

Alati za modifikaciju i korekciju slika

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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

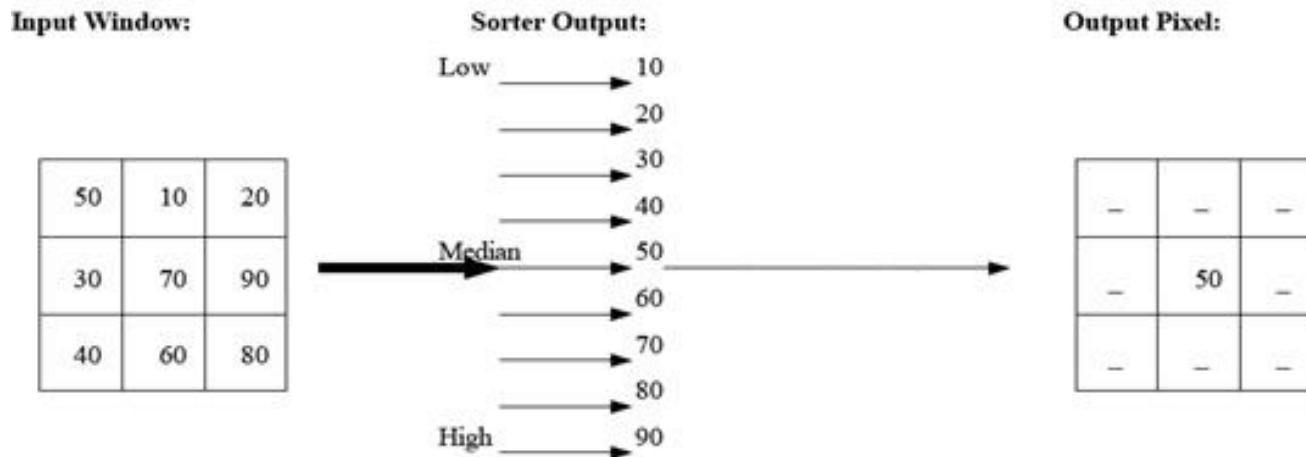
$$\frac{1}{9} \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$

