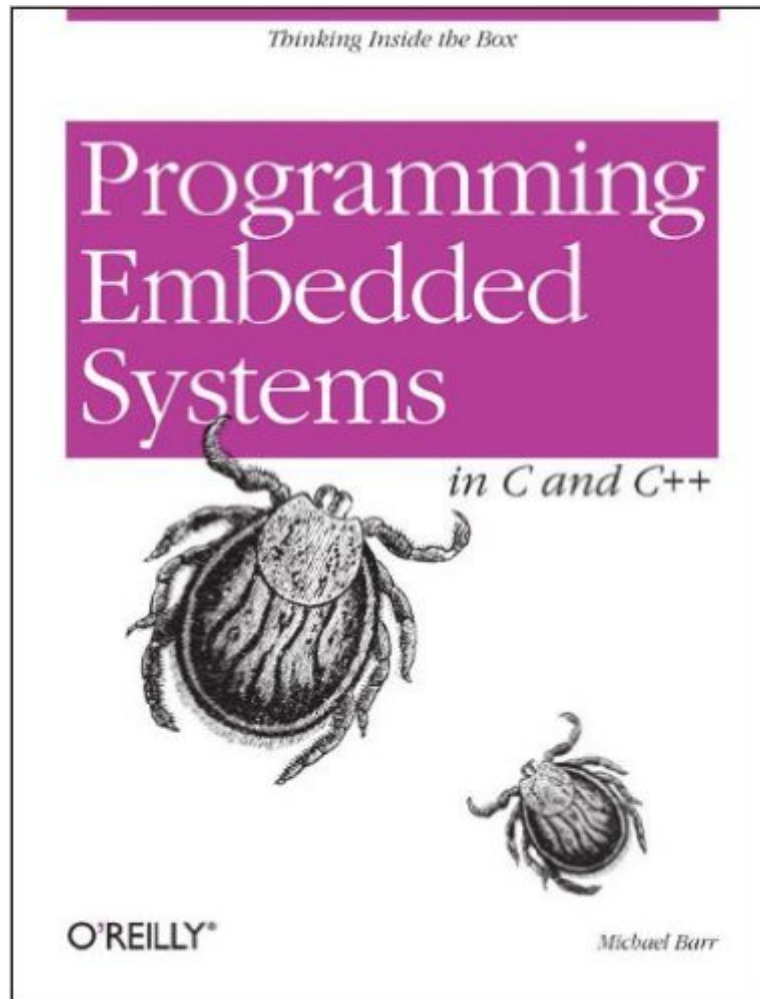


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# Programming Embedded Systems In C And C++



## Synopsis

Embedded software is in almost every electronic device designed today. There is software hidden away inside our watches, microwaves, VCRs, cellular telephones, and pagers; the military uses embedded software to guide smart missiles and detect enemy aircraft; communications satellites, space probes, and modern medicine would be nearly impossible without it. Of course, someone has to write all that software, and there are thousands of computer scientists, electrical engineers, and other professionals who actually do. Each embedded system is unique and highly customized to the application at hand. As a result, embedded systems programming is a widely varying field that can take years to master. However, if you have some programming experience and are familiar with C or C++, you're ready to learn how to write embedded software. The hands-on, no-nonsense style of this book will help you get started by offering practical advice from someone who's been in your shoes and wants to help you learn quickly. The techniques and code examples presented here are directly applicable to real-world embedded software projects of all sorts. Even if you've done some embedded programming before, you'll still benefit from the topics in this book, which include: Testing memory chips quickly and efficiently Writing and erasing Flash memory Verifying nonvolatile memory contents with CRCs Interfacing to on-chip and external peripherals Device driver design and implementation Optimizing embedded software for size and speed So whether you're writing your first embedded program, designing the latest generation of hand-held whatchamacalits, or simply managing the people who do, this book is for you.

## Book Information

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## Customer Reviews

I found this book to be a great introduction to the world of Embedded C++. The book is well written which does make it easier to understand some of the more complicated aspects covered. I don't agree with the other reviews in this book that it would serve as a good reference; however, it does serve as a great introduction. Just wanted to add that the review from the English guy makes no sense in the context of this book. I have read the entire book and still can't fix a Volkswagon! Seriously though for beginners this is an excellent first book to read, gives you lots of practical information without overpowering the reader. I would not recommend this book as a pure reference book, more of an informative read.

