

Homework 1

Due on Wednesday 04/19/2000, 12pm (before class)

Problem 1:

Using the non-folded FIR architecture presented in “FIRGEN: A computer aided design system for high performance FIR filter Integrated circuits,” consider three components possibly contributing to the critical path (VMA, CSA tap calculation, data broadcast). Every tap has the same fixed CSD coefficient $0.4375 (= 1/2 - 1/16)$. Derive an expression for the critical path based on word-width and number of taps. Using a plot with the number of taps as the x-axis and word-width as the y-axis, show the regions where different critical paths exist. Submit your plot and your calculations/derivations for the critical path analysis.

| Cell | Delay (ns) | Size ($\mu\text{m} \times \mu\text{m}$) |
|------------------------------|----------------------|---|
| CSA any input to any output | 2 | 51 x 56 |
| VMA, LSB input to MSB output | $3.0 \log_2 n$ | ignore |
| Buffer | $2 + 2 * Cload (pF)$ | ignore |
| Register | 2 | 51 x 83 |

| Other parameters | Value |
|--------------------------|------------------------|
| Routing capacitance | 0.25 fF/ μm |
| Input capacitance to CSA | 0.10 fF |
| N = number of taps | max 20 |
| n = word with | max 32 |

Problem 2:

In the handouts the delay of a carry tree is given as $\log_2 N \cdot Ta$ with N the number of taps. In the paper, the delay of the carry tree is given as $\log_{1.5} N \cdot Ta$. What are the assumptions of both equations? Which one is correct or are both correct? Limit your answer to MAXIMUM 1/2 page.

Problem 3:

In table 3 of the paper “Digital Signal Processing: The new semiconductor industry technology driver,” a list of DSP Silicon IP startups is given. Select 4 companies from the list according to the following rule: select the four companies of which the first letter of the name follows the first letter of your last name. (Basically, I want all companies covered.) Compare the companies based on: architecture style, target application field, do they provide only the platform or also the application, do they provide hardware and/or software, do they provide a “soft” solution or real silicon? Limit yourself to maximum one page in total. Include webpage of the source of your information.