Morfolojik İmge İşleme

Morphologic Image Processing

Morfolojik İmge İşleme

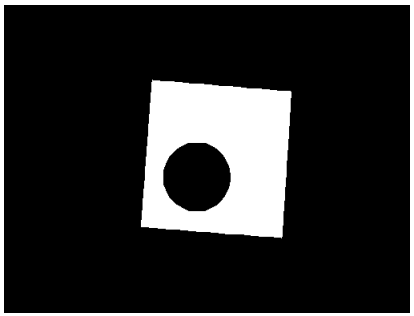
Morfoloji:

Canlıların yapıları ve şekilleri ile ilgilenen bir biyoloji dalıdır.

Matematiksel Morfoloji:

İmge işlemede sıkça kullanılan, temel küme işlemlerine dayanan yöntemlerdir.

Genellikle ikili imgeler üzerinde kullanılırlar.



Morfolojik İmge İşleme

Morfolojik işlemler ikili / iki değerli (binary) imgelerin analizinde: kenar bulma, gürültü giderme, pekiştirme ve bölütleme gibi uygulamalarda kullanılmaktadır.

Morfolojik filtreleme, inceltme (thinning) ve budama (pruning) gibi ön/son işlemlerde de sıkça kullanılır.

Morfolojik İmge İşleme

Morfolojik imge işlemede temel olarak kullanılan iki işlem vardır:

- Yayma (dilation)
- Aşındırma (erosion)

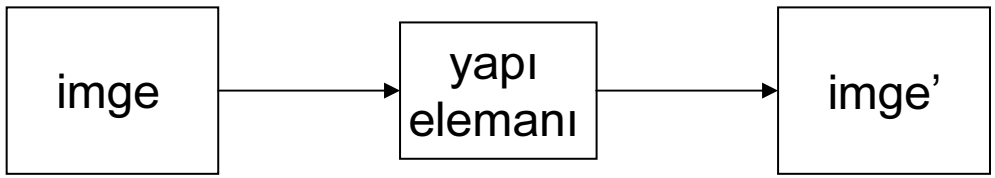
Diğer morfolojik işlemler, bu temel iki işlem kullanılarak yapılmaktadır. Örn; açma (opening), kapama (closing).

Morfolojik İmge İşleme - Yayma

Yayma, ikili imgedeki nesneyi büyütmeye ya da kalınlaştırmaya yarayan morfolojik işlemdir.

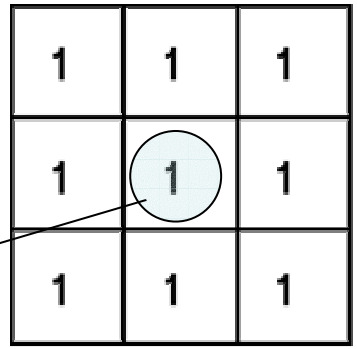
$$A \oplus B$$

Kalınlaştırma işleminin nasıl yapılacağını yapı elemanı (structure element) belirler.



Morfolojik İmge İşleme - Yayma

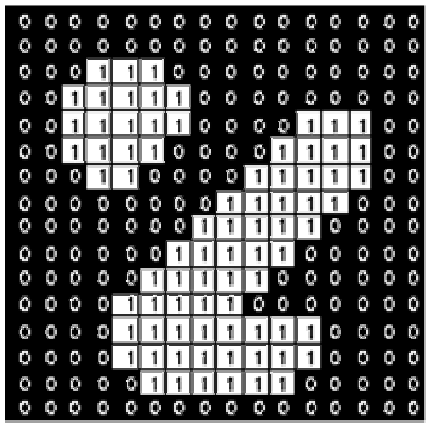
Yapı elemanı



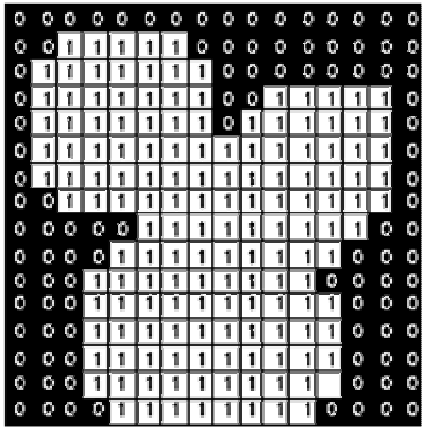
merkez nokta

Set of coordinate points =

{ (-1, -1), (0, -1), (1, -1),
(-1, 0), (0, 0), (1, 0),
(-1, 1), (0, 1), (1, 1) }



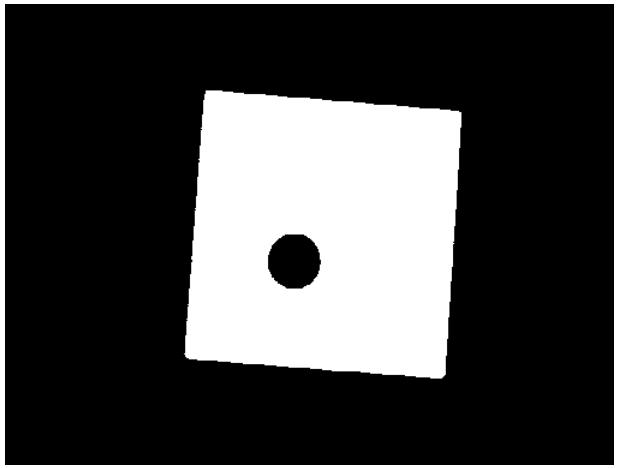
İki değerli imge

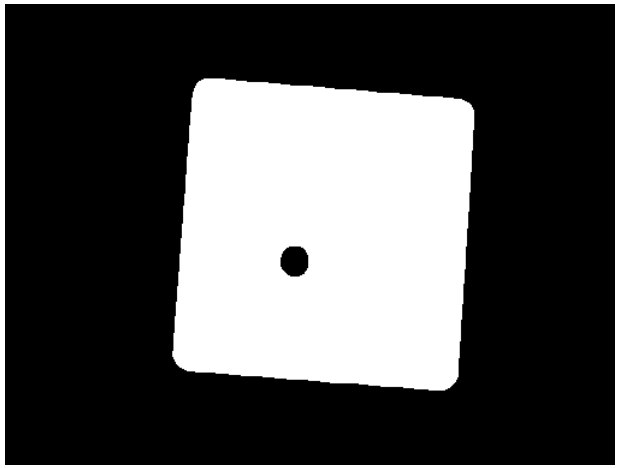


Yayma işlemi sonrası elde edilen imge

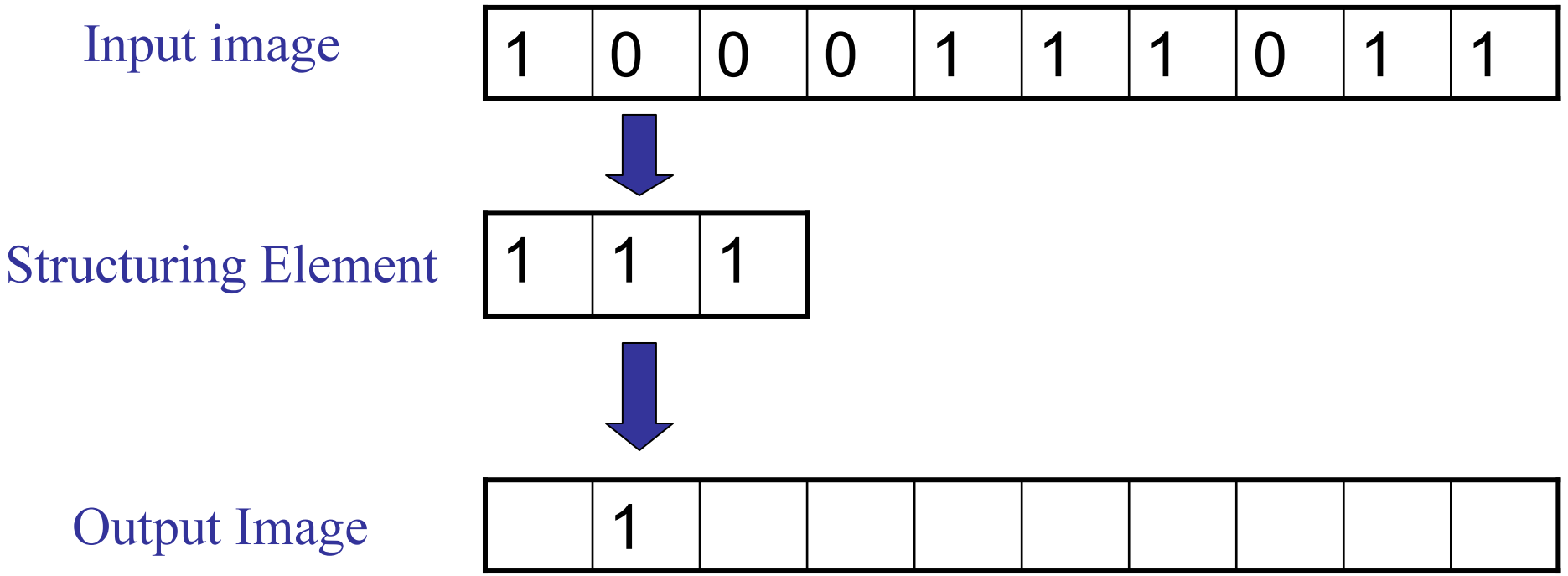
İmdilate(A,B)

