



ივანე ჯავახიშვილის სახელობის
თბილისის სახელმწიფო უნივერსიტეტი

ლექცია 6

სტუდენტთა და პროფესიული კურსების მიერთვის მუნიციპალიტეტი 2,
ს. თბილი (2016)

Visualization

N dimensions – observer

M dimensions – information

No Information Lost: $N = M+1$

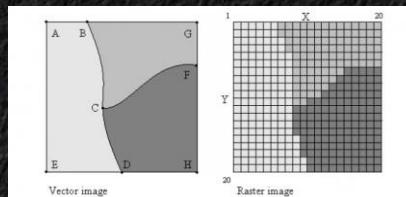
2D visualization

**3D – intrinsic information loss;
choose important visual information (3D->2D)**

სტუდენტთა და პროფესიული კურსების მიერთვის მუნიციპალიტეტი 2,
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Digital Images: Grayscale

Raster image:



8 bit: $2^8=256$ levels

0-255, normalized(1/255): 0-1

```
x = imread('your_image','jpg');
```

Astronomical images: 8bit, 16bit, 32bit;

Grayscale



8 bit grayscale

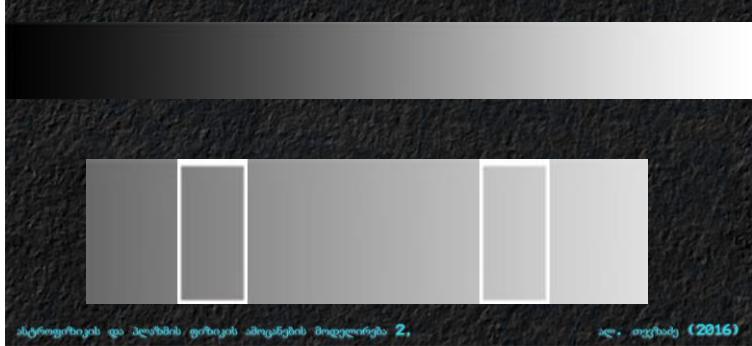
BW (1 bit)

სტუდენტთა და პროფესიული კურსების მიერთვის მუნიციპალიტეტი 2,
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Gray Perception

Human perception limits 1:

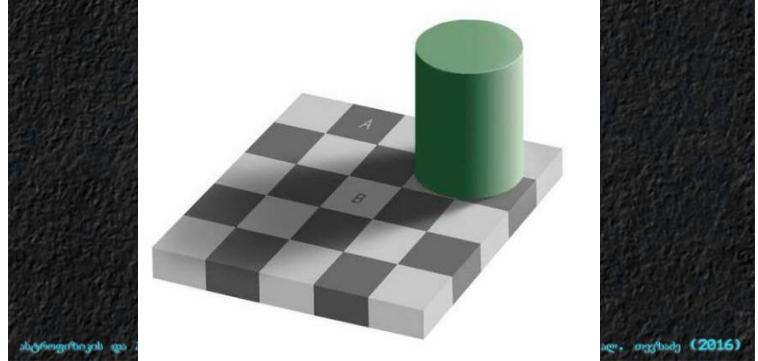
Levels in gray: 20?



Gray Perception

Human perception limits 2:

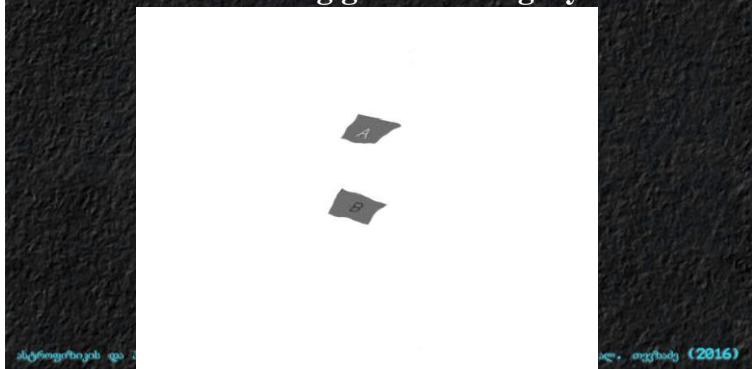
smooth vs strong gradients in grayscale



Gray Perception

Human perception limits 2:

smooth vs strong gradients in grayscale



Digital Color: RGB

$X(M,N,3)$

Red Channel: $X(M,N,1)$

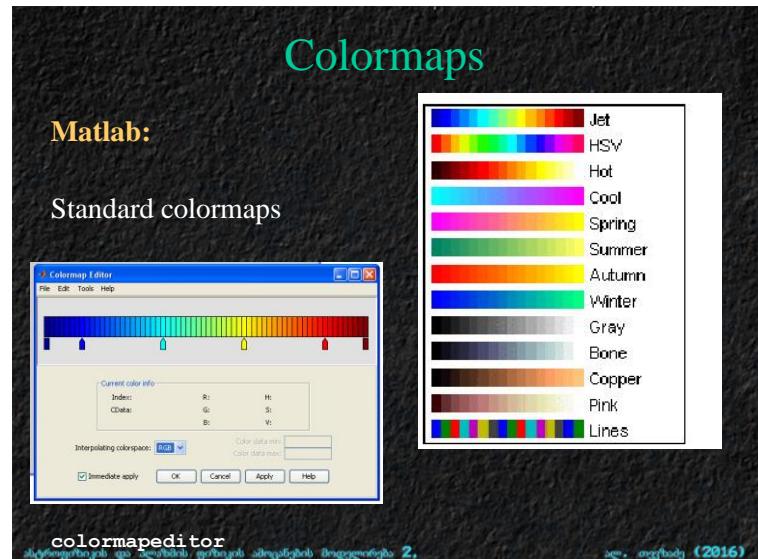
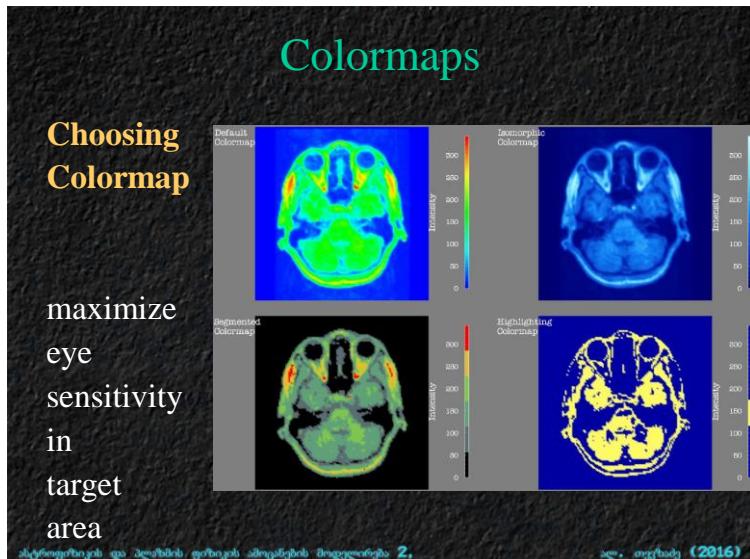
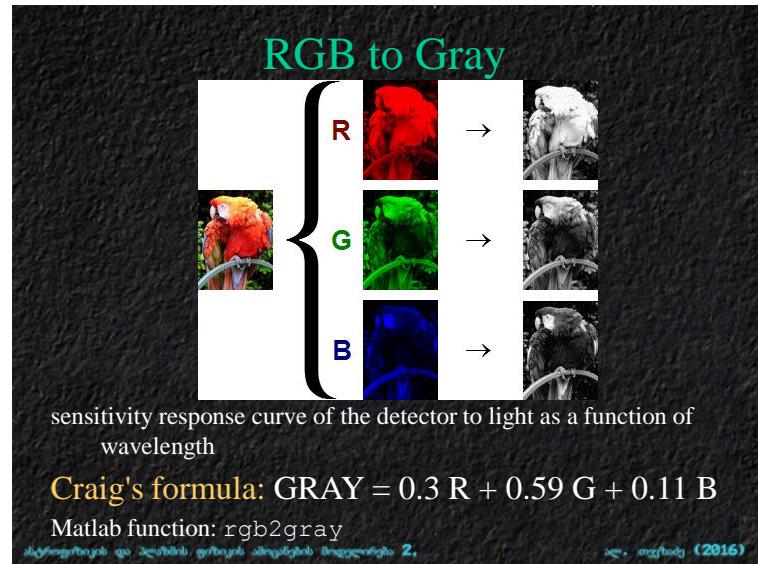
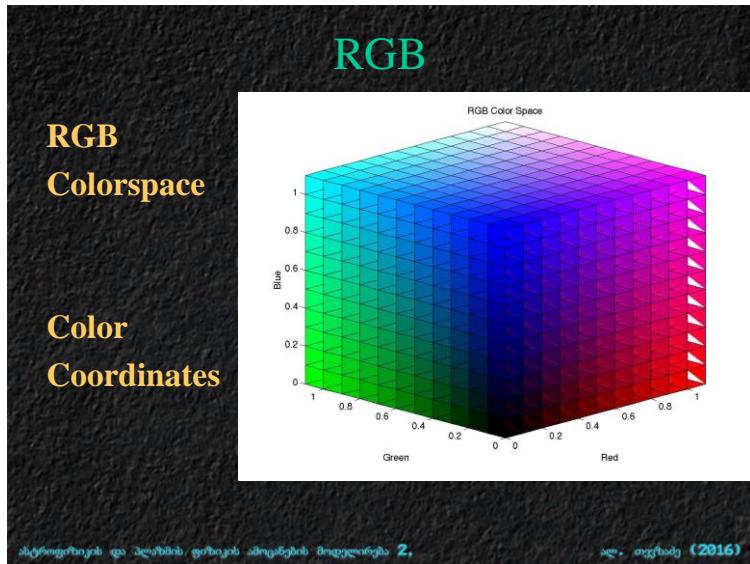
Green Channel: $X(M,N,2)$

