

Alati za modifikaciju i korekciju slika

Aleksandar Anžel 1025/2018
Matematički fakultet

Konvolucija

$$\begin{matrix} I \\ \hline \begin{matrix} 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{matrix} \end{matrix} * \begin{matrix} K \\ \hline \begin{matrix} 0 & 0.5 \\ 0.5 & 0 \end{matrix} \end{matrix} = \begin{matrix} S \\ \hline \begin{matrix} 0+0.5 \\ +0+0 & 0+0.5 \\ +0+0 & 0+0 \\ 0+0 \\ +0+0 \end{matrix} \end{matrix} = \begin{matrix} S \\ \hline \begin{matrix} 0.5 & 0.5 & 0 \\ 0.5 & 0 & 0 \\ 0 & 0.5 & 1 \end{matrix} \end{matrix}$$

Zamućivanje konvolucijom

Gauß filter

$$\frac{1}{256} \begin{bmatrix} 1 & 4 & 6 & 4 & 1 \\ 4 & 16 & 24 & 16 & 4 \\ 6 & 24 & 36 & 24 & 6 \\ 4 & 16 & 24 & 16 & 4 \\ 1 & 4 & 6 & 4 & 1 \end{bmatrix}$$

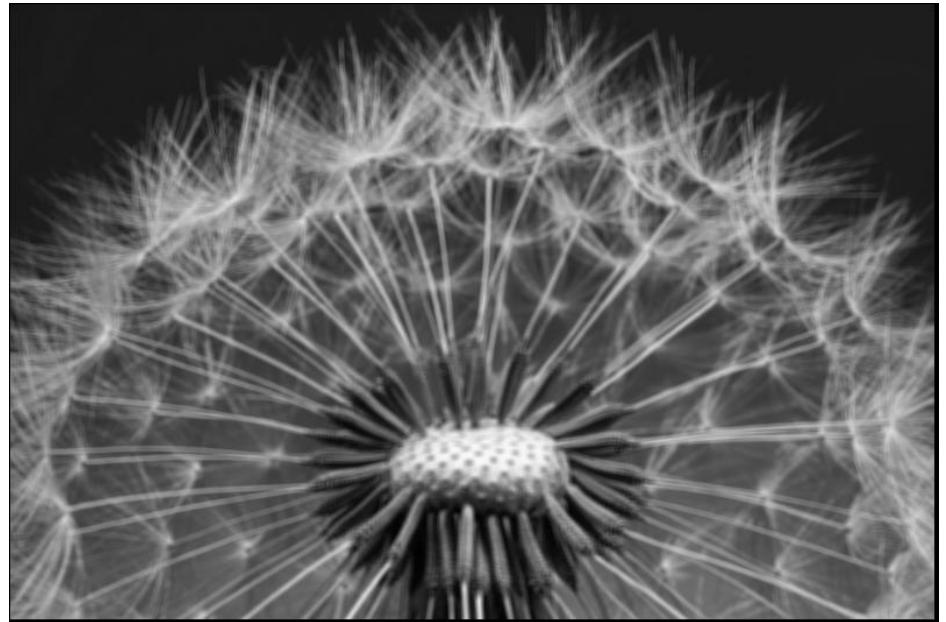
Gauß filter



Prosek filter

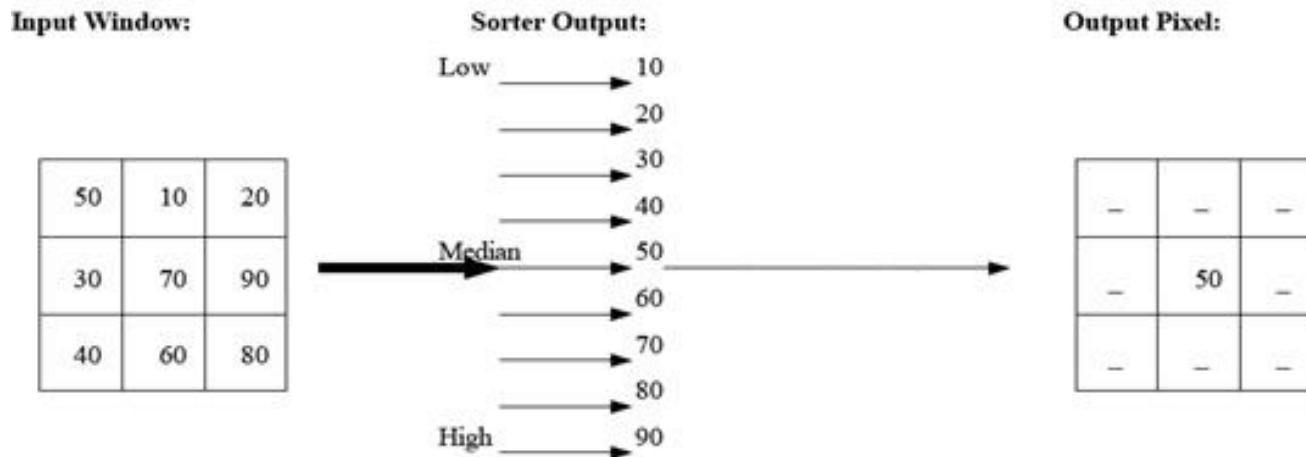
$$\frac{1}{9} \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$

