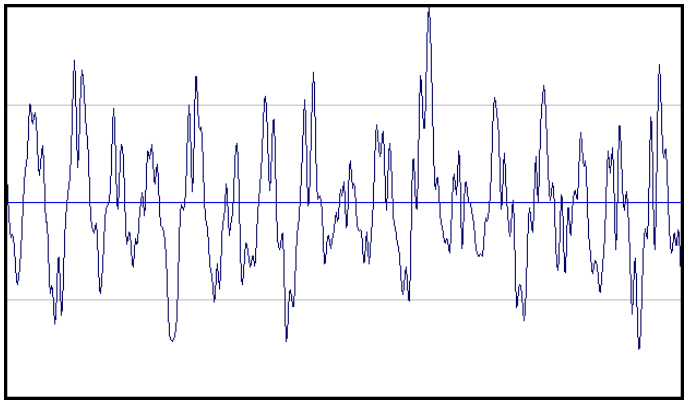
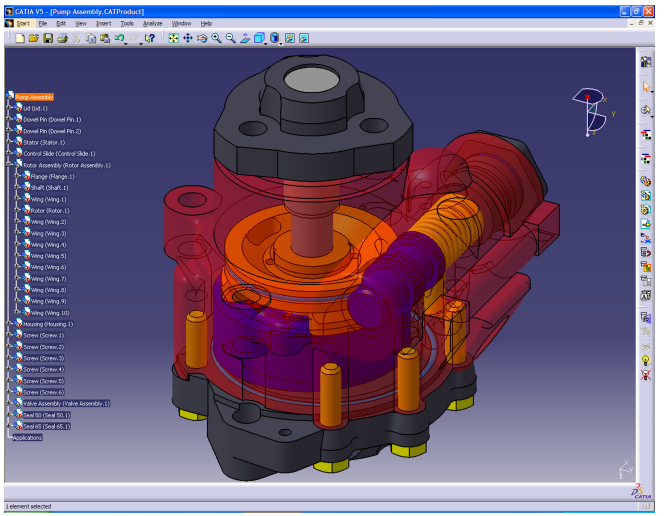
Diviser pour régner

François Schwarzentruber

Applications





Agrégation de mathématiques option informatique

- C'est une leçon !

