DC Motor Control by ARM-Based Developer Suite

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Abstract

In this paper, the Advanced RISC Machine 9 (ARM9) based software of ARM developer suite (ADS) is utilized to control speed of DC motor. The educational kit of DMA 2440 is used to demonstrate the theoretical and experimental performances. The development procedure of ADS will be illustrated at first then an example of DC motor speed control is verified. The experimental result reveals that good DC motor speed control performance is possessed in this paper.

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Keywords: *ARM, DC motor, Speed control, ARM developer suite (ADS)*

I. INTRODUCTION

Non-operation system (NOS) is easy to be implemented. Many industrial researches are developed which are based on central processing unit (CPU) of Advanced RISC Machine (ARM). For example, the research of face recognition technology based on ARM9 and Linux operating system can be found in [1]. The method of designing the control of an energy-efficient, knee-less, essentially planar, four-legged bipedal robot system based on ARM9 has been developed in [2].

In this paper, the ARM9 based Samsung S3C2440A CPU [3], ARM developer suite (ADS) [4] and educational development kit of DMA 2440 manufactured by *DMATEK Ltd, Taiwan* [5] are used to do experimental and educational DC motor control. The experimental results reveal that the good performances of DC motor speed control are possessed.

II. THE ARM DEVELOPER SUITE (ADS)

The ARM developer suite (ADS) is developed and is an integrated development environment (IDE) supported to us to compile a C program such as to achieve an optimized machine code of ARM target.The ADS is based on Metrowerks CodeWarrior IDE version 4.2. It has been tailored to support the ADS tool-chain. It includes ARM-specific configuration panels that enable us to configure the ARM development tools from the ADS IDE; and ARM-targeted project stationery that enables us to create basic ARM and Thumb projects from the ADS IDE. Although most of the ARM tool-chain is tightly integrated with the ADS IDE, there are a number of areas of functionality that are not implemented by the ARM version of the ADS IDE. In most cases, these are related to debugging, because the ARM debuggers are provided separately [4]. The diagram of ADS project window is shown in Fig. 1. The Editor window for C program of this paper is shown in Fig. 2. The Compile window for C program of this paper is shown in Fig. 3.

