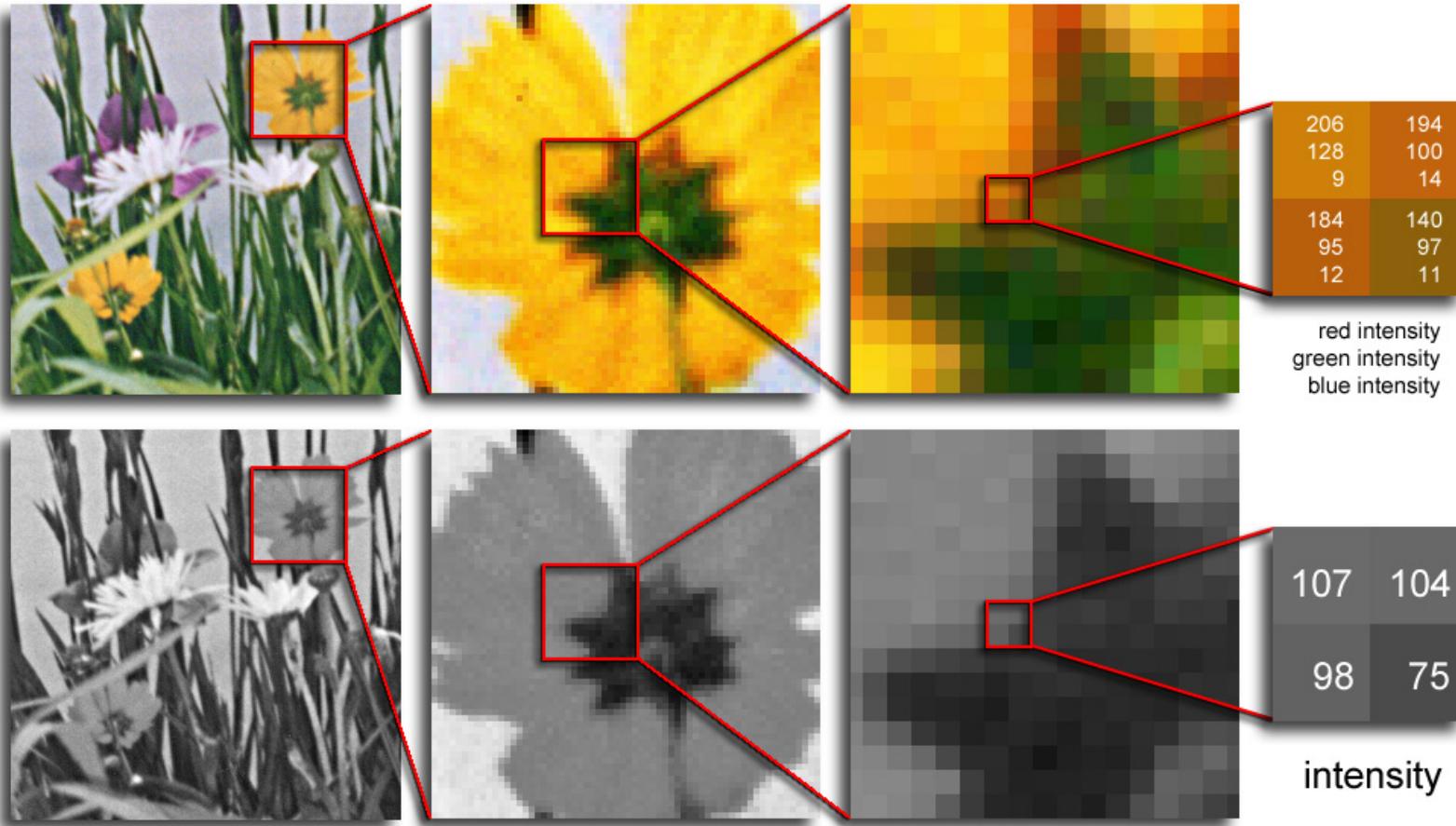


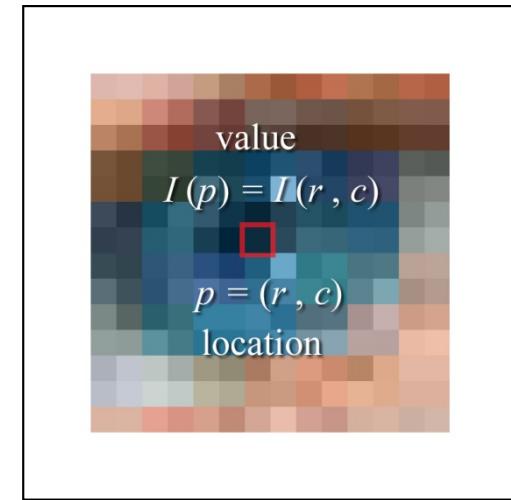
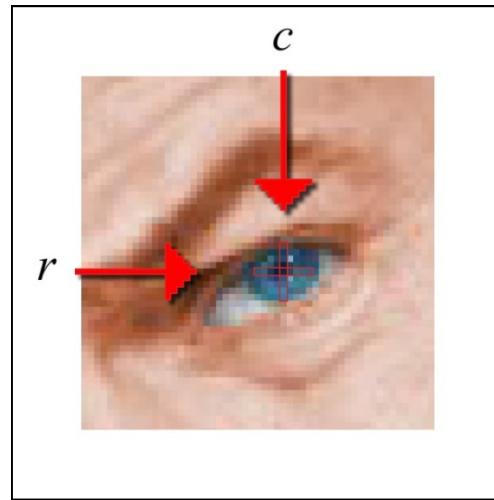
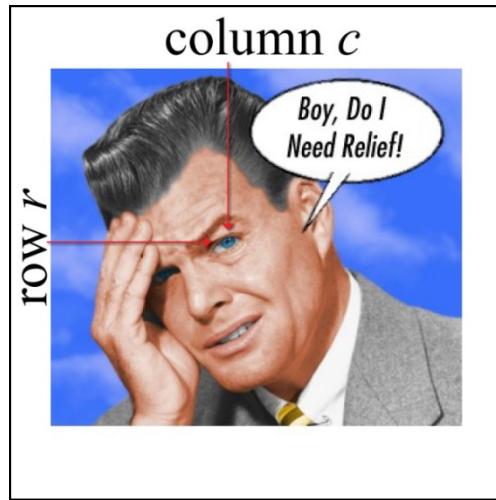
# Matlabda Görüntü İncelemeye Giriş

# Sayısal İmge

Renkli imgeler her pikselde 3 değer taşıırken, Monochrome imgeler sadece 1 değer taşır.



# Pikseller



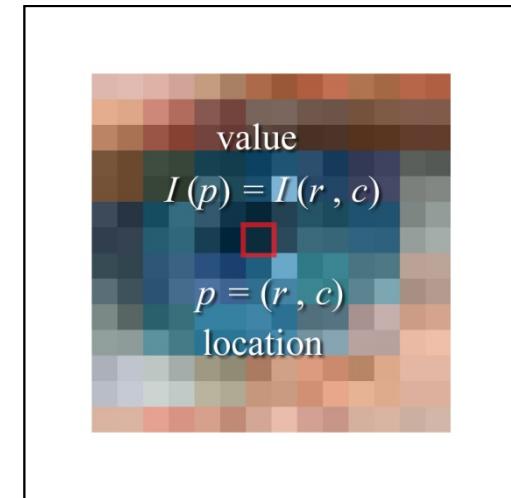
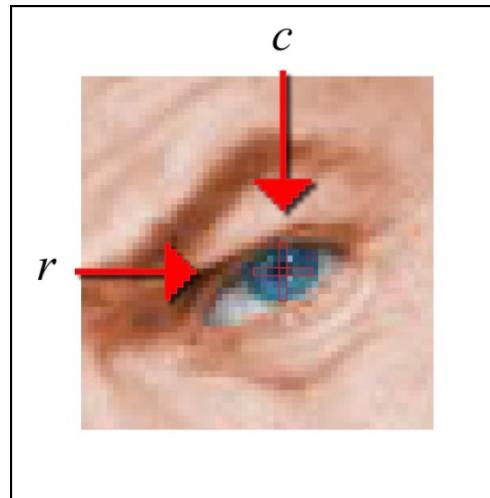
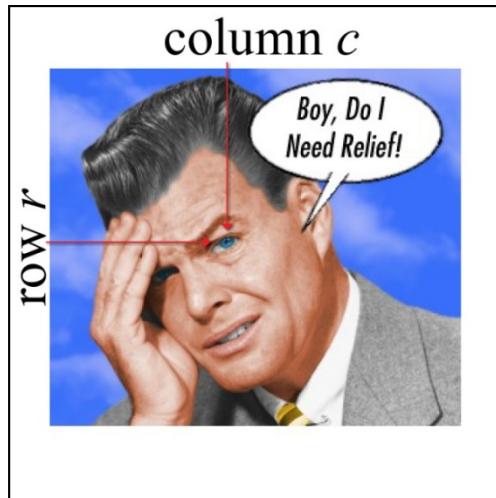
Pixel Location:  $p = (r, c)$

Pixel Value:  $I(p) = I(r, c)$

Pixel :  $[p, I(p)]$

# Pikseller

Pixel : [  $p$ ,  $I(p)$  ]



$$\begin{aligned} p &= (r, c) \\ &= (\text{row \#}, \text{col \#}) \\ &= (272, 277) \end{aligned}$$

$$I(p) = \begin{bmatrix} \text{red} \\ \text{green} \\ \text{blue} \end{bmatrix} = \begin{bmatrix} 12 \\ 43 \\ 61 \end{bmatrix}$$

# Matlabda Piksel İndeksleme

Matlabda «FOR» döngüsü yavaştır. Doğal vektörel indeksleme çok hızlıdır.

