

PODSTAWY PRZETWARZANIA OBRAZÓW CYFROWYCH

Formaty obrazów cyfrowych

FORMATY OBRAZÓW CYFROWYCH:

- rastrowe
 - bezstratne
 - BMP, PNG, TIFF*, ...
 - stratne
 - jpg, gif, ...
- wektorowe
 - DTP:
 - ps, eps, pdf *, ...
 - grafika wektorowa
 - wmf, emf, svg, obj, ...
 - mapy
 - shp, ...
- chmura punktów

2D / 3D

Krótko o grafice wektorowej

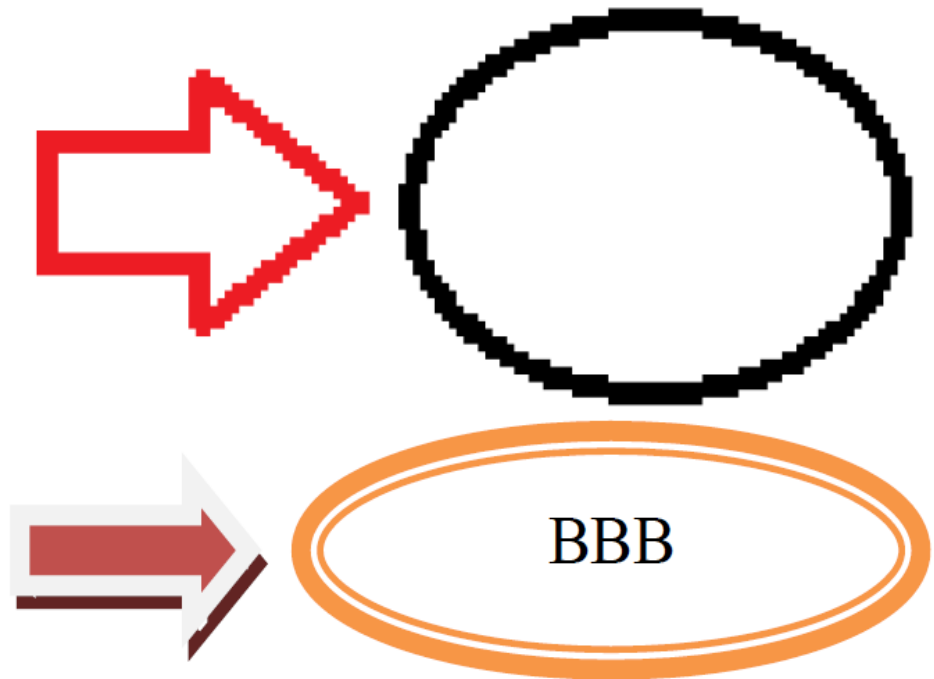
grafika rastrowa



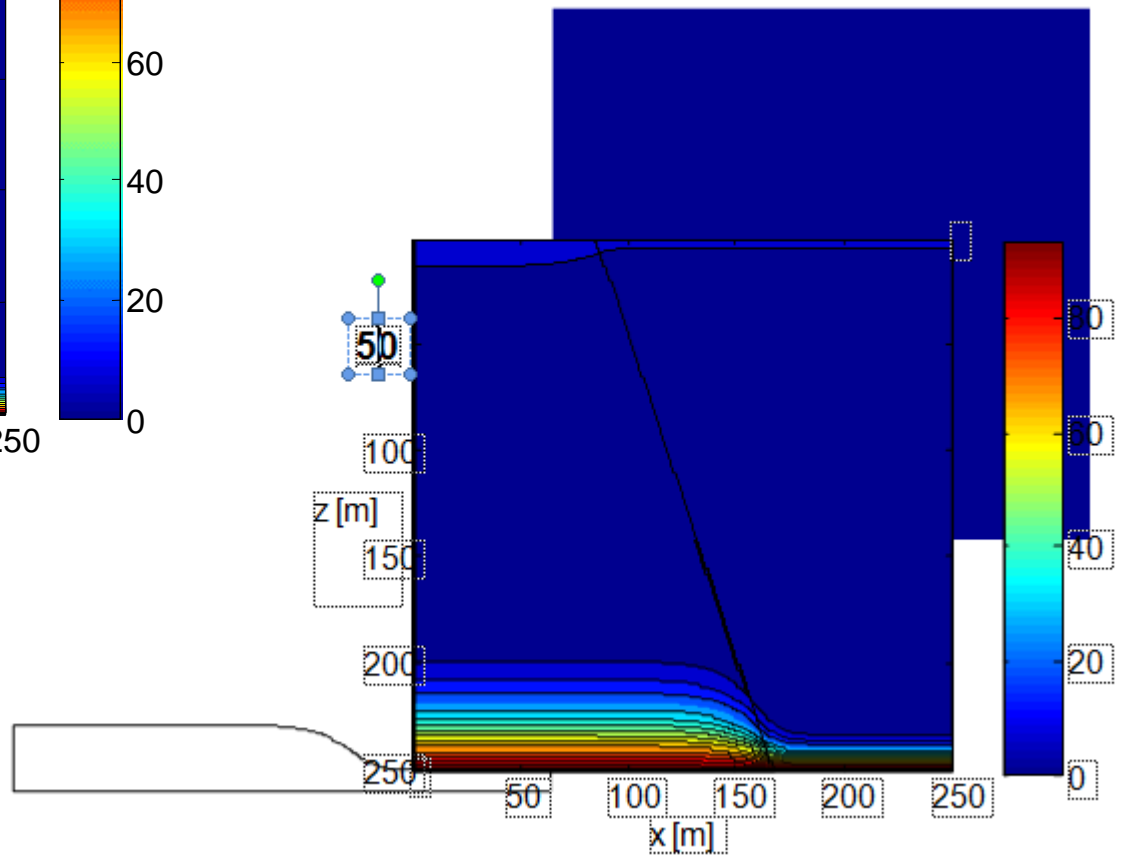
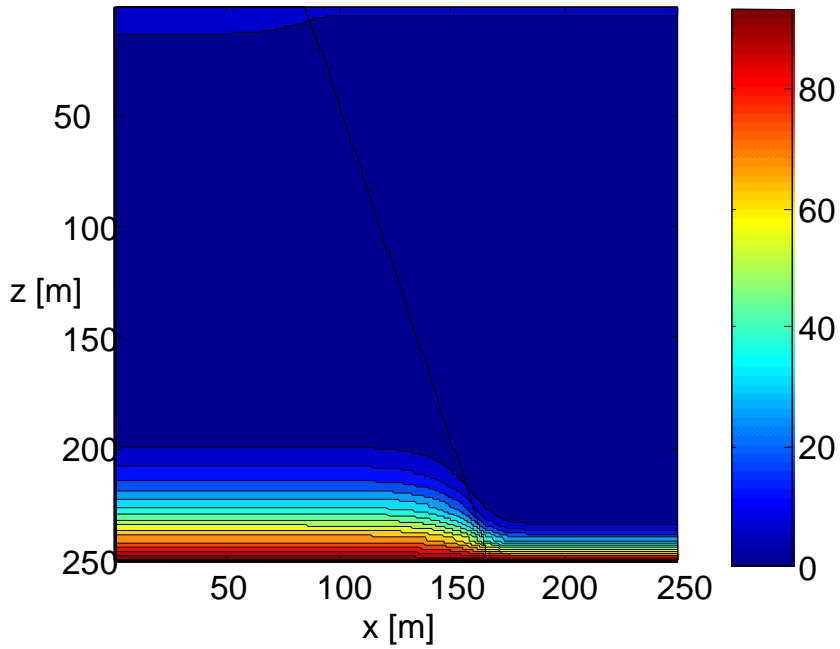
grafika wektorowa

