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Department 6.2 - Computer Science
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Computer Architecture II - WS 08/09

Exercise Sheet 8 (due: 5.01.09)

Excercise 1: (Binary Representation of e_0 of E_0 in Booth Recoding) (2 Points)
To avoid summing of negative numbers C_{2j} in Booth recoding we consider positive E_{2j} instead:

$$E_{2j} = C_{2j} + 3 \cdot 2^{n+1}$$
$$E_0 = C_0 + 4 \cdot 2^{n+1}$$

where corresponding binary representations are:

$$e_{2j} = bin_{n+3}(E_{2j})$$
$$e_0 = bin_{n+4}(E_0)$$

In the class was proved that binary representation $e_{2j} of \mathrm{E}_{2j}$ can be computed by

$$\langle e_{2j} \rangle = \langle 1 \bar{s_{2}}_j, d_{2j} \oplus s_{2j} \rangle + s_{2j} \quad \text{for} \quad j > 0$$

Derive the formula of binary representation for case j = 0 and prove its correctness.

Excercise 2: (The Sign Bit of the Last Booth Digit) (4 Points)
In the class a booth digit was defined, show that the last booth digit $B_{2m'-2}$ is always positive, i.e. $s_{2m'-2} = 0$, where $m' = \left\lceil \frac{(m+1)}{2} \right\rceil$.

Excercise 3: (Number of Excess Full Adders) (10 Points)
Prove or disprove: the number of excess full adders in binary addition tree for Booth recoding is $O(m \cdot log\ m)$