Prosek filter



Zamućivanje medijanom

Medijana filter



Medijana filter



Poređenje



Gauß

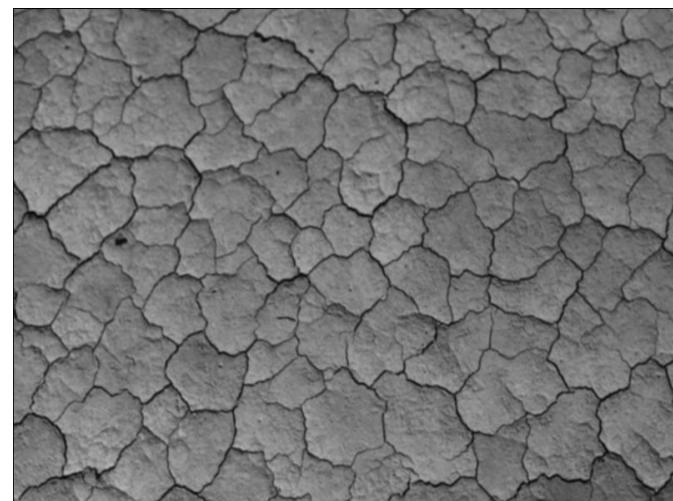


Prosek

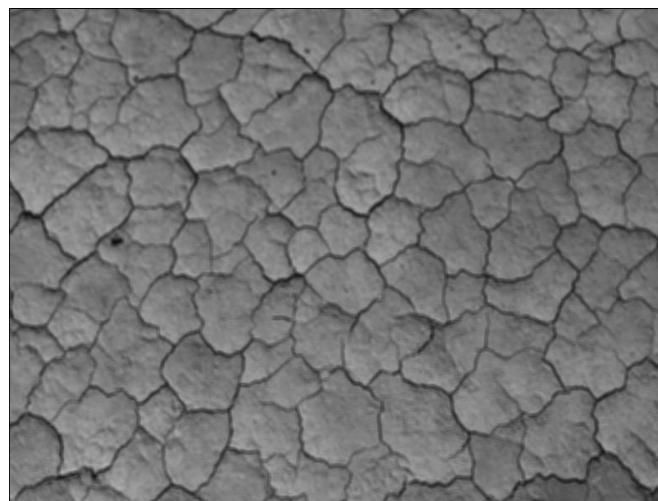


Medijana

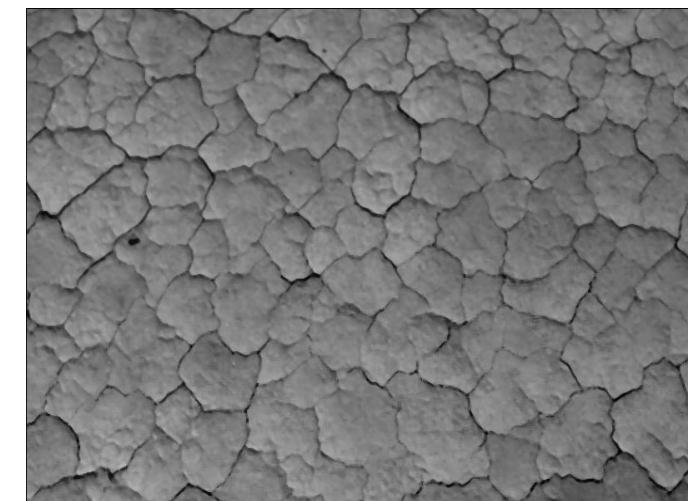
Poređenje



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

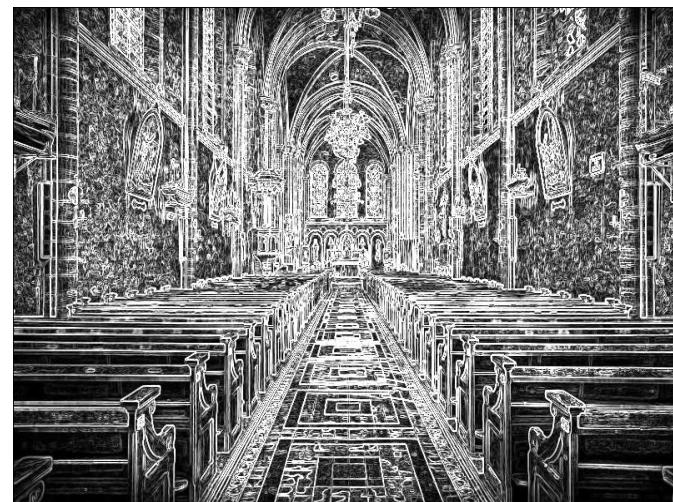
$$G_x = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