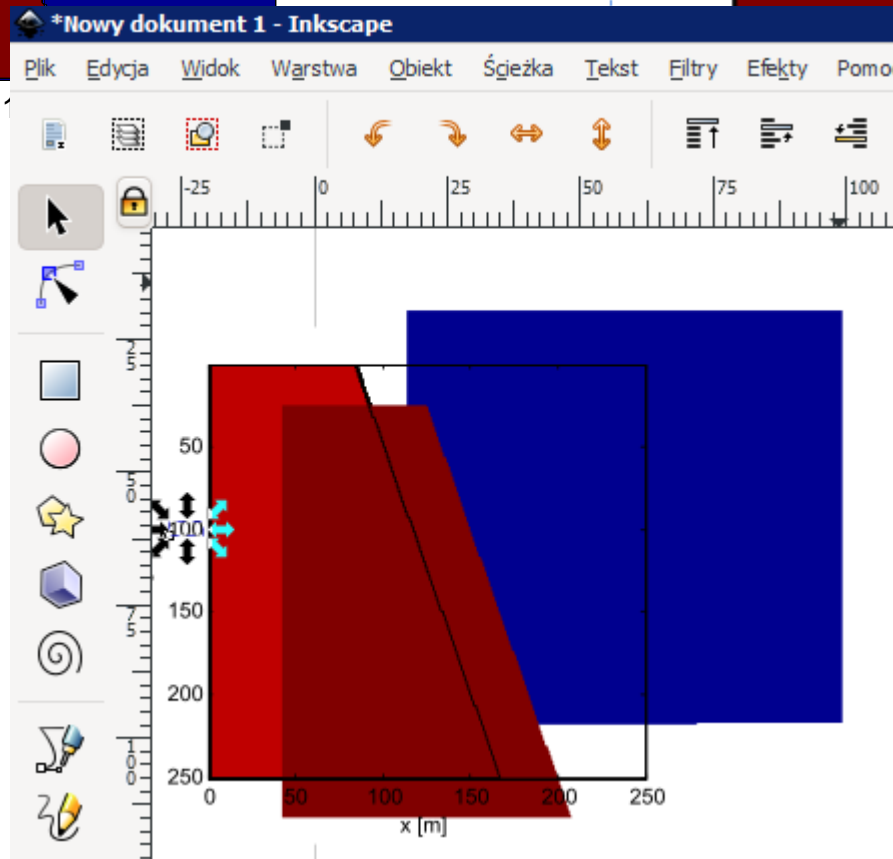