Bunun yerin

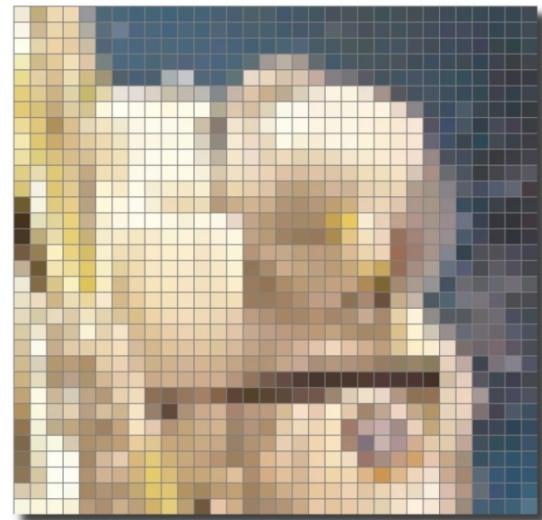
```
for r = 1:R
    for c = 1:C
        J(r,c,:) = IP_Function(I(r,c,:));
    end
end
```

mükemmelse bunu kullan

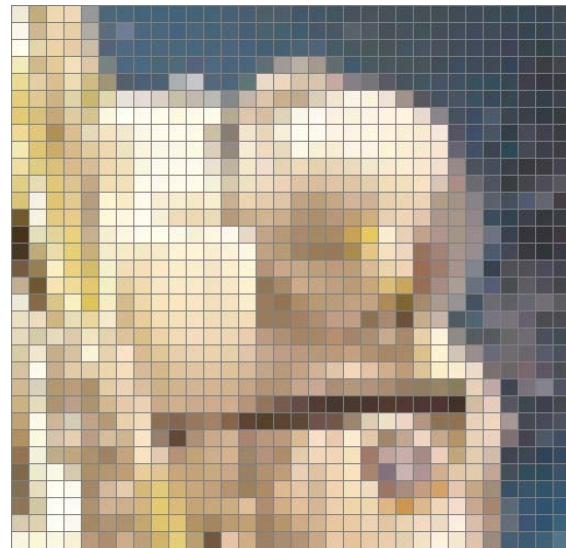
```
J = IP_Function(I);
```

Fakat bazı durumlarda bu imkansız olur.

"IP\_Function"  
fonksiyonu vektörel  
olarak yazılmış bir  
fonksiyondur.



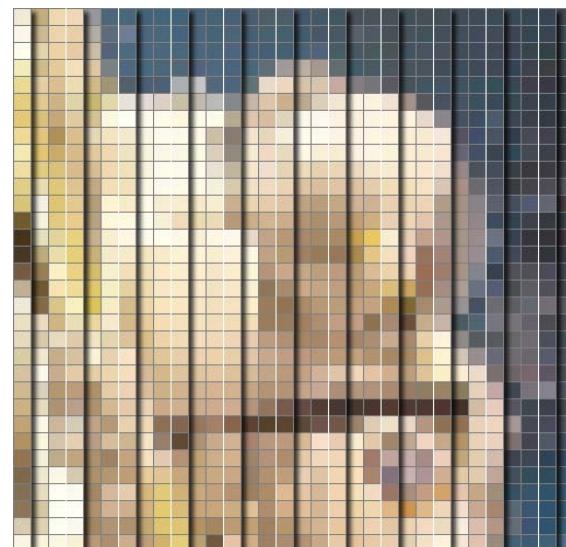
# Matlabda Piksel İndeksleme



$r = 1:n:R;$   
 $I(r,:,:)$

$c = 1:n:C;$   
 $I(:,c,:)$

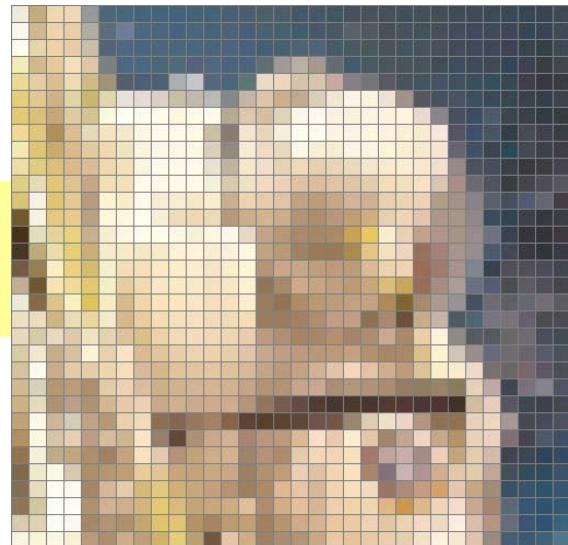
$n=3$



$r = [1 4 7 10 13 16 19 22 25 28 31]$        $c = [1 4 7 10 13 16 19 22 25 28 31]$

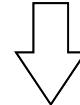
# Matlabda Piksel İndeksleme

Bu işlem  
'vektörleştirme'  
olarak bilinir

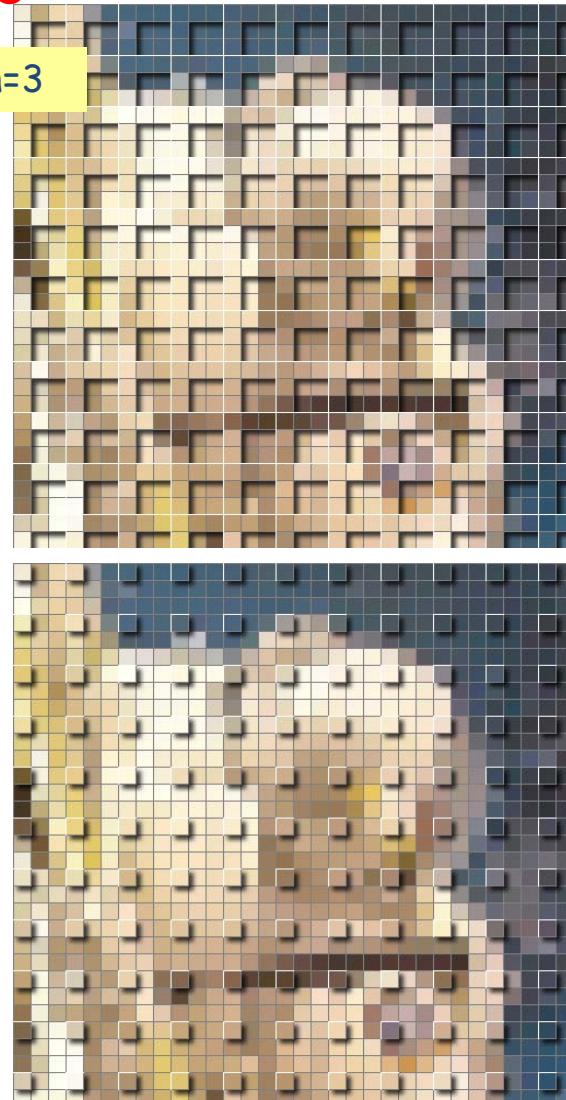


$n=3$

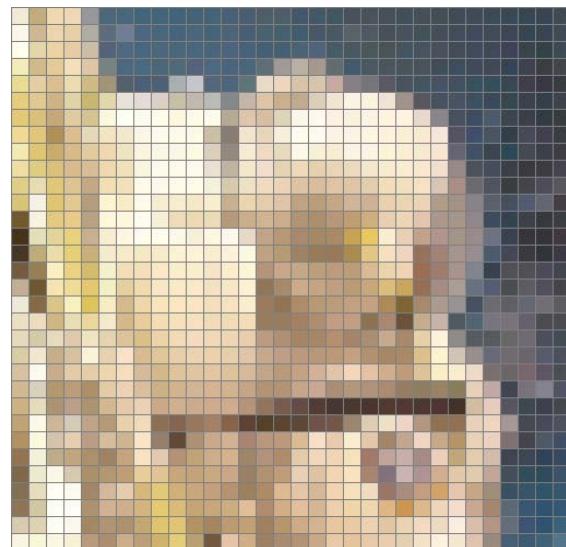
$r$  ve  $c$   
tarafından  
indekslenen  
miş  
pikselleri  
al