Prosek filter



Zamućivanje medijanom

Medijana filter



Medijana filter



Poređenje



Gauß

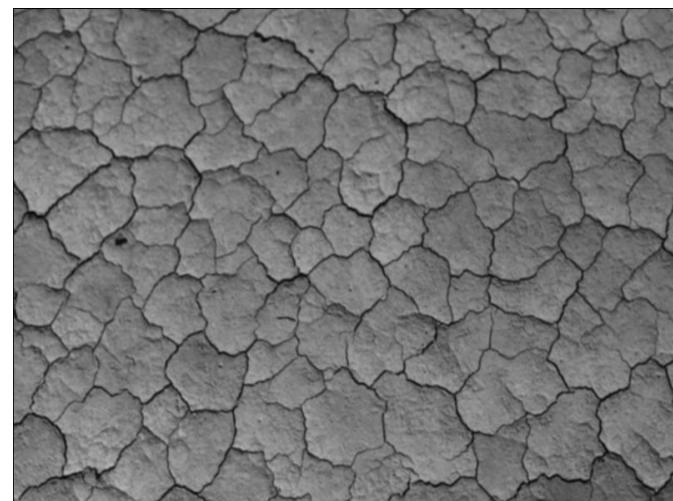


Prosek

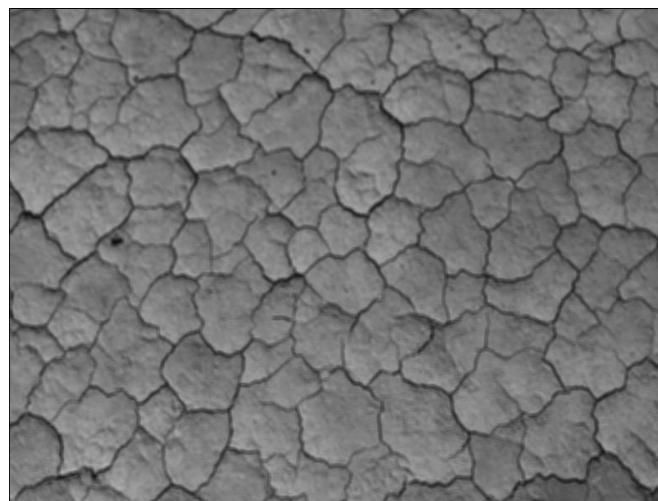


Medijana

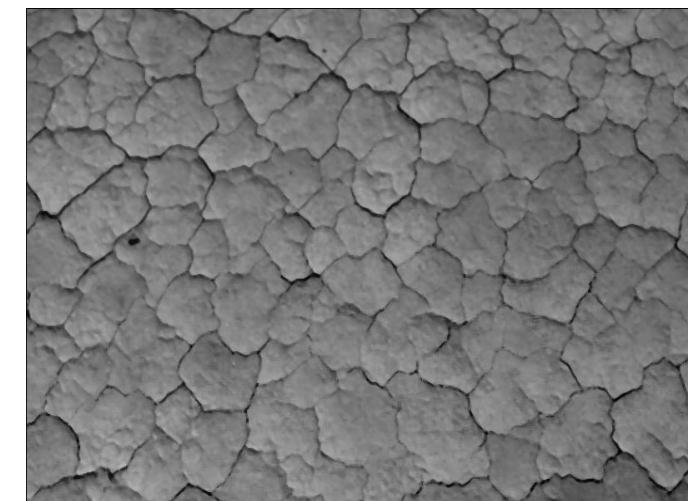
Poređenje



Gauß



Prosek



Medijana

Poređenje



Gauß



Prosek



Medijana

Primena

- Zamućivanje
- Otklanjanje šuma
- Preprocesiranje (detektovanje ivica)

Detektovanje ivica konvolucijom

Sobel filter

$$G_x = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & -2 \\ -1 & 0 & 1 \end{bmatrix} \quad G_y = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & 1 \end{bmatrix}$$

Sobel filter



Prewitt filter

$$G_x = \begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix}$$

$$G_y = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ -1 & -1 & -1 \end{bmatrix}$$

Prewitt filter



Roberts filter

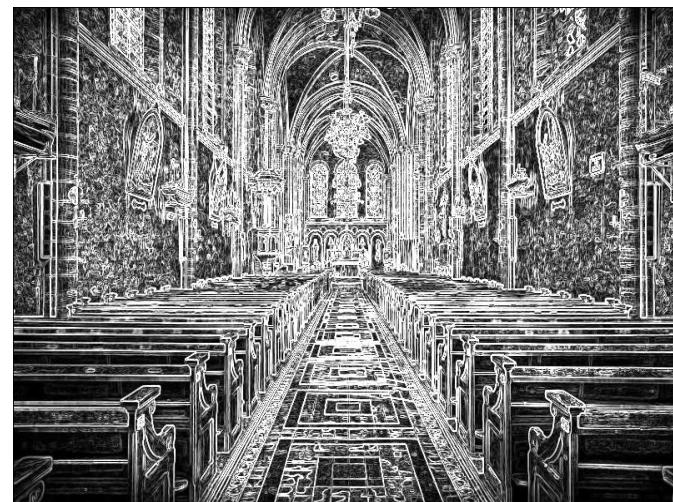
$$G_x = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