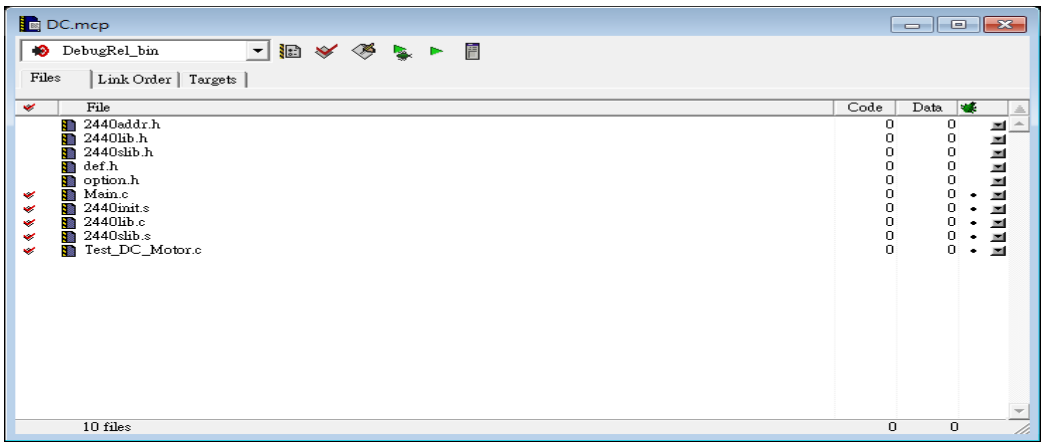

Fig. 1 The ADS project window diagram for DC motor control

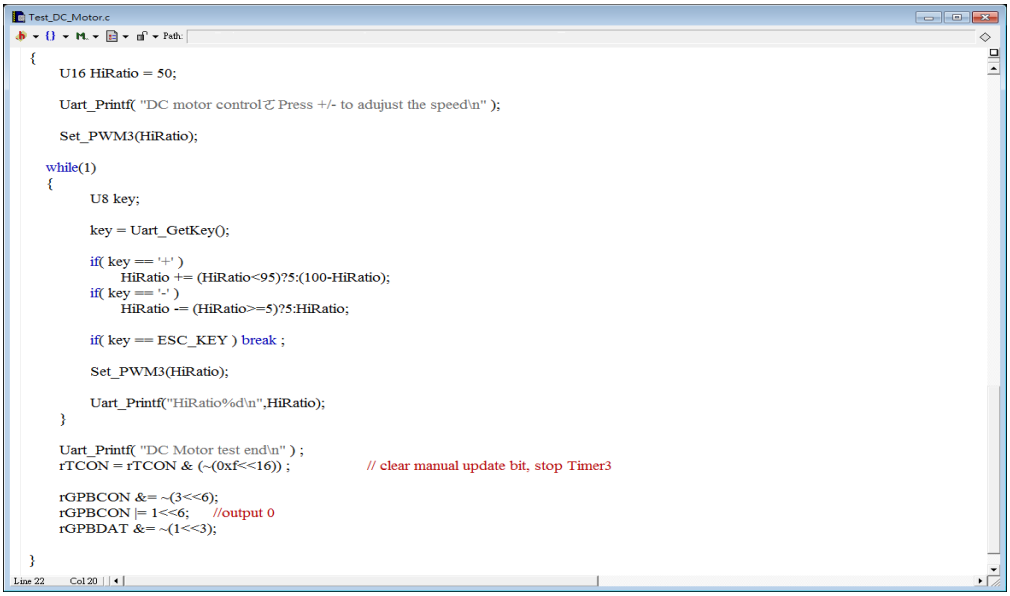

Fig. 2 The Editor window of C program for DC motor control

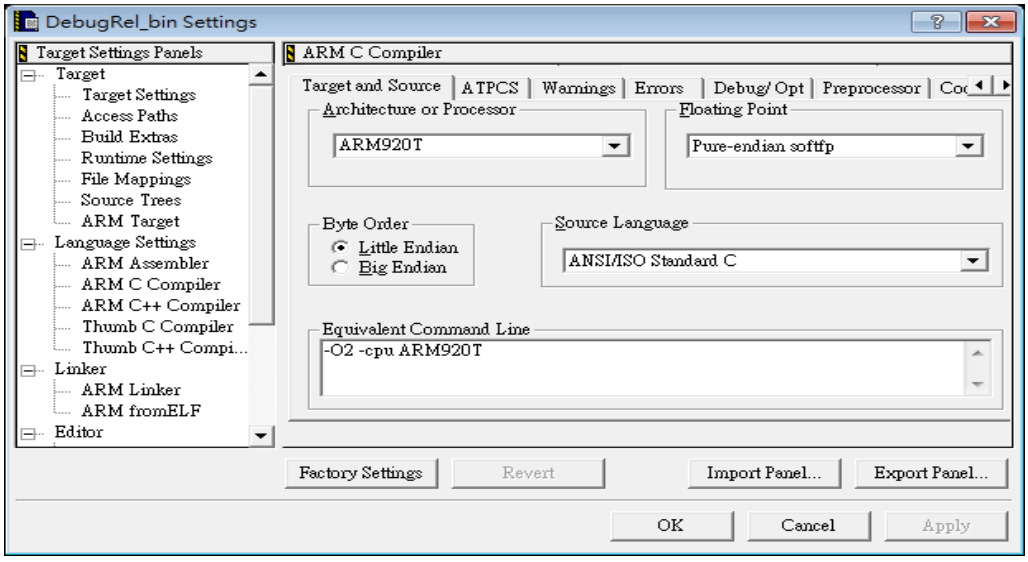

Fig. 3 The Compile window of C program for DC motor control

III. EXPERIMENTAL RESULTS

The main specification of SAMSUNG S3C2440 CPU is using 16/32 bit ARM920T RISC core CPU technology designed by Advanced RISC Machines (ARM). It can reach frequency of 400M Hz. It has core of ARM920T with 0.13um CMOS standard cells and a memory complier. It possesses advantages of lower power consumption and easy design so it is particularly suitable for mobile applications of power saving and low cost. Its new bus architecture is developed by a well known as Advanced Micro controller Bus Architecture (AMBA). The S3C2440A CPU implements MMU, AMBA BUS, and Harvard cache architecture with separate 16KB instruction and 16KB data caches, each with an 8-word line length [4]. Photo of DMA 2440 educational kit [5] is shown in Fig. 4. It provides a DC motor interface to support DC motor applications. The PC control panel diagram is shown in Fig. 5. This panel can control the speed of DC motor.

In this paper, the DC motor is controlled by keyboard of personal computer (PC) and the digital vales of control will be shown in control panel. The digital values of low speed control for DC motor shown in PC screen and the DC motor photo are shown in Fig. 6. The digital values of high speed control for DC motor shown in PC screen and the DC motor photo are shown in Fig. 7. From the experimental results, good performances of DC motor speed control are possessed in this paper.

