h e p i a

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Cache memories

Introduction

In the Nios-II processor configuration, we have two independent cache memories available (instructions and data). Using the detailed knowledge of our application we can target the right amount of cache memory to be used. By choosing the cache size and selecting the data to be stored in the cache, we can improve the overall performance of the system.

1 Bitstream generation

As we are planning to change the hardware definition to perform different tests, it may be worth it to save the generated bitstream of the different configurations to avoid spending too much your time in the hardware generation.

You can select your own method to save the different hardware projects, however, be sure that you keep, at least, the generated *.sopcinfo* and *.sof* files and the f_{max} frequency from the "Timing Analyzer" reports.

2 Data cache size selection

In order to fully exploit the data cache, you will have to adapt the *conv_grayscale* and *sobel_complete* functions to work with parts of the image. Then, in the *main.c* call, you will have to adapt the calls to the previous functions to work with a set of sub-images.

In order to properly compare the performance values, measure the number of cycles, cycles per pixel, seconds per image and images per second. To avoid statistical errors, save a number of measures (as much as possible) and compute the average.

Keep in mind that the optimal configuration would be to save the *conv_grayscale* result in cache and the *sobel_complete* directly in the main memory. You may want to bypass the cache to force writing into the main memory.

- What is the optimal configuration that you obtain ? What is the size of the data cache ?
- How many sub-images do you use ?
- How many cycles per pixel do you get in *-O0* and *-O3* configurations ?
- What is the maximum frequency of operation of such as system ?