

由 $F(x)F(x)$ 得到 $F(x+c)F(x+c)$ □

$$F(x+c) = \sum_{i=0}^n F[i](x+c)^i F(x+c) = \sum_{i=0}^n F[i](x+c)^i$$

$$= \sum_{i=0}^n F[i] \sum_{j=0}^i \binom{i}{j} x^j c^{i-j} = \sum_{i=0}^n F[i] \sum_{j=0}^i \binom{i}{j} x^j c^{i-j}$$

(二项式定理)

$$= \sum_{i=0}^n F[i] \sum_{j=0}^i \frac{i!}{j!(i-j)!} x^j c^{i-j} = \sum_{i=0}^n F[i] \sum_{j=0}^i \frac{i!}{j!(i-j)!} x^j c^{i-j}$$

$$= \sum_{i=0}^n F[i] i! \sum_{j=0}^i \frac{x^j}{j!} \frac{c^{i-j}}{(i-j)!} = \sum_{i=0}^n F[i] i! \sum_{j=0}^i \frac{x^j}{j!} \frac{c^{i-j}}{(i-j)!}$$

$$j! x^j$$

$$(i-j)! c^{i-j}$$

$$= \sum_{j=0}^n \frac{x^j}{j!} \sum_{i=j}^n F[i] i! \frac{c^{i-j}}{(i-j)!} = \sum_{j=0}^n \frac{x^j}{j!} \sum_{i=j}^n F[i] i! \frac{c^{i-j}}{(i-j)!}$$

$$i=j \sum_{i=j}^n F[i] i! \frac{c^{i-j}}{(i-j)!}$$

(交换和式)

设 $G(x) = F(x+c)G(x) = F(x+c)$, 提取系数可得:

$$G[j] = \frac{1}{j!} \sum_{i=j}^n F[i] i! \frac{c^{i-j}}{(i-j)!} G[j] = \frac{1}{j!} \sum_{i=j}^n F[i] i! \frac{c^{i-j}}{(i-j)!}$$

$$i=j \sum_{i=j}^n F[i] i! \frac{c^{i-j}}{(i-j)!}$$


我们设 $P[n] = F[n]n!$, $H[n] = \frac{c^n}{n!}$ $P[n] = F[n]n!$, $H[n] = \frac{c^n}{n!}$

$$, \text{ 则 } G[j] j! = \sum_{i=j}^n P[i] H[i-j] G[j] j! =$$

$i=j \sum_{i=j}^n P[i] H[i-j]$ 这就是差卷积了。

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