$$G_y = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

Roberts filter



Poređenje



Sobel



Prewitt

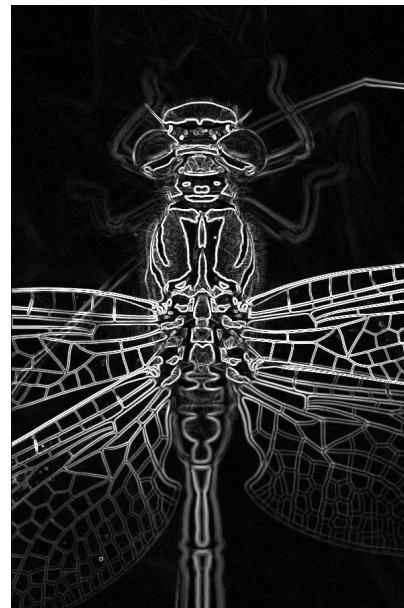


Roberts

Poređenje



Sobel

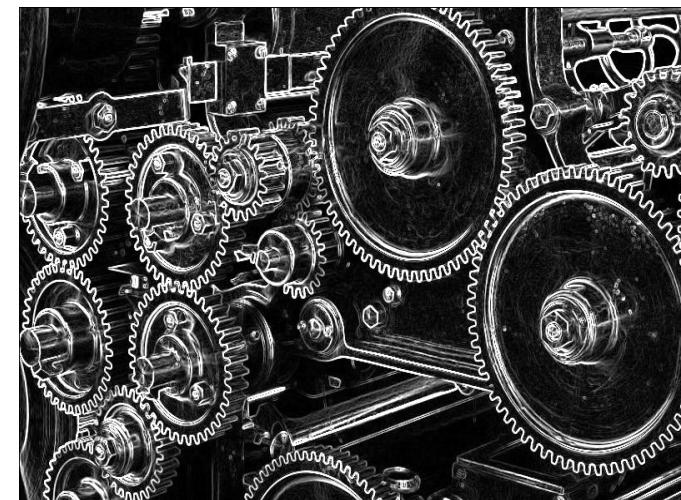


Prewitt

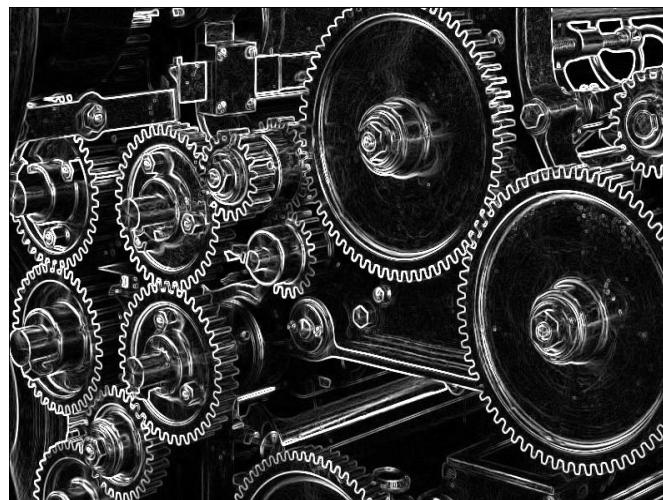


