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Description:

1. Binarize lena.bmp with threshold 128
2. Down sampling lena.bmp from 512x512 to 64x64, and using 8x8 blocks as a unit, take the topmost-left pixel as the downsampled data.
3. Creat marked image
4. Thinning
5. Iterate step 3 and step 4, 7 times.

Algorithm:

Pair relation operator

H function: (m="1", means "edge" in Yokoi)

- $$h(a,m)=\begin{cases}1, if\ a=m\\0, otherwise\end{cases}$$

Output:

- $$y=\begin{cases}q, if\ \sum_{n=1}^{4}h(x_n,m)<1\ or\ x_0\neq m\\p, if\ \sum_{n=1}^{4}h(x_n,m)\geq 1\ and\ x_0=m\end{cases}$$

Thinning operator

H function: (yokoi corner => "q")

- $$h(b,c,d,e)=\begin{cases}1, if\ b=c\ and\ (d\neq b\ or\ e\neq b)\\0, otherwise\end{cases}$$

Output:

- $$f(a_1,a_2,a_3,a_4,x)=\begin{cases}g, if\ exactly\ one\ of\ a_n=1, n=1\sim 4\\x, otherwise\end{cases}$$

Result:

Thresholding and downsampling

thinning after 7 iteration