I just got my hands on a copy of the book yesterday and after spending several hours browsing it, I am very pleased with the purchase. I've been programming embedded systems in C for well over 15 years now but I'm always looking for new & better ways to implement systems. Most of what I've found in the book so far is a helpful encapsulation of the information I've learned and gathered over the years. One of the roles I have is to "bring along" young engineers. Now I have a book to which I can point and say "Read this, then let's discuss it". The sections discussing the use of an OS in small systems are particularly informative to even the experienced programmer. -Bill Knight R O Software

This book makes a great reference for anyone who is just beginning their journey into the world of embedded systems, as well as for those who already have lots of practical programming experience but are looking for a deeper understanding. As an embedded programmer myself, I was finally able to put all the pieces of embedded development that I have learned over the years into perspective. Michael is an excellent writer. His friendly style makes even complicated topics like device drivers and memory testing easy to understand. I highly recommend this book.

This book is geared towards people who intend to venture into the field of embedded systems and need an overview on the basics. These include the scope of development and most importantly, things that the developer should pay attention to (In the embedded system field, the developer has to pay close attention to the underlying hardware's characteristics such as registers, interrupts and memory address locations, in Java application development on the other hand, the underlying hardware and to some extent the OS is considered an afterthought). Though the examples are targeted to the Arcom board, the author makes a good effort to extract general principles applicable

to any other hardware type. A passing knowledge of C and C++ is required though to understand the code. Of course, experienced embedded systems programmers would find the text a rehash of what they know however for those new to the field, this serves as a very good foundation.

Having great regard for O'Reilly books, I had expected great breadth and depth from an O'Reilly book titled "Programming Embedded Systems in C & C++". However, this text takes disappointingly small steps towards 80x86 based embedded systems. The ARCOM systems are well designed, but much more expensive than the text would suggest. The chapter on A Decent Embedded OS, ADEOS, does not provide or describe a complete working OS. Jean LaBrosses' texts "MicroCOS II : The Real-Time Kernel" and "Embedded Systems Building Blocks..." do. Better Bang per Buck: Having been a 68xx, PIC and 80x86 programmer for years, I would now recommend ATMEL systems AVR xxx- Code Composer Studio Free, AVR In Circuit Emulators (ICE) - Inexpensive, C & C++ or other free or inexpensive compilers & resources. The books by "Embedded Systems Programming" Journal authors are also generally quite excellent - "Math Toolkit for REAL-TIME programming" & TCP/IP Lean being good examples.

"But keep in mind, it is extremely superficial. In other words, it's a great introduction for people who have no idea whatsoever what embedded development involves." This is a quote from a reviewer that gave it 5 stars. I agree with this reviewer comments but don't buy a book you will outgrow before you finish reading it! For now, I still recommend the David E. Simon book.

I bought this book after writing embedded software in C for televisions for about 18 months. Anyone with a little interest and curiosity in embedded software should find this book very easy to read and understand. The examples and sample code are also easy to follow considering that embedded code cannot be run on arbitrary platforms. All in all, a very good buy.

This book is indeed quite useful, as so it has assisted me with essential information that will help:

- Engineers: design better embedded PC hardware
- Programmers: write high-performance embedded firmware
- Technicians: debug obstinate ISA bus gadgets
- Students: relate abstract theory to applications
- Enthusiasts: control unique projects with standard PCs

The topics range from pure firmware to detailed hardware, including the BIOS routines and circuitry on the PC's side of the ISA bus that you can use throughout your embedded systems designs.

- Examine: I/O ports, memory, IRQs, and bus cycles
- Control: hardware with C and Assembly language
- Adapt: working source code

and programs \*Gadgets\*Build: ISA bus memory and I/O circuitsProtect: code with watchdogs and power monitorsIdentify: hardware with unique serial numbersDisplay: text and graphics on big LCD panels \*Practical Tricks\*Run: code in EPROM, EEPROM, or nonvolatile RAMMeasure: wait states and interrupt latencyFix: hardware problems with firmwareDebug: firmware using hardware outputsReading Michael Barr's book, "Programming Embedded Systems in C and C++", I couldn't help thinking about Volkswagen Bugs. In the 70's, tinkerers put VW engines into buggies, hovercraft, helicopters, snowmobiles, airplanes, etc. Now, Michael is showing us how to use cheap, reliable, adaptable, and surprisingly powerful PC motherboards as 'volks controllers.' This book's generous code listings, diagrams, projects, and crystal-clear explanations make embedding a PC easier than a VW tune up. -Raymond Edwards, Chief Technical Engineer

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