Görüntü İşleme

Morphological Image Processing (devam)

Orijinal not: Ders-11.pdf

UYARI Bu belge, el yazısı ders notlarından Claude (Anthropic) yardımıyla dijitale aktarılmıştır. Yardımcı kaynak olarak hazırlanmıştır; hata veya eksik içerebilir. Lütfen orijinal notları ve ders kaynaklarını esas alın.

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Not: Orijinal dosyadaki basılı sayfalar (s. 2, 7) dijitalleştirilmedi; yalnızca el yazısı sayfalar aktarıldı.

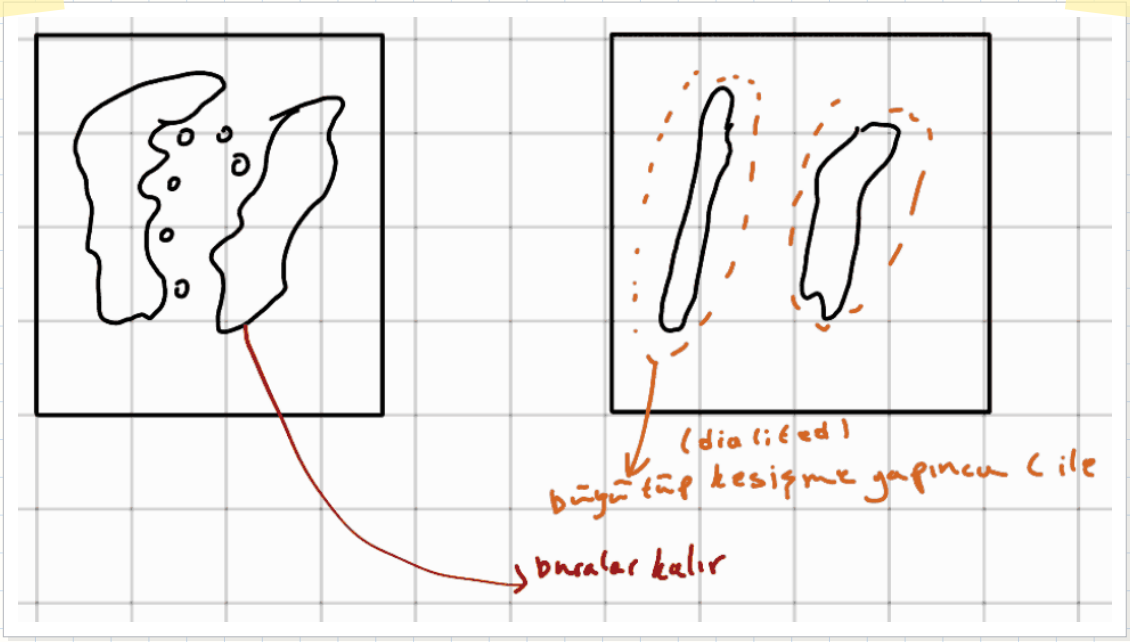
orj. s. 1

Conditional dilation

$$A \oplus_C B = (A \oplus B) \cap C$$

(c)

$A = C \circ D$ (opening) ← D büyük olsun



orijinal çizim, s. 1

Connected component bulmak için

$$X_k = (X_{k-1} \oplus B) \cap A$$

$$k = 1,2,\ldots$$

X_0 ihtiyaç var, objenin üzerindeki herhangi bir nokta

> **Şekil:** Bu sayfa basılı materyal içeriyor (ör. ders slaytı); dijitalleştirilmedi.
> *(orijinal notta, s. 1)*