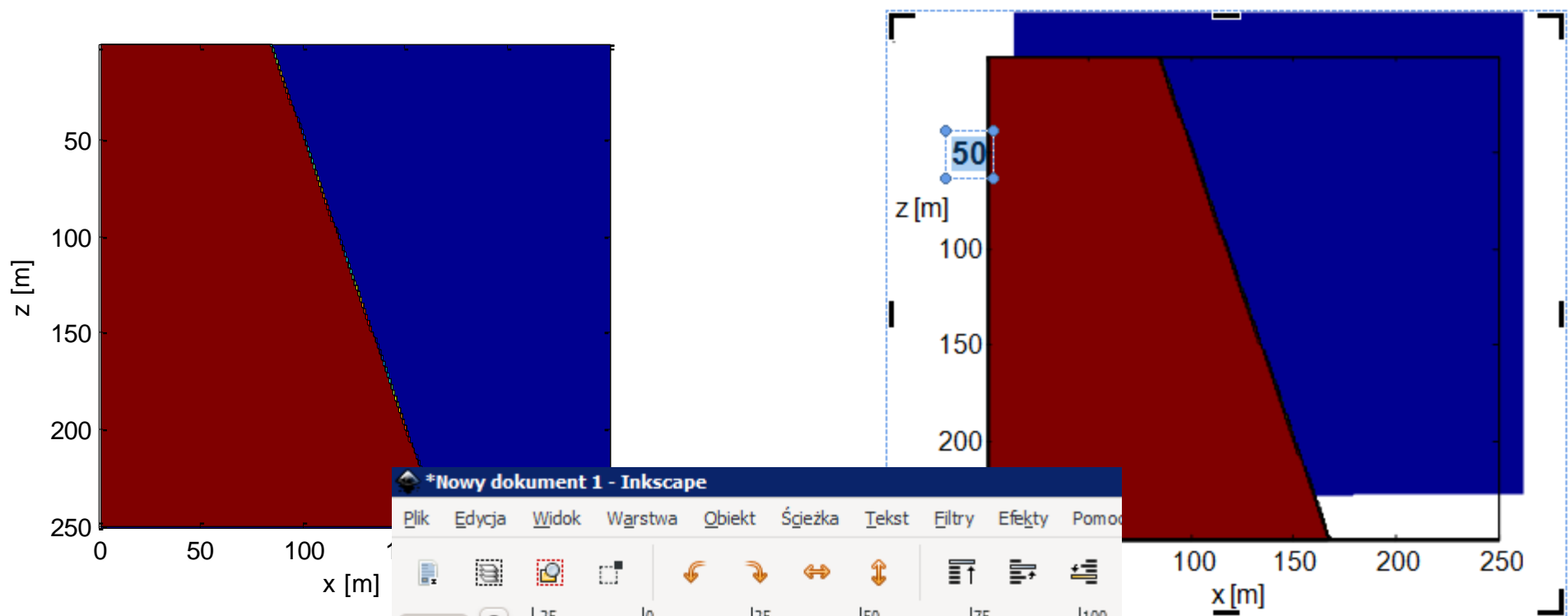


