Junk Box Arduino

Ten Projects in Upcycled Electronics

James R. Strickland
For Marcia, who’s been very patient with little bits of wire everywhere.
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James R. Strickland is a professional nerd who writes science fiction, steampunk, technical books, and technical videos. When that doesn’t fill his time, he builds retrocomputers, repairs antique radios, programs computers, and is still known to play role-playing games occasionally. He lives in the Denver metro area with his wife, Marcia, and a variable number of cats. He can be found at www.jamesrstrickland.com.
About the Technical Reviewers

Terry King has designed broadcast stations, recording studios, broadcast equipment, intelligent machines, and special computer languages for IBM, and has worked as a broadcast journalist covering elections, fires, riots, and Woodstock.

He has taught electronics at SUNY and IBM, and “Bits&Bytes” to many high schools.

Terry received an Outstanding Technical Achievement award from IBM for the software architecture of IBM Chip Test systems.

He is now “retired” and writing about Arduino/Embedded systems (http://ArduinoInfo.Info) and running YourDuino.com with his friend from China, Jun Peng, and his library designer wife, Mary Alice Osborne. Since “retirement” Terry has lived and taught in Africa, China, the Middle East, and Italy. Now he is “home again” in rural Vermont and working 40-plus hours a week on ArduinoInfo.Info, firewood cutting, woodworking, and electronics.

Andrew Terranova has been fascinated with electronics since childhood, and fell in love with digital circuit design while working with communication satellites. Today he is an engineer, maker, and writer who is usually found taking something apart or putting something together. Andrew makes robots, electronics, and other fun stuff whenever he gets the chance. His projects and articles have been published in Make: Magazine and Popular Science.
Admit it: you have an electronics junk box.

Human beings like to hang on to stuff. We get sentimental about the computers we had in high school, or junior high school. If you’re in your 20s (or younger) today, you might still have the first computer your parents let you play with when you were old enough to reach the keyboard and the mouse. Human beings haven’t yet adapted to Moore’s Law, where processing power doubles every 18 months, nor to the idea that everything we buy is already obsolete by the time we buy it. So we sentimentalize equipment that really has very little useful value, and it winds up in the junk box, still good, hopelessly obsolete, useless, but we just can’t bear to throw it away or recycle it properly. I’ve been a computer nerd since the early 1980s. My junk boxes take up about a quarter of my basement.

It’s easy to look at the contents of these boxes as frozen magic: tools and arcana from another time and place, distinct from the modern age because the modern equipment is so much more powerful, so much slicker, so much more magical.

There is no magic. There never was. If you’ve experimented with Arduinos already, this may have dawned on you, at least in a small way. There is no magic. The world runs on electronics and code and the machines these electronics and code control. All of those things, in turn, were designed by people, coded by people, and manufactured by people. If they can understand it, so can you.

Our junk boxes, then, have a purpose in addition to providing ballast for our homes to keep the basement end down and the roof end up. The very fact that the stuff in our junk boxes has no practical value anymore, means we can pull it apart, see what’s in it. If we add an Arduino, we can talk to these parts, see what they do, and learn how they communicate. It’s fun, and it dispels the magic even further. Once we understand how the old things work, we really are most of the way to understanding the modern, and to putting modern equipment in its proper place, as tools, as entertainment, as machines that do our bidding.

That’s what this book is about.
How to Use This Book

The first thing you need to do in order to use this book is to read it. Seriously. Read each chapter all the way through, preferably before you sit down with the parts in front of you to put something together. Pay close attention to The Stuff You Need part of each chapter, as it lists the tools and parts you need for each project. I’ve burned up more electronics trying to work around a missing tool or part than any other single cause.

Please also read the chapters in order. Some of the projects may look like respins of hoary old Arduino projects, like the Larson (Memorial) Scanner. “Come on,” you might say, “I’ve done that.” Please do it again anyway. I use these basic projects to demonstrate powerful techniques and concepts that the classic versions and traditional Arduino programming stop short of. Each chapter assumes that you know the stuff in the previous chapter, that you got that project to work, and that you’re comfortable with how it works.

At the end of each chapter is a section called “Further.” In these, I talk about how the project might be expanded into something more complex. These are suggestions. Sometimes I’m working from directions others have taken similar projects, sometimes I’m speculating into the clear blue sky. The important point is that I haven’t tested the ideas in the Further sections, and you’ll be on your own figuring out if the ideas are even practical, designing the circuits and making them work.

Finally, I do make an assumption in this book: that you are already familiar with Arduinos and the Arduino software. We’ll be using both. If you haven’t touched an Arduino before, please stop here, flip ahead to Chapter 1, and get one of the 5 volt Arduinos that I recommend. Then hook it up, get the Arduino software working, and play with it. There are hundreds of tutorials online, and they’ll get you going with the basics. Once you’ve got that going, you’ll have what you need for this book.