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

Roberts filter



Poređenje



Sobel



Prewitt



Roberts

Poređenje



Sobel

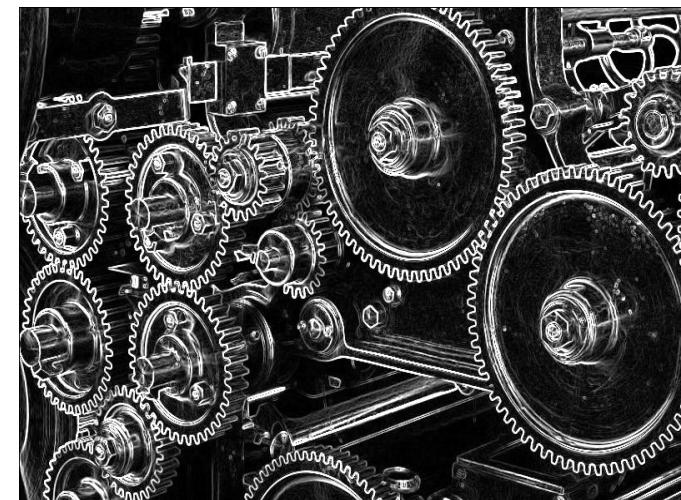


Prewitt

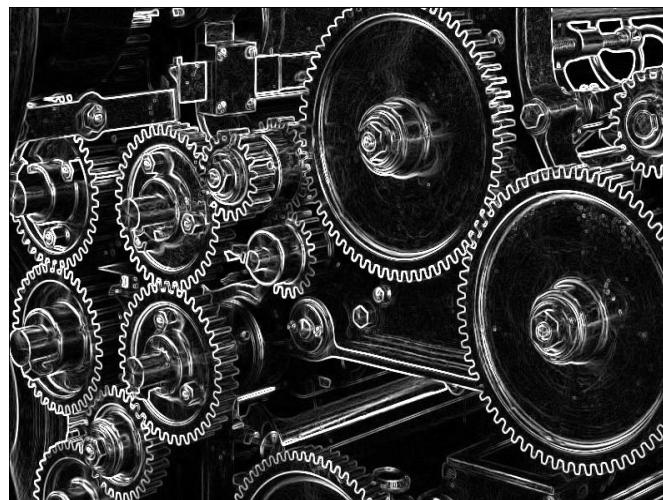


Roberts

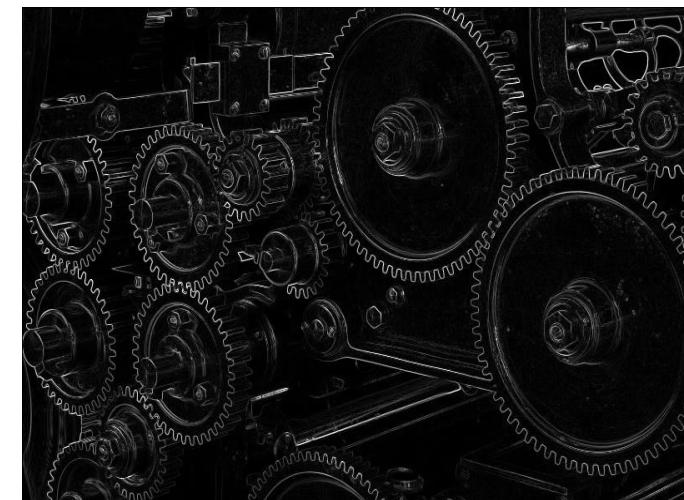
Poređenje



Sobel



Prewitt