po powiększeniu obrazy wyglądają następująco:



Krótko o grafice wektorowej

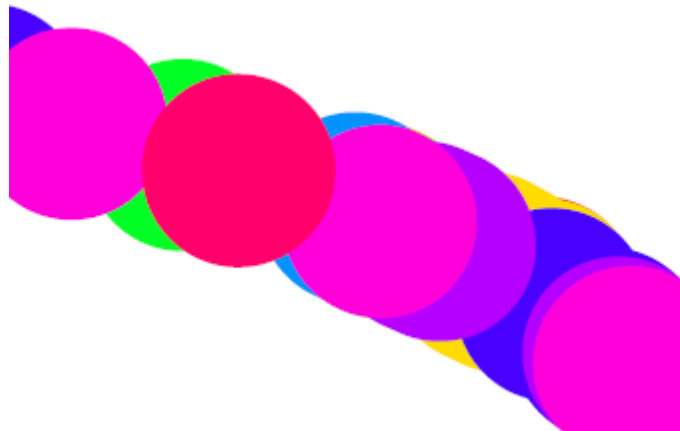
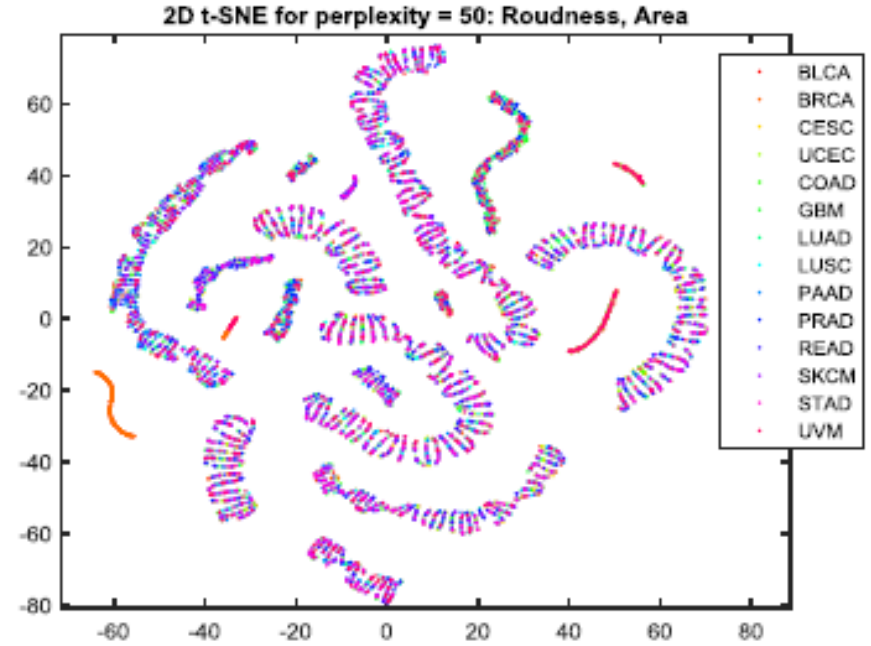
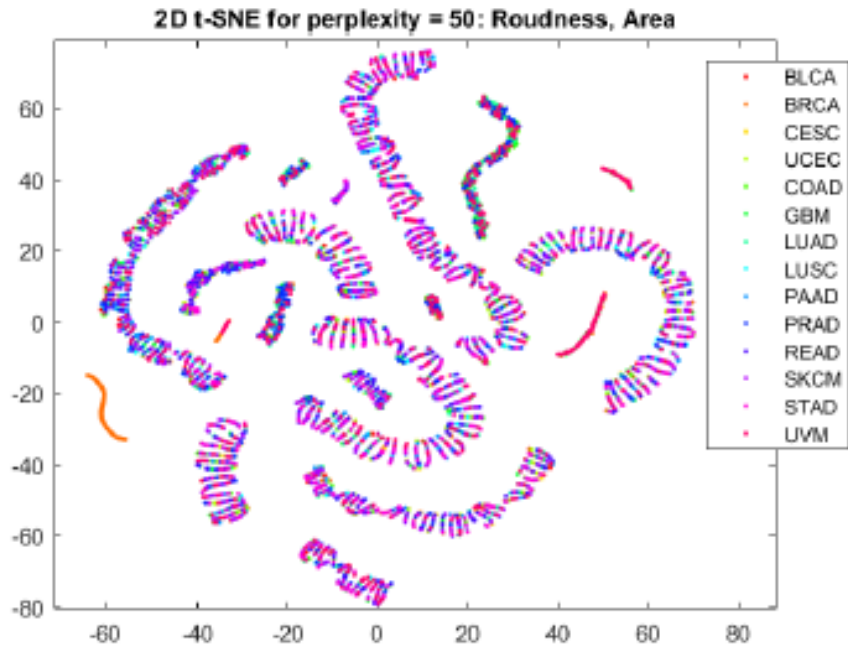