Morfolojik İmge İşleme - Yayma

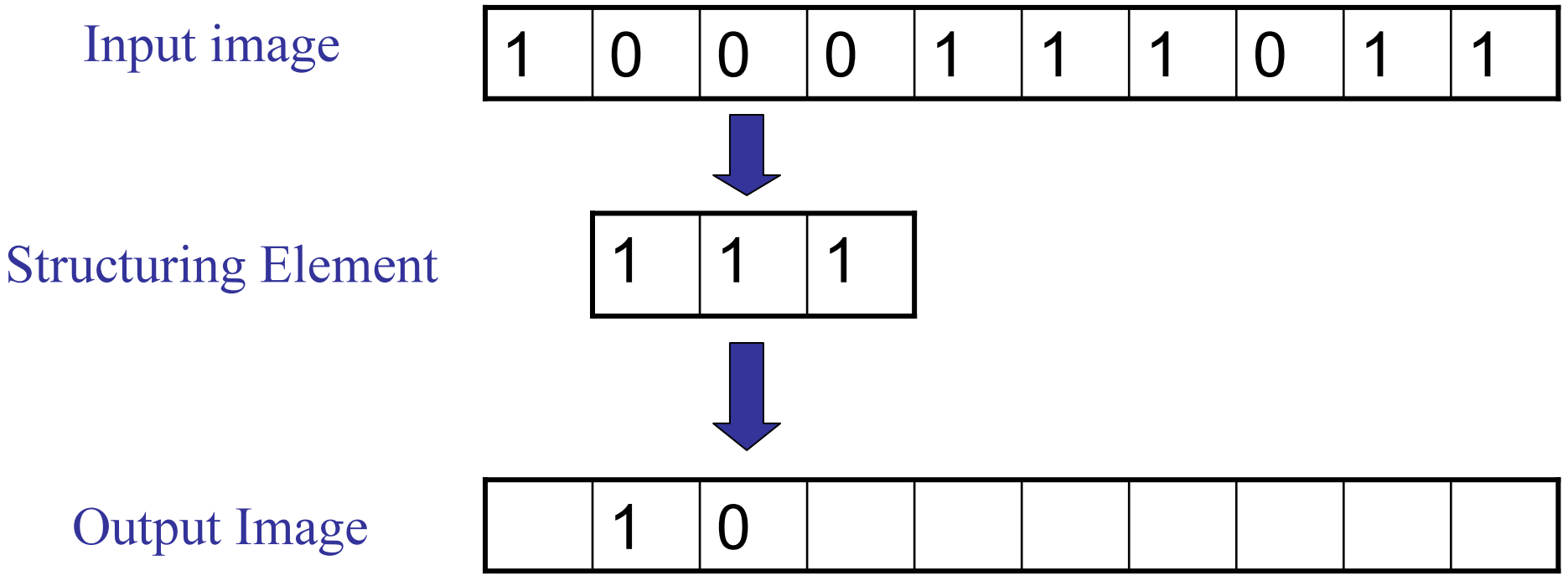




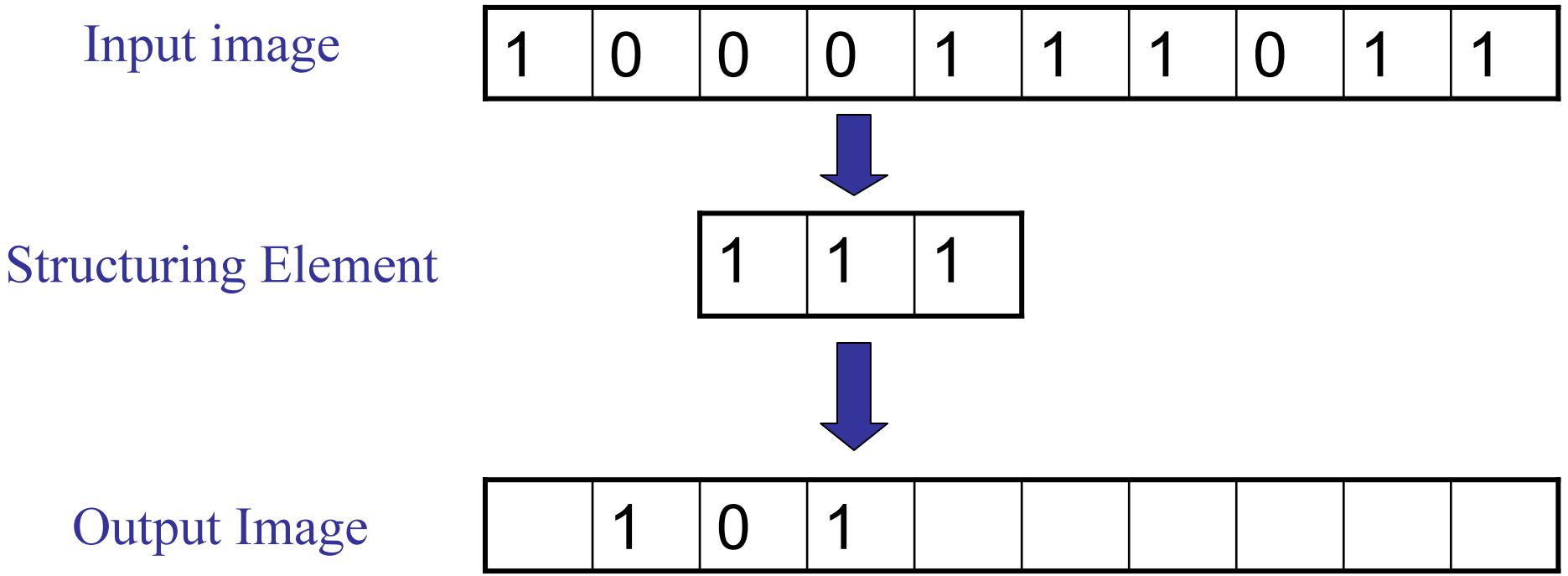
Morfolojik İmge İşleme - Yayma



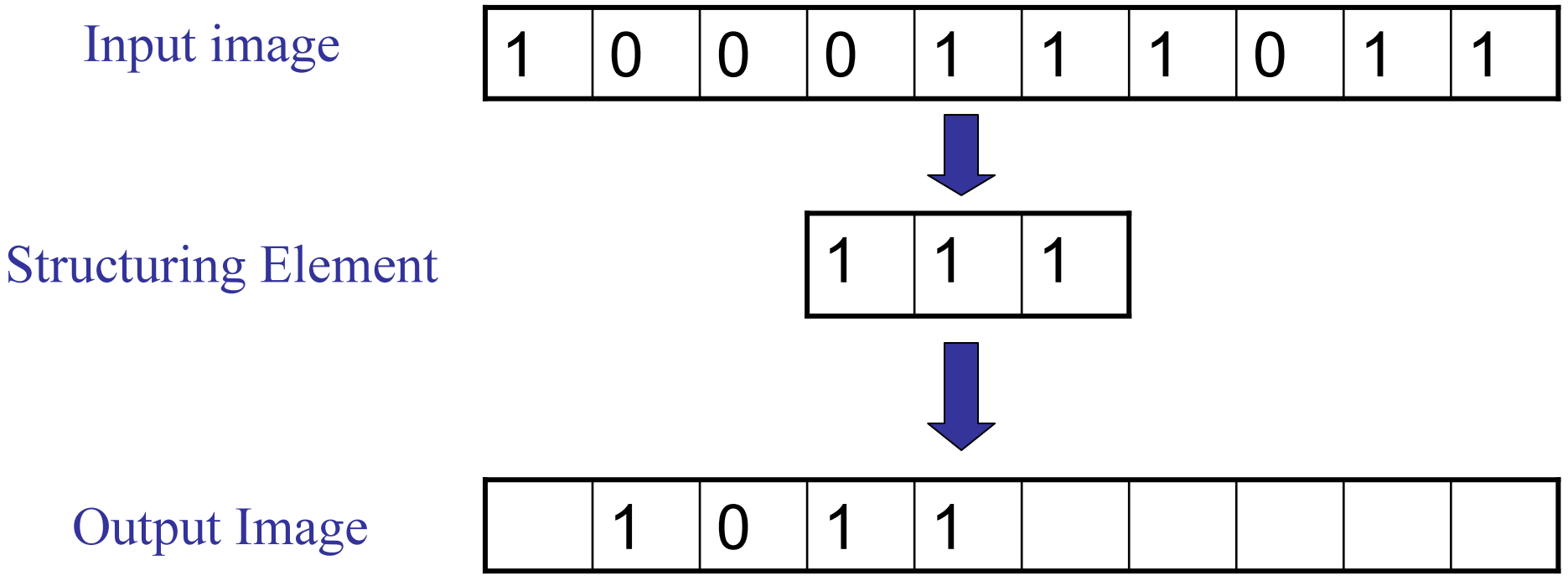
Morfolojik İmge İşleme - Yayma



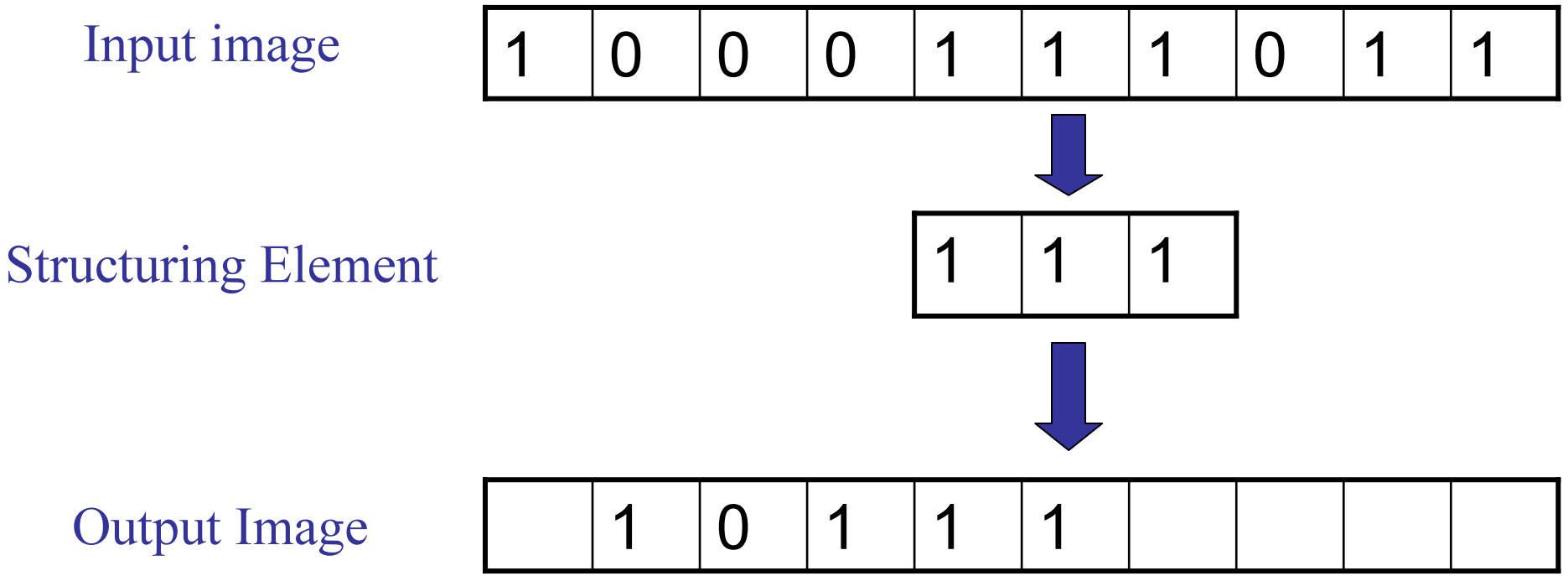