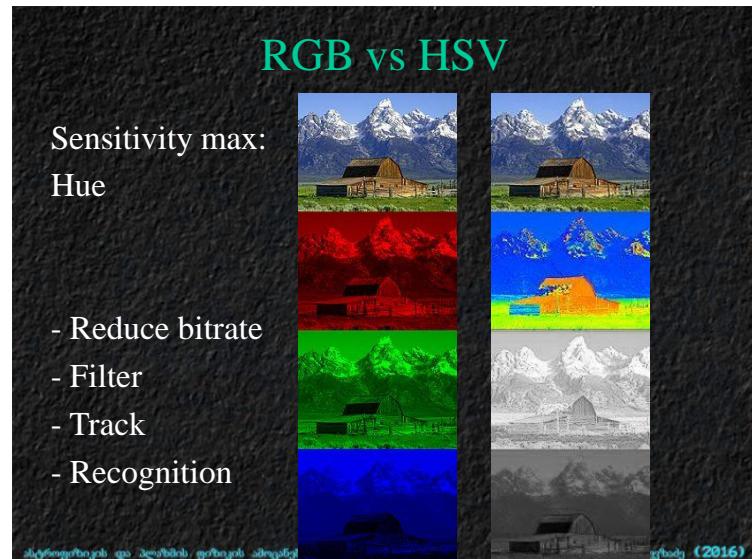
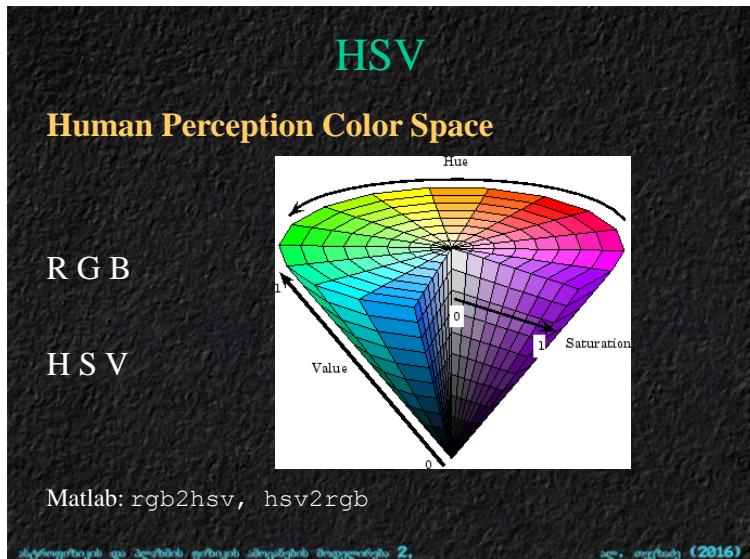
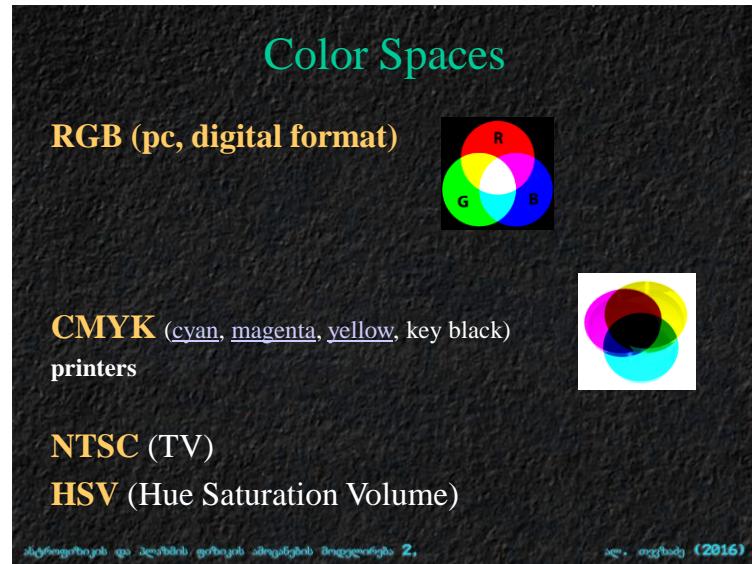
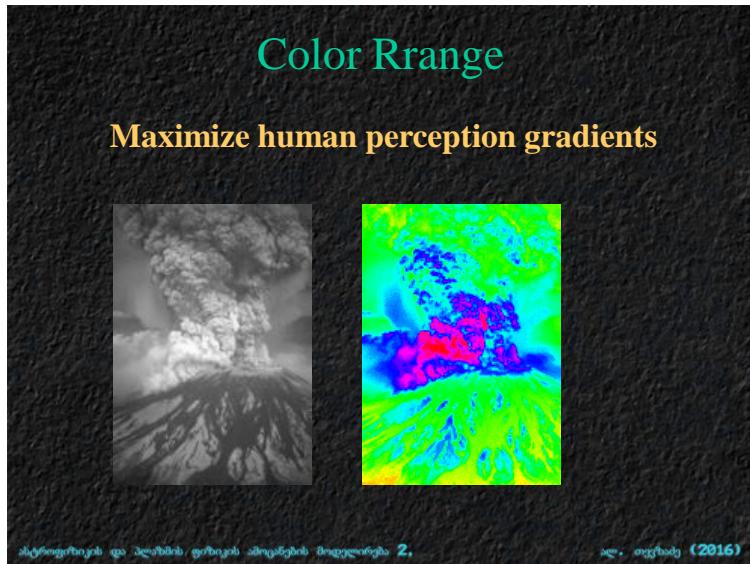
Blue Channel: $X(M,N,3)$