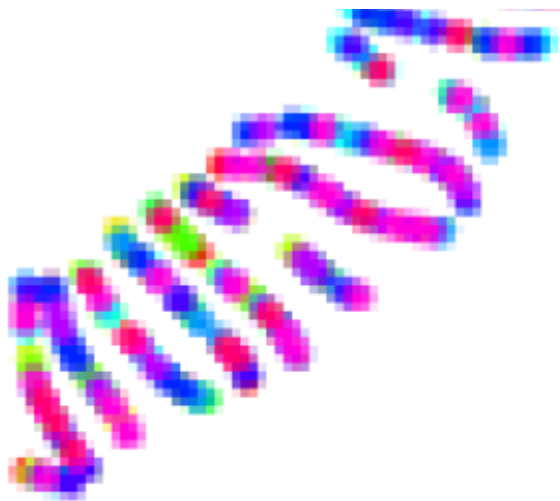


MS Word

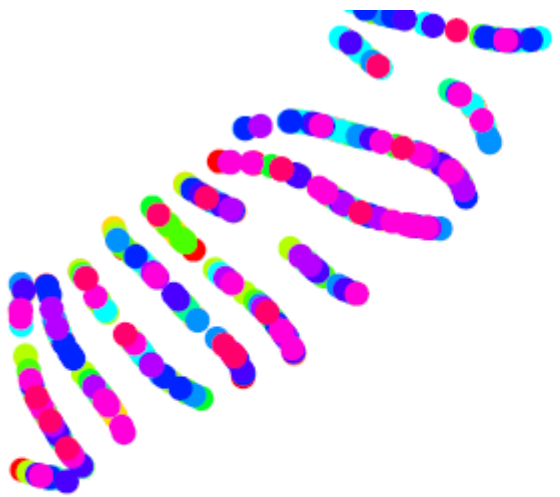
Inkscape

Krótko o grafice wektorowej





- READ
- SKCM
- STAD
- UVM



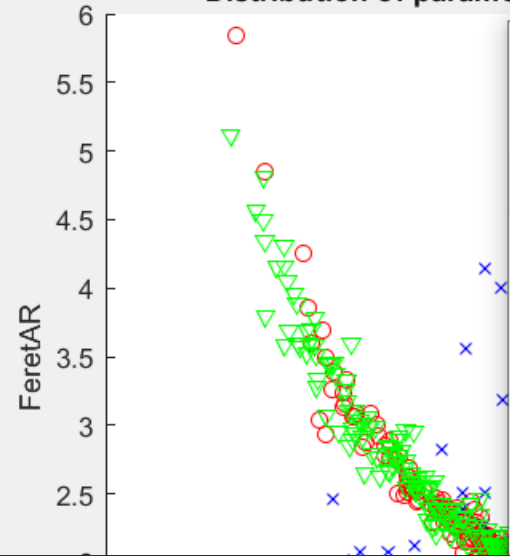
- READ
- SKCM
- STAD
- UVM

$$S_N = \frac{N}{1 + (N - 1)\alpha}$$

$$S_N = \frac{N}{1 + (N - 1)\alpha}$$



Distribution of parameters: Roudness, FeretAR



Save As

Ten komputer > Windows (C:)

Przeszukaj: Windows (C:)

Organizuj Nowy folder

Nazwa	Data modyfikacji	Typ
LUAD-LUSC-PAA		
MATLAB		
EBro	19.06.2019 12:58	Folder plików

- EPS file (*.eps)
- Bitmap file (*.bmp)
- Enhanced metafile (*.emf)
- JPEG image (*.jpg)
- MATLAB Figure (*.fig)
- Paintbrush 24-bit file (*.pcx)
- Portable Bitmap file (*.pbm)
- Portable Document Format (*.pdf)
- *.pgm)
- ics file (*.png)
- ppm)
- s file (*.svg)
- age (*.tif)

Zapisz Anuluj

Wklejanie specjalne

Źródło: Wykres programu Microsoft Office Excel

Jako:

- Wklej: Wykres programu Microsoft Office Excel - obiekt
- Wklej łącze: Obraz (Windows Metafile)
- Mapa bitowa
- Obraz (rozszerzony metaplik)**
- Obraz (GIF)
- Obraz (PNG)
- Obraz (JPEG)
- Obiekt graficzny pakietu Microsoft Office