Diviser pour régner

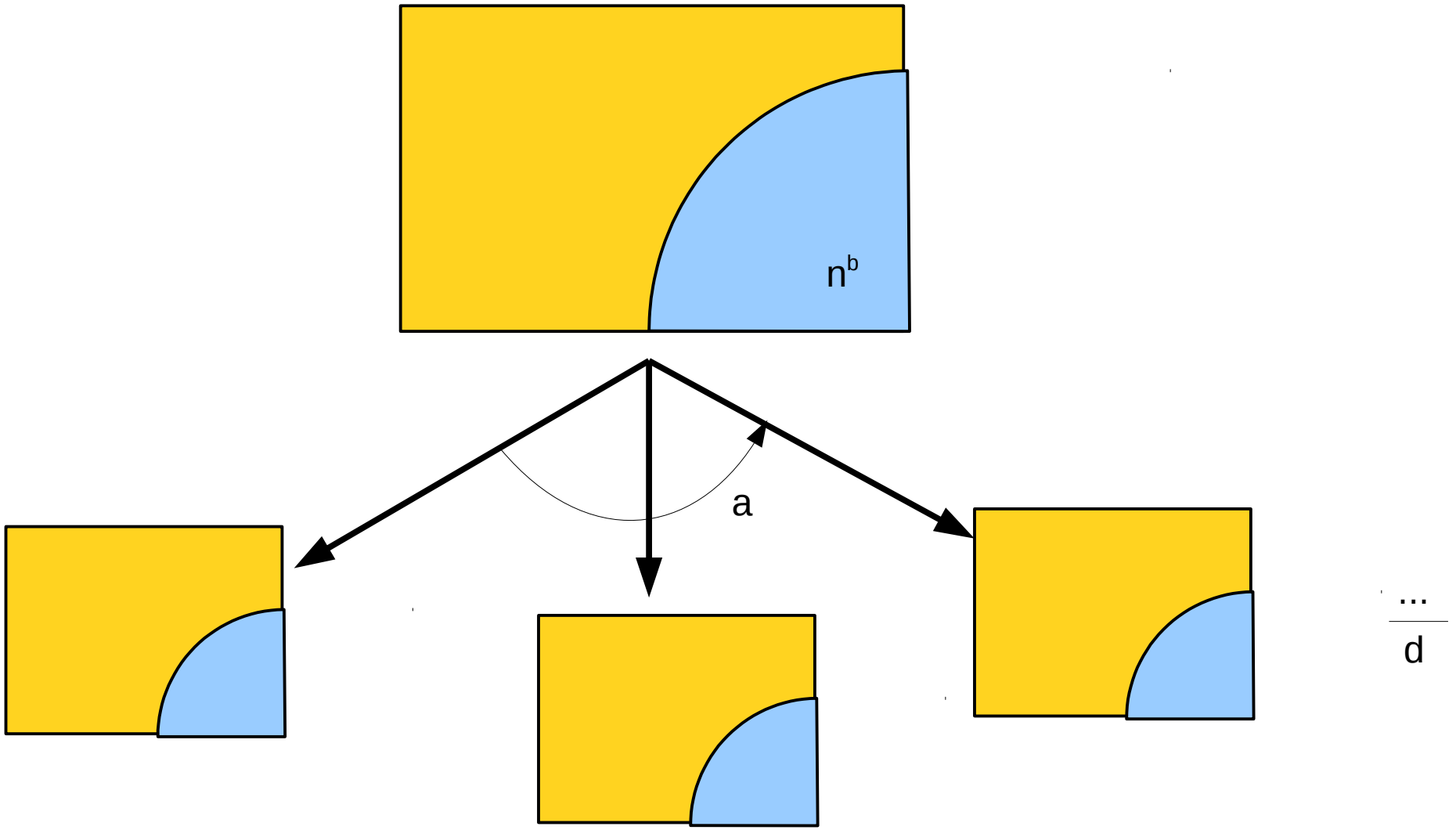
- Théorème fondamental
- Applications

  - Calcul : multiplications de nombres et matrices