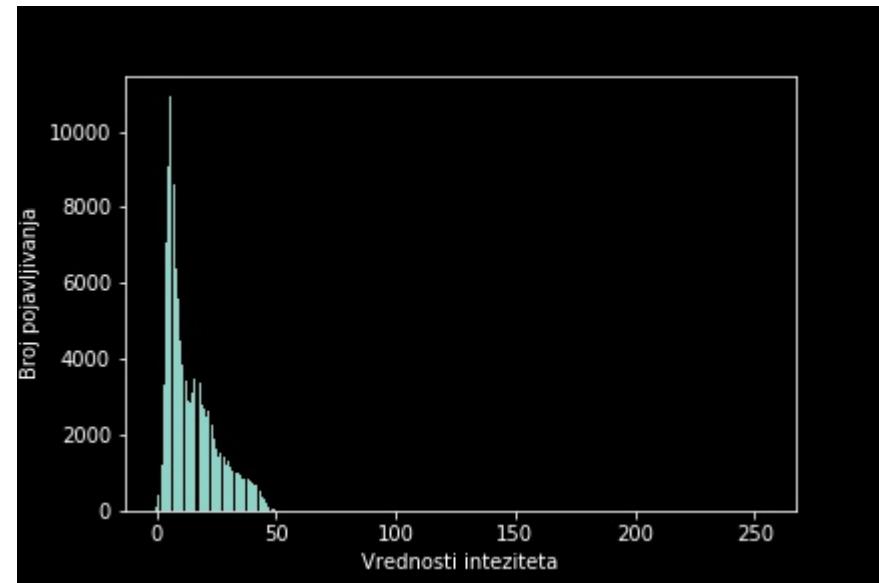
Roberts

Primena

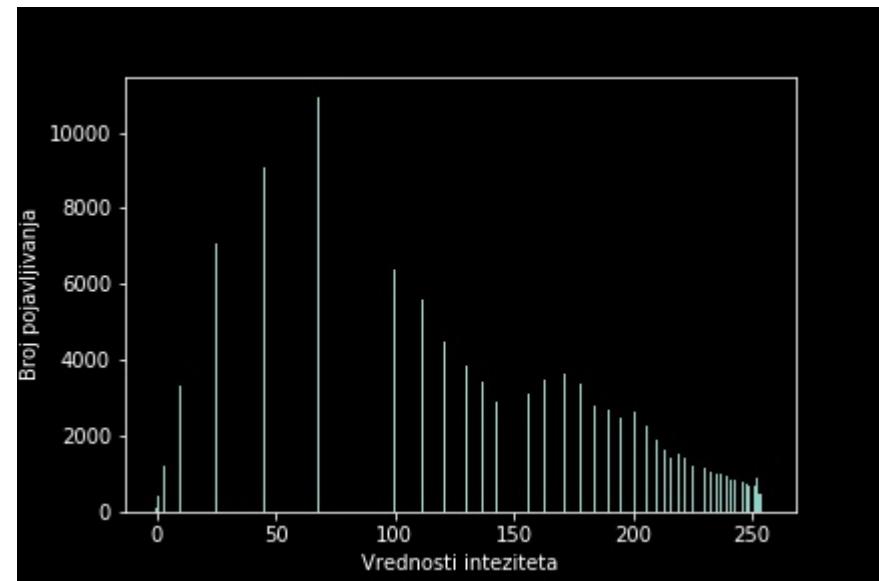
- Automobilska industrija
- Medicina
- Robotic vision

Korekcija slika pomoću histograma intenziteta piksela

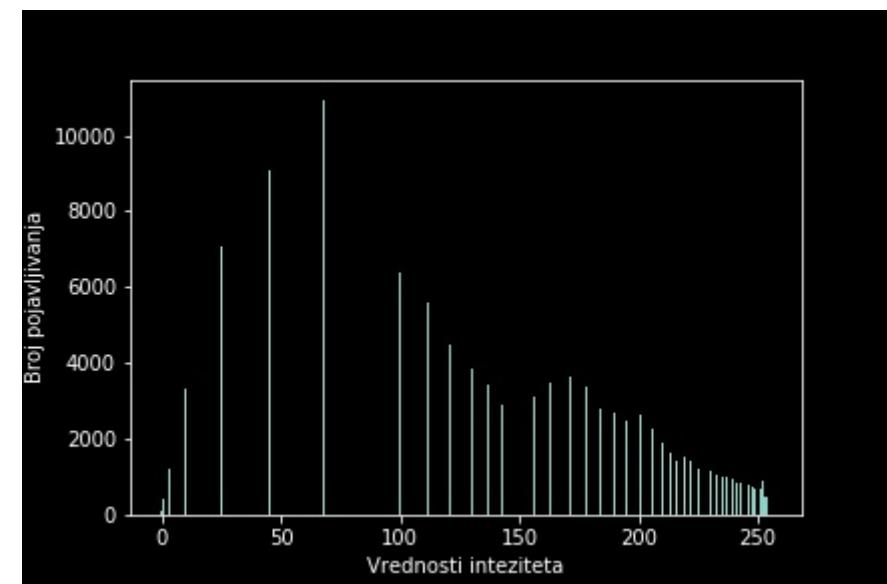
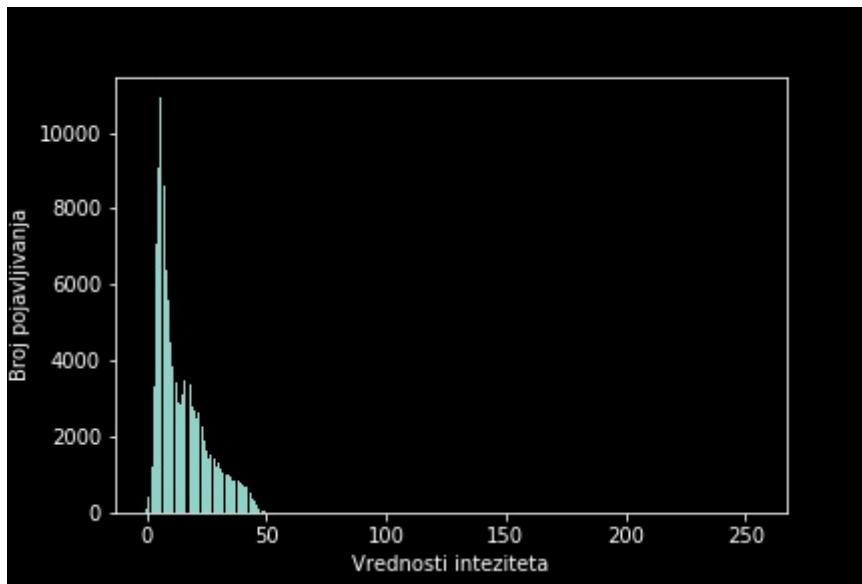
Histogram inteziteta piksela