Roberts

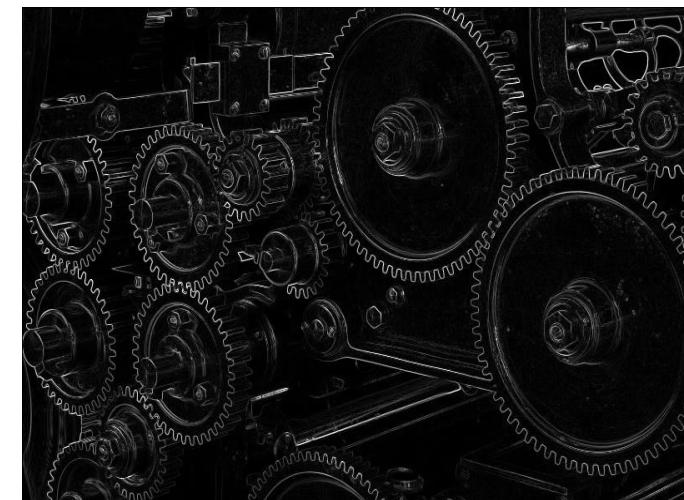
Poređenje



Sobel



Prewitt



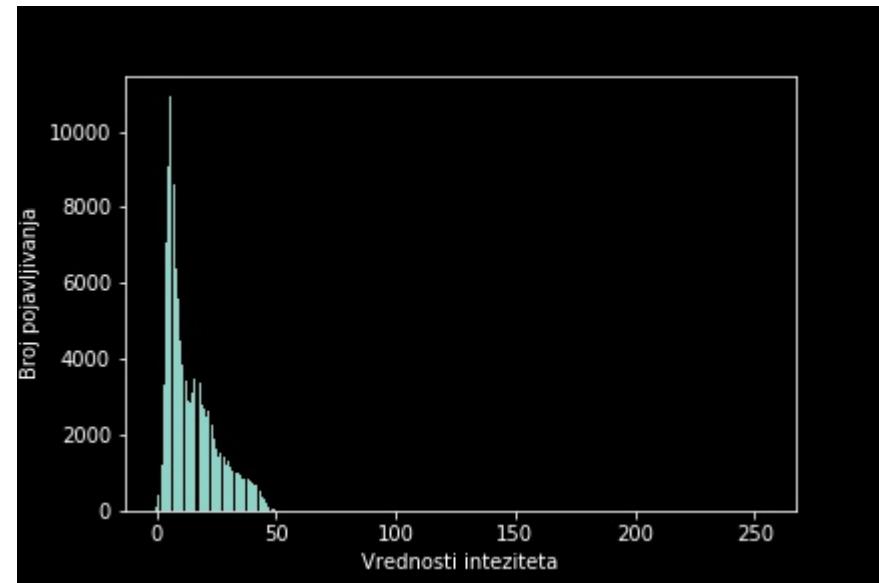
Roberts

Primena

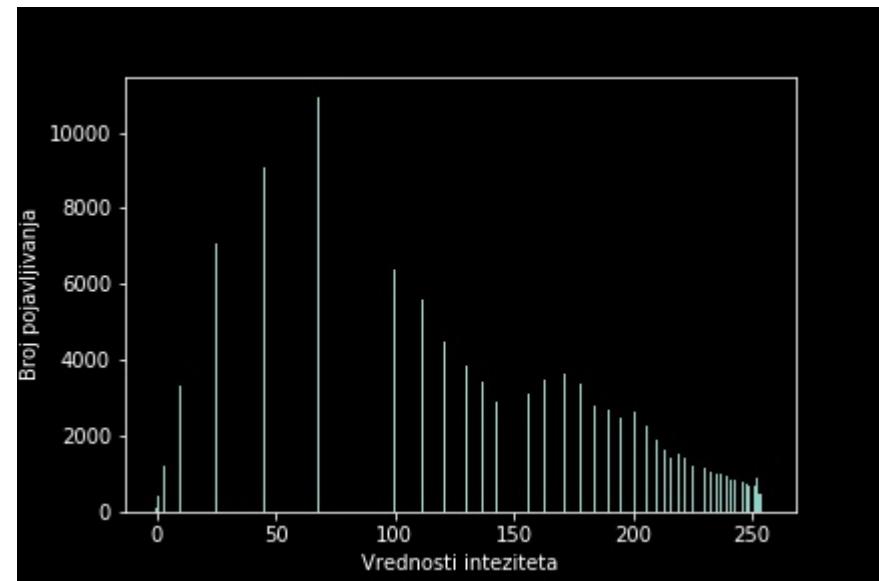
- Automobilska industrija
- Medicina
- Robotic vision

