazzero for trying all the projects and making them clearer, and to Patrick DiJusto for imagining that a book could be built from some of my blog posts—and then editing that book.

Also thanks to Linda Keefe, who raised me with a passion for projects, supported my curiosity even when I took apart household appliances and caught tons of typos in these pages.

—John Keefe, July 2016, New York City

Make:
Family Projects for Smart Objects

You Only Have to Do This Once

You're about to embark on the world of smart objects using Arduinos. There's so much you can do and it's all a lot of fun. You'll say "Wow!" and "Yay!" and maybe even "Eureka!"

But first, we need to get you set up. This will take several steps, but I'll walk you through each one. Think of me as a computer professional (or a talented child) walking you through each step; a kind, patient computer professional/talented child.

Ingredients

- **1 Arduino Uno (Revision 3)**
- **1 Arduino USB cable**
- **Your computer: a desktop or laptop running Mac OS, Windows, or Linux**

Most importantly, you only have to do this once. I *really* want you to remember that, which is why I put it right up there as the title of this chapter. Once you're set up, the projects in this book will be a breeze.

So here we go!

Arduinos come in many, many flavors. That's largely because it's "open source" hardware, meaning anyone can build an Arduino from scratch. Each flavor has different features, sizes, and quirks.

I recommend you start out with the Arduino Uno, Revision 3. It's the classic beginner's board, and it's the board I'll assume you have throughout this book.

Almost any Arduino starter kit you find online will contain both the Arduino Uno and the Arduino USB cable. Many kits also have a bunch of the parts you'll need for the projects in this book. For a list of kits and ways to buy parts individually, and some key parts you won't find in a kit, check out Appendix A, "Everything You Need" at the end of the book, or visit http://keefe.cc/family-projects.

You also will need a computer onto which you have permission to install new software. If you've successfully installed new software before, you almost certainly have permission. If someone else such as a parent, a company manager, or the computer's owner has the Administrator password, you're going to need that person's help to continue.

NOTE ABOUT PARTS FOR LATER PROJECTS

In the last half of this book, we'll get your smart objects on the Internet—making them even smarter. Those projects require access to a wifi network and a particular wifi card for your Arduino. Get information about that part and other ingredients used throughout the book in Appendix A, "Everything You Need," or at http://keefe.cc/family-projects.

STEPS

To make the Arduino do things, we'll need to give it instructions. Normally, you give a computer instructions using a keyboard and a screen. But your Arduino doesn't have a keyboard or screen. So instead, we write the instructions on a desktop or laptop computer and send them to the Arduino over the USB cable.

So let's make that connection, physically linking your Arduino to your computer.

Get Connected

1. Plug the flatter end of the USB cable into a USB outlet on your computer.
2. Plug the squarish end of the USB cable into the matching outlet on the Arduino.

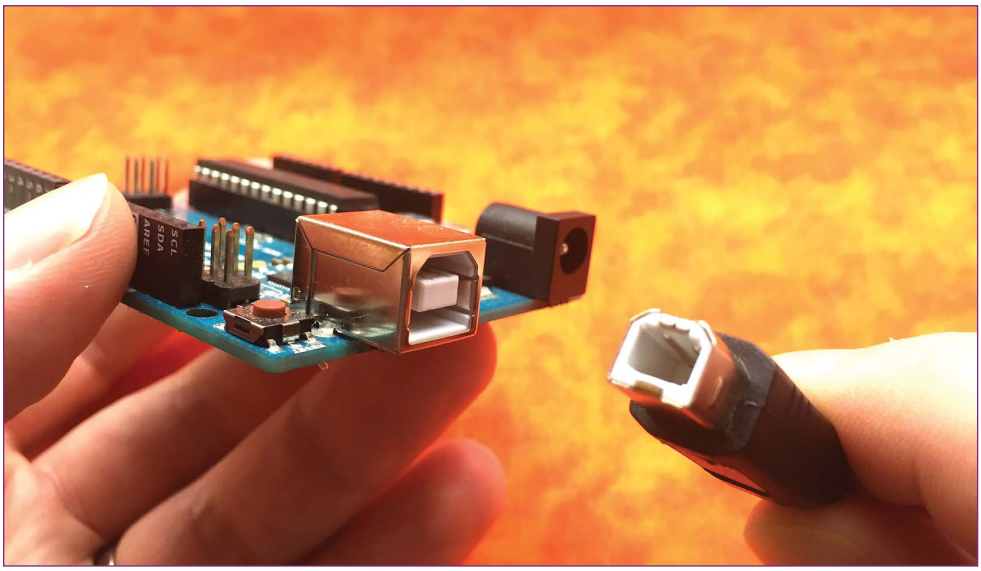

FIGURE 1-1: The squarish end of the USB cable goes into the squarish outlet on the Arduino.

3. If your computer alerts you about detecting a new device, just cancel out of the alert for now.

Great. You're connected, but you can't communicate with the Arduino until you install some free software onto your desktop or laptop computer. The installation is slightly different depending on your type of computer: Mac OS, Windows, or a type of Linux. So pick the next section that fits you, and remember: You only have to do this once.