→ 8 komşuluk

dilation and intersection

X_0 bulmak için etiketlemenin herhangi bir noktası

orj. s. 3

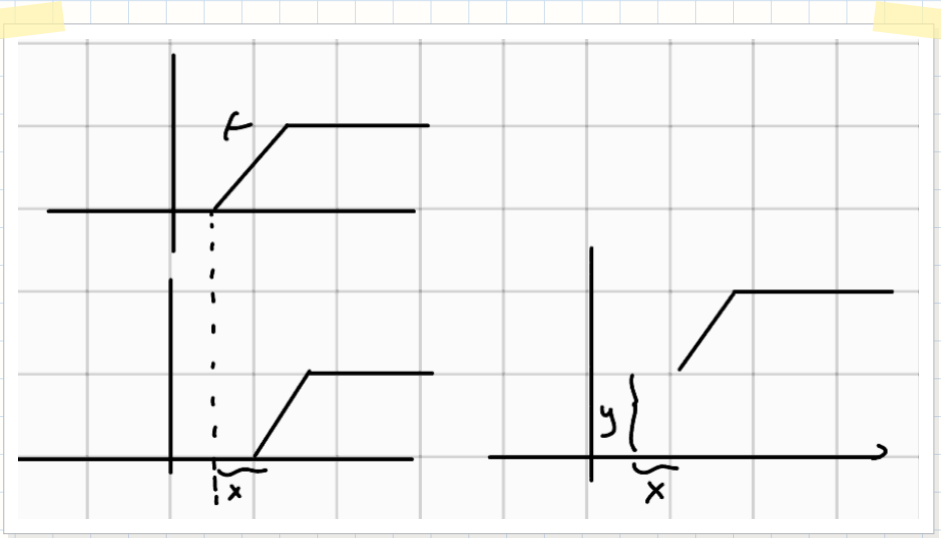
x bir değişken

$$f(x)$$

$f_x(z) = f(z - x)$ translation by x

$(f + y)(z) = f(z) + y$ offset by y

$f_x + y$



orijinal çizim, s. 3

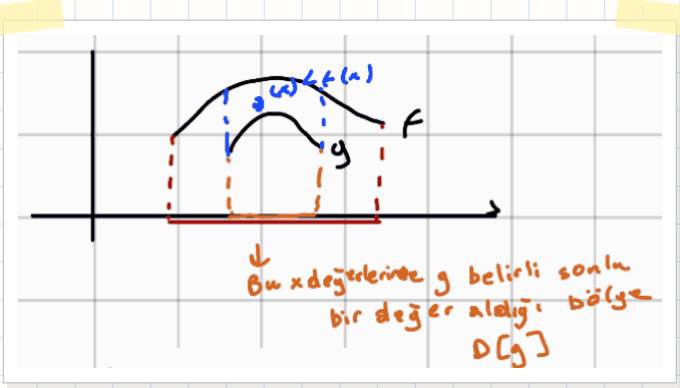
$D[g]$ $D[f]$

g and f are signals with domain $D[g]$ and $D[f]$ we say that g is beneath of (altında) f, if

1) $D[g] \subseteq D[f]$

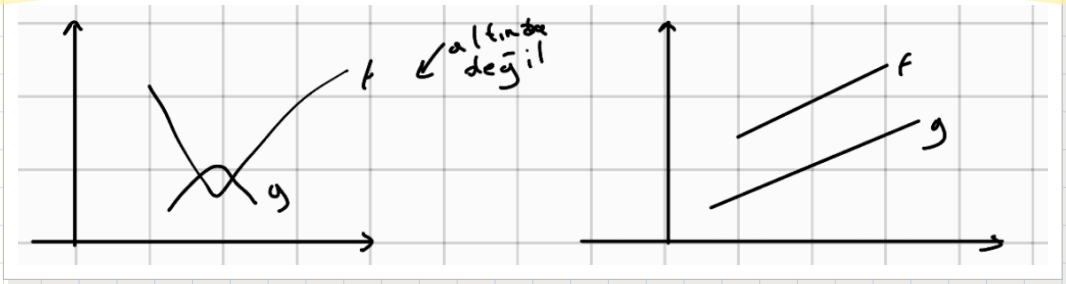
2) $g(x) \leq f(x)$ for any $x \in D[g]$