Morfolojik İmge İşleme - Yayma



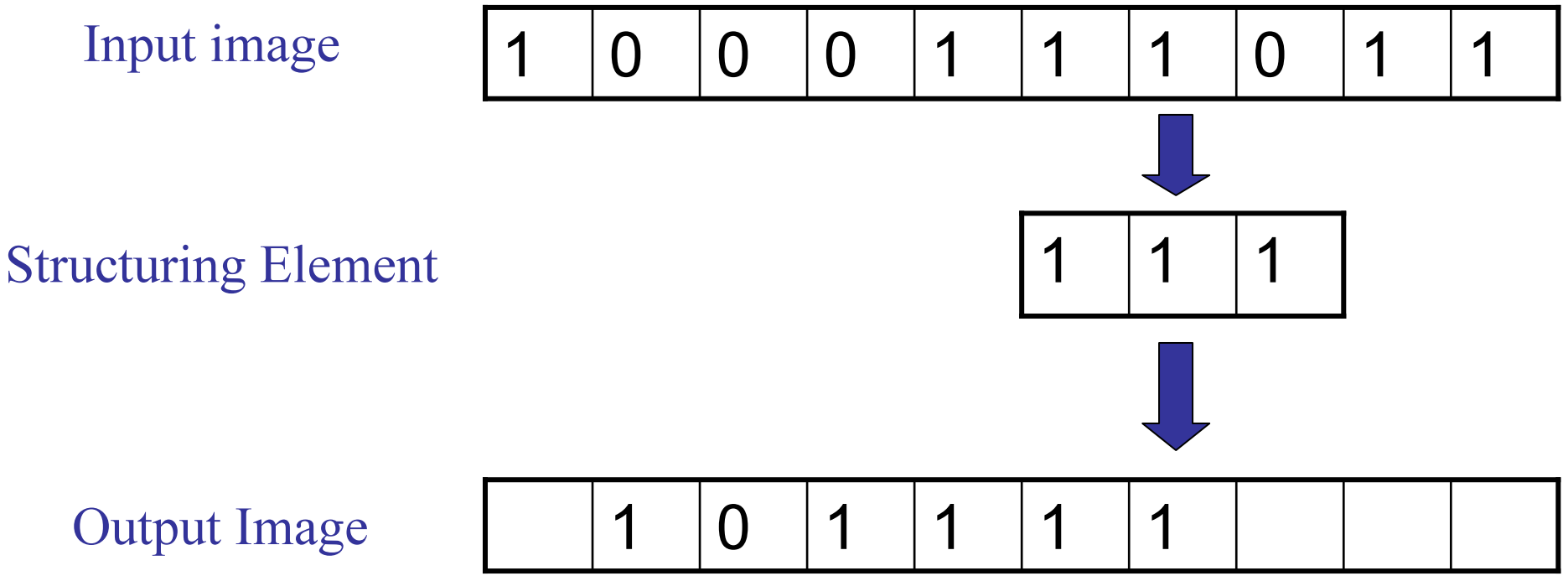
Morfolojik İmge İşleme - Yayma



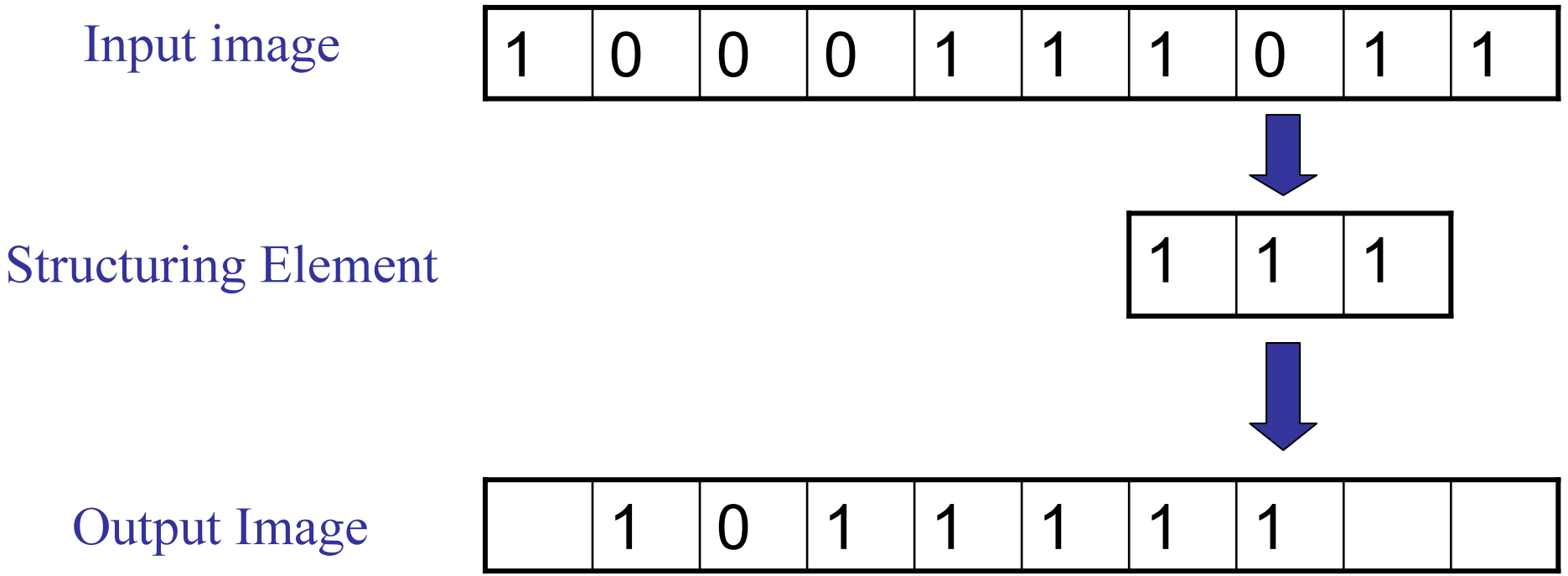
Morfolojik İmge İşleme - Yayma



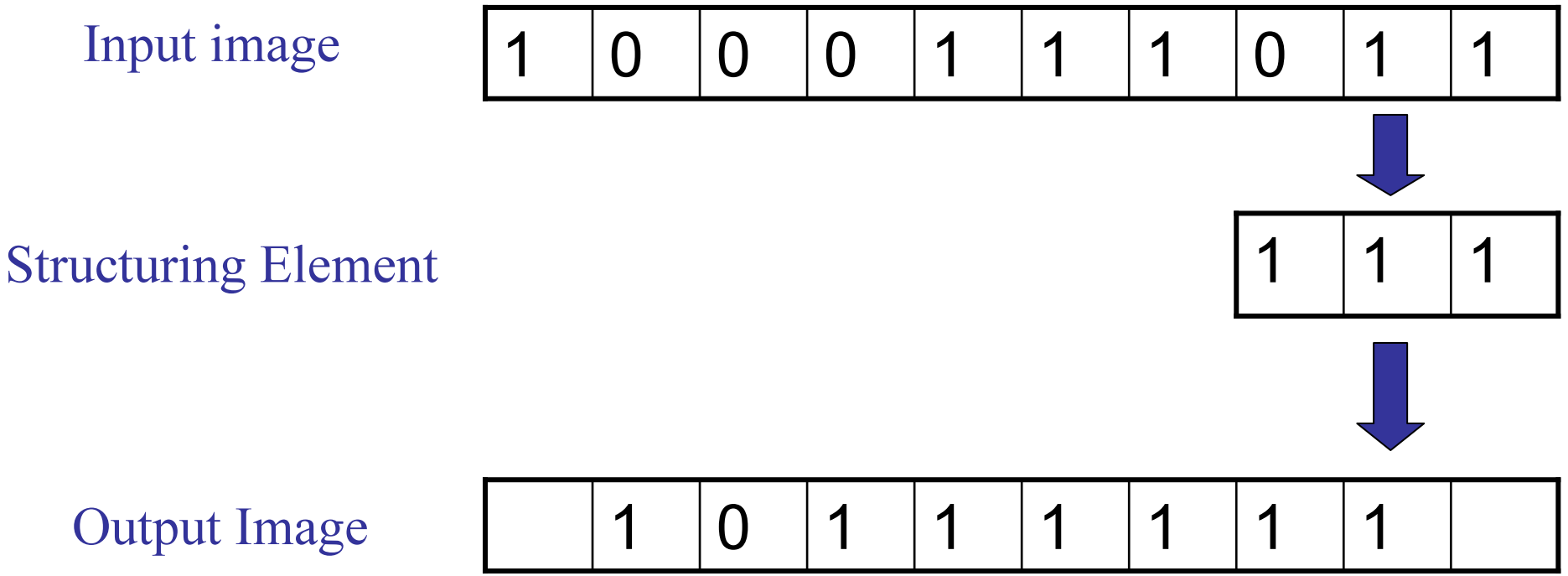
Morfolojik İmge İşleme - Yayma



