**Report 1 on DSP Optimizations**

The inner loop of the convolve function is the most used code of the program. Before the DSP, this inner loop was already sped up by a factor of 2, using the profiler of Visual Studio and the default windows C compiler. Now, an attempt to speed it up even more was made by unrolling this inner loop and hardcoding the filter coefficients in it. Some noticeable gain was expected, considering unrolled code improves pipelining and the hardcoded coefficients should require less data accesses. However, only a very small gain in speed was realized. Therefore, and because of the unreadability of the manually unrolled code (manually to hardcode the coefficients), the changes were reverted. (Only filter2 and filter3 were hardcoded. This should be enough to test the impact of the change.)

The amount of cycles is for an input file of 2986 samples

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| --- | --- | --- | --- | --- | --- |
|  | **Major Optimization** | **Functions Effected** | **Total Cycles\*** | | **Change (in %)** |
| **Before** | **After** |
| Base Code |  |  |  |  |  |
| Session 1 | Hardcoded filter in unrolled inner loop of convolve for filter2 and filter3 | Convolve 🡪 convolveFilter2Odd, convolveFilter2Even, convolveFilter3Odd, convolveFilter3Even | 21,8M | 21,7M | 0,5 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Function Name | File Name | Total no. of calls | Exclusive Count Total\* | | | Inclusive Count Total\* | | | Optimization carried out |
| Before  (Previous Session) | After  (This Session) | % Change | Before  (Previous Session) | After  (This Session) | % Change |
| Convolve  🡪  Convolve,  convolveFilter2Odd, convolveFilter2Even, convolveFilter3Odd, convolveFilter3Even | Analysis.c | 3840 | 3,5M | 3,4M | 3 | 13,5M | 13,4M | 1 | Hardcoded filter coefficients in an unrolled inner loop |