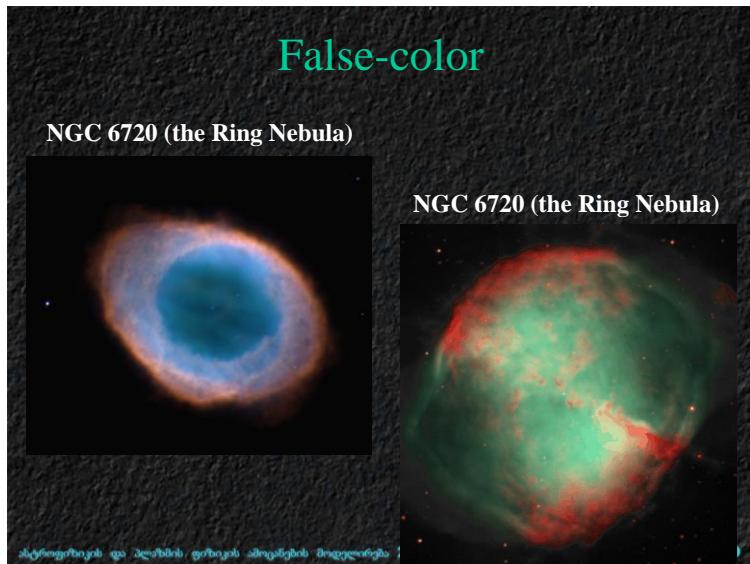
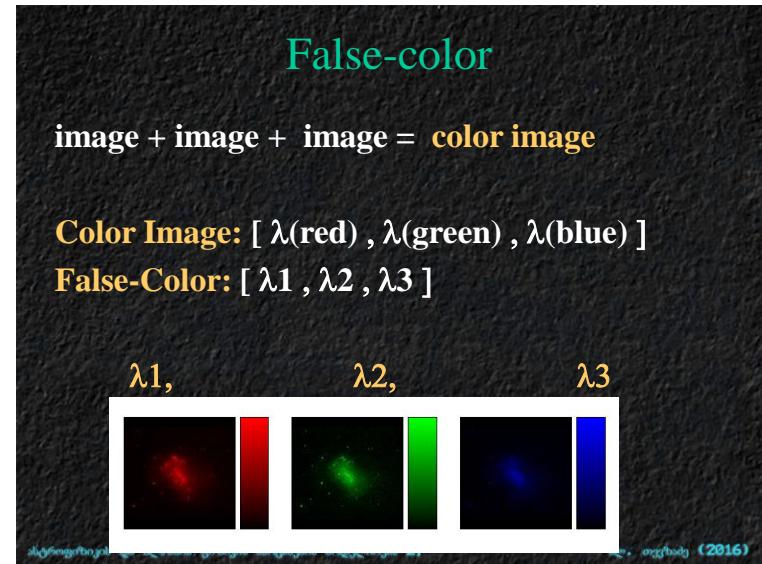
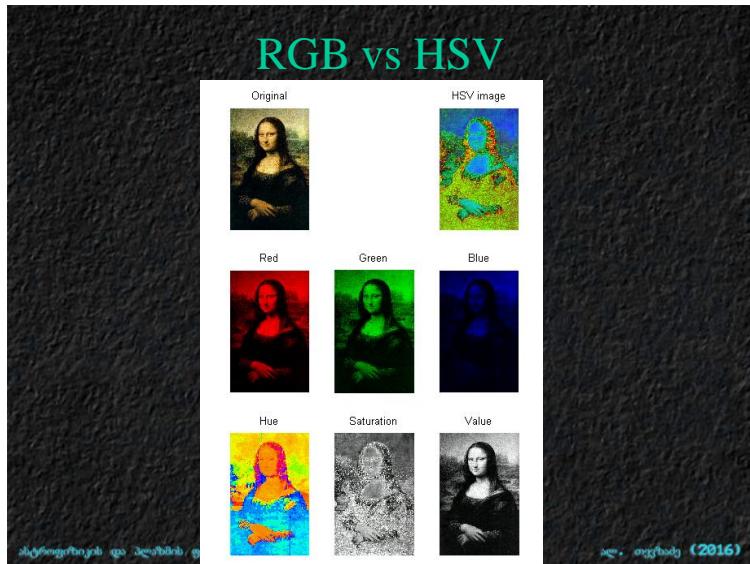
24 bit color: [8 red, 8 green, 8 blue]