Histogram inteziteta piksela



Histogram inteziteta piksela



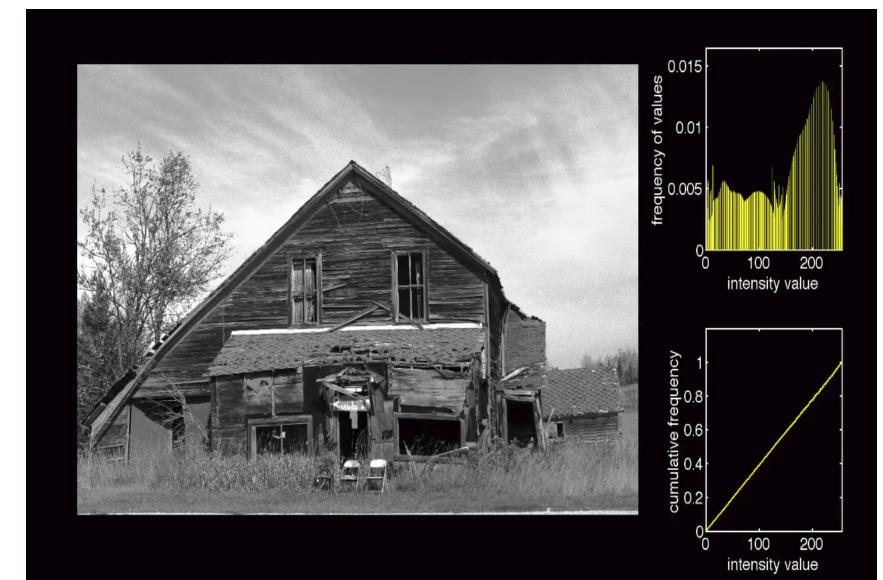
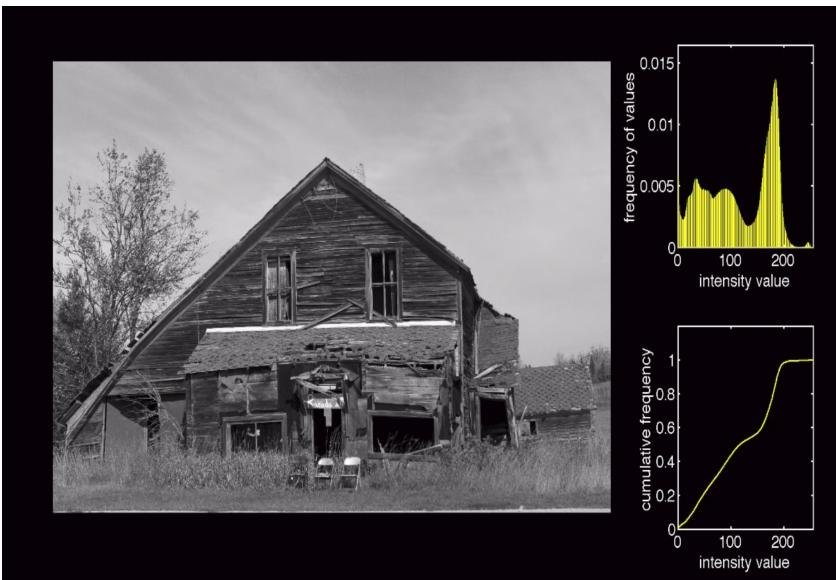
Funkcija transfera