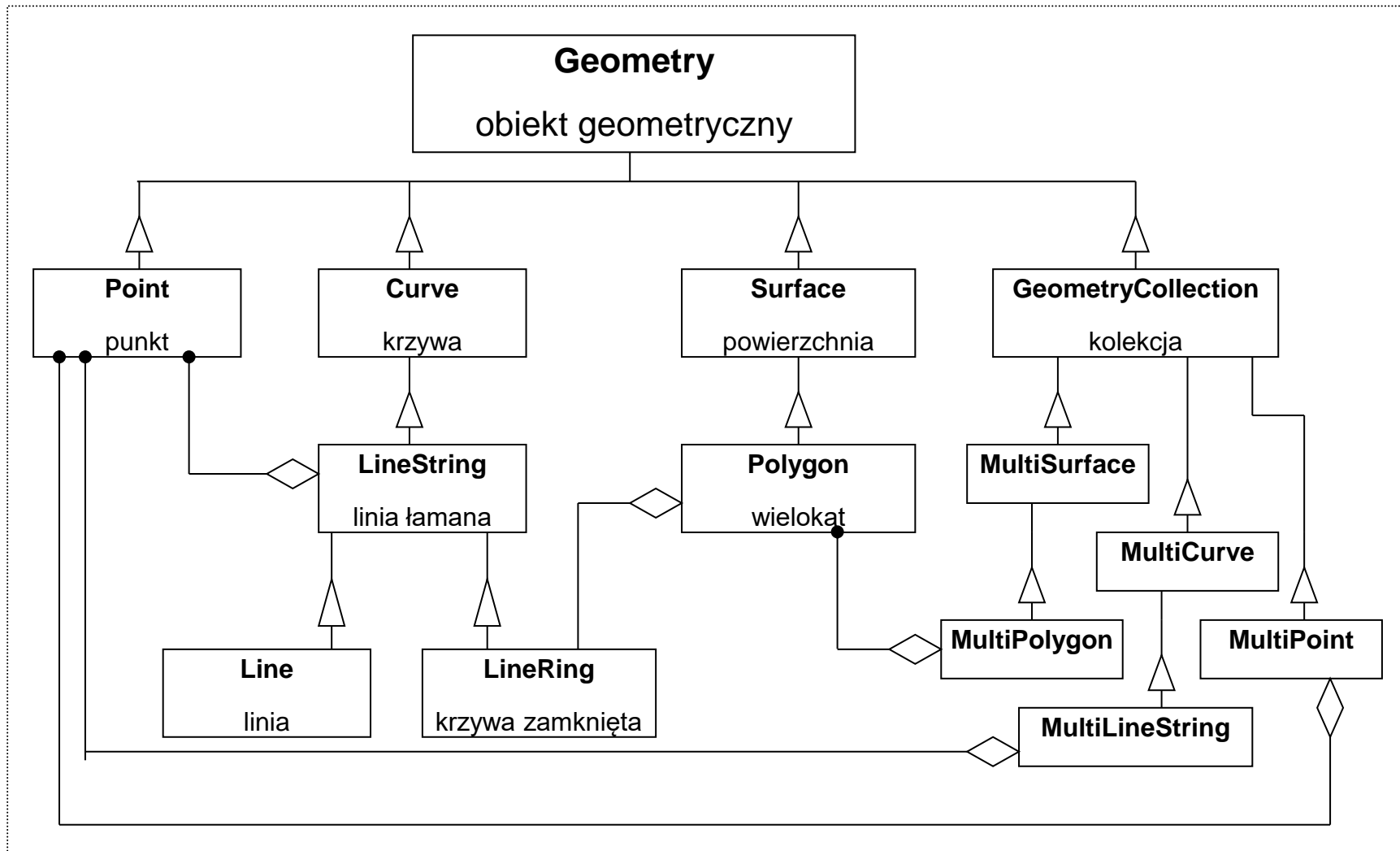
Wyświetl jako ikonę

Wynik

Zawartość Schowka jest wstawiana jako rozszerzony metaplik.

