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Embedded Systems with ARM[®] Cortex-M3 Microcontrollers in Assembly Language and C

Dr. Yifeng Zhu

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About the Author

Yifeng Zhu is Professor of Electrical and Computer Engineering at the University of Maine. He received his Ph.D. in Computer Science from the University of Nebraska in 2005. His current research interests include computer architecture and systems, data storage systems, energy-efficient memory systems, cloud computing, parallel and distributed computing, and wireless sensor networks. He has published more than 60 peer-reviewed conference and journal papers.

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This book introduces basic programming of ARM Cortex chips in assembly language and the fundamentals of embedded system design. It presents data representations, assembly instruction syntax, implementing basic controls of C language at the assembly level, and instruction encoding and decoding. The book also covers many advanced components of embedded systems, such as software and hardware interrupts, general purpose I/O, LCD driver, keypad interaction, real-time clock, stepper motor control, PWM input and output, digital input capture, direct memory access (DMA), digital and analog conversion, and serial communication (USART, I2C, SPI, and USB). The book has the following features:

- Emphasis on structured programming and top-down modular design in assembly language
 - Line-by-line translation between C and ARM assembly for most example codes
 - Mixture of C and assembly languages, such as a C program calling assembly subroutines, and an assembly program calling C subroutines
 - Implementation of context switch between multiple concurrently running tasks according to a round-robin scheduling algorithm
-
- Sales Rank: #262797 in Books
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 - Original language: English
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Most helpful customer reviews

14 of 16 people found the following review helpful.

"Masterpiece"

By darklord

I am not sure where does all these 5 stars come from. Maybe they are the author's friends?

I have bought hundreds of books online and this is first book I feel obligated to give a one star. I am shocked by the irresponsibility by the author.

Typos and mistakes are everywhere. Some times you can find more than ten typos in a page. In some sections every r2 is printed as r6. Some sections every '1' is printed as '2'. (I am not sure if the author is capable of counting from 0 to 9)

To give you an example, let's see how the author solves the problem "counting the number of 1-bits in a 32 bit integer". Savor the masterpiece:

```
// Count the number of ones in x
// Result saved in counter

int main(void) {
unsigned int x=0xAAAAAAAA;
unsigned int y, z;
unsigned int counter = 0;
counter = x >> 31;
while(x > 0) {
y = x > 31;
if (x < y) {
counter += z + 1;
} else {
counter += z;
}
x = y;
}
while(1)
}
```

I cannot tell you what's wrong with this program because I have no idea how the author's mind works. The author uses 2 pages to give you a detailed explanation of how that masterpiece generates a 16. Yes indeed 0xAAAAAAAA does have 16 ones in it. However the award winning piece also tells you 0xFFFFFFFF has 16 ones in it and 0x22222222 has 16 ones in it. Actually I would rather call this "program" a "16-generator".

So I just want to give you an simple. Don't take it too serious. These kind of masterpieces is every in the book. I think it may take me 60-150 pages of A4 pages to list them all.

This book is also "amazing" because the author can use two pages to explain something that can be explained by two lines, without giving you a clear idea what he is talking about. However, he can also use several characters to explain something that deserves some examples. To give you an example, here is how he teaches you the instruction STM:

STM Rn, register_list store multiple words

That's it, the only place tell you the usage of STM in this book. (Maybe I am not smart enough but I really still don't know how STM works)

I won't give you a vise-versa example because I don't want to type two pages in the comment.

Also when I see a figure or table in a book I don't expect how nice it is. But I certainly don't want them to be upside down or mirrored. But..

Anyways I am tired of typing now. It's your choice whether to buy this book. I know when readers buy a book the author gets money. Everyone likes money. But you should have the basic conscience when writing a book and doing anything.

4 of 4 people found the following review helpful.

Excellent book for beginners to learn embedded systems

By hengshanli

Excellent book for beginners to learn embedded systems, particularly on ARM assembly programming.

This book provides many C programs with side-by-side assemblies, making me understand assembly codes better.

All codes do NOT use ARM CMSIS and the standard API libraries. The programs interface peripherals directly by controlling and accessing peripheral registers. This enables deeper understanding how a microprocessor works.

I enjoyed the lab-in-a-box platform (32L152CDISCOVERY Discovery Kit) very much. It is very convenient to program and debug the kit. All I need is an USB cable. The kit replaces the STM32L Discovery Kit. However, they are exactly the same except that 32L152CDISCOVERY has larger flash memory.

While the book covers Cortex-M3, all assembly programs of the book can run on Cortex-M4 without any modification. In a simple word, Cortex-M4 = Cortex-M3 + DSP + Optional FPU.

5 of 6 people found the following review helpful.

Contents

By Chris Santos

The above comment with the contents of the book is incomplete, below is the correct table of contents.

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Chapter 2. Data Representation

Chapter 3. ARM Instruction Set Architecture

Chapter 4. Arithmetic and Logic

Chapter 5. Load and Store

Chapter 6. Branch and Conditional Execution

Chapter 7. Structured Programming

Chapter 8. Subroutines

Chapter 9. 64-bit Data Processing

Chapter 10. Mixing C and Assembly

Chapter 11. Fixed-point and Floating-point Arithmetic

Chapter 12. Interrupt

Chapter 13. Instruction Encoding and Decoding

Chapter 14. Generic-purpose I/O

Chapter 15. General-purpose Timers

Chapter 16. Stepper Motor Control

Chapter 17. Liquid-crystal Display (LCD)

Chapter 18. Real-time Clock (RTC)

Chapter 19. Direct Memory Access (DMA)

Chapter 20. Analog-to-Digital Converter

Chapter 21. Digital-to-Analog Converter
Chapter 22. Serial Communication Protocols
Chapter 23. Multitasking
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