Morfolojik İmge İşleme - Yayma



Morfolojik İmge İşleme - Yayma



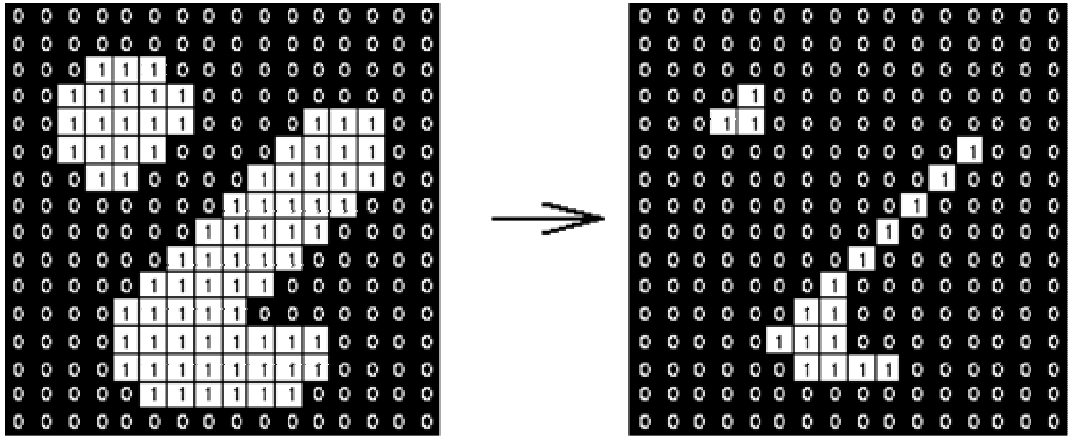
Morfolojik İmge İşleme - Aşındırma

Aşındırma, ikili imgedeki nesneyi küçültmeye ya da inceltmeye yarayan morfolojik işlemdir. $A \ominus B$