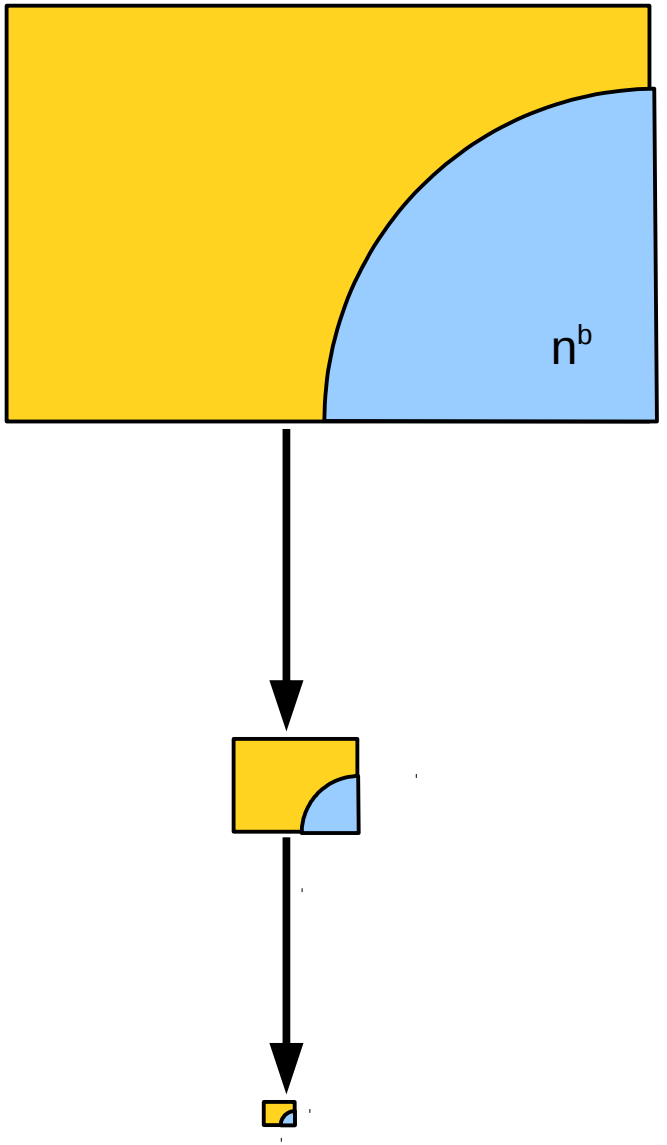
  - Traitement du signal : FFT

  - Géométrie : deux points les plus proches
- Circuit LVSI