$I(r,c)$

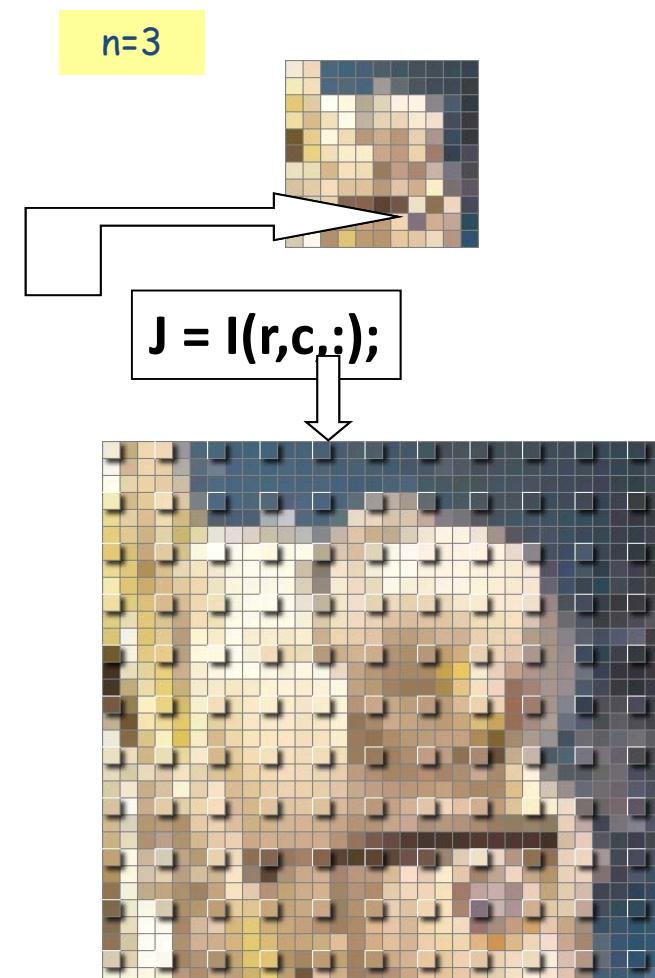


# Matlabda Piksel İndeksleme



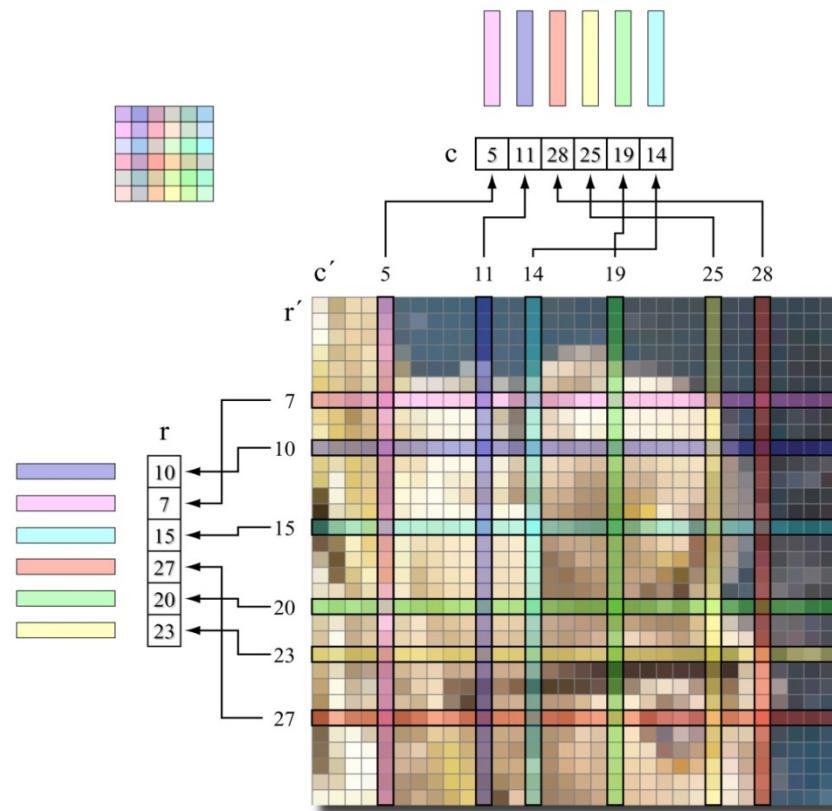
$r = 1:n:R;$

$c = 1:n:C;$



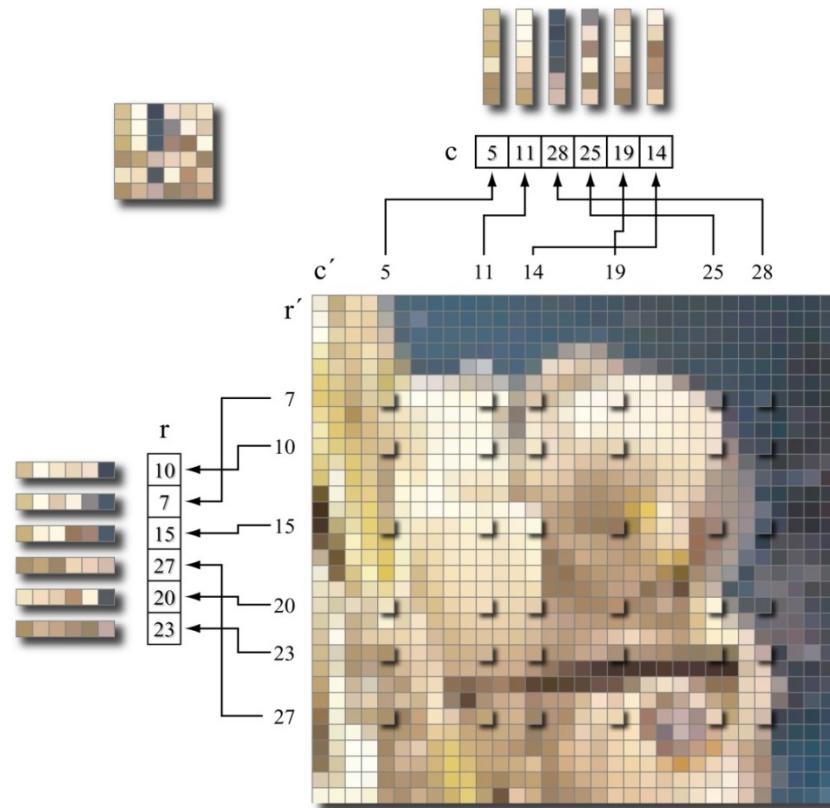
# Matlabda Piksel İndeksleme

İndekleme matlabda tamamen geneldir.

