



Análisis de Algoritmos

Tarea 2

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Grupo: 3CM3

Algoritmo de Karatsuba

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$$A = \overbrace{1\ 2\ 3\ 4}^a \overbrace{5\ 6\ 7\ 8}^b = (10^4)(1234) + 5678$$

$$B = \overbrace{9\ 1\ 0\ 1}^c \overbrace{1\ 1\ 2\ 1}^d = (10^4)(9101) + 1121$$

$$a = 1234 \quad b = 5678$$

$$c = 9101 \quad d = 1121$$

$$(a+b) \quad (c+d)$$

Paso 1: $a * c$

$$(1\ 2\ 3\ 4) * (9\ 1\ 0\ 1) = 1\ 1\ 2\ 3\ 0\ 6\ 3\ 4$$

Paso 2: $b * d$

$$(5\ 6\ 7\ 8) * (1\ 1\ 2\ 1) = 6\ 3\ 6\ 5\ 0\ 3\ 8$$

Paso 3: $(a+b)(c+d)$

$$(1234 + 5678) * (9101 + 1121) = (6912) * (10222) = 70654464$$

Paso 4: $P_3 - P_2 - P_1$

$$70654464 - 6365038 - 11230634 = 53658792$$

Paso 5: $(10^8) \text{ Paso 1} + (10^{12}) \text{ Paso 4} + \text{Paso 2}$

$$(10)^8 (11230634) + (10)^4 53658792 + 6365038$$

$$= 1123593994 \times 10^6$$

Algoritmo de Strassen

$$A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 1 & 2 & 1 & 2 \\ -1 & 3 & -1 & 1 \\ 1 & 2 & 3 & 4 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ -1 & -1 & 0 & 0 \\ 2 & 1 & 2 & 1 \end{bmatrix}$$

$$A \times B = \begin{bmatrix} P_5 + P_4 - P_2 + P_6 & P_1 + P_7 \\ P_3 + P_4 & P_1 + P_5 - P_3 - P_7 \end{bmatrix}$$

$$P_1 = A(F+H)$$

$$P_4 = D(G-E)$$

$$P_7 = (A-C)(E+F)$$

$$P_2 = (A+B)W$$

$$P_5 = (A+D)(E+W)$$

$$P_3 = (C+D)E$$

$$P_6 = (B-D)(G+H)$$

$$P_1 = A(F+H) = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix} * \begin{bmatrix} 1 & 1 \\ -1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$$

$$P_2 = (A+D)W = \begin{bmatrix} 2 & 0 \\ 2 & 4 \end{bmatrix} * \begin{bmatrix} 0 & 0 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 8 & 4 \end{bmatrix}$$

$$P_3 = (C+D)E = \begin{bmatrix} -2 & 4 \\ 4 & 6 \end{bmatrix} * \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} -2 & -2 \\ 4 & 4 \end{bmatrix}$$

$$P_4 = D(G-E) = \begin{bmatrix} -1 & 1 \\ 3 & 4 \end{bmatrix} * \begin{bmatrix} -2 & -2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 3 \\ 2 & -2 \end{bmatrix}$$

$$P_5 = (A+D)(E+W) = \begin{bmatrix} 0 & 1 \\ 4 & 6 \end{bmatrix} * \begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 4 & 8 \end{bmatrix}$$

$$A \times B = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 4 & 2 & 7 & 5 \\ 2 & 1 & 4 & 3 \\ 6 & 2 & 11 & 7 \end{bmatrix}$$

$$P_6 = (B-D)(G+H) = \begin{bmatrix} 2 & -1 \\ -2 & -2 \end{bmatrix} * \begin{bmatrix} -1 & -1 \\ 4 & 2 \end{bmatrix} = \begin{bmatrix} -6 & -4 \\ -6 & -2 \end{bmatrix}$$

$$P_7 = (A-C)(E+F) = \begin{bmatrix} 2 & -3 \\ 0 & 0 \end{bmatrix} * \begin{bmatrix} 2 & 2 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$$