Visualisation-Multiresolution
3-Multiresolution Chaikin

Polytech-Grenoble

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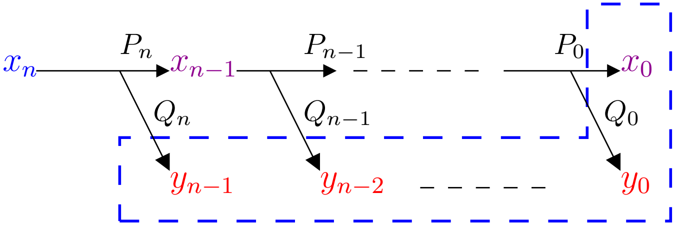
Principe Géneral

- $x_{n+1} = P_n(x_n) + Q_n(y_n)$



Subdivision de Chaikin

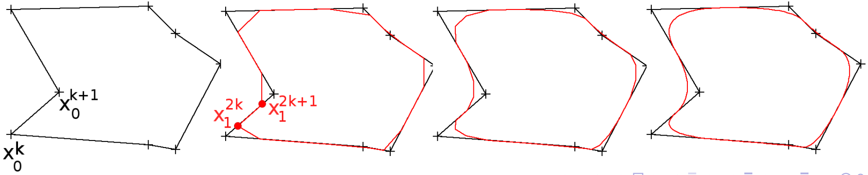
- Subdivision pour obtenir une courbe lisse

$$x_n^k = \begin{vmatrix} \frac{3}{4} x_{n-1}^{\frac{k}{2}} + \frac{1}{4} x_{n-1}^{\frac{k}{2}+1} & k \text{ pair} \\ \frac{1}{4} x_{n-1}^{\frac{k-1}{2}} + \frac{3}{4} x_{n-1}^{\frac{k-1}{2}+1} & k \text{ impair} \end{vmatrix}$$

Ou bien

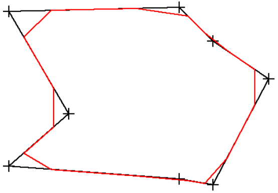
Subdivision de Chaikin

$$\begin{cases} x_n^{2k} & = & \frac{3}{4} x_{n-1}^k + \frac{1}{4} x_{n-1}^{k+1} \\ x_n^{2k+1} & = & \frac{1}{4} x_{n-1}^k + \frac{3}{4} x_{n-1}^{k+1} \end{cases}$$



Decomposition Multiresolution - Méthode de Chaikin

- Peut on faire l'inverse ?
- On a une courbe fine de 2^n points.
  On recherche le “polygone grossier” ainsi que ces détails associés.



Decomposition Multiresolution - Méthode de Chaikin

- Inverser le systeme

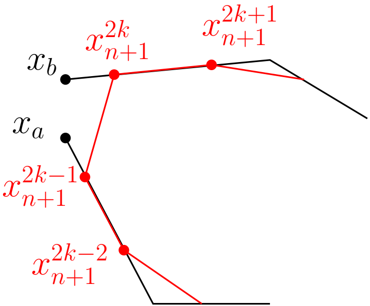
$$\begin{cases} x_n^{2k} & = \frac{3}{4}x_{n-1}^k + \frac{1}{4}x_{n-1}^{k+1} \\ x_n^{2k+1} & = \frac{1}{4}x_{n-1}^k + \frac{3}{4}x_{n-1}^{k+1} \end{cases}$$

Fournis 2 solutions possible pour x_n^k

$$\begin{vmatrix} x_a & = -\frac{1}{2}x_{n+1}^{2k-2} + \frac{3}{2}x_{n+1}^{2k-1} \\ x_b & = \frac{3}{2}x_{n+1}^{2k} - \frac{1}{2}x_{n+1}^{2k+1} \end{vmatrix}$$

- On prend la moyenne et on encode l'erreur

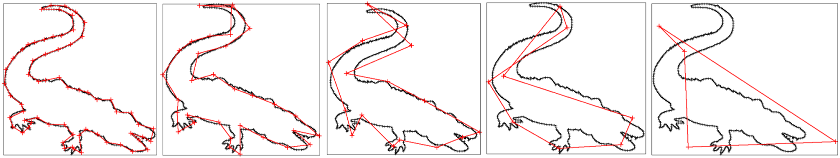
$$x_n^k = \frac{x_a + x_b}{2} \text{ et } y_n^k = \frac{x_b - x_a}{2}$$



Decomposition Multiresolution - Méthode de Chaikin

Décomposition

$$\begin{cases} x_n^k = \frac{1}{4}\left(-x_{n+1}^{2k-2} + 3x_{n+1}^{2k-1} + 3x_{n+1}^{2k} - x_{n+1}^{2k+1}\right) \\ y_n^k = \frac{1}{4}\left(x_{n+1}^{2k-2} - 3x_{n+1}^{2k-1} + 3x_{n+1}^{2k} - x_{n+1}^{2k+1}\right) \end{cases}$$



Decomposition Multiresolution - Méthode de Chaikin

Reconstruction + details

$$\begin{cases} x_{n+1}^{2k} & = & \frac{3}{4}\left(x_n^k + y_n^k\right) + \frac{1}{4}\left(x_n^{k+1} - y_n^{k+1}\right) \\ x_{n+1}^{2k+1} & = & \frac{1}{4}\left(x_n^k + y_n^k\right) + \frac{3}{4}\left(x_n^{k+1} - y_n^{k+1}\right) \end{cases}$$