IP Core Design Homework 2 Baseline JPEG Software Encoder

Instructor: Prof. Chein-Wei Jen Announcement: 2001.11.12

As shown in Figure 1, imagine the source of your JPEG is those signals digitized from CCD (or CMOS) sensor and in RGB format. These digitized signals are usually processed with DSP functions, such as image enhancement and interpolation, before JPEG encoding, but we ignore this step in our homework.



Figure 1. Simplified block diagram for a digital camera system.

In this homework, port your own software JPEG encoder written in homework 1 to ARM hardware development system. To access the BMP file, you may load the portion of the picture (e.g., line by line or block by block) from the host, process the data, and write result to the host. If the performance of your design is constrained by the file I/O, you may load the whole picture into memory first and then process it.

You have to take the following considerations into account:

- performance & constraint of different types of memory (SSRAM, SDRAM, and Flash, and possible the cache
- data alignment and data layout (in which type of memory)
- available data bus and memory bandwidth

As described in homework 1, we assume the maximum image size is 2048×1536. However, a design that its memory requirement for intermediate data, excluding the final JPEG format file, is independent of the size, the width or the height of the image size is a plus. For example, the buffer for those intermediate data after DCT stage but before quantization stage is kept the same for all the size of image, while the buffer for data after color conversion stage but before DCT stage is kept the same for those images with the same width.

Note:

• Disable the cache if your Core Module is ARM720T

Deliverable

Your deliverable has to include:

- 1. Report that describes your idea and result.
 - Performance: use the timers/counters to record the time your program spends and show it on the host console.
 - Memory requirement: describe your memory organization for each stage of data processing in detail and explain how it works. Evaluate the maximum memory requirement during your program. Note that the same memory space can be shared with different data structures if their life times are not overlapped. Also, the memory requirement for the program itself and variables have to be mentioned if you modify your program in homework 1.
- 2. Source code of your JPEG encoder.
- 3. All setting and information required for regenerating the result shown in your report.

State your approaches, key ideas and results clearly and formally, and avoid redundant description. Your report can be written in Chinese or English. However, make sure your report is readable. A manual report won't degrade your score, unless it is scrabbled.

If your JPEG encoder is modified from an existing reference code, please acknowledge in the last section of your documentation that you've used the reference code.

Important Date

Due : 5:00 p.m. Nov. 26, 2001

For more information

- The contents of this document: Kun-Bin Lee
- ARM development tools: contact the TA with the number = your team number %5

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