Parallel Angle Recording
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parallel angle selection scheme

for unknown rotation angles

dynamic angle selection

test the elementary angle α_i in parallel
- can be tested in parallel
- can determine the direction quickly
- can reduce the iteration period

during each iteration,
the residual angle w
→ a set of n adder-subtracter units
compute $\Delta_i = (w - \sigma_i \cdot \alpha_i)$ in parallel
$\alpha_i = \tan^{-1} 2^{-i}$

$0 \leq i < n$

$\Delta_0, \Delta_1, \Delta_2, \Delta_3$ 4 parallel units

→ a binary-tree like structure
to find the smallest differences

$w_i - \sigma_i \alpha_i$ ← using that of the smallest $(\Delta_i)_{max}$

difference. The $\sigma_i \cdot \alpha_i$ corresponding to the smallest difference $(\Delta_i)_{\min}$ is used as the angle of micro-rotation. The architecture for parallel angle recoding of [22] is shown in Fig. 4.

The parallel AR reduces the overall latency at the cost of high hardware-complexity of add/subtract-compare unit. For actual implementation, it is required to find a space-time trade-off and look at the relative performance in comparison with other approaches as well. The AR schemes based on EAS and EEAS however are useful for those cases where the angle of rotation is known in advance.

$\alpha \leftarrow \alpha_N$

$Z \leftarrow \theta$

while $(|Z| > \alpha_{min}/2)$ {

$\sigma = (Z \geq 0)\ ?\ +1 : -1;$

foreach $\alpha_i\ (\alpha_0,\ \alpha_1, \cdots, \alpha_N)$ {

if $(||Z| - \alpha_i| < ||Z| - \alpha_{max}|)$ {

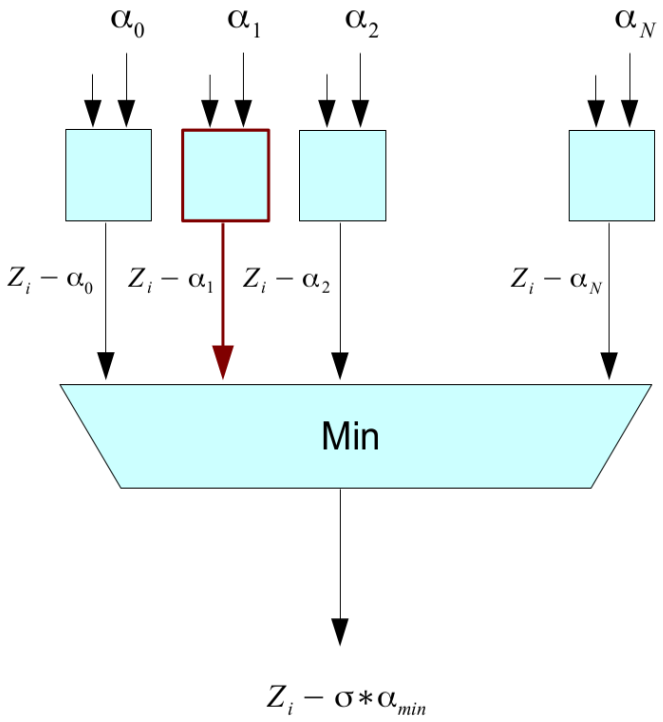
$\alpha_{min} = \alpha_i$

}

Store α_{max} *on* *adaptive−angle−list*

$Z = Z - \sigma * \alpha_{max}$

}



Dynamic Angle Selection

Direct Hardware Implementation

if all the angle constants (α_i's) are tested in parallel

Can handle any rotation angle dynamically

Δ_i's are compared with each other

using binary-tree like structure

the smallest Δ_i → (α_i angle constant, the index i)

determines the shift amount to be used

then x, y coordinates of the vector can be updated

- Adder subtractor units
- binary tree comparison

) on the critical path

greatly increase the cycle time