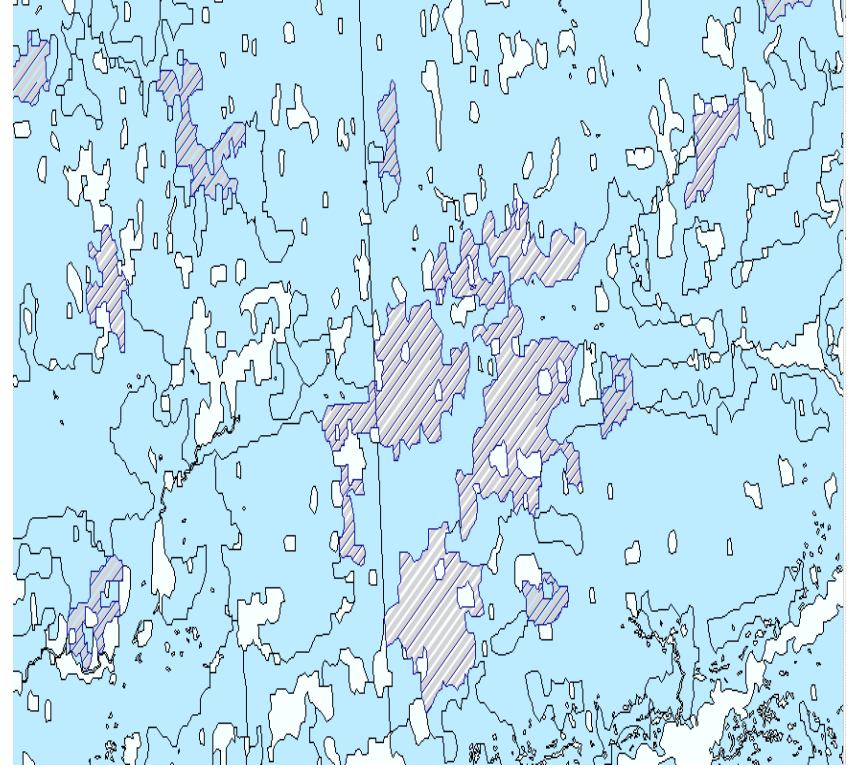
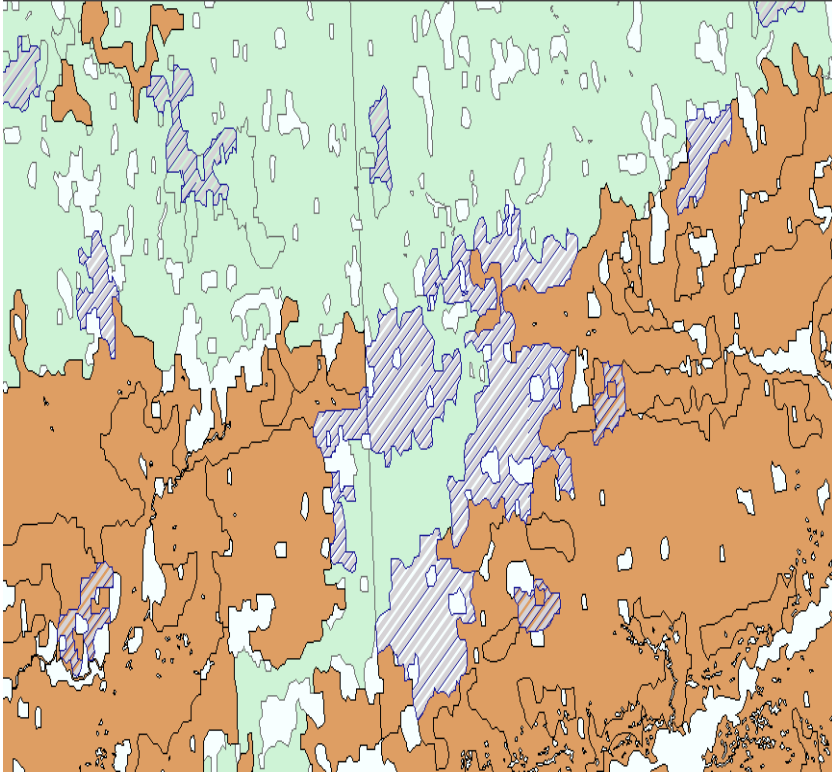
OK Anuluj

Krótko o grafice wektorowej



Część formatów definiuje wypełnienia, tekstury ...

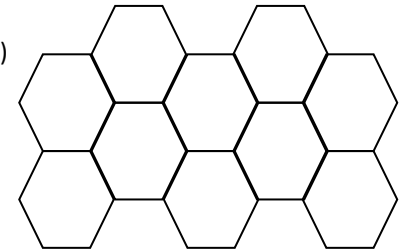
Krótko o grafice wektorowej



tundra, swamp, trees

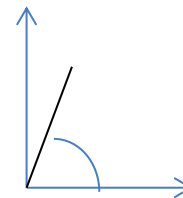