Korekcija slika pomoću histograma intenziteta piksela

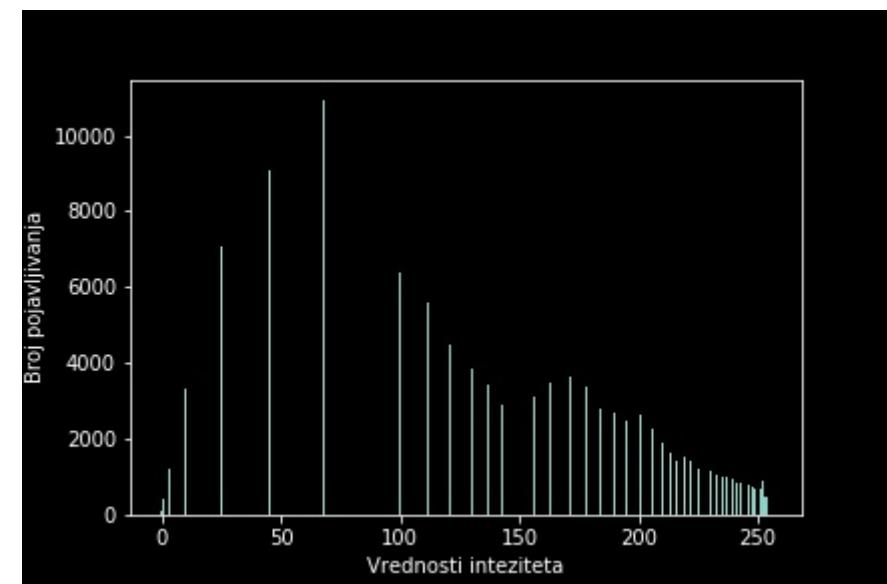
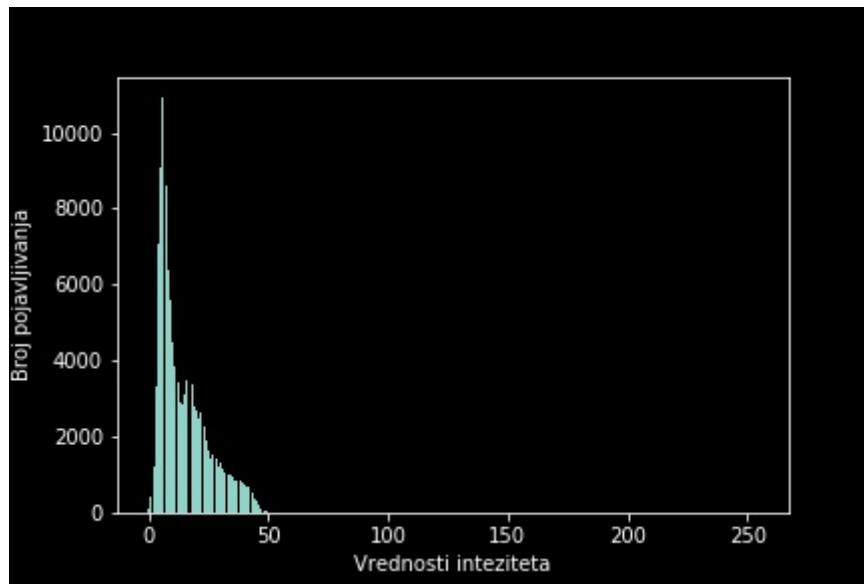
Histogram inteziteta piksela



