Differencing Multistage Detector

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Background and Algorithm

- Multiuser detector architecture for next generation CDMA base station
- Advanced Interference cancellation
- Computation efficient algorithm

\[
\begin{align*}
\mathbf{z}^{(l)} &= \mathbf{y} - R\mathbf{A}\mathbf{d}^{(l-1)} \\
\text{where } \mathbf{d}^{(l-1)} &= \text{sign}(\mathbf{z}^{(l)}) \\
(d_k = \{+1,-1\})
\end{align*}
\]

\[
\begin{align*}
\mathbf{z}^{(l)} &= \mathbf{z}^{(l-1)} - R\mathbf{A}\hat{\mathbf{x}}^{(l-1)} \\
\text{where } \hat{\mathbf{x}}^{(l-1)} &= \mathbf{d}^{(l-1)} - \mathbf{d}^{(l-2)} \\
(\hat{x}_k &= \{0, +2, -2\})
\end{align*}
\]
Description of the Chip -- MUDDY

- 8 synchronous mobile users
- 12-bit fixed point arithmetic
- 10-bit input/output interface
- 6100 transistors
- 34 pins
- Cascade of 3 chips
Pin Description

- LOAD - Load cross-correlation matrix
- FIN/RST - Finish input/Reset
- FOUT - Finish Output
- 1#/2 - First/Second (Third) Chip

I0-I9 Soft Decision/ Cross-correlationInput
PREV HI - Previous Hard Decision Input
O0- O9 Soft Decision Output
HO - Hard Decision Input
ALU Structure
Critical Path Analysis

**ALU is the critical path**

**IRSIM Simulation**
25ns

**Crystal Simulation**
42.63ns

**Spice Simulation**
20ns.

**Max. Clock Frequency**
25 MHz*
Floor Plan and Final Layout
Final Simulation