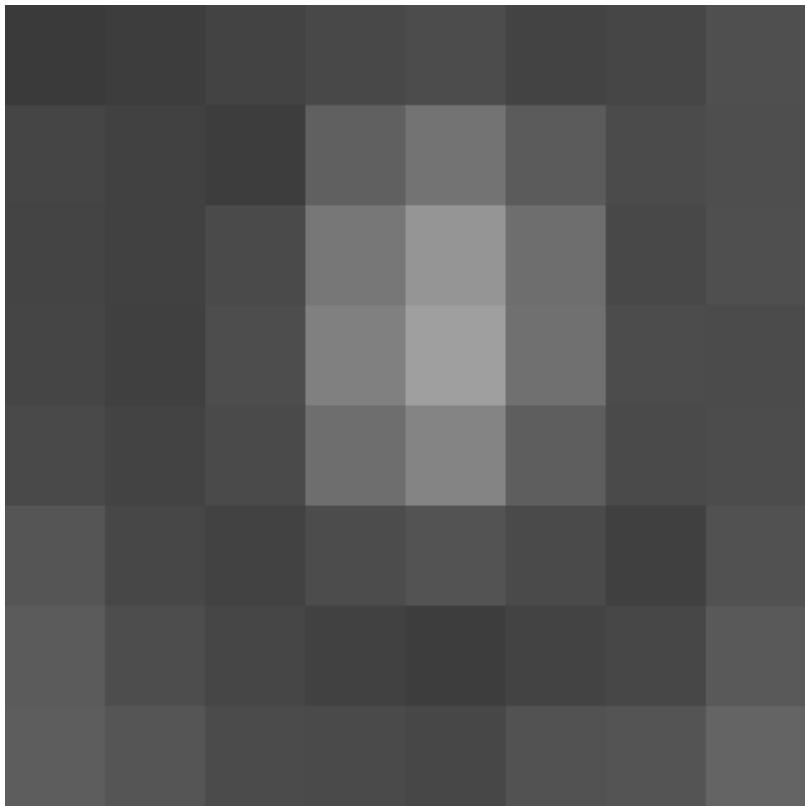
$$p_x(i) = p(x=i) = \frac{n_i}{n}$$

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

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

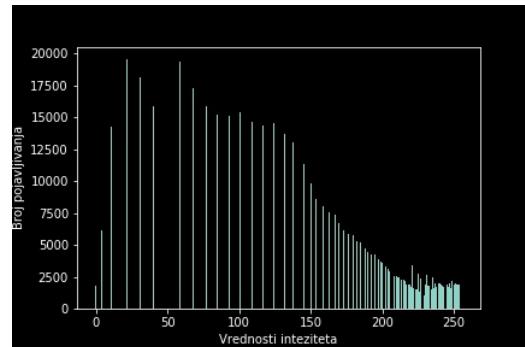
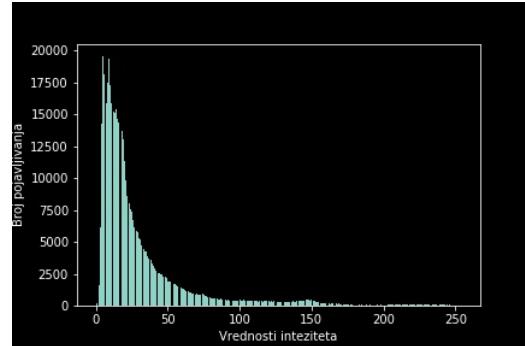
Kumulativna funkcija distribucije