1	1	1
1	1	1
1	1	1

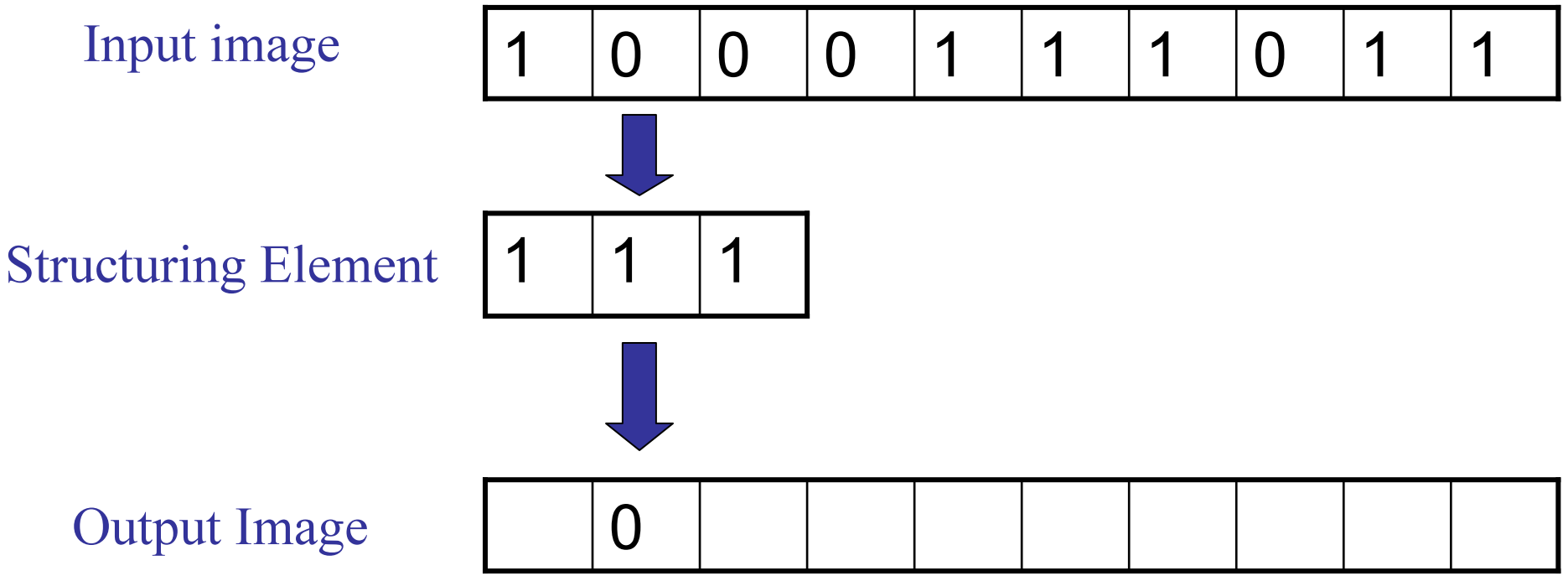
Set of coordinate points =

{ (-1, -1), (0, -1), (1, -1),
(-1, 0), (0, 0), (1, 0),
(-1, 1), (0, 1), (1, 1) }

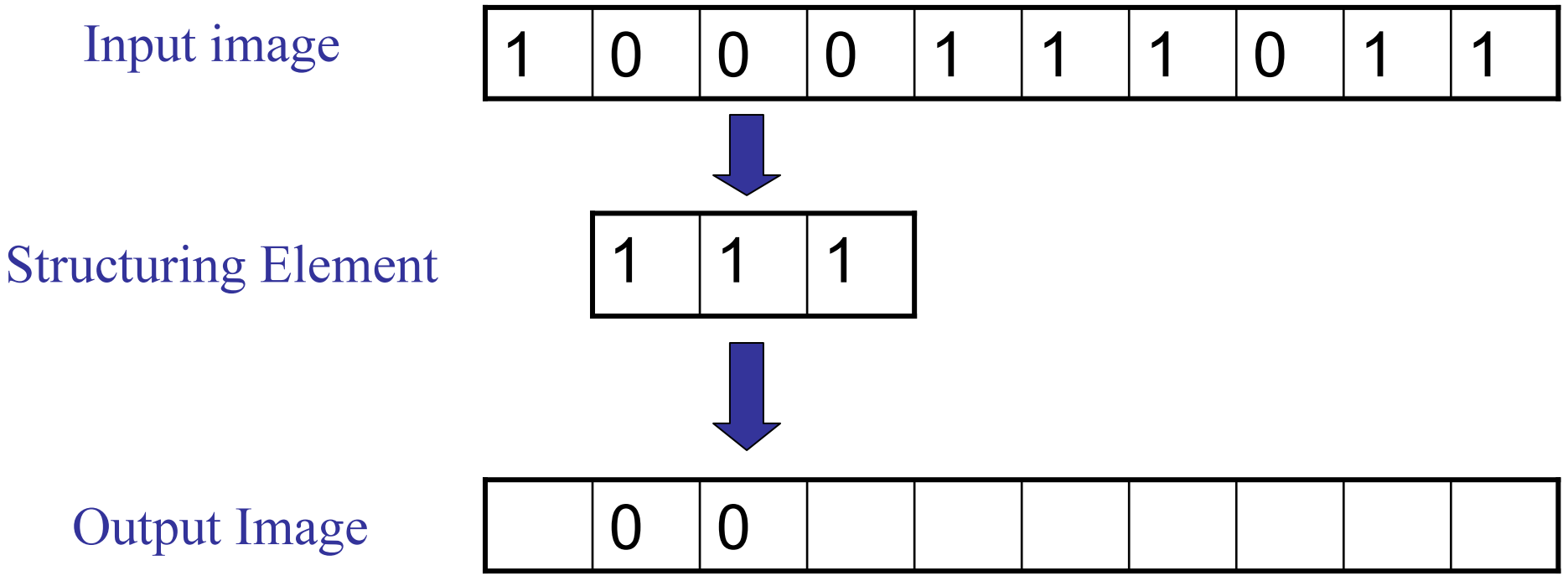


İmerode(A,B)

