

① • Kaitan pengolahan citra dengan computer vision

→ Pengolahan citra merupakan bagian dari computer vision. Pengolahan citra merupakan proses awal (preprocessing) pada computer vision.

• Contoh pengolahan citra :

1) Perbaikan kualitas citra (image enhancement)

↳ penajaman, penapisan derau, perbaikan kontras

2) Pemugaran citra (image restoration)

↳ debluring, penghilangan noise

3) Pemampatan citra (image compression)

4) Segmentasi citra

5) Image analysis : edge detection, boundary, region

6) Rekonstruksi citra

② Contoh aplikasi :

1) Bidang perdagangan

↳ pembacaan code batang yang ada pada barang (pada supermarket)

↳ mengenali huruf/angka pada suatu formulir secara otomatis

2) Bidang militer

↳ mengenali sasaran peluru kendali melalui sensor visual

↳ mengidentifikasi jenis pesawat musuh

3) Bidang kedokteran

↳ pengolahan citra sinar x

↳ XMR (Nuclear Magnetic Resonance)

4) Bidang biologi = pengenalan jenis kromosom melalui gambar mikroskopik

5) Hiburan = pemampatan video (MPEG)

③ Diketahui $f(x,y) =$

213	172	125	121	15
12	15	16	117	198
155	115	216	74	165
132	137	217	26	113
157	123	27	113	16

Jika $f'(x,y) = f(x,y) + 53$, maka $f'(x,y) =$

266	225	178	174	68
65	68	69	170	251
208	168	269	127	218
185	190	270	79	166
210	176	80	166	69

operasi clipping

di halaman selanjutnya

[2]

Hasil clipping dengan fungsi clipping pada soal =

$$f'(x,y) = \begin{bmatrix} 255 & 225 & 178 & 174 & 68 \\ 65 & 68 & 69 & 170 & 251 \\ 208 & 168 & 255 & 127 & 218 \\ 185 & 190 & 255 & 79 & 166 \\ 210 & 176 & 80 & 166 & 69 \end{bmatrix}$$

(4) a) Diketahui :

$$h(x,y) = \begin{bmatrix} 211 & 21 & 134 & 154 & 68 \\ 14 & 224 & 175 & 180 & 11 \\ 112 & 145 & 157 & 82 & 132 \\ 143 & 15 & 235 & 67 & 156 \\ 67 & 35 & 134 & 167 & 24 \end{bmatrix} \text{ dan } g(x,y) = \begin{bmatrix} 1 & -1 & 1 \\ -1 & 4 & -1 \\ 1 & -1 & 1 \end{bmatrix}$$

Perhitungan konvolusi

- (1,1) → $211 + (-21) + 134 + (-14) + 896 + (-175) + 112 - 145 + 157 = 1155$
- (1,2) → $21 - 134 + 154 - 224 + 700 - 180 + 145 - 157 + 82 = 407$
- (1,3) → $134 - 154 + 68 - 175 + 4(186) - 11 + 157 - 82 + 132 = 789$
- (2,1) → $14 - 224 + 175 - 112 + 4(145) - 157 + 143 - 15 + 235 = 639$
- (2,2) → $224 - 175 + 180 - 145 + 4(157) - 82 + 15 - 235 + 67 = 477$
- (2,3) → $175 - 180 + 11 - 157 + 4(82) - 132 + 235 - 67 + 156 = 369$
- (3,1) → $112 - 145 + 157 - 143 + 4(15) - 235 + 67 - 35 + 134 = -28$
- (3,2) → $145 - 157 + 82 - 15 + 4(235) - 67 + 35 - 134 + 167 = 996$
- (3,3) → $157 - 82 + 132 - 235 + 4(67) - 156 + 134 - 167 + 24 = 75$

Hasil konvolusi =

$$h(x,y) * g(x,y) = \begin{bmatrix} 211 & 21 & 134 & 154 & 68 \\ 14 & 1155 & 407 & 789 & 11 \\ 112 & 639 & 477 & 369 & 132 \\ 143 & -28 & 996 & 77 & 156 \\ 67 & 35 & 134 & 167 & 24 \end{bmatrix}$$

Setelah clipping =

$$\begin{bmatrix} 211 & 21 & 134 & 154 & 68 \\ 14 & 255 & 255 & 255 & 11 \\ 112 & 255 & 255 & 255 & 132 \\ 143 & 0 & 255 & 75 & 156 \\ 67 & 35 & 134 & 167 & 24 \end{bmatrix}$$

b) Algoritma masalah 4a

```
void konvolusi ( citra Image, citra ImageResult, imatrix Mask, int N, int M)
{
```

```
    int i, j;
```

```
    // konvolusi
```

```
    for (i = 1; i <= N-2; i++)
```

```
        for (j = 1; j <= M-2; j++)
```

```
            ImageResult[i][j] =
```

```
                Image[i-1][j-1] * Mask[0][0] +
```

```
                Image[i-1][j] * Mask[0][1] +
```

```
                Image[i-1][j+1] * Mask[0][2] +
```

```
                Image[i][j-1] * Mask[1][0] +
```

```
                Image[i][j] * Mask[1][1] +
```

```
                Image[i][j+1] * Mask[1][2] +
```

```
                Image[i+1][j-1] * Mask[2][0] +
```

```
                Image[i+1][j] * Mask[2][1] +
```

```
                Image[i+1][j+1] * Mask[2][2];
```

```
    // pengisian pixel pinggir kanan kiri
```

```
    for (i = 0; i <= N-1; i++)
```

```
        ImageResult[i][0] = Image[i][0];
```

```
        ImageResult[i][M-1] = Image[i][M-1];
```

```
    // pengisian pixel atas bawah
```

```
    for (i = 0; i <= M-1; i++)
```

```
        ImageResult[0][i] = Image[0][i];
```

```
        ImageResult[N-1][i] = Image[N-1][i];
```

```
    // clipping hasil konvolusi yang tengah saja, tanpa tepi
```

```
    for (i = 1; i <= N-2; i++)
```

```
        for (j = 1; j <= M-2; j++)
```

```
            if (ImageResult[i][j] < 0) then
```

```
                ImageResult[i][j] = 0;
```

```
            else if (ImageResult[i][j] > 255) then
```

```
                ImageResult[i][j] = 255;
```