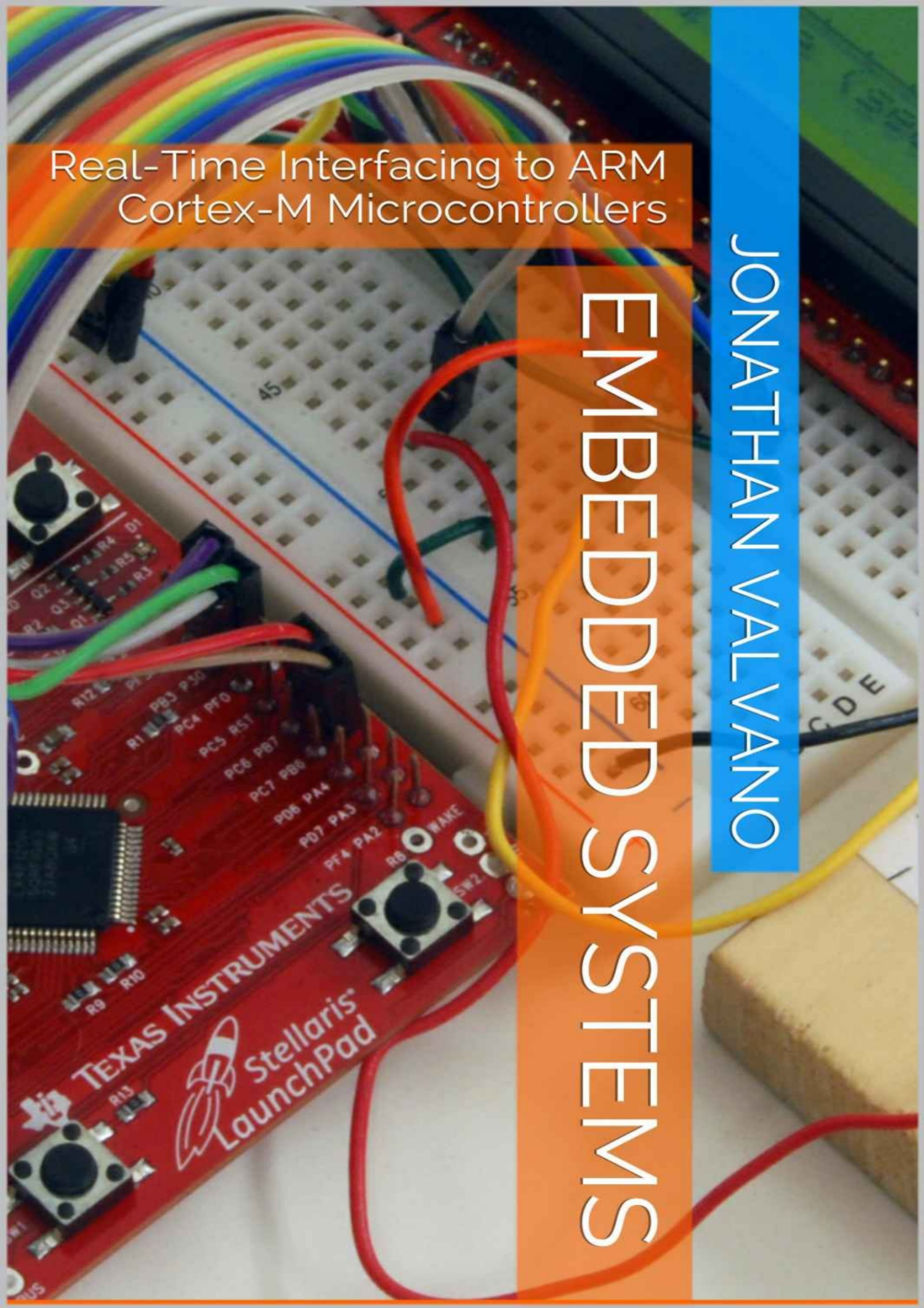
Real-Time Interfacing to ARM Cortex-M Microcontrollers
EMBEDDED SYSTEMS
JONATHAN VALVANO
TEXAS INSTRUMENTS
Stellaris LaunchPad

EMBEDDED SYSTEMS:

REAL-TIME INTERFACING TO ARM® CORTEX™-M MICROCONTROLLERS

Volume 2

Fourth Edition,

July 2014

Jonathan W. Valvano

Fourth edition

2nd Printing

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In order to reduce costs, this college textbook has been self-published. For more information about my classes, my research, and my books, see http://users.ece.utexas.edu/~valvano/

For corrections and comments, please contact me at: valvano@mail.utexas.edu. Please cite this book as: J. W. Valvano, Embedded Systems: Real-Time Interfacing to ARM ® Cortex™-M Microcontrollers, http://users.ece.utexas.edu/~valvano/, ISBN: 978-1463590154, 2014.

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Preface to Third Edition

There are a new features added to this third edition. The new development platform based on the TM4C123 is called Tiva LaunchPad. Material in this book on the TM4C also applies to the LM4F because Texas Instruments rebranded the LM4F series as TM4C (same chips new name), and rebranded StellarisWare™ as TivaWare™. These new microcontrollers run at 80 MHz, include single-precision floating point, have two 12-bit ADCs, and support DMA and USB. A wonderful feature of these new boards is their low cost. As of December 2013, the boards are available on TI.com as part number EK-TM4C123GXL for $12.99. They are also available from $13 to $24 at regular electronics retailers like arrow.com, newark.com, mouser.com, and digikey.com. The book can be used with either a LM3S or TM4C microcontroller. Although this edition now focuses on the M4, the concepts still apply to the M3, and the web site associated with this book has example projects based on the LM3S811, LM3S1968, and LM3S8962.

Preface to Fourth Edition

This fourth edition includes the new TM4C1294-based LaunchPad. Most of the code in the book is specific for the TM4C123-based LaunchPad. However, the book website includes corresponding example projects for the LM3S811, LM3S1968, LM4F120, and TM4C1294, which are ARM ® Cortex™-M microcontrollers from Texas Instruments. There are now two lost-cost development platforms called Tiva LaunchPad. The EK-TM4C123GXL LaunchPad retails for $12.99, and the EK-TM4C1294XL Connected LaunchPad retails for $19.99. The various LM3S, LM4F and TM4C microcontrollers are quite similar, so this book along with the example code on the web can be used for any of these microcontrollers. Compared to the TM4C123, the new TM4C1294 microcontroller runs faster, has more RAM, has more ROM, includes Ethernet, and has more I/O pins. This fourth edition switches the syntax from C to the industry-standard C99, adds a line-tracking robot, designs an integral controller for a DC motor, and includes an expanded section on wireless communication and Internet of Things.