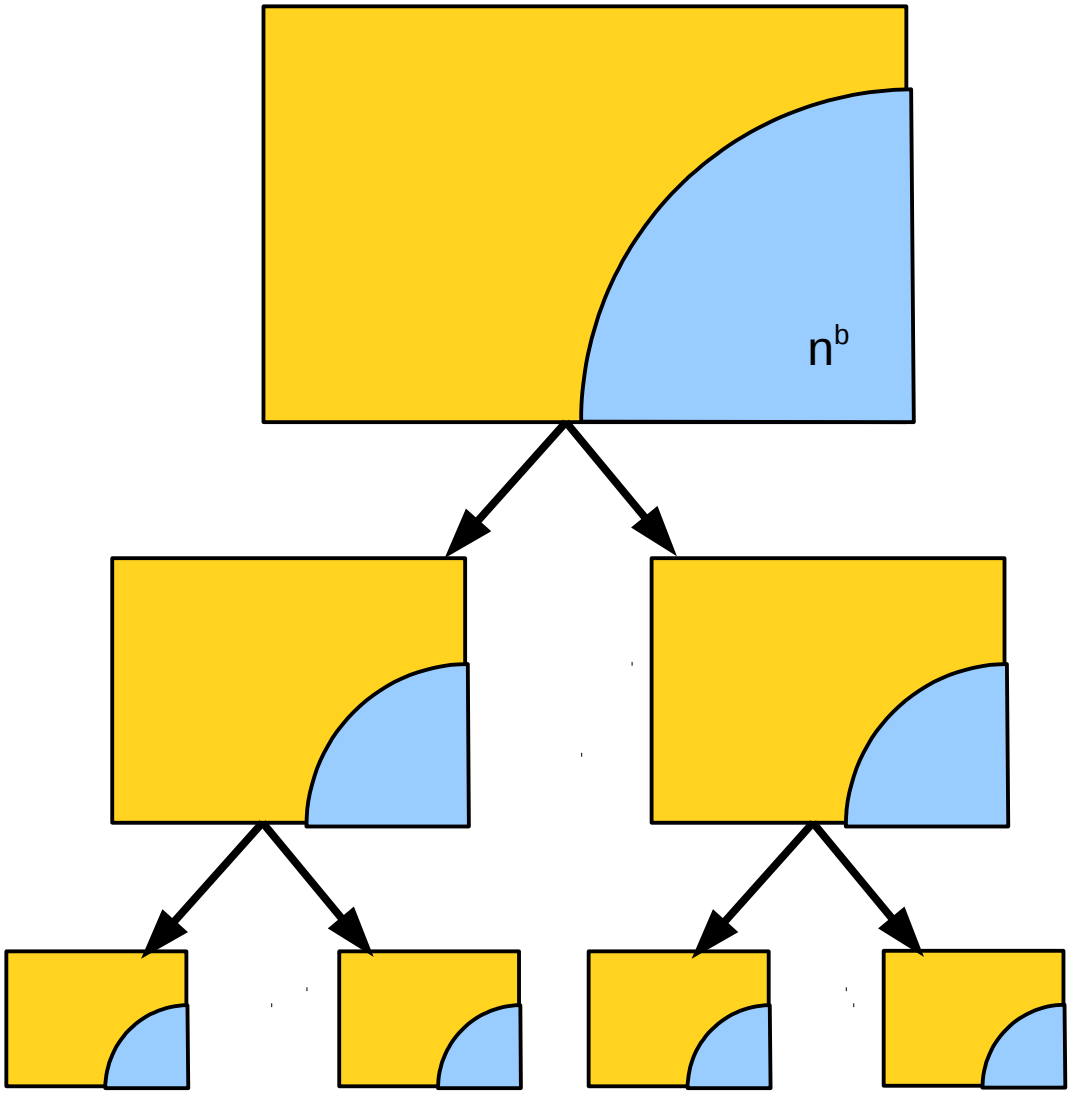
Théorème fondamental



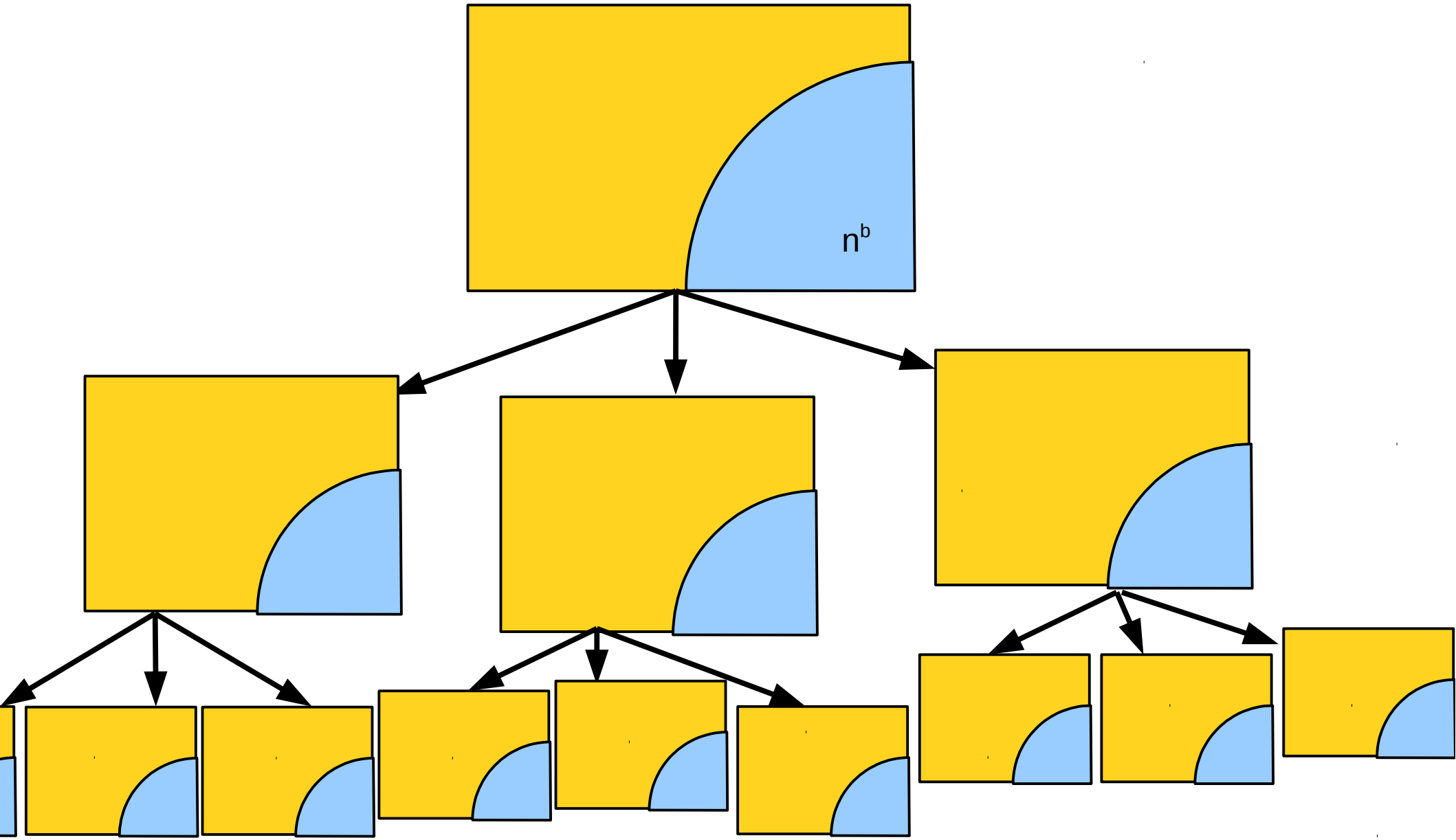
Cas où divise beaucoup / peu d'appels



Cas « équilibre »