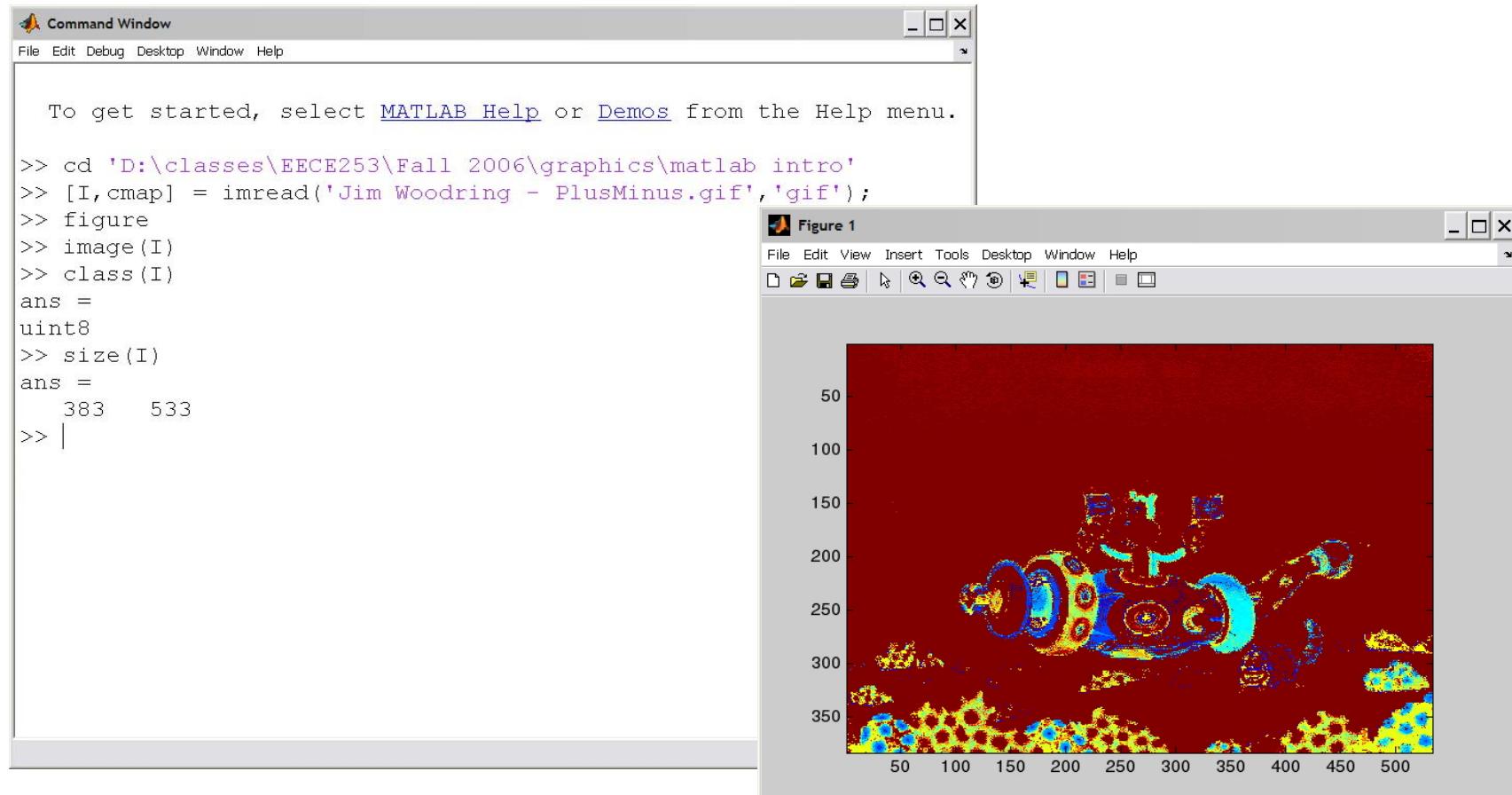


# Matlabda Piksel İndeksleme

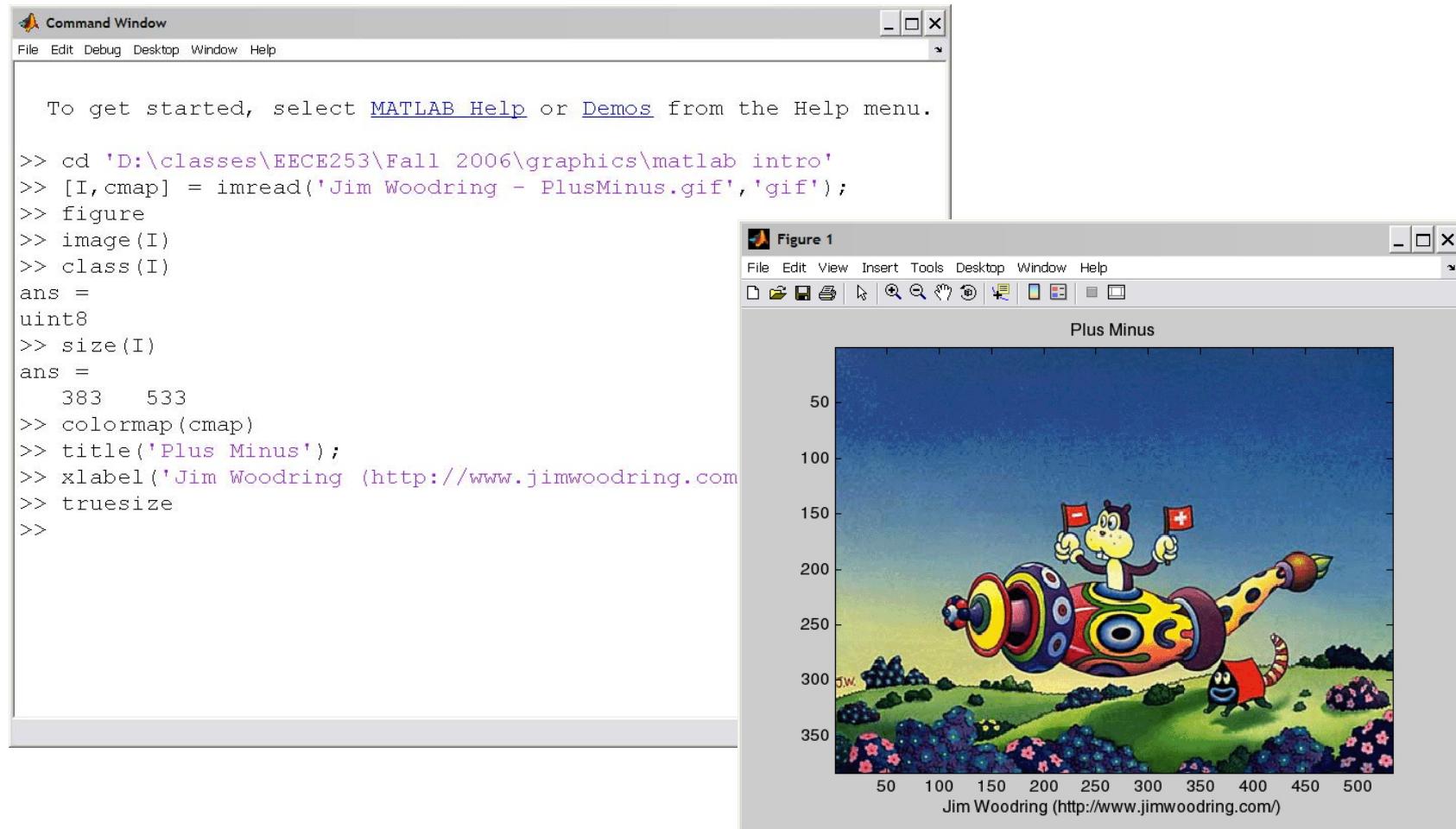
İndekleme matlabda tamamen geneldir.



# Renk haritalı bir görüntü okumak



# Renk haritalı bir görüntü okumak



The image shows a MATLAB session with two windows. On the left is the 'Command Window' with the following text:

```
To get started, select MATLAB Help or Demos from the Help menu.  
>> cd 'D:\classes\EECE253\Fall 2006\graphics\matlab intro'  
>> [I,cmap] = imread('Jim Woodring - PlusMinus.gif','gif');  
>> figure  
>> image(I)  
>> class(I)  
ans =  
uint8  
>> size(I)  
ans =  
383 533  
>> colormap(cmap)  
>> title('Plus Minus');  
>> xlabel('Jim Woodring (http://www.jimwoodring.com)');  
>> truesize  
>>
```

On the right is the 'Figure 1' window titled 'Plus Minus'. It displays a cartoon illustration by Jim Woodring. A yellow dog-like character with a large head and a red and yellow striped body is standing on a colorful, abstract base. The character is holding two small flags with a white cross on a red background. The background features a blue sky, green hills, and purple flowers. The x-axis is labeled '50 100 150 200 250 300 350 400 450 500' and the y-axis is labeled '50 100 150 200 250 300 350'. The watermark 'Jim Woodring (<http://www.jimwoodring.com>)' is visible at the bottom of the figure.