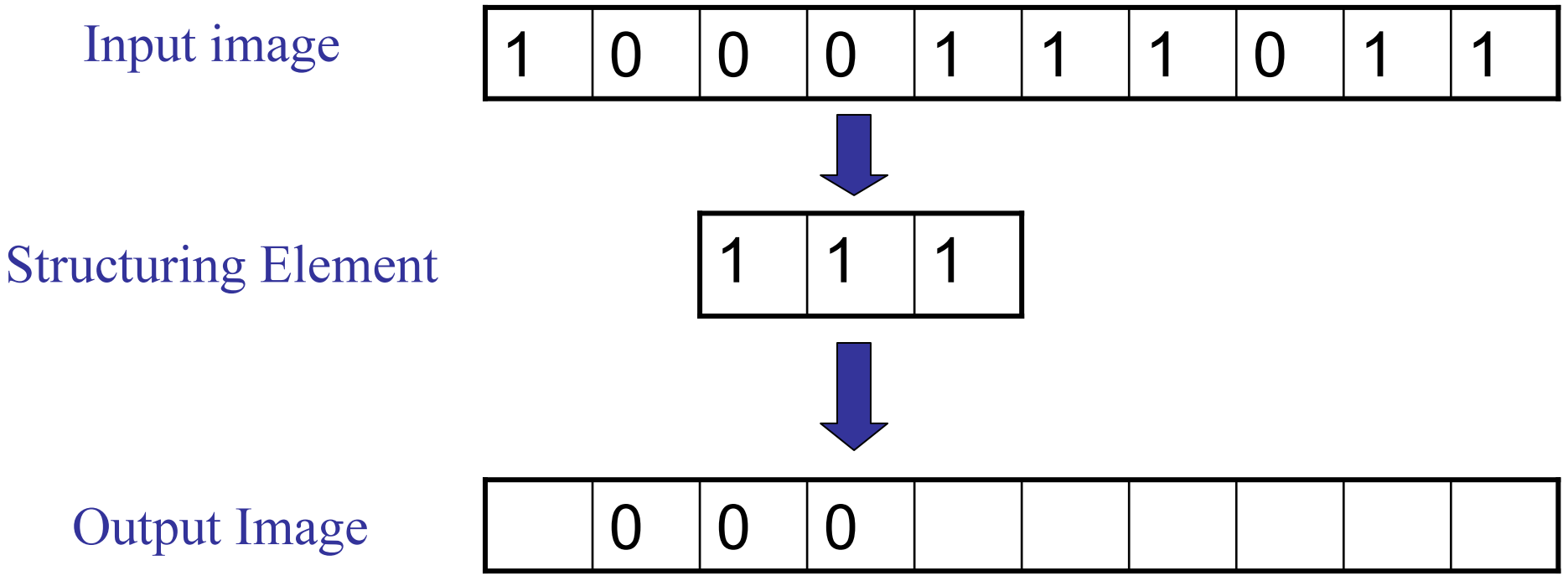
Morfolojik İmge İşleme - Aşındırma



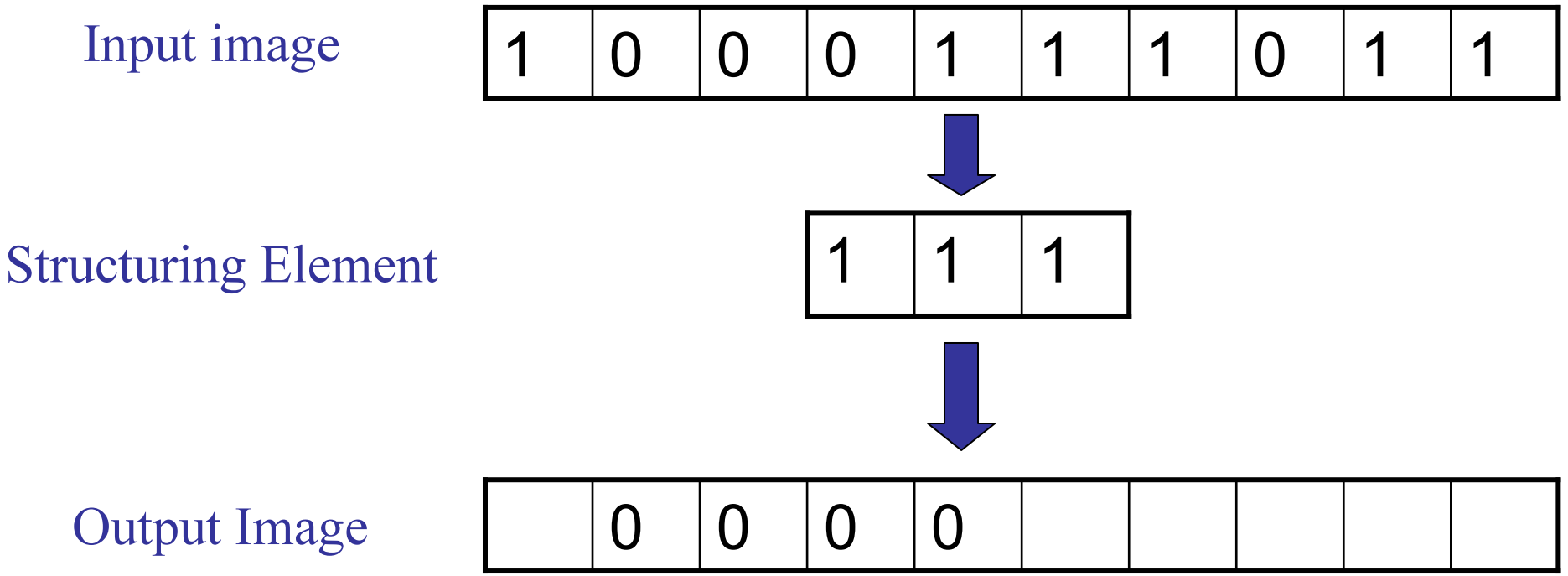
Morfolojik İmge İşleme - Aşındırma



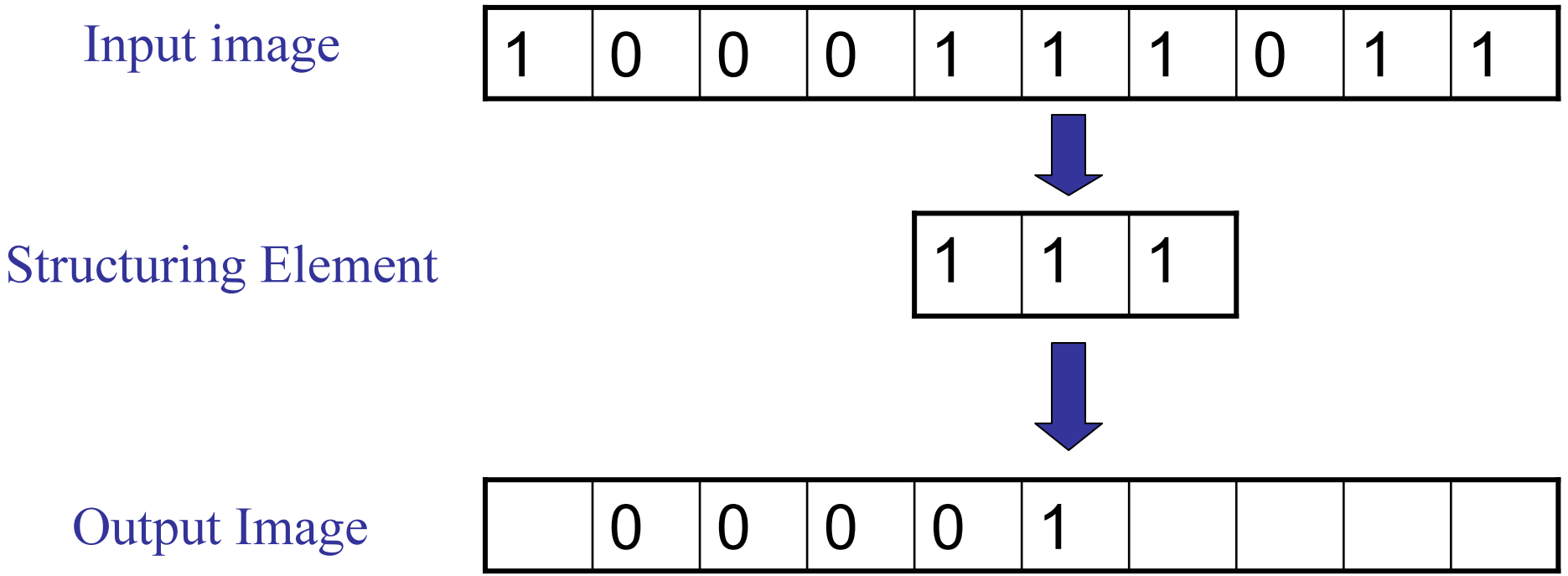
Morfolojik İmge İşleme - Aşındırma



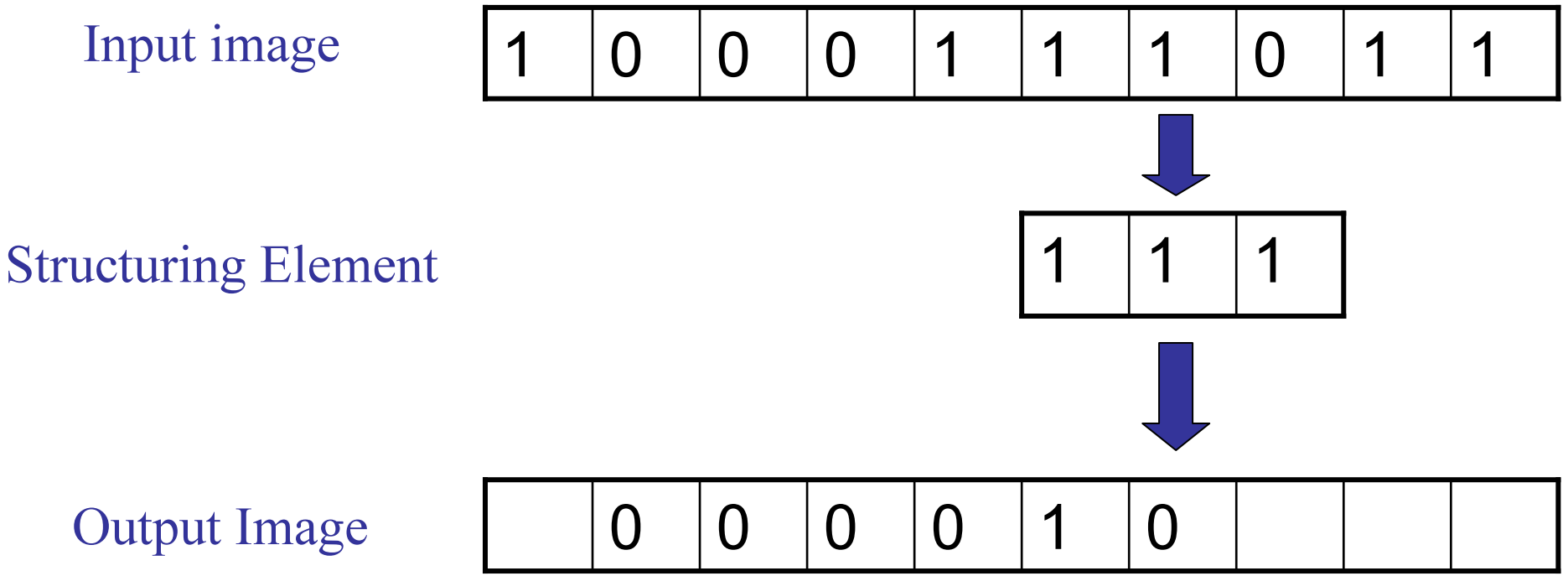
Morfolojik İmge İşleme - Aşındırma



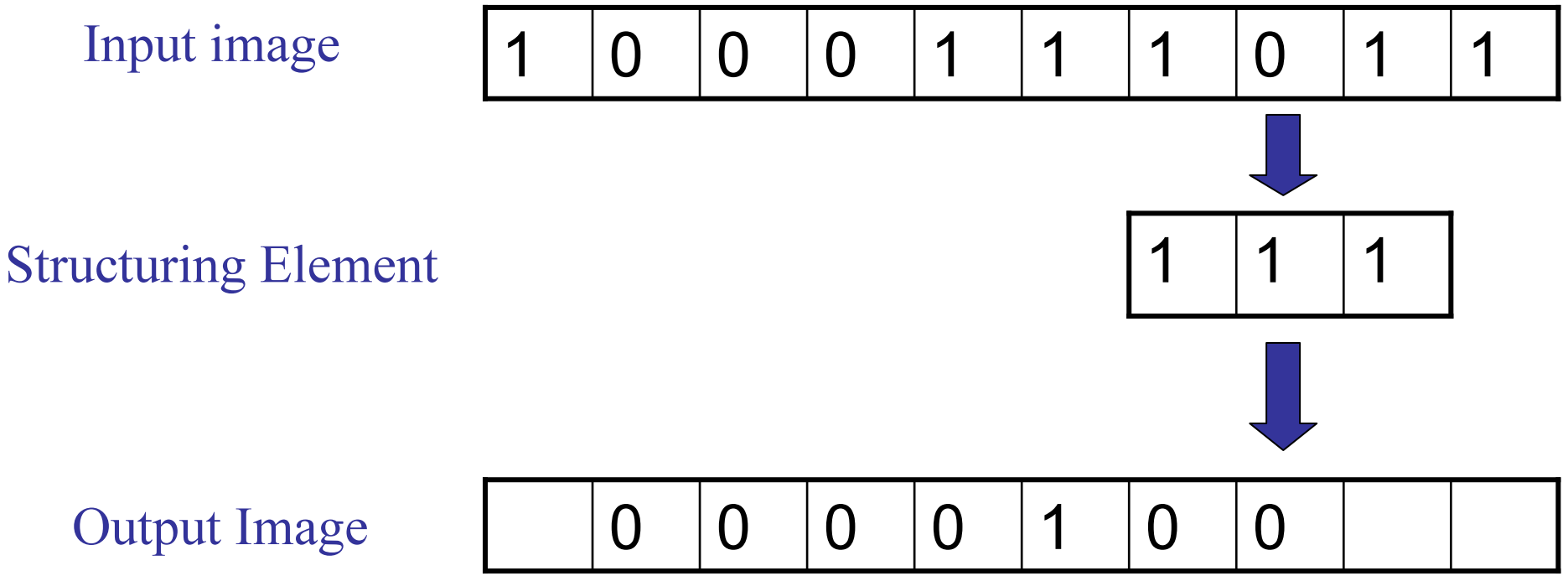
Morfolojik İmge İşleme - Aşındırma



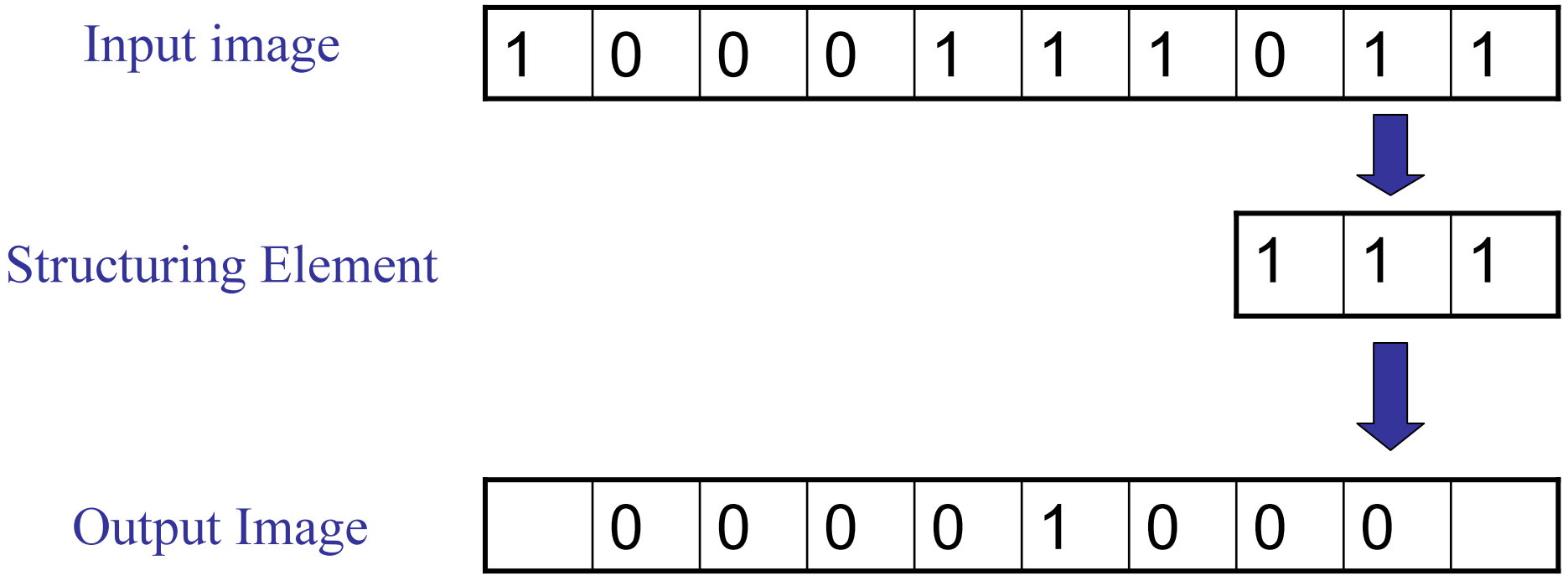
Morfolojik İmge İşleme - Aşındırma