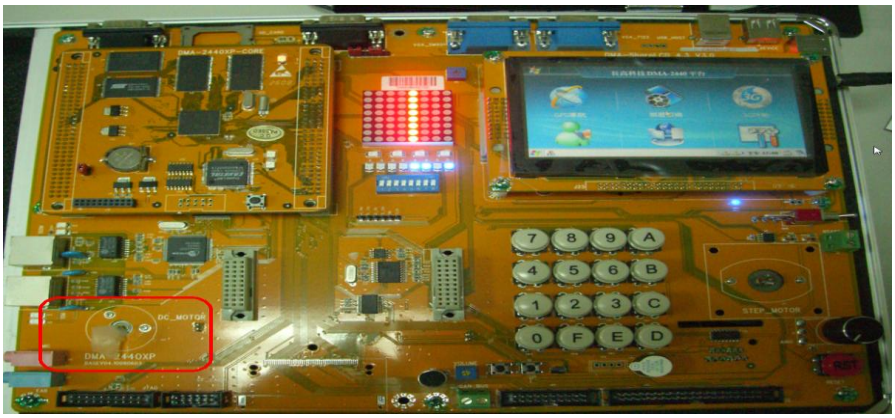

Fig. 4 The photo of DMA 2440

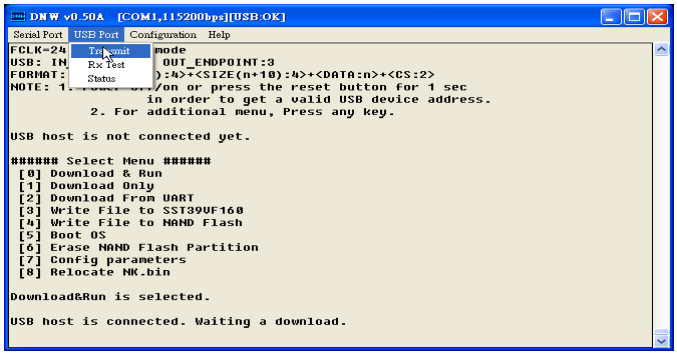

Fig. 5 The Diagram of PC control panel for DMA 2440

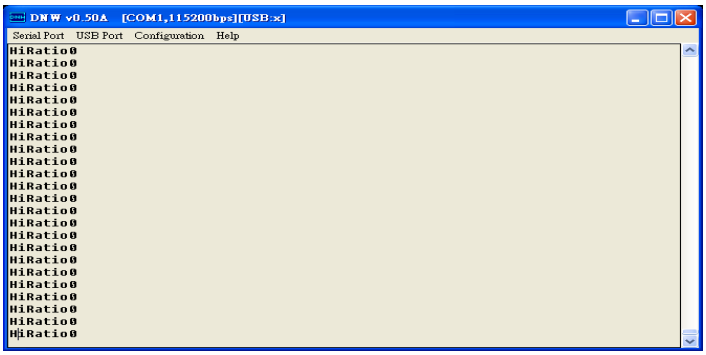

Fig. 6 (a) The low speed diagram of PC control panel

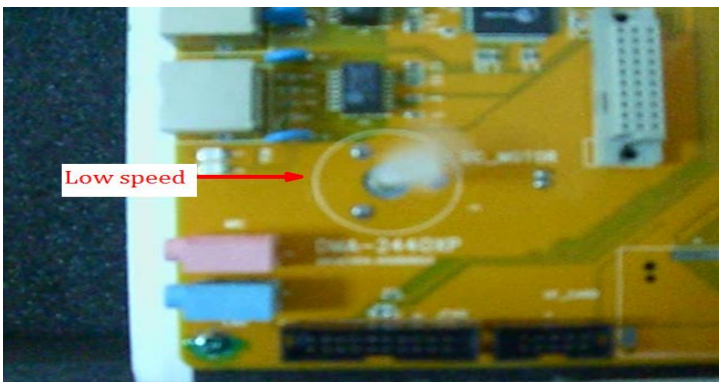

Fig. 6 (b) The low speed photo of DC motor

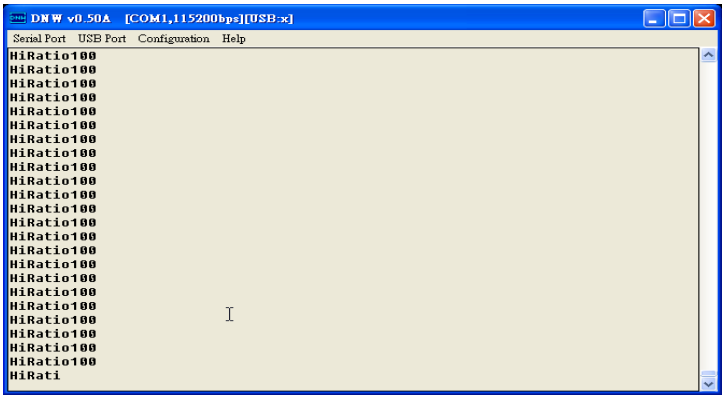

Fig. 7 (a) The high speed diagram of PC control panel

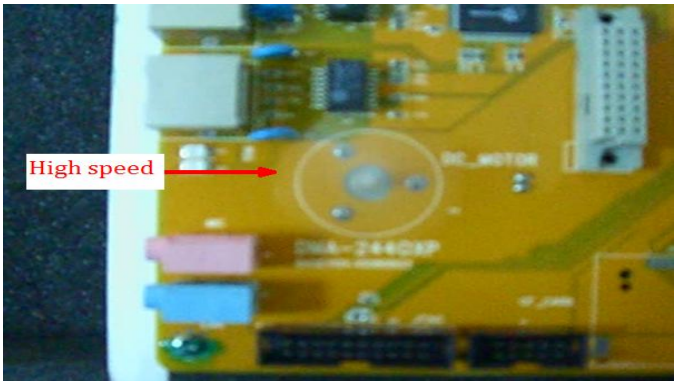

Fig. 7 (b) The high speed photo of DC motor

IV. CONCLUSION

In this paper, the ARM developer suite (ADS) have been installed successfully to develop DC motor control applications. This is verified by the ARM9 based DMA 2440 kit. The development of DC motor control applications can be used to develop other different industrial applications. The experimental results demonstrate that good performances of DC motor control are possessed in this paper.

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References

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