# Renk haritalı bir görüntü okumak

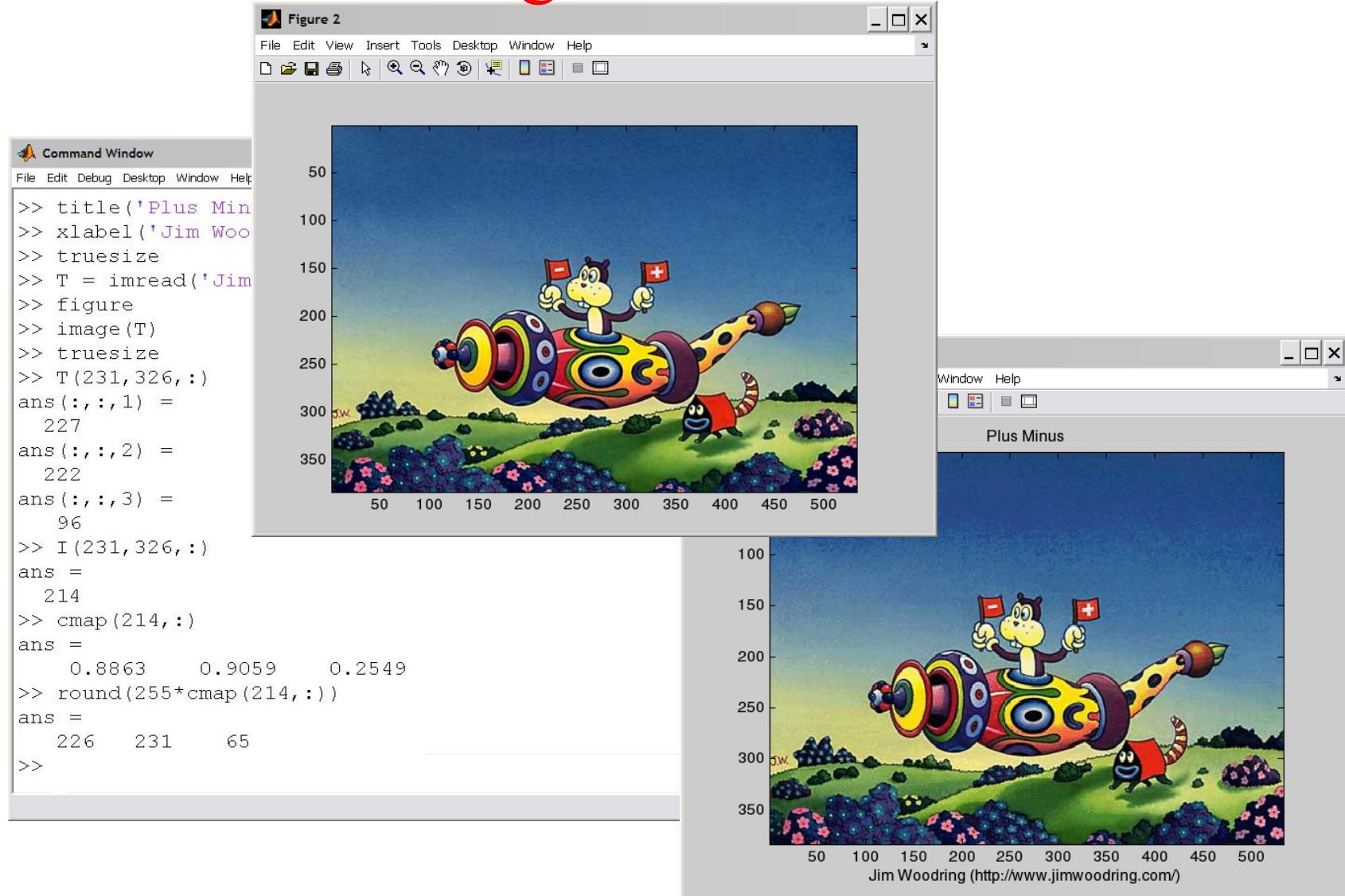
To get started, select MATLAB Help or Demos from the Help menu.

```
>> cd 'D:\classes\EECE253\Fall 2006\graphics\matlab intro'
>> [I,cmap] = imread('Jim Woodring - PlusMinus.gif','gif');
>> figure
>> image(I)
>> class(I)
ans =
uint8
>> size(I)
ans =
    383    533
>> colormap(cmap)
>> title('Plus Minus');
>> xlabel('Jim Woodring (http://www.jimwoodring.com/)');
>> truesize
>> T = imread('Jim Woodring - PlusMinus.jpg','jpg')
>> figure
>> image(T)
>> truesize
>> |
```

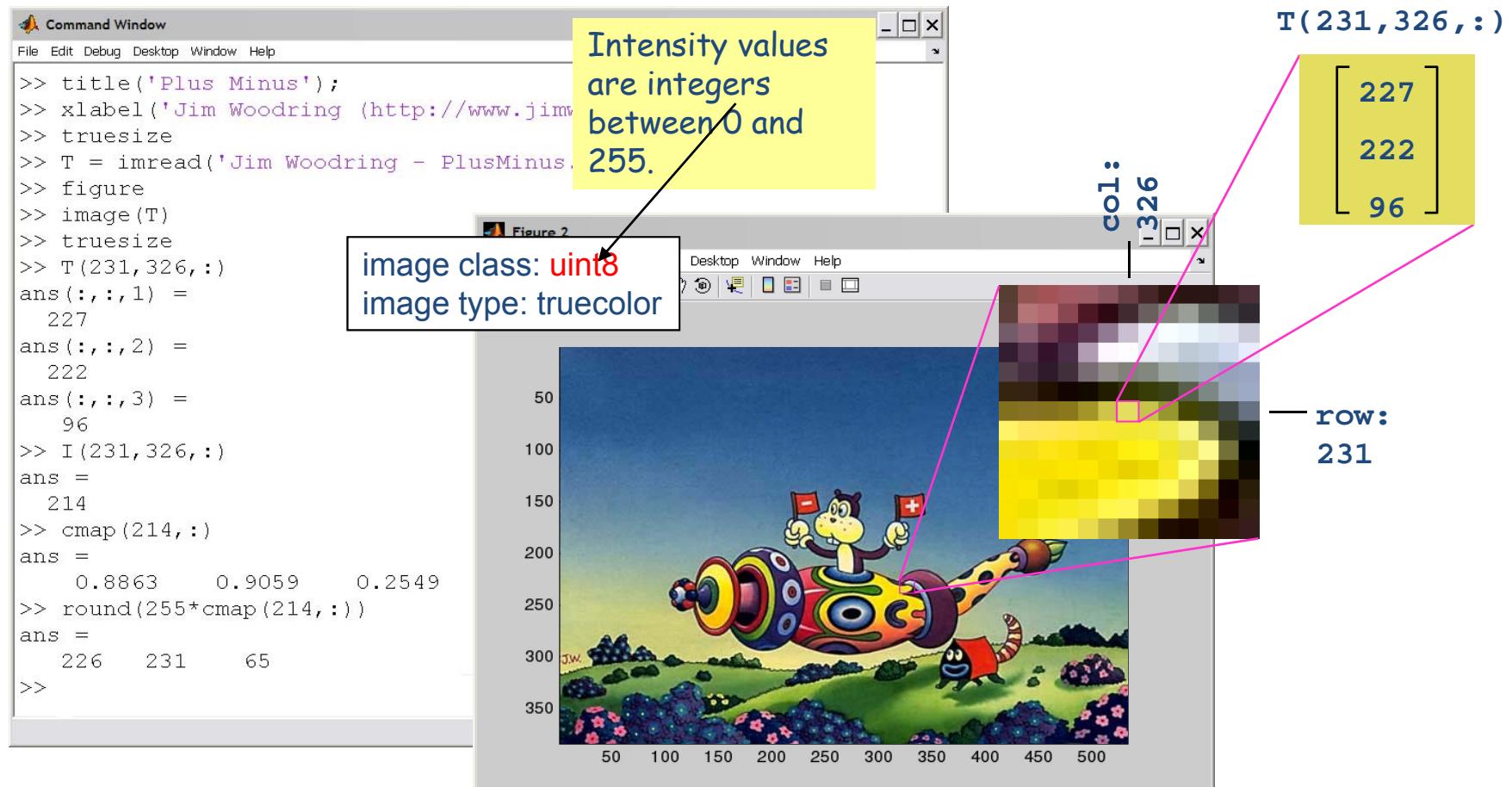
Figure 2

Jim Woodring (<http://www.jimwoodring.com/>)

