

# BLM19204-BLM204 Bilgisayar Programlama III ve BLM217 Bilgisayar Programlama III Lab. Dersi 1. Proje

Son Teslim Tarihi: 19.12.2021 - 23:59

Bu projede, iki boyutlu matrisler üzerinde aşağıda detayları anlatılan işlemleri gerçekleştiren C programının yazılması beklenmektedir.

## Dikkat Edilmesi Gerekenler:

- Parametre olarak gönderilen veya geriye döndürülen iki boyutlu matrisler dinamik olarak heap'te tutulmalıdır.
- main fonksiyonda herhangi bir hesaplama yapılmayacaktır, tüm matris hesaplamaları için bir adet matris kütüphanesi yazılmalıdır,
- Matris işlemleri **matrisoperations.h** ve **matrisoperations.c** dosyalarında yapılmalıdır,
- **matrisoperations.h** kütüphane dosyasında fonksiyonların sadece prototipleri bulunmalıdır,
- main fonksiyonda sadece orijinal matrisler tanımlanmalı ve işlemler ilgili kütüphanede tanımlanan fonksiyonlar ile yapılmalıdır, matrisler elle veya random olarak doldurulabilir,
- Program sonlandığında çöp bellek alanları oluşmamalıdır ve allocation yapılan alanla iade edilmelidir,
- Program tüm girdilere karşı robust olarak cevap vermeli, runtime error oluşmaması için gerekli kontroller programcı tarafından yapılmalıdır.
- Boyut aşma problemlerini aşmak için şu kurallara uygun matrislerin kullanılması önerilir;
- Projenin teslim edilmesi aşamasında, bir adet **Makefile** hazırlanmalıdır, **Makefile** olmayan projeler 60 puan üzerinden değerlendirilir,
  - Matris1 boyutları tek değerlerden oluşmalıdır (5x5, 7x7, 11x11 gibi)
  - Matris2 boyutları tek değerlerden oluşmalıdır (3x3, 5x5 gibi)
  - Matris2 boyutları sadece 3x3 ve 5x5 değerler için test edilmelidir.
- Senaryolar örnek olarak verilmiştir. Farklı girdi ve parametreler için çalışan C kodu yazılmalıdır.

## Yazılması beklenen fonksiyonlar:

1) **int\*\* operasyon1(int\*\* matris1, int\*\* matris2, int islemTipi)**

Bu fonksiyon, **matris1** ve **matris2** üzerinde birbirine karşılık gelen elemanlar birbirleri ile çarpılıp tüm değerler toplanarak oluşturulacak yeni matrisin ilgili elamanının değeri hesaplanacaktır (Şekil 1' de ilk çarpa işlemi ve hesaplama sonucu örnek olarak gösterilmiştir). Aşağıda bu fonksiyonun farklı parametreler sonucunda nasıl çalışacağını gösteren örnekler gösterilmektedir.

## Matematiksel Hesaplamalar:

- **operasyon1** sonucunda oluşacak matrisin boyutu Denklem 1'e göre hesaplanır:

$$\frac{G - F + 2D}{1} + 1 \quad (1)$$

G: Matris1 satır sayısı  
F: Matris2 satır sayısı

D\*: Dolgu değeri

- \*: Dolgu değeri parametre olarak gönderilen işlem tipine göre belirlenir. Gönderilen işlem tipi 0 ise D değeri metot içerisinde 0 (sıfır) olarak değiştirilir. Eğer gönderilen değer 1 ise D değeri denklem 2 kullanılarak hesaplanır:

$$\frac{F - 1}{2} \quad (2)$$

### Senaryo 1:

**matris1:** 5x5 boyutunda tam sayı değerlerden oluşan bir matris

**matris2:** 3x3 boyutunda tam sayı değerlerden oluşan bir matris

**islemTipi:** 0

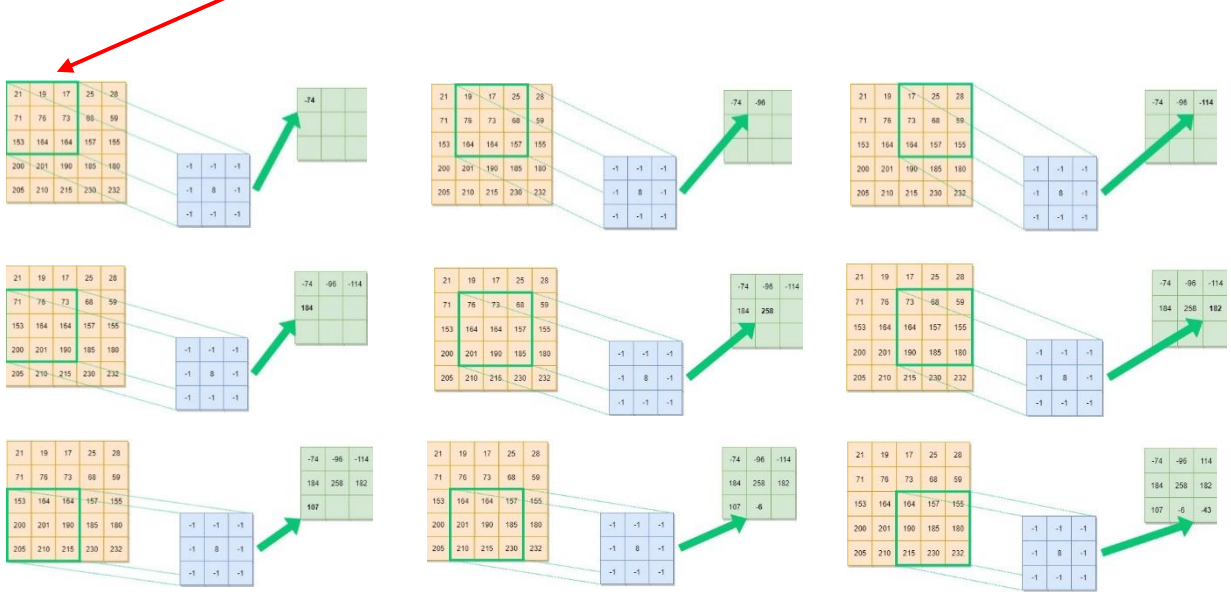
Çıktı matrisinin boyutu denklem (1)'e göre hesaplanır:

$$\text{Çıktı Matrisi Boyutu} = \frac{5 - 3 + 2 * 0}{1} + 1 = 3$$

Çıktı matrisi 3x3 boyutunda bir matris olmalıdır. Çıktı matrisi oluşturulduktan sonra içerisindeki değerler aşağıdaki adımlara uygun olarak hesaplanmalıdır (Matris 1 ve Matris 2 için verilen değerler örnek olarak verilmiştir. Değişkenlik gösterebilir).

Örnek eleman-eleman çarpma ve değer hesaplama:

Değer = (21\*-1)+(19\*-1)+(17\*-1)+(71\*-1)+(76\*8)+(73\*-1)+(153\*-1)+(164\*-1)  
+(164\*-1)-> sonuç -74



**Şekil 1.** Operasyon1 metodunun senaryo 1 için verilen parametreler ile çalıştırılması sonucu elde edilmesi beklenen çıktı (Sarı matris: matris1, Mavi matris: matris2, Yeşil Matris: çıktı matrisi).

### Senaryo 2:

**matris1:** 5x5 boyutunda tam sayı değerlerden oluşan bir matris

**matris2:** 3x3 boyutunda tam sayı değerlerden oluşan bir matris

**islemTipi:** 1

“islemTipi” değişkeni 1 olarak seçildiği için ilk önce Denklem 2’ye göre D değeri hesaplanır:

$$D = \frac{3 - 1}{2} = 1$$

Çıktı matrisinin boyutu denklem (1)'e göre hesaplanır:

$$\text{Çıktı Matrisi Boyutu} = \frac{5-3+2*1}{1} + 1 = 5$$

Çıktı matrisi 5x5 boyutunda bir matris olmalıdır. Çıktı matrisi oluşturulduktan sonra içerisindeki değerler aşağıdaki adımlara uygun olarak hesaplanmalıdır (Matris 1 ve Matris 2 için verilen değerler örnek olarak verilmiştir. Değişkenlik gösterebilir).

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