Then we write $g \ll f$



orijinal çizim, s. 3

→ $g \ll f$

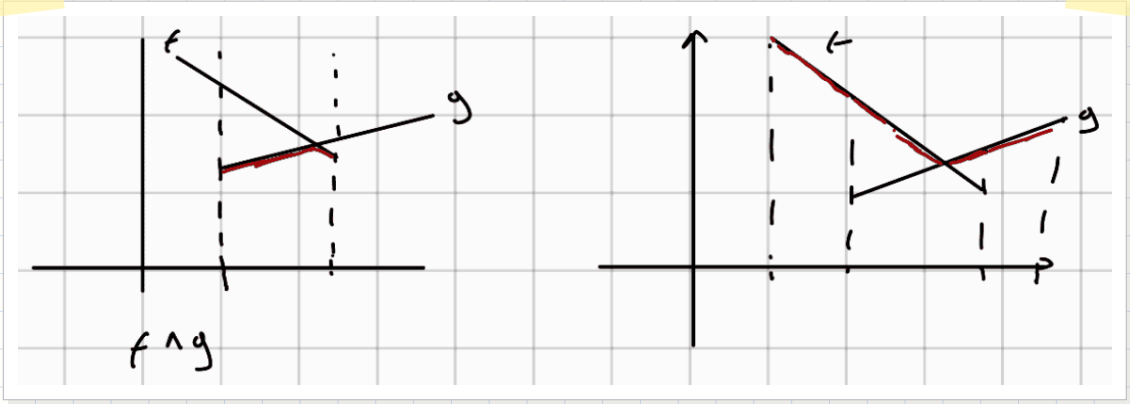


orijinal çizim, s. 3

orj. s. 4

$$(f \wedge g)(x) = \min\{f(x), g(x)\} \quad \text{for } x \in D[f] \cap D[g]$$

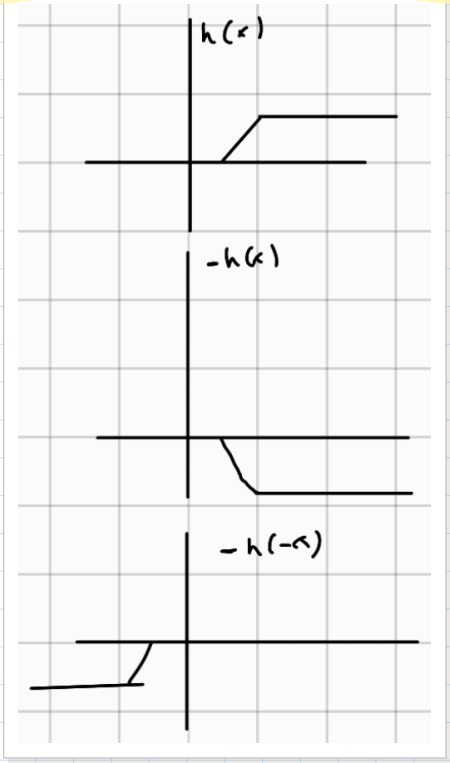
$$(f \vee g)(x) = \begin{cases} \max\{f(x), g(x)\} & \text{for } x \in D[g] \cap D[f] \\ f(x) & \text{for } x \in D[f] \text{ and } x \notin D[g] \\ g(x) & \text{for } x \in D[g] \text{ and } x \notin D[f] \\ \text{not defined} & \text{for } x \notin D[g] \text{ and } x \notin D[f] \end{cases}$$