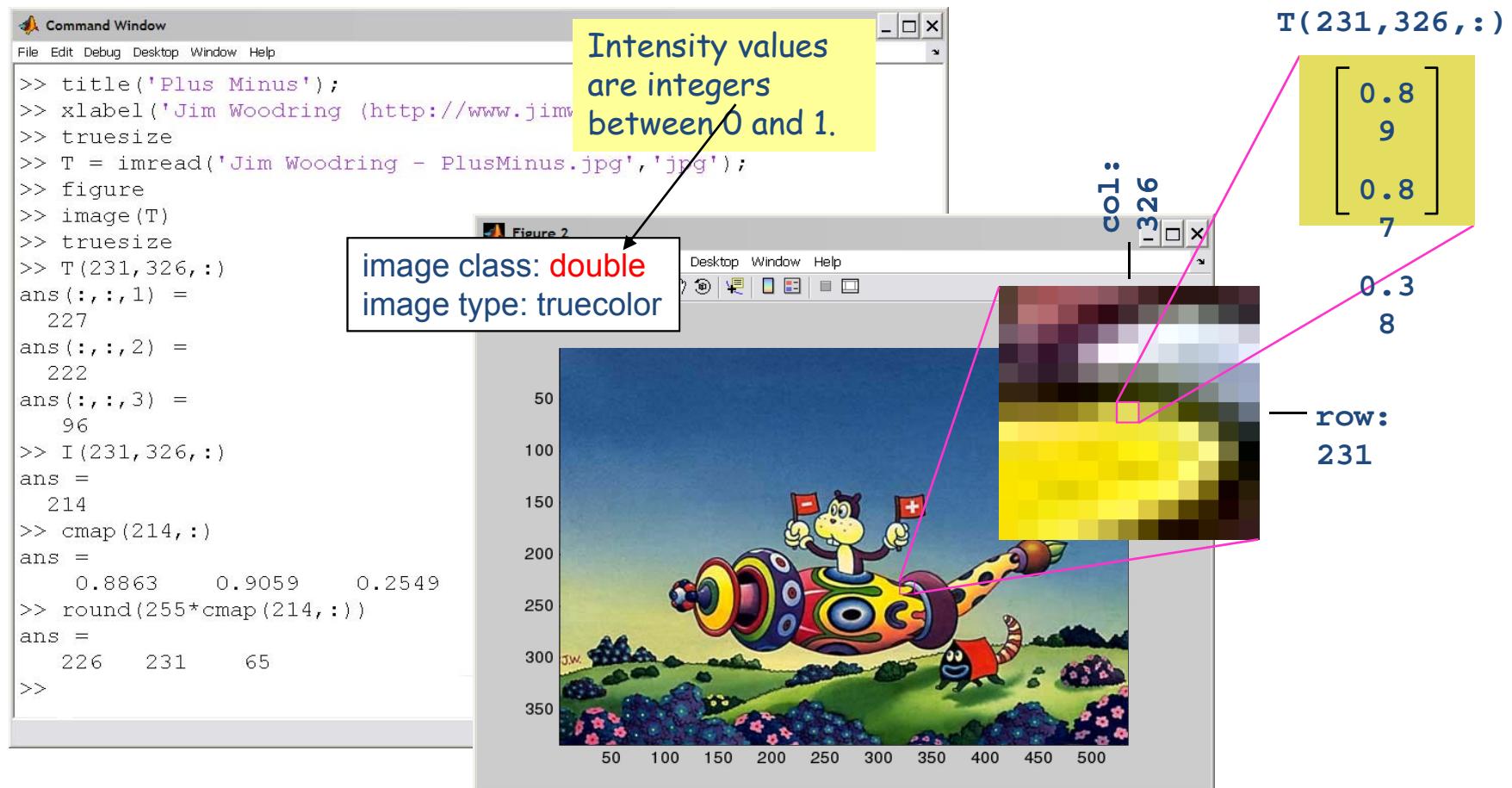
# Renk haritalı bir görüntü okumak



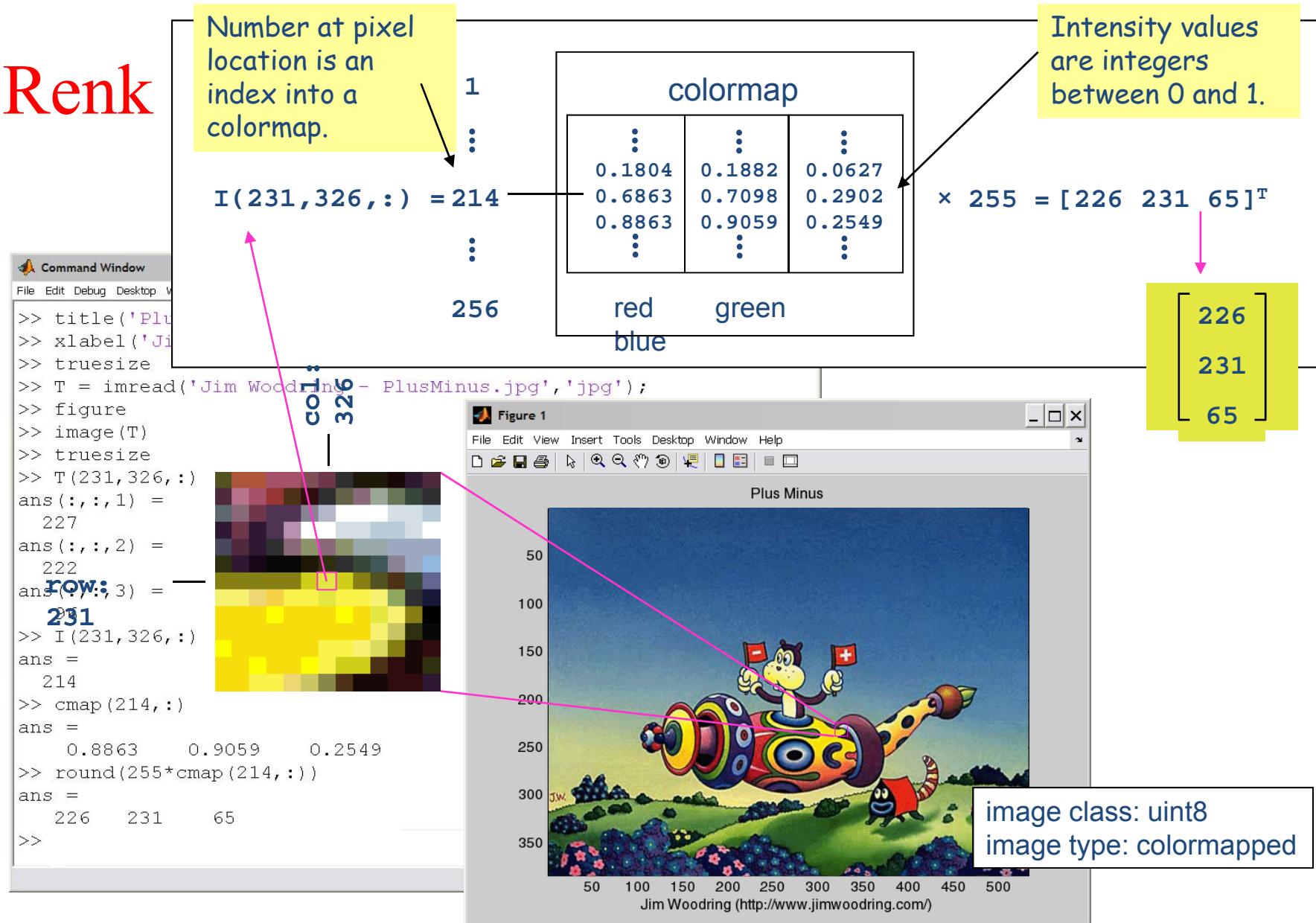
# Renk haritalı bir görüntü okumak



# Renk haritalı bir görüntü okumak



# Renk



# Renk haritasını inşa etmek

The image shows a MATLAB Command Window with the following code:

```
>> ramp = (0:255)'/255;
>> kcm = [ramp ramp ramp];
>>
>>
>> rcm = [ramp zeros(256,2)];
>>
>>
>> gcm = [zeros(256,1) ramp zeros(256,1)];
>>
>>
>> bcm = [zeros(256,2) ramp];
>>
>>
>> % apply one by selecting the figure
>> % then entering:
>>
>> colormap(kcm)
```

Annotations explain the code's behavior:

- A yellow callout points to the line `kcm = [ramp ramp ramp];` with the text "256 x 3 matrix".
- Four colored boxes describe colormaps:
  - gray colormap:  $R(k)=G(k)=B(k)$
  - red colormap:  $G = B = 0;$
  - green colormap:  $R = B = 0;$
  - blue colormap:  $R = G = 0;$
- An arrow points from the text "gray colormap" to the first column of a vertical vector on the right.
- Arrows point from the text "red colormap", "green colormap", and "blue colormap" to the second and third columns of the same vector.
- The vector contains the following values:

0
0.0039
0.0078
0.0118
0.0157
:
0.9843
0.9882
0.9922
0.9961
1.0000

Bu kod, 0:255 arasındaki değerleri 1x256 boyutlu vektöre aktarır.  
[0 1 2 ... 255] şeklinde

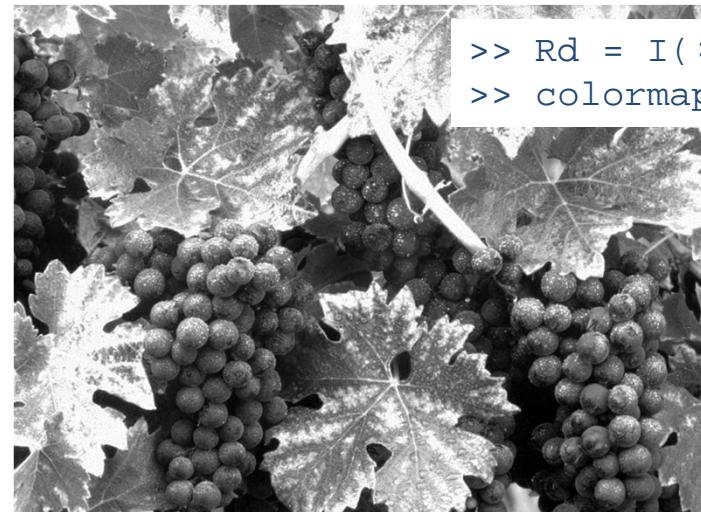
Bu ise,  $(0:255)'$ , yukarıdaki sonucun transpozunu üretir.  
[0  
1  
2  
...  
255]

