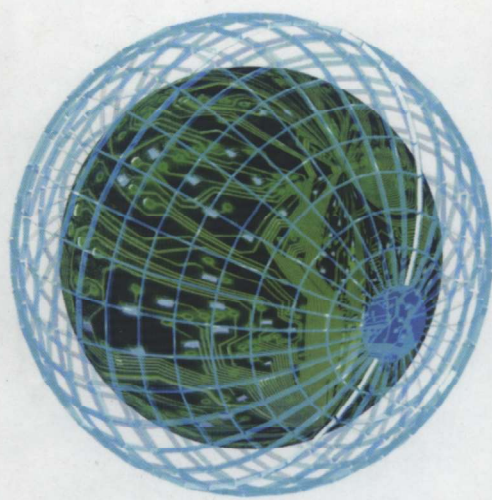


# the avr microcontroller and embedded system

using assembly and c



**MUHAMMAD ALI MAZIDI**  
**SARMAD NAIMI**  
**SEPEHR NAIMI**





# the avr microcontroller and embedded systems using assembly and c

**MUHAMMAD ALI MAZIDI, SARMAH NAIMI, AND SEPEHR NAIMI**



The AVR microcontroller from Atmel is one of the most widely used 8-bit microcontrollers in the world. In this book the authors use a step-by-step and systematic approach to show the programming of the AVR chip. Examples in both Assembly language and C show how to program many of the AVR features, such as timers, serial

communication, ADC, SPI, I2C, and PWM. The text is organized into two parts:

- The first seven chapters use Assembly language programming to examine the internal architecture of the AVR.
- Chapters 7–18 use both Assembly and C to show the AVR peripherals and I/O interfacing to real-world devices such as LCDs, motors, and sensors.

*The AVR Microcontroller and Embedded Systems* is the latest volume in the series of textbooks by Mazidi et al. This series of texts is widely used around the world by both industry and academics and has been translated into many languages. The other titles in the series are:

*The x86 PC* (5th ed.)

*The 8051 Microcontroller and Embedded Systems* (2nd ed.)

*The PIC Microcontroller and Embedded Systems*

*The HCS12 Microcontroller and Embedded Systems*

Titles to come include:

*The ARM Microcontroller and Embedded Systems*

## CHAPTERS

- 0: Introduction to Computing
- 1: The AVR Microcontroller: History and Features
- 2: AVR Architecture and Assembly Language Programming
- 3: Branch, Call, and Time Delay Loop
- 4: AVR I/O Port Programming
- 5: Arithmetic, Logic Instructions, and Programs
- 6: AVR Advanced Assembly Language Programming
- 7: AVR Programming in C
- 8: AVR Hardware Connection, Hex File, and Flash Loaders
- 9: AVR Timer Programming in Assembly and C
- 10: AVR Interrupt Programming in Assembly and C
- 11: AVR Serial Port Programming in Assembly and C
- 12: LCD and Keyboard Interfacing
- 13: ADC, DAC, and Sensor Interfacing
- 14: Relay, Optoisolator, and Stepper Motor Interfacing with AVR
- 15: Input Capture and Wave Generation in AVR
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- 18: I2C Protocol and DS1307 RTC Interfacing

ISBN-13: 978-0-13-800331-9  
ISBN-10: 0-13-800331-9



9 780138 003319

**Prentice Hall**  
is an imprint of

**PEARSON**

[www.pearsonhighered.com](http://www.pearsonhighered.com)

# **THE AVR MICROCONTROLLER AND EMBEDDED SYSTEMS**

## **Using Assembly and C**

**Muhammad Ali Mazidi**

**Sarmad Naimi**

**Sepehr Naimi**

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**Printer/Binder:** Courier/Kendallville  
**Cover Printer:** Demand Production Center  
**Text Font:** Times Roman

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### Library of Congress Cataloging in Publication Data

Mazidi, Muhammad Ali.

The AVR microcontroller and embedded systems: using Assembly and C /  
Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi.

p. cm.

ISBN-13: 978-0-13-800331-9 (alk. paper)

ISBN-10: 0-13-800331-9 (alk. paper)

1. Atmel AVR microcontroller. 2. Embedded computer systems. 3. Assembler language (Computer program language) 4. C (Computer program language) I. Naimi, Sarmad. II. Naimi, Sepehr. III. Title.

TJ223.P76M378136 2009

004.16--dc22

2009039790

10 9 8 7 6 5 4 3 2 1

**Prentice Hall**

is an imprint of



[www.pearsonhighered.com](http://www.pearsonhighered.com)

ISBN 10: 0-13-800331-9

ISBN 13: 978-0-13-800331-9

*This book is dedicated  
to the memory of Dr. Kamal Bakhtavar  
for all his sacrifices.  
– Muhammad Ali Mazidi*

*This book is dedicated  
to the memory of Dr. P. Javid  
for his inspiring example of dedication to the education of young people.  
– Sarmad Naimi*

*This book is dedicated to  
Yaran.  
– Sepehr Naimi*

Regard man as a mine rich in gems of  
inestimable value. Education can, alone, cause it  
to reveal its treasures, and enable mankind to  
benefit therefrom.

Baha'u'llah

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