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 IIRC 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.

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