Total number = $256^3 = 16\ 777\ 216$ “colors”

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Pseudo-color

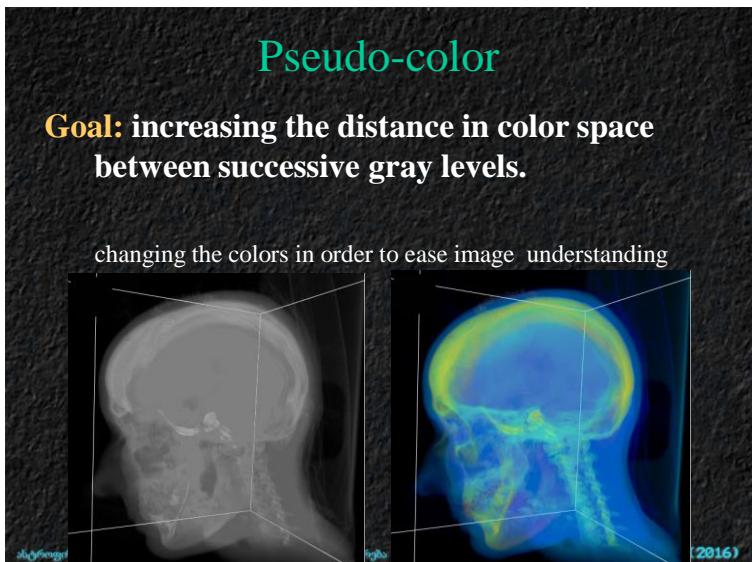
image + idea + ... + idea = color image

*technique for artificially assigning colors
visualize ideas*

Image_gray -> Image_color

```
rgb2gray(Image_color) = Image_gray
```

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Pseudo-color

Grayscale image

Ideas:

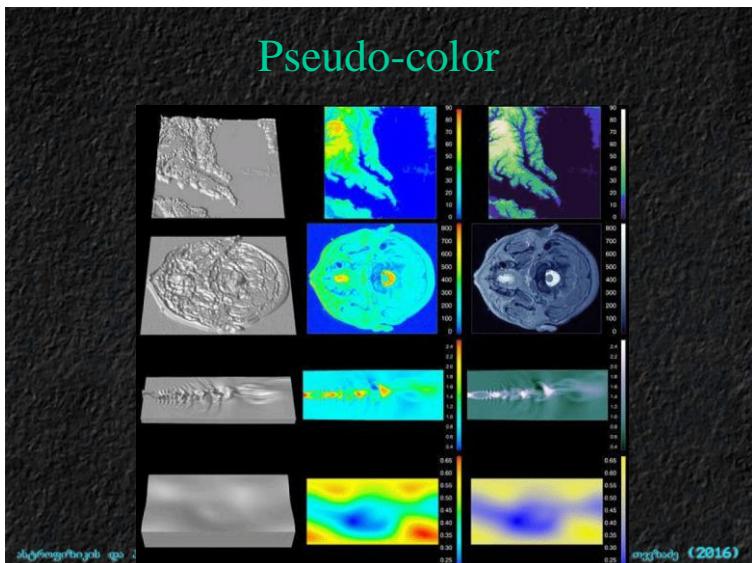
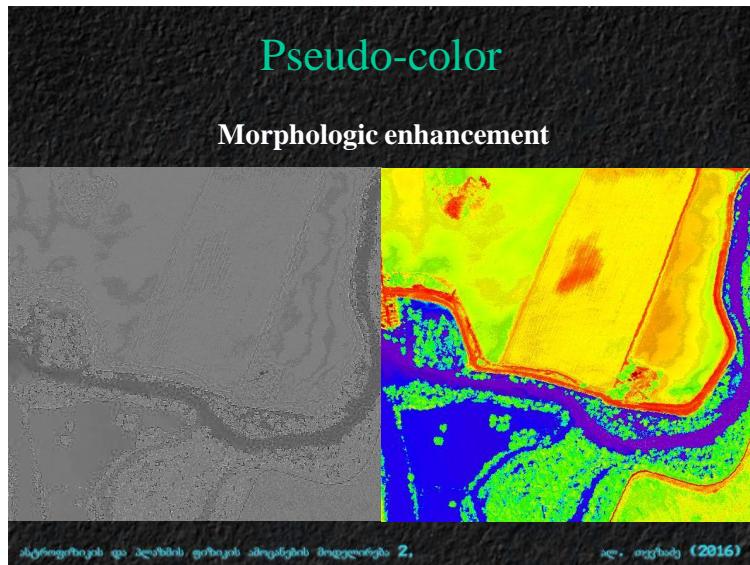
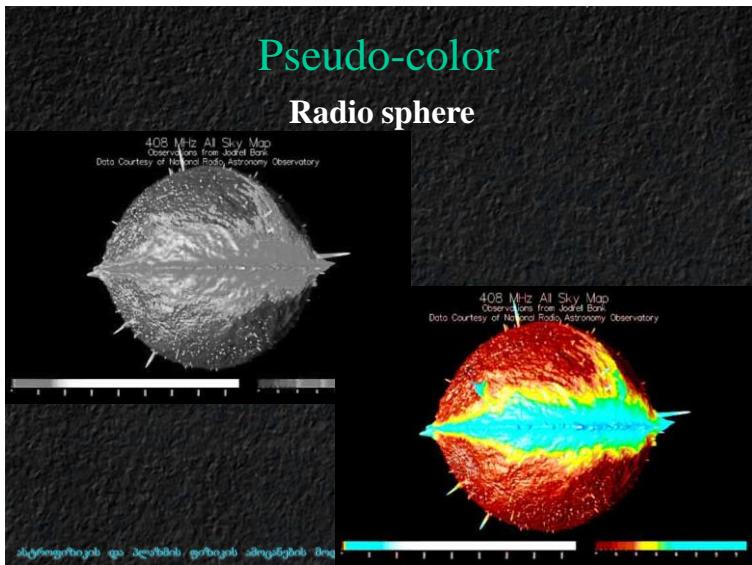
- Strong gradient: blue
- Smooth gradient: red

Morphology coloring (pixel based filtering, pixel geometry, blobs, holes, etc.)

Edge detection: (harder edges, outer glow, inner glow ...)

Color Image

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end

www.tevza.org/home/course/modelling-II_2016/

ატენისის და ბათუმის გენერალური მუსიკურის მუსიკურის 2,

ივ. მოგიძე (2016)