# Her kanal aynı renk haritasına sahip

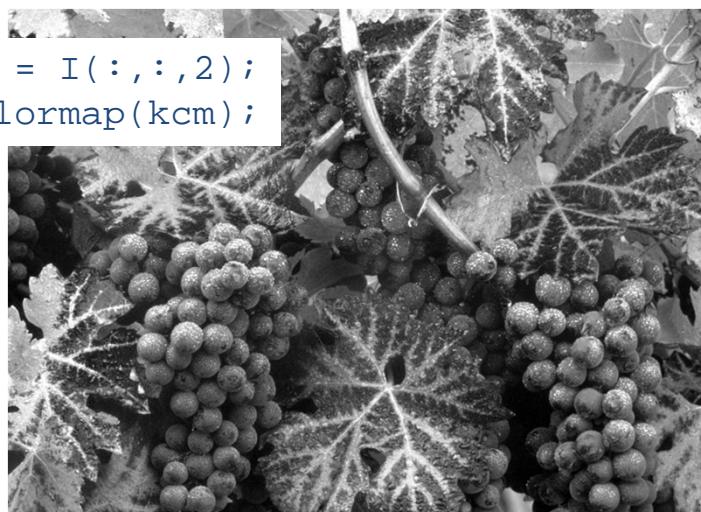
```
>> I = imread('blue_grapes_sm.jpg', 'jpg');
```



```
>> Rd = I(:,:,1);  
>> colormap(kcm);
```



```
>> Gn = I(:,:,2);  
>> colormap(kcm);
```



```
>> Bl = I(:,:,3);  
>> colormap(kcm);
```



# Her kanal ayrı renk haritasına sahip

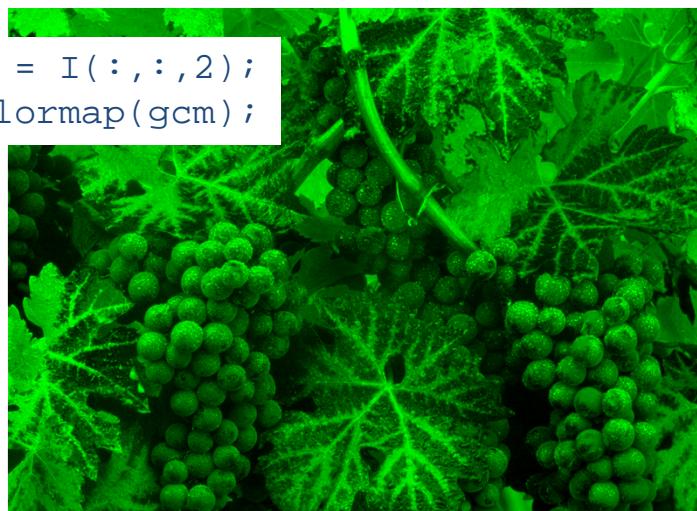
```
>> I = imread('blue_grapes_sm.jpg', 'jpg');
```



```
>> Rd = I(:,:,1);  
>> colormap(rcm);
```



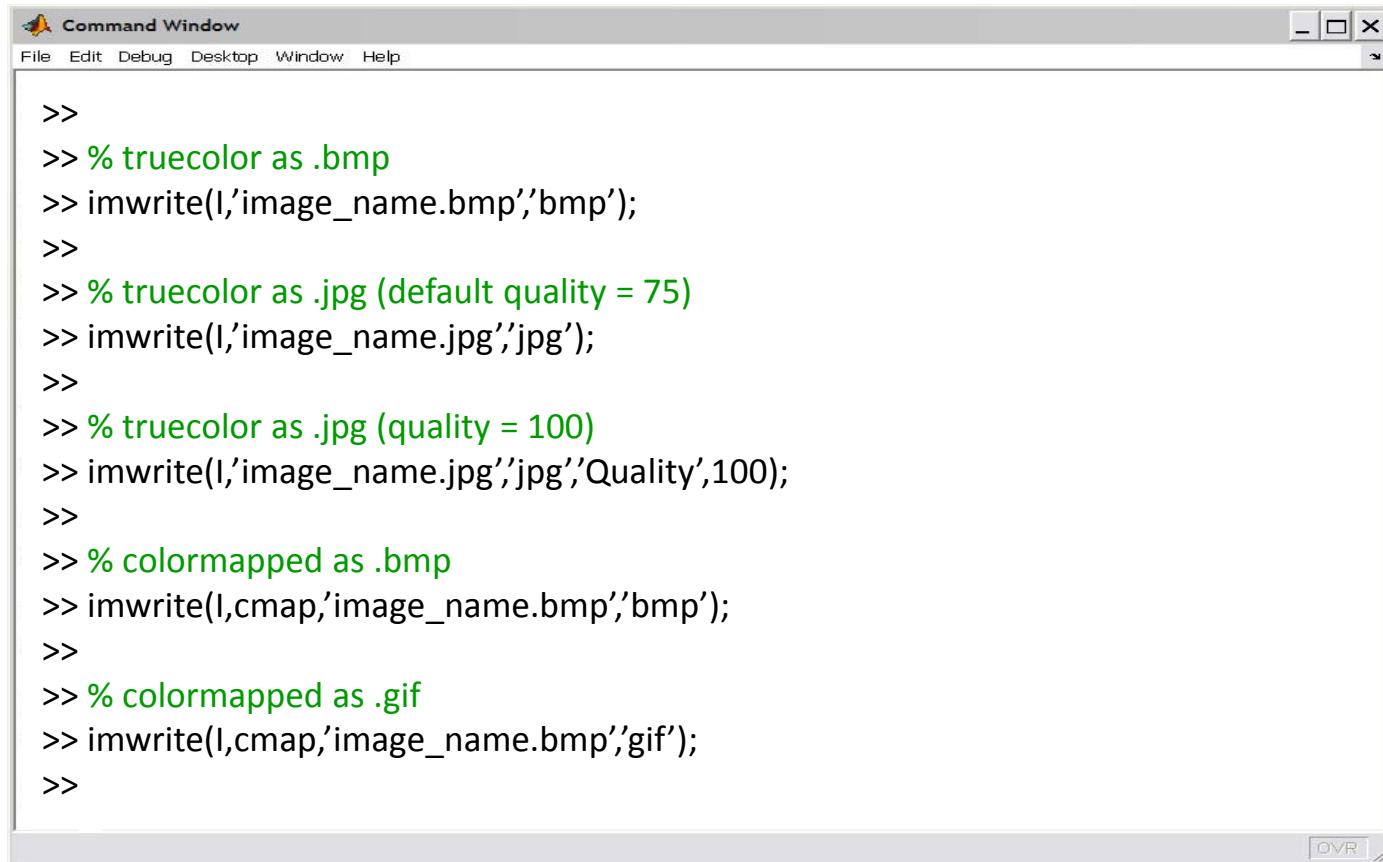
```
>> Gn = I(:,:,2);  
>> colormap(gcm);
```



```
>> Bl = I(:,:,3);  
>> colormap(bcm);
```



# Görüntü kaydetme



A screenshot of the MATLAB Command Window. The window title is "Command Window". The menu bar includes "File", "Edit", "Debug", "Desktop", "Window", and "Help". The toolbar has standard icons for minimize, maximize, and close. The main text area contains the following MATLAB code:

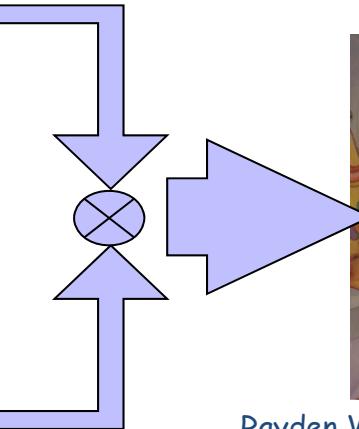
```
>>
>> % truecolor as .bmp
>> imwrite(l,'image_name.bmp','bmp');
>>
>> % truecolor as .jpg (default quality = 75)
>> imwrite(l,'image_name.jpg','jpg');
>>
>> % truecolor as .jpg (quality = 100)
>> imwrite(l,'image_name.jpg','jpg','Quality',100);
>>
>> % colormapped as .bmp
>> imwrite(l,cmap,'image_name.bmp','bmp');
>>
>> % colormapped as .gif
>> imwrite(l,cmap,'image_name.bmp','gif');
>>
```

The code demonstrates various methods for saving images in MATLAB, including saving a truecolor image as a BMP file, saving it as a JPEG file with different qualities, and saving a colormapped image as both a BMP and a GIF file.