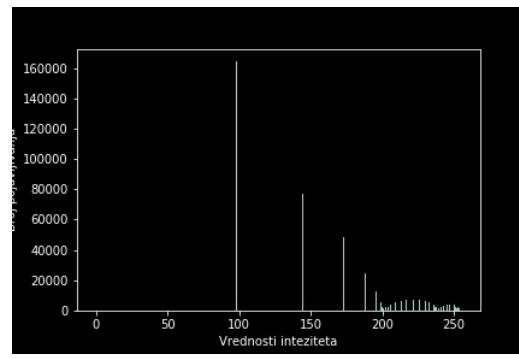
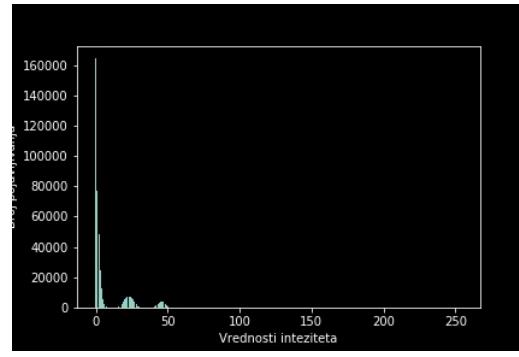
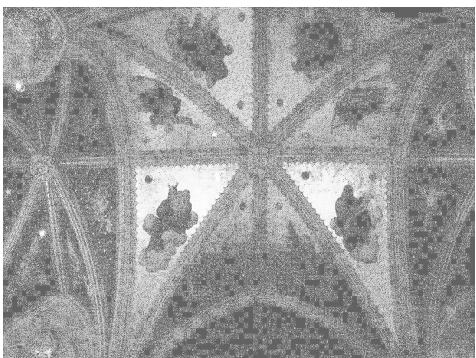
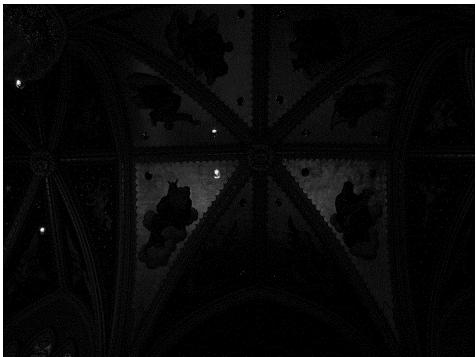


| v (intenzitet piksela) | cdf (v) | h(v) |
|------------------------|---------|------|
| 52 | 1 | 0 |
| 55 | 4 | 12 |
| 58 | 6 | 20 |
| 59 | 8 | 32 |
| 60 | 10 | 36 |
| 61 | 14 | 53 |
| 62 | 15 | 57 |
| 63 | 17 | 65 |
| 64 | 18 | 73 |
| 65 | 22 | 85 |
| ... | ... | ... |

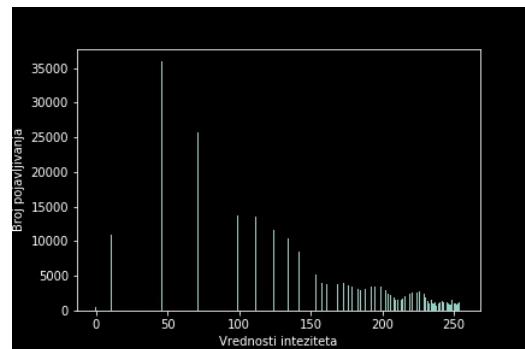
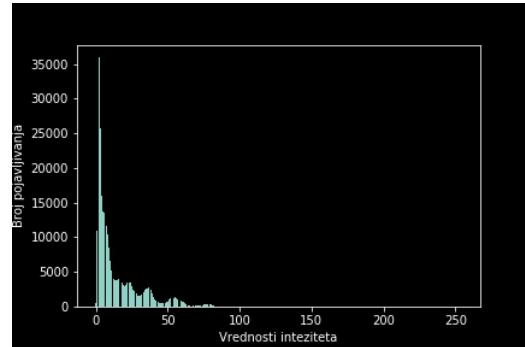
Poređenje



Poređenje



Poređenje



Primena

- Korekcija medicinskih snimaka
- Korekcija slika nebeskih tela (svemirska industrija)
- Korekcija slika dobijenih dronovima (vojna industrija)

Hvala na pažnji!