C Programming of Microcontrollers for Hobby Robotics

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Abstract. This handout supplies the necessary start up information for programming microcontrollers in C language. The examples of the handout is selected on the amateur robotics applications such as line tracking by a mobile platform, on-off, proportional, proportional-integral-derivative control for servomotor control.

Keywords: PIC microcontroller, C for hobby robotics, line tracking, PID controller.

1 Introduction

This article is written for the novice robotics hobbyists who want to have a quick start in microprocessor programming, for the IJRC 2008 Robotics Competition. It is a great opportunity for a hobbyist to enjoy the competition with a home-made robot.

A *microcontroller* (or MCU) [1] is a computer-on-a-chip used to control electronic devices. It is a type of microprocessor emphasizing self-sufficiency and cost-effectiveness, in contrast to a general-purpose microprocessor used in a PC. A typical microcontroller contains all the memory and interfaces needed for a simple application, whereas a general purpose microprocessor requires additional chips to provide the same functions.

The microcontroller applications are mainly categorized into the following fields in an alphabetic listing: Audio; Automotive; Wired communication; Computers and peripherals; Consumer Appliances; Industrial Instrumentation; Imaging and video application; Medical Instrumentation; Military and aerospace instrumentation; Mobile and wireless devices; Motor control; Security Equipments; General Purpose Devices; and Miscellaneous Applications. From these fields, robotics uses the wired and wireless communication, image processing, and motor control extensively.

A microcontroller is a must of a mechatronics device which combines intelligence, mechanical actions, and sensory devices for a goal. Robotics and Hobby Robotics are typical fields of mechatronics. In a robot, microcontrollers are embedded to implement intelligent control algorithms.

A low-end microcontroller can execute most of the robotics control algorithms. Implementation of robotics microcontroller applications requires two main components, a microcontroller and its IC-programming tool, and a convenient programming language to express the algorithms. The main objective of this article is an introduction to these item.

C Programming Of Microcontrollers For Hobby Robotics

Padhraic Smyth

C Programming Of Microcontrollers For Hobby Robotics:

   Robot Programmer's Bonanza John Blankenship,Samuel Mishal,2008-06-14 The first hands on programming guide for today s robot hobbyist Get ready to reach into your programming toolbox and control a robot like never before Robot Programmer s Bonanza is the one stop guide for everyone from robot novices to advanced hobbyists who are ready to go beyond just building robots and start programming them to perform useful tasks Using the versatile RobotBASIC programming language you ll discover how to prototype your creative ideas using the integrated mobile robot simulator and then port your finished programs to nearly any hardware software configuration You can even use the built in wireless protocol to directly control real world robots that can be built from readily available sensors and actuators Start small by making your robot follow a line hug a wall and avoid drop offs or restricted areas Then enable your robot to perform more sophisticated actions such as locating a goal sweeping the floor or navigating a home or office Packed with illustrations and plenty of inspiration the unique Robot Programmer s Bonanza even helps you teach your robot to become intelligent and adapt to its behavior Everything you need to program and control a robot In depth coverage of the RobotBASIC simulator as well as how it can be used to control real world robots either directly or through the integrated wireless protocol A companion website with a FREE download of the full version of the RobotBASIC robotic simulator and control language Remote control algorithms as well as autonomous behaviors Integrated debugger facilitates program development Appendices that detail RobotBASIC s extensive commands and functions as well as the integrated programming environment Adaptable and customizable programs that solve realistic problems use simulations to prototype robots that can mow a yard deliver mail or recharge a battery then port your algorithms to real world robots Chapters devoted to creating contests with RobotBASIC and utilizing RobotBASIC in the classroom to teach programming   Intermediate Robot Building David Cook,2010-08-13 For readers of Robot Building for Beginner Apress 2002 and 2009 welcome to the next level Intermediate Robot Building Second Edition offers you the kind of real world knowledge that only renowned author David Cook can offer In this book you ll learn the value of a robot heartbeat and the purpose of the wavy lines in photocells You ll find out what electronic part you should sand You ll discover how a well placed switch can help a robot avoid obstacles better than a pair of feelers And you ll avoid mistakes that can cause a capacitor to explode Want a robot that can explore rooms follow lines or battle opponents in mini sumo This book presents step by step instructions and circuit and part descriptions so that you can build the robot featured in the book or apply the modules to your own robot designs Finally you ll find the complete schematics for Roundabout a room explorer that requires no programming and uses only off the shelf electronics With Roundabout you ll use many of the same techniques used by professional robotics engineers and you ll experience many of the same challenges and joys they feel when a robot comes to life   **Programming Robot Controllers** Myke Predko,2003 Details the PICmicro microcontroller Covers designing the robot system software development and advanced programming

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Focuses on the C programming language which is by far the most popular for microcontrollers MCUs Features Proteus VSMg the most complete microcontroller simulator on the market along with CCS PCM C compiler both are highly compatible with Microchip tools Extensive downloadable content including fully worked examples   *Robot Science & Technology* ,1998

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