

## BOOK REVIEWS

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1. PRINCIPLES OF FIRMWARE ENGINEERING IN MICROPROGRAM CONTROL  
by Michael Andrews (Army Research Office)  
published by Computer Science Press, 1980

The contents of this book are as follows:

Chapter 1: Control in Digital Machines. This chapter develops the concept of the control unit and compares hardwired control units with microprogrammed control units.

Chapter 2: Sequencing Inside the Control Unit. This chapter covers in detail various microprogrammed control unit organizations.

Chapter 3: Microinstruction Organization. This chapter covers various aspects of microinstruction design such as vertical versus horizontal formats and mono versus polyphase clock organization.

Chapter 4: Minimization of ROM Width. This chapter deals with techniques to reduce the number of bits used in a given microprogram.

Chapter 5: Firmware Engineering. This chapter covers various techniques of microprogram optimization.

Chapter 6: A Firmware Engineering Development Tool. This chapter describes a specific microprogram design technique based on algorithmic state machine concepts.

Chapter 7: This chapter surveys microprogrammable bit-slice devices and microcontroller devices.

At the end of each chapter questions and references are provided.

Perhaps the most serious defect of the book is in its use of out of date computers as real life examples. For example, the IBM System 360 - out of production for over ten years - is used as the focal point of several discussions. However, no mention is made of more recent IBM System 370 processors that utilize large writeable control stores to contain microprograms that implement not just the base 370 machine instruction set but also operating system functions.

All things considered, the book meets the goals given by the author. The coverage of general microprogramming techniques in chapter 1 through 3 is very good. This book would serve well as a text for a

course on microprogramming if the students had access to supplementary information about more recent microprogrammed computer systems.

## II. DIGITAL SYSTEM DESIGN WITH LSI BIT-SLICE LOGIC

by Glenford J. Myers (IBM Systems Research Institute)  
published by John Wiley and Sons, 1980

The contents of the book are as follows:

Chapter 1: An Introduction to Bit-Slice Logic. This chapter provides an overview of the bit-slice approach as well as a slice of history.

Chapter 2: An Introduction to Microprogrammed Control. This chapter provides an introduction to the concepts of microprogramming.

Chapter 3: ALU/Register Slices. This chapter provides detailed information about a large variety of commercial ALU/Register slice devices. (About 90 pages of information.)

Chapter 4: Microprogram Sequencing Devices. This chapter provides detailed information about microprogram sequencers. Detailed information is presented about a cross section of commercial devices. (About 71 pages of information.)

Chapter 5: Microinstruction Design. This chapter provides information about designing microinstruction formats. It covers encoding techniques, pipelining, residual control, etc.

Chapter 6: Other Bit-/Slice and Support Devices. This chapter describes commercial devices used to complete the bit-slice families such as interrupt controllers, etc.

Chapter 7: Programmable Logic. This chapter covers both programmable logic arrays as well as programmable gate arrays.

Chapter 8: Microprogram Support Tools. This chapter provides coverage of microassemblers, PROM formatters, development systems, and simulators.

Chapter 9: Firmware Engineering. This chapter considers how techniques used for software engineering may be applied to the production of firmware.

References are provided at the end of each chapter.

This excellent book easily fulfills the goal of the author to provide a tutorial and reference for the system architect and digital design engineer. Moreover, it also contains a great deal of general information about the subject of microprogramming.

The presentation of information about specific devices is detailed. The author provides not just technical specifications but rather