Morfolojik İmge İşleme - Aşındırma



Morfolojik İmge İşleme - Aşındırma



Morfolojik İmge İşleme – Açma ve Kapama

Açma ve kapama, yayma ve aşındırma işlemlerinin iki değerli imgeye ardışıl uygulanmasıyla yapılan işlemlerdir.

Açma işlemi:

$$A \circ B = (A \ominus B) \oplus B$$

imopen(A,B)

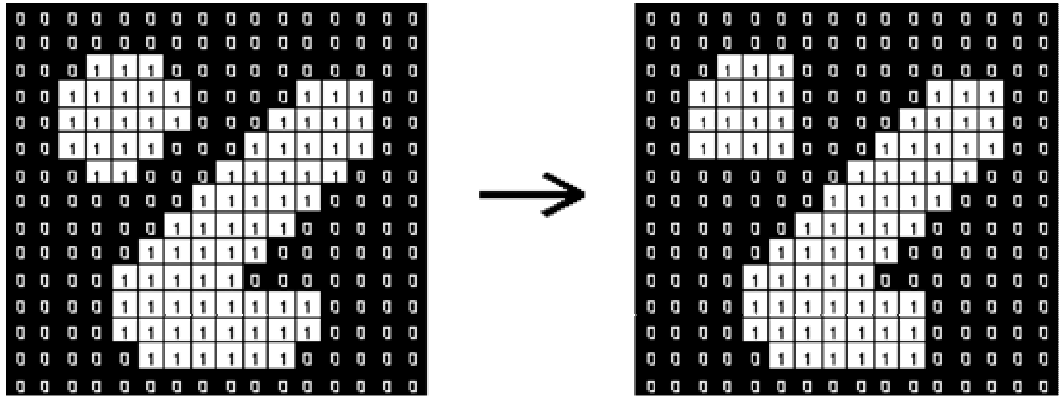
Kapama işlemi:

$$A \bullet B = (A \oplus B) \ominus B$$

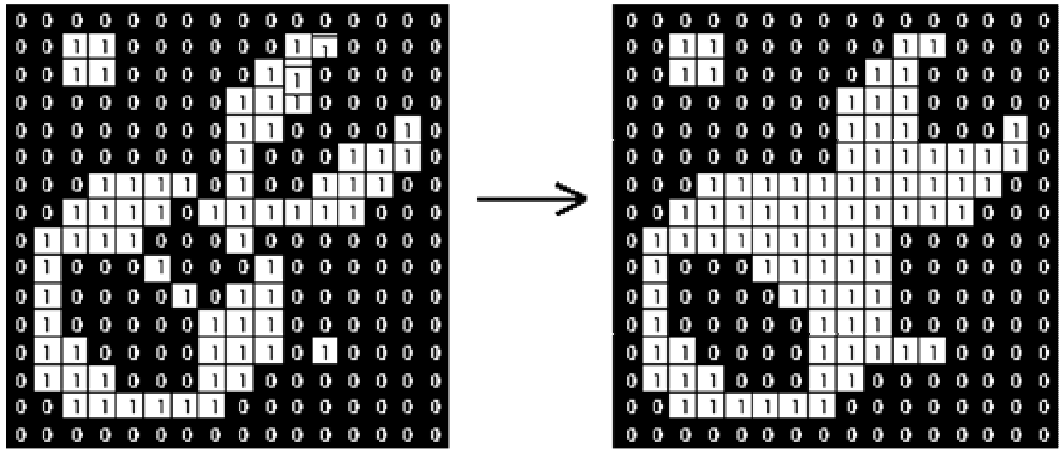
İmclose(A,B)