Cas où on divise peu / beaucoup d'appels



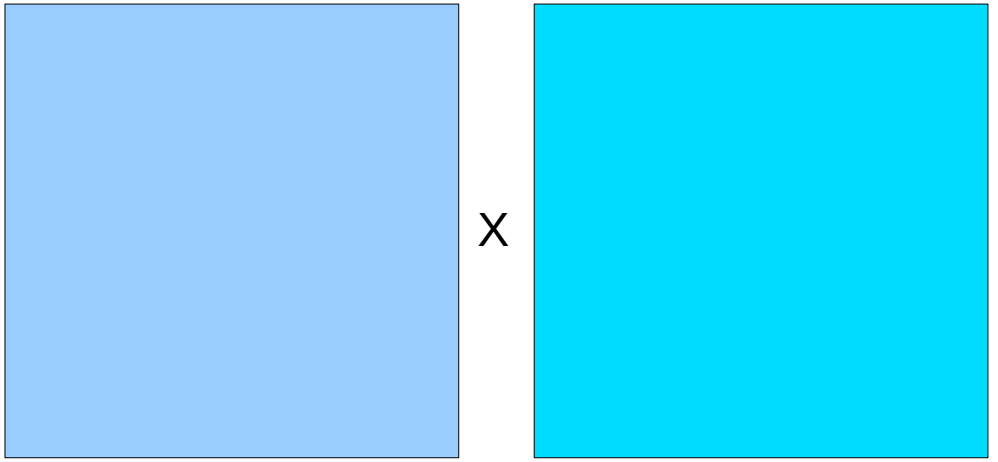
Algorithme rapide de multiplication de grands nombres (1960-1962)

Karatsuba

$$
\begin{array}{rr}
 & 12349786142315647935453125849633 1 \\
\times & 13254687914312347864153569843 21 \\
\hline
\end{array}
$$

Algorithme rapide de multiplication de matrices (1969)

