

Architecture des ordinateursExercice 1: Codage des entiers.

$$\alpha = 197 = 128 + 64 + 4 + 1.$$

$$\frac{11000101_2}{\text{C} \quad \text{5}} = 0x \text{C5}$$

$$\beta = 125 = 64 + 32 + 16 + 8 + 4 + 1$$

$$\frac{01111101_2}{\text{7} \quad \text{D}} = 0x \text{7D}$$

Exercice 2: Posons $A = 00100100$ $B = 10100101$

a) non signé $A = 36$ $B = 165$ $S = A + B = 201$

$$\begin{array}{r} 00100100 \\ + 10100101 \\ \hline S = 11001001 \end{array} \quad S = 201.$$

b) signé $A = +36$ $B = -91$

$$\begin{array}{r} 00100100 \\ + 10100101 \\ \hline S' = 11001001 \end{array} \quad \begin{aligned} &= -0110111 \\ &= -(32 + 16 + 4 + 2 + 1) \\ &= -55 \end{aligned}$$

$$\begin{array}{r} A \ 00100100 \\ + -B \ 01011011 \\ \hline D' = 01111111 \end{array} \quad D' = 127.$$

c) $\alpha = 119$ $\beta = 15$

$$\alpha + \beta = 134 = 128 + 4 + 2 = 10000110 \quad \begin{array}{l} \text{en non signé } 134 \\ \text{en signé } -122 \end{array}$$

Exercice 3: Codage des réels

a) Coder en simple et double précision les 2 réels.

$$\alpha = 56,375 = 111000,011 = 32 + 16 + 8 + \frac{1}{4} + \frac{1}{8}$$

$$\beta = -25,8 = 11001,101101101101$$

$$\begin{array}{l} \alpha = 0 \ 10000100 \ 1100001100000000000000 \\ \alpha = 0 \ 100000000000 \ 1100001100000000000000 \end{array} \quad +29 \times 0.$$

$$\begin{array}{l} \beta = 1 \ 10000011 \ 10011100110011001100110 \\ \beta = 1 \ 1000000011 \ 10011100 + 11 \times (1100). \end{array}$$

$$0,8 \times 2 = 1,6 \quad r = 1$$

$$0,6 \times 2 = 1,2 \quad r = 1$$

$$0,2 \times 2 = 0,4 \quad r = 0$$

$$0,4 \times 2 = 0,8 \quad r = 0$$

$$b) \alpha + \beta =$$

$$\begin{array}{r} x^7(\beta) \quad 11, 1000011000 \\ + \quad 1, 1001110011001100 \\ \hline 100, 0 \quad 0100010110011001100110 \\ 101, 001000101100110011001100 \times 2^6 \end{array}$$

$$\begin{aligned} \alpha - \beta &= \alpha + (-\beta) = 1, 11000011 \times 2^5 \\ &+ 0, 110011100110011001100110 \times 2^5 \\ &= 1, 100100010110011001100110 \times 2^5 \\ &= 1, 0100100010110011001100110 \times 2^6 \end{aligned}$$

$$\begin{aligned} \alpha + \beta &= \alpha - (-\beta) = 1, 11000011 \times 2^5 \\ &+ 0, 110011100110011001100110 \times 2^5 \\ &= 0, 111101001001100110011010 \times 2^5 \end{aligned}$$

Exercice 4: Erreur relative maximale d'approximation en simple précision.

$$\begin{aligned} 2 \text{ nombres consécutifs: } x &= 1, \text{---}0 \times 2^e \\ y &= 1, \text{---}1 \times 2^e \end{aligned}$$

$$y - x = 0, 0 \text{---}01 \times 2^e$$

$$\text{erreur relative} \approx 2^{-23} \approx 10^{-7}$$