Histogram inteziteta piksela



Histogram inteziteta piksela



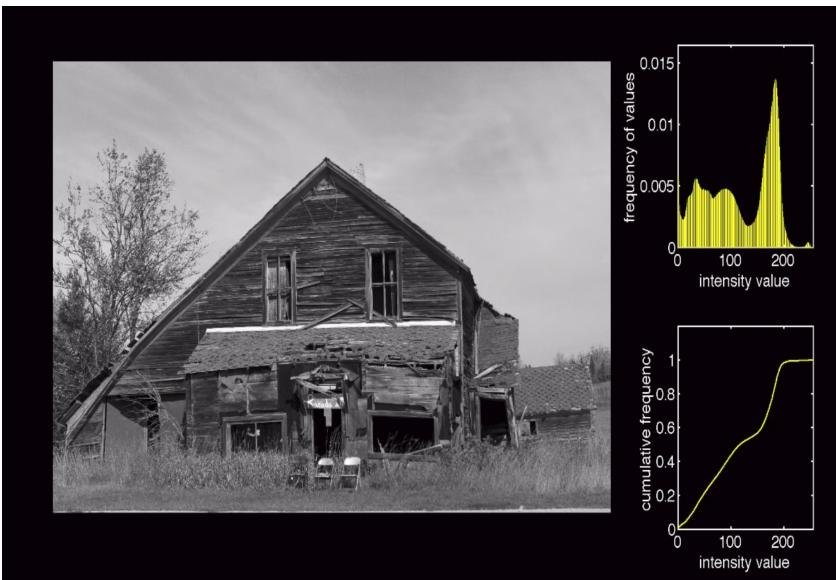
Funkcija transfera

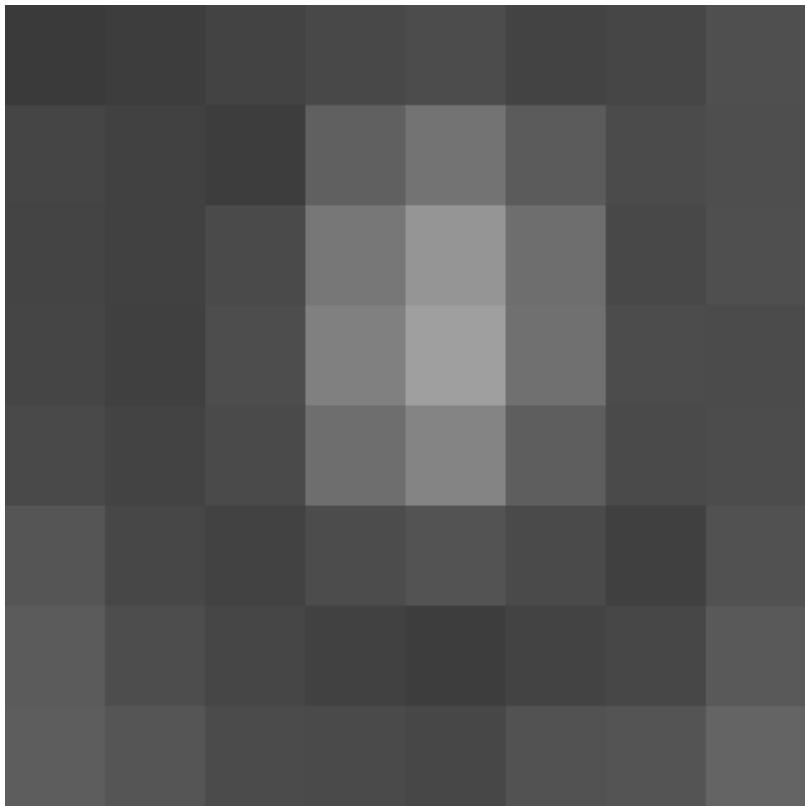
$$p_x(i) = p(x=i) = \frac{n_i}{n}$$