orijinal çizim, s. 4

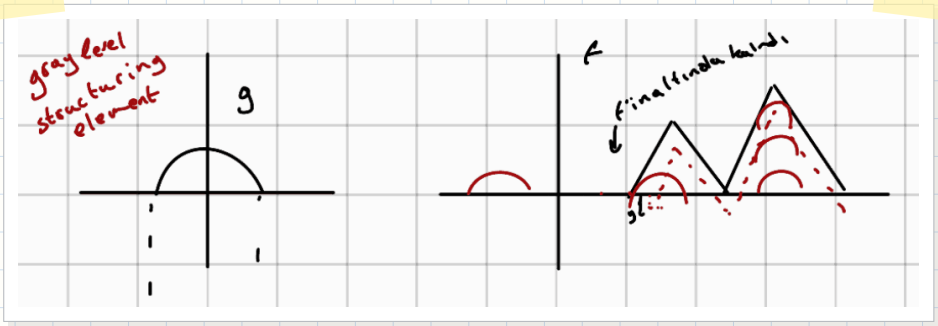
Reflection of h

$$\hat{h}(x) = -h(-x)$$



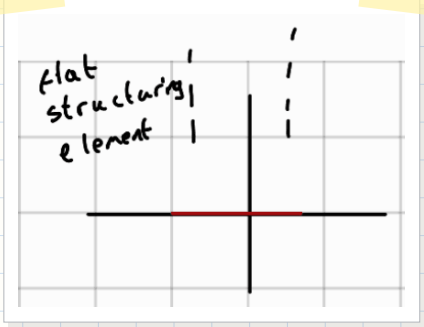
orijinal çizim, s. 4

$$(f \ominus g)(x) = \max\{y : g_x + y \ll f\}$$



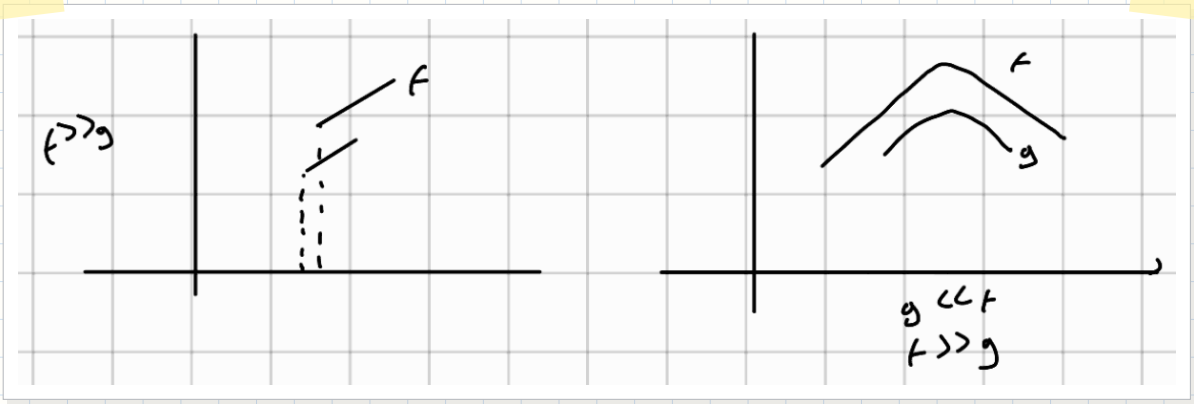
orijinal çizim, s. 4

orj. s. 5



orijinal çizim, s. 5

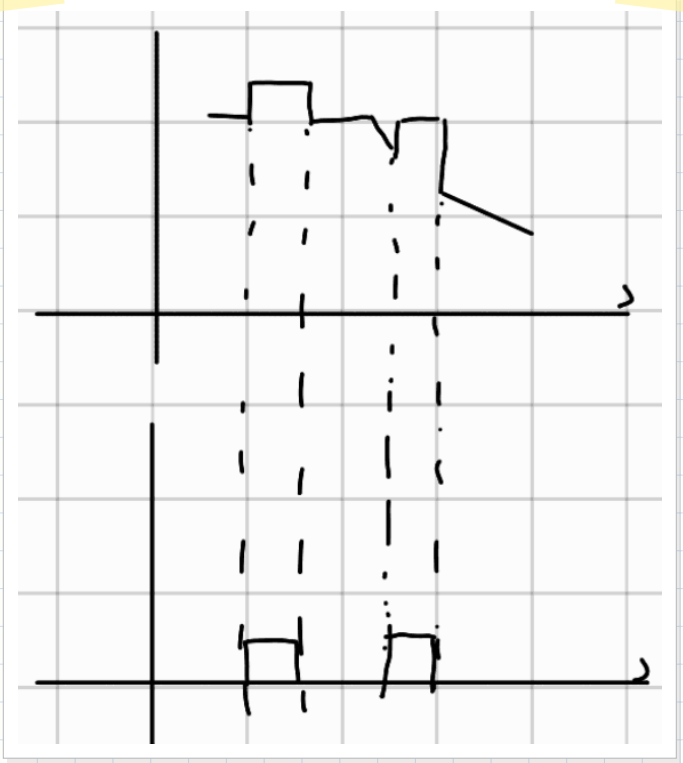
$$(f \oplus g)(x) = \min\{y : (\hat{g})_x + y \gg f\}$$
$$= \max_{} \bigvee \{f_x + g(x) : x \in D[g]\}$$



orijinal çizim, s. 5

$$f \circ g = (f \ominus g) \oplus g$$
$$f \bullet g = (f \oplus g) \ominus g$$
$$(f \circ g) \circ g = f \circ g$$

$$\text{Grad}(f) = f \oplus g - f \ominus g$$
$$\text{Top-Hat}(f) = f - f \circ g$$



orijinal çizim, s. 5

opening olayı background estimation olarak yarar

$f \circ g$ background

↙ arkası karanlık üstü beyaz şeyler için

> **Şekil:** Bu sayfa basılı materyal içeriyor (ör. ders slaytı); dijitalleştirilmedi.
> *(orijinal notta, s. 5)*

orj. s. 6

$$\text{Bottom Hat}(f) = f - f \bullet g^{1}$$

↓ Gradient

$$A \oplus B - A \ominus B$$

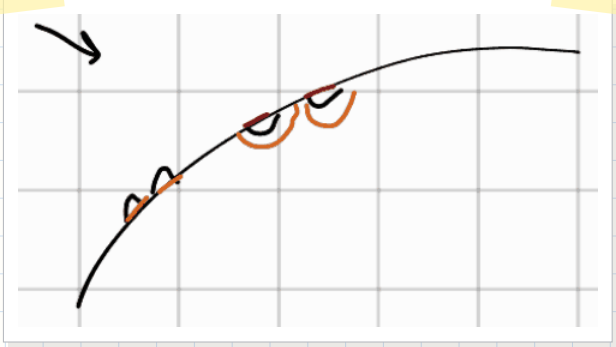
Morphological laplacian

$$\frac{1}{2}(A \oplus B + A \ominus B - 2A)$$

$$\frac{1}{2}\Big(\underbrace{(A \oplus B - A)}_{\text{türev}} - \underbrace{(A - A \ominus B)}_{\text{türev}}\Big)$$

↓ smoothing

$$(A \circ B) \bullet B$$



orijinal çizim, s. 6

minimum

$$\left.\frac{A - A \ominus B}{A \oplus B - A \ominus B}\right\} \text{normalizasyon gibi}$$

↘ B biraz büyük seçilmeli

contrast stretching local

erosion karanlık alanları büyütüyor

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> *(orijinal notta, s. 6)*

[1] Claude notu: muhtemelen $f \bullet g - f$ olmalı.