Morfolojik İmge İşleme

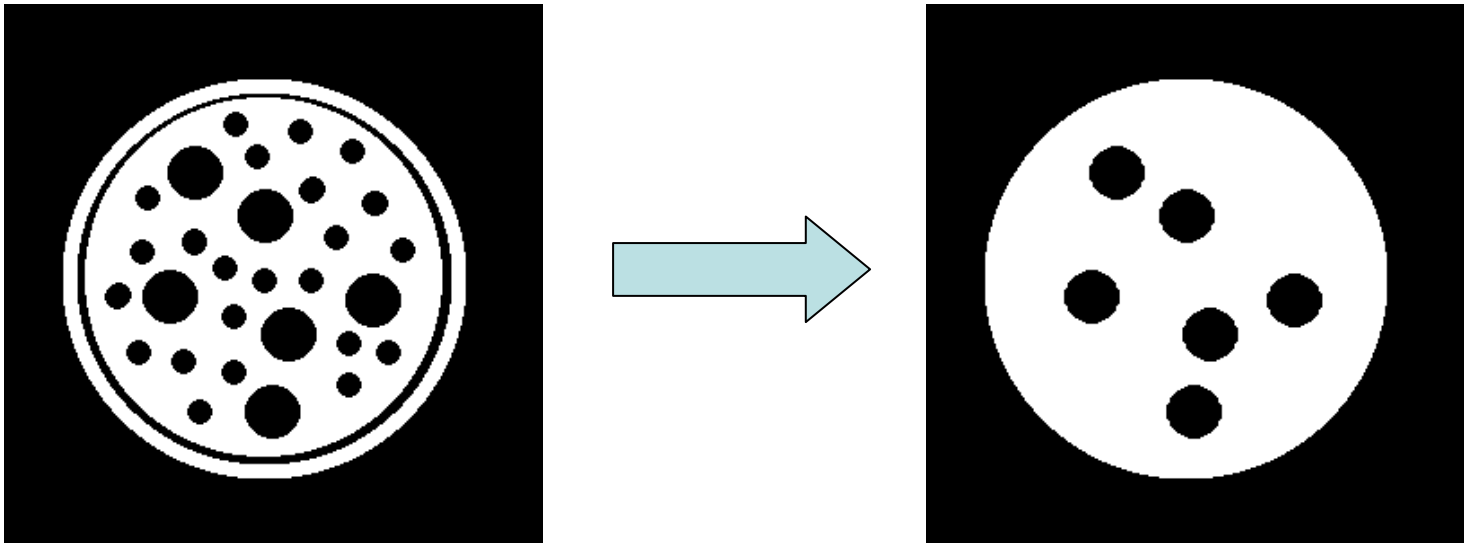
Açma

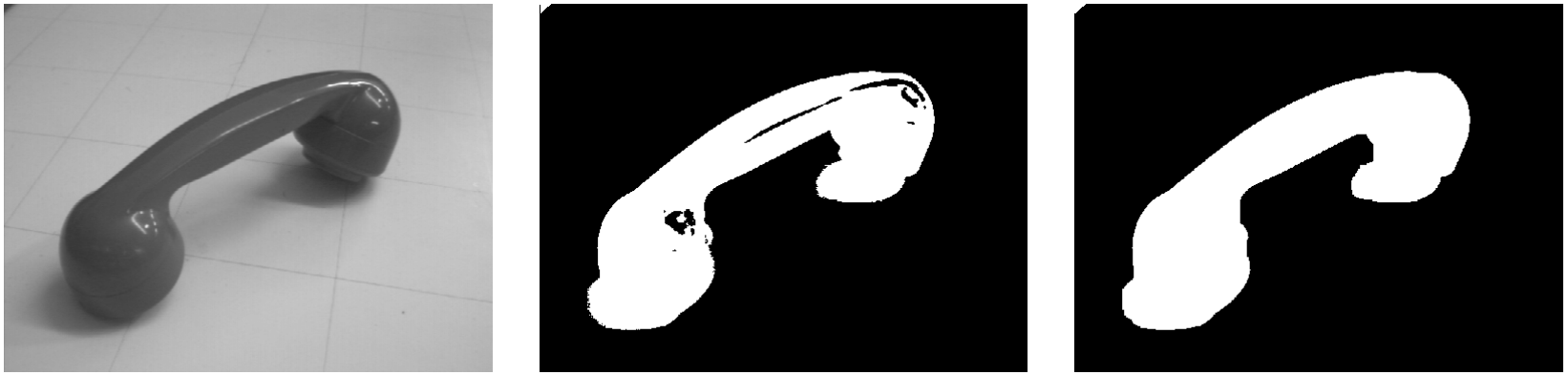


Kapama

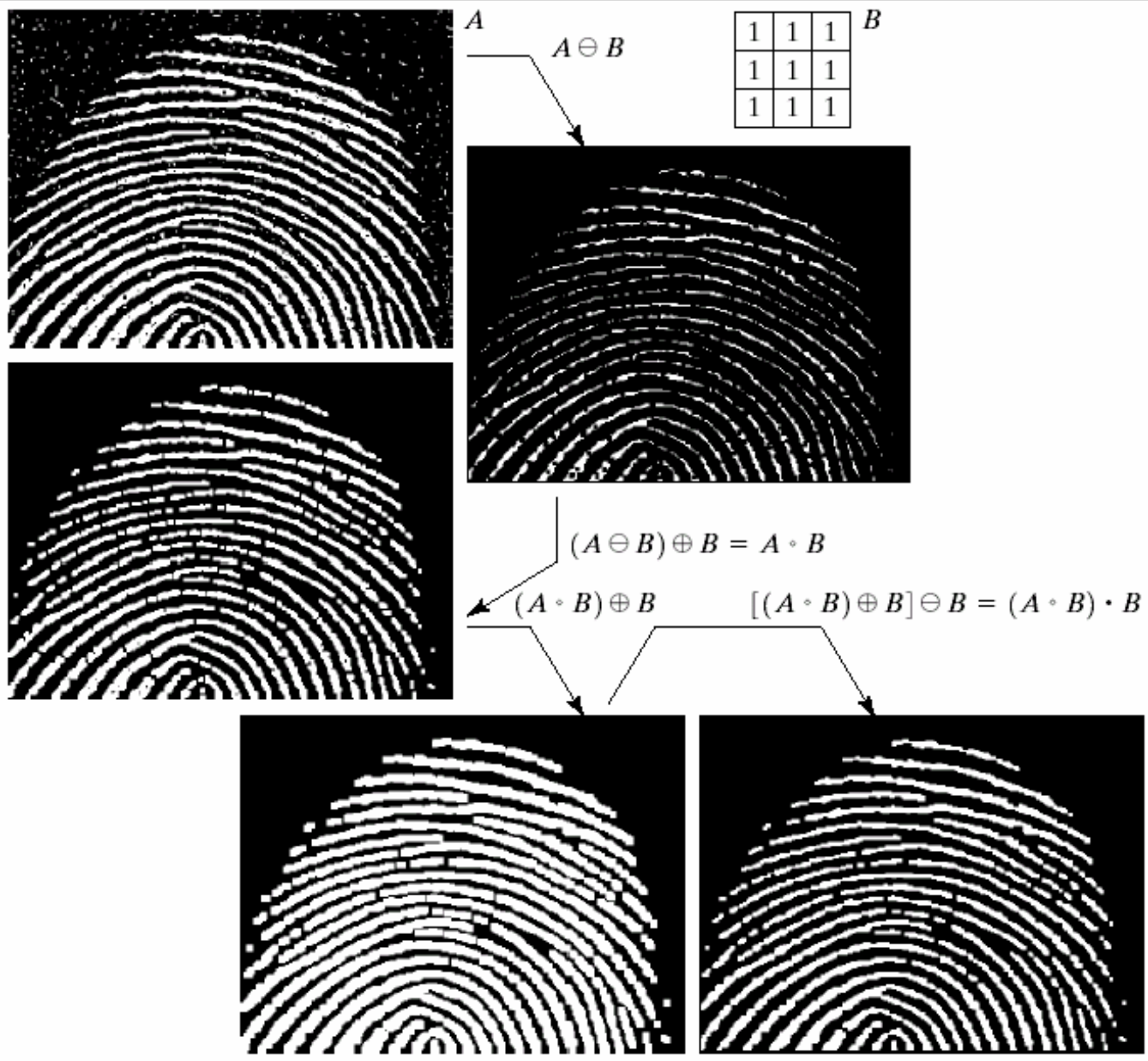


Morfolojik İmge İşleme - Uygulama





Morfolojik İmge İşleme - Uygulama



a b
d c
e f

FIGURE 9.11
(a) Noisy image.
(c) Eroded image.
(d) Opening of A.
(d) Dilation of the opening.
(e) Closing of the opening. (Original image for this example courtesy of the National Institute of Standards and Technology.)