$$cdf_x(i) = \sum_{j=0}^i p_x(j)$$

$$h(v) = round\left(\frac{L-1}{n} * cdf(v)\right)$$

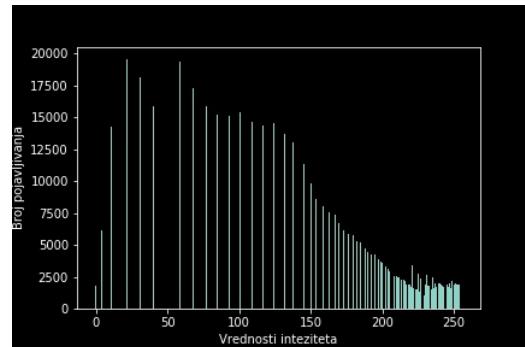
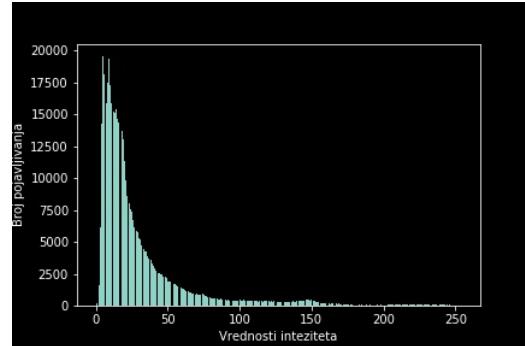
Kumulativna funkcija distribucije