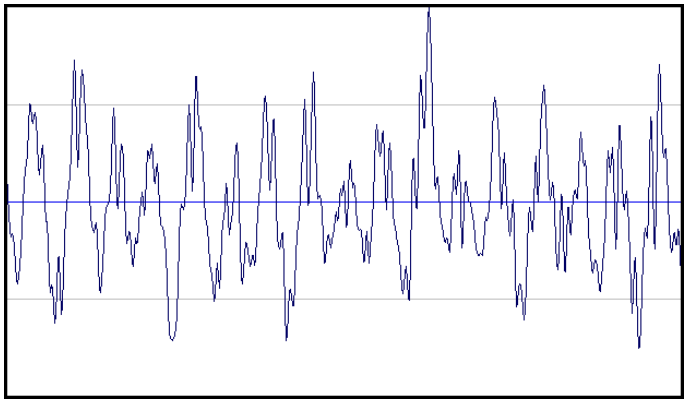
Strassen

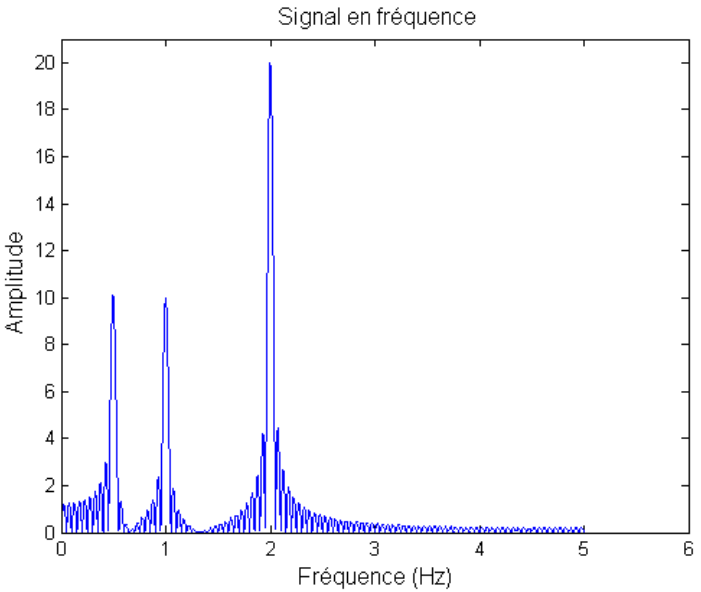


Multiplication de matrices

Year	$\omega <$	
< 1969	3	
1969	2.81	Strassen
1978	2.79	Pan
1979	2.78	Bini et al
1981	2.55	Schonhage
1982	2.50	Pan; Romani; CW
1987	2.48	Strassen
1987	2.38	CW

FFT

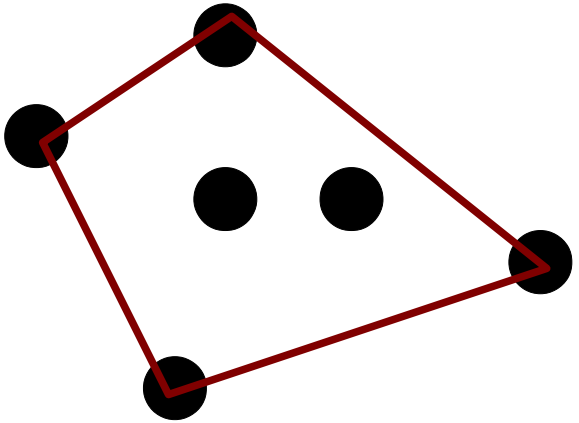


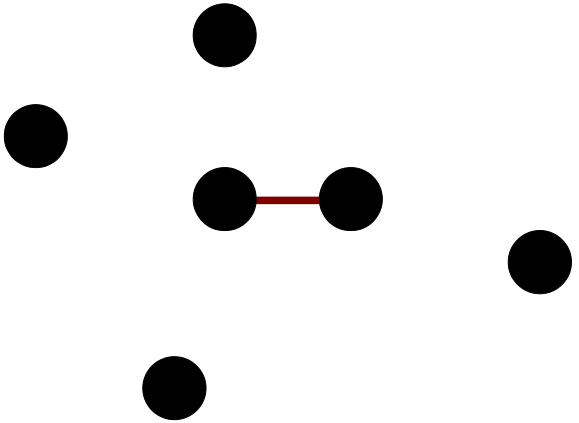

Signal en fréquence
Amplitude
Fréquence (Hz)
0
2
4
6
8
10
12
14
16
18
20
0
1
2
3
4
5
6

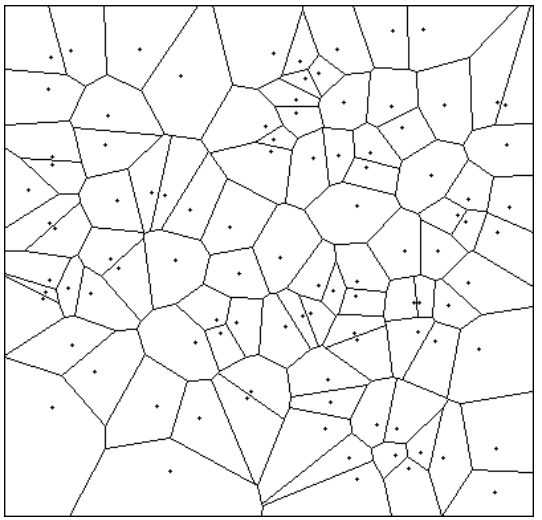
FFT (1962... but 1805)

Cooley Tukey Gauss

Géométrie







Deux points les plus proches