

ESTIMATION OF NUMBER OF OPERATIONS

Let I be an image of size $N \times N$

Let B, C and D are 3 structuring elements:

B: square $M \times M$

C: 1xM

$$D: M \times 1$$

If $B = \text{dilation_C}$ (D) = dilation_D (C)

B (square MxM)

C (1xM)

$$D \quad (M \times 1)$$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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then the dilation by structuring element B can be computed by sequentially composing dilations by C and by D:

$$\begin{aligned} \text{dilation_B (I)} &= \text{dilation_D (dilation_C (I))} \\ &= \text{dilation_C (dilation_D (I))} \end{aligned}$$

In order to consider the estimated number of operations associated to both ways, we are going to assume:

- The maximum (or minimum) of n numbers can be computed using $(n-1)$ elementary maximum (or minimum) operations.
- Border effects are disregarded, i.e., all pixels are going to be equally considered.

Option of dilation_B (I)

Number of elementary maximum operations:
number of pixels x number of operations per pixel

$$(N \times N) \times (M \times M - 1)$$

Option of dilation_D (dilation_C (I))

Number of elementary maximum operations
(2 sequential dilations):

$$\frac{(N \times N) \times (M - 1)}{2 \times (N \times N) \times (M - 1)} + \frac{(N \times N) \times (M - 1)}{2 \times (N \times N) \times (M - 1)} =$$