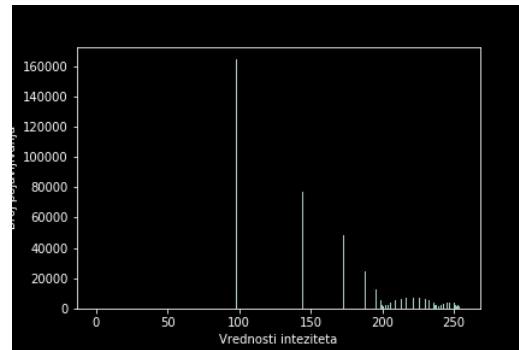
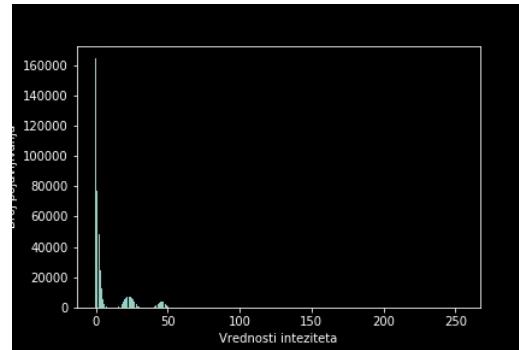
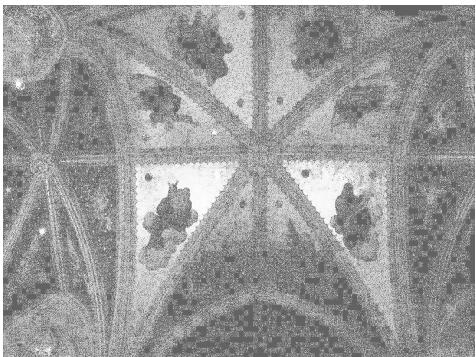
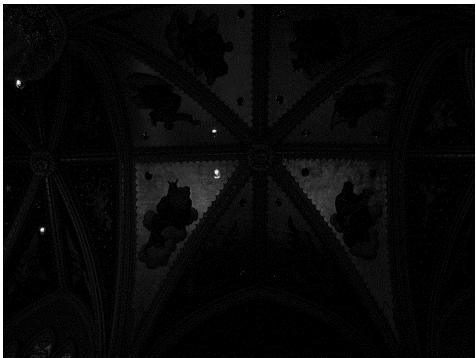


v (intenzitet piksela)	cdf (v)	h(v)
52	1	0
55	4	12
58	6	20
59	8	32
60	10	36
61	14	53
62	15	57
63	17	65
64	18	73
65	22	85
...

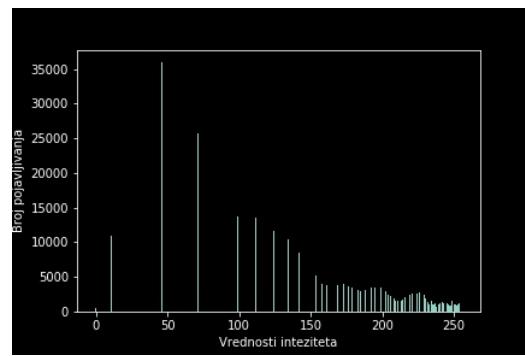
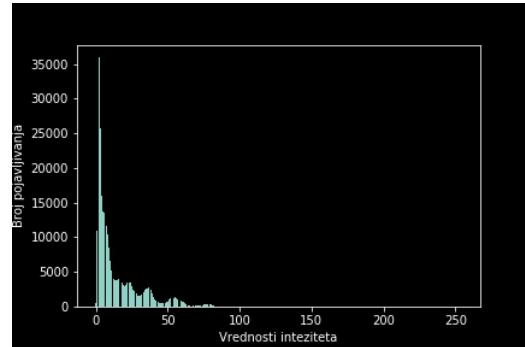
Poređenje



Poređenje



Poređenje



Primena

- Korekcija medicinskih snimaka
- Korekcija slika nebeskih tela (svemirska industrija)

Hvala na pažnji!