# İki İmgeyi Üst Üste Ekleme



Jim Woodring - Bumperillo



Rayden Woodring - The Ecstasy of Bumperillo (?)



Mark Rayden - The Ecstasy of Cecelia

# KOD: İki İmgeyi Üst Üste Ekleme

```
>> cd 'D:\Classes\EECE253\Fall 2006\Graphics\matlab intro'
>> JW = imread('Jim Woodring - Bumperillo.jpg', 'jpg');
>> figure
>> image(JW)
>> truesize
>> title('Bumperillo')
>> xlabel('Jim Woodring')
>> MR = imread('Mark Ryden - The Ecstasy of Cecelia.jpg', 'jpg');
>> figure
>> image(MR)
>> truesize
>> title('The Ecstasy of Cecelia')
>> xlabel('Mark Ryden')
>> [RMR,CMR,DMR] = size(MR);
>> [RJW,CJW,DJW] = size(JW);
>> rb = round((RJW-RMR)/2);
>> cb = round((CJW-CMR)/2);
>> JWplusMR = uint8((double(JW(rb:(rb+RMR-1),cb:(cb+CMR-1),:))+double(MR))/2);
>> figure
>> image(JWplusMR)
>> truesize
>> title('The Ecstasy of Bumperillo')
>> xlabel('Jim Woodring + Mark Ryden')
```

# KOD: İki İmgeyi Üst Üste Ekleme

```
>> cd 'D:\Classes\EECE253\Fall 2006\Graphics\matlab intro'  
>> JW = imread('Jim Woodring - Bumperillo.jpg', 'jpg');  
>> figure  
>> image(JW)  
>> truesize  
>> title('Bumperillo')  
>> xlabel('Jim Woodring')  
>> MR = imread('Mark Ryden - The Ecstasy of Cecelia.jpg', 'jpg');  
>> figure  
>> image(MR)  
>> truesize  
>> title('The Ecstasy of Cecelia')  
>> xlabel('Mark Ryden')  
>> [RMR,CMR,DMR] = size(MR);  
>> [RJW,CJW,DJW] = size(JW);  
>> rb = round((RJW-RMR)/2);  
>> cb = round((CJW-CMR)/2);  
>> JWplusMR = uint8((double(JW(rb:(rb+RMR-1),cb:(cb+CMR-1),:))+double(MR))/2);  
>> figure  
>> image(JWplusMR)  
>> truesize  
>> title('The Ecstasy of Bumperillo')  
>> xlabel('Jim Woodring + Mark Ryden')
```

Büyük imgenin içerisindeki küçük imge boyutlarındaki alanı kopyala

# KOD: İki İmgeyi Üst Üste Ekleme

```
>> cd 'D:\Classes\EECE253\Fall 2006\Graphics\matlab intro'  
>> JW = imread('Jim Woodring - Bumperillo.jpg','jpg');  
>> figure  
>> image(JW)  
>> truesize  
>> title('Bumperillo')  
>> xlabel('Jim Woodring')  
>> MR = imread('Mark Ryden - The Ecstasy of Cecelia.jpg','jpg');  
>> figure  
>> image(MR)  
>> truesize  
>> title('The Ecstasy of Cecelia')  
>> xlabel('Mark Ryden')  
>> [RMR,CMR,DMR] = size(MR);  
>> [RJW,CJW,DJW] = size(JW);  
>> rb = round((RJW-RMR)/2);  
>> cb = round((CJW-CMR)/2);  
>> JWplusMR = uint8([double(JW(rb:(rb+RMR-1),cb:(cb+CMR-1),:))+double(MR))/2]);  
>> figure  
>> image(JWplusMR)  
>> truesize  
>> title('The Ecstasy of Bumperillo')  
>> xlabel('Jim Woodring + Mark Ryden')
```

Piksellerin ortalama değerlerinin alındığına dikkat et.

# KOD: İki İmgeyi Üst Üste Ekleme

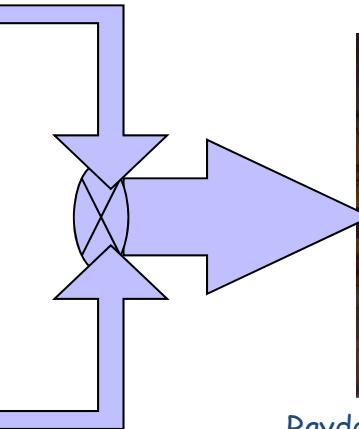
```
>> cd 'D:\Classes\EECE253\Fall 2006\Graphics\matlab intro'  
>> JW = imread('Jim Woodring - Bumperillo.jpg', 'jpg');  
>> figure  
>> image(JW)  
>> truesize  
>> title('Bumperillo')  
>> xlabel('Jim Woodring')  
>> MR = imread('Mark Ryden - The Ecstasy of Cecelia.jpg', 'jpg');  
>> figure  
>> image(MR)  
>> truesize  
>> title('The Ecstasy of Cecelia')  
>> xlabel('Mark Ryden')  
>> [RMR, CMR, DMR] = size(MR);  
>> [RJW, CJW, DJW] = size(JW);  
>> rb = round((RJW-RMR)/2);  
>> cb = round((CJW-CMR)/2);  
>> JWplusMR = uint8(double(JW(rb:(rb+RMR-1), cb:(cb+CMR-1), :)) + double(MR))/2;  
>> figure  
>> image(JWplusMR)  
>> truesize  
>> title('The Ecstasy of Bumperillo')  
>> xlabel('Jim Woodring + Mark Ryden')
```

↑                      ↑                      ↑  
Veri sınıf dönüşümü  
yapıldığına dikkat et

# İki İmgeyi Çarpma (Yoğunluk Maskeleme)



Jim Woodring - Bumperillo



Rayden Woodring - Bumperillo Ecstasy (?)



Mark Rayden - The Ecstasy of Cecelia

# Kod: İki İmgeyi Çarpma

```
>> JW = imread('Jim Woodring - Bumperillo.jpg','jpg');
>> MR = imread('Mark Ryden - The Ecstasy of Cecelia.jpg','jpg');
>> [RMR,CMR,DMR] = size(MR);
>> [RJW,CJW,DJW] = size(JW);
>> rb = round((RJW-RMR)/2);
>> cb = round((CJW-CMR)/2);
>> JWplusMR = uint8((double(JW(rb:(rb+RMR-1),cb:(cb+CMR-
1),:))+double(MR))/2);
>> figure
>> image(JWplusMR)
>> truesize
>> title('The Extacsy of Bumperillo')
>> xlabel('Jim Woodring + Mark Ryden')
>> JWtimesMR = double(JW(rb:(rb+RMR-1),cb:(cb+CMR-1),:)).*double(MR);
>> M = max(JWtimesMR(:));
>> m = min(JWtimesMR(:));
>> JWtimesMR = uint8(255*(double(JWtimesMR)-m)/(M-m));
>> figure
>> image(JWtimesMR)
>> truesize
>> title('EcstasyBumperillo')
```

# Kod: İki İmgeyi Çarpma

```
>> JW = imread('Jim Woodring - Bumperillo.jpg','jpg');
>> MR = imread('Mark Ryden - The Ecstasy of Cecelia.jpg','jpg');
>> [RMR,CMR,DMR] = size(MR);
>> [RJW,CJW,DJW] = size(JW);
>> rb = round((RJW-RMR)/2);
>> cb = round((CJW-CMR)/2);
>> JWplusMR = uint8((double(JW(rb:(rb+RMR-1),cb:(cb+CMR-1),:))+double(MR))/2);
>> figure
>> image(JWplusMR)
>> truesize
>> title('The Extacy of Bumperillo')
>> xlabel('Jim Woodring + Mark Ryden')
>> JWtimesMR = double(JW(rb:(rb+RMR-1),cb:(cb+CMR-1),:)).*double(MR);
>> M = max(JWtimesMR(:));
>> m = min(JWtimesMR(:));
>> JWtimesMR = uint8(255*(double(JWtimesMR)-m)/(M-m));
>> figure
>> image(JWtimesMR)
>> truesize
>> title('EcstasyBumperillo')
```

Piksellerin çarpıldığına dikkat et

Görüntü yoğunluk değerlerinin tekrar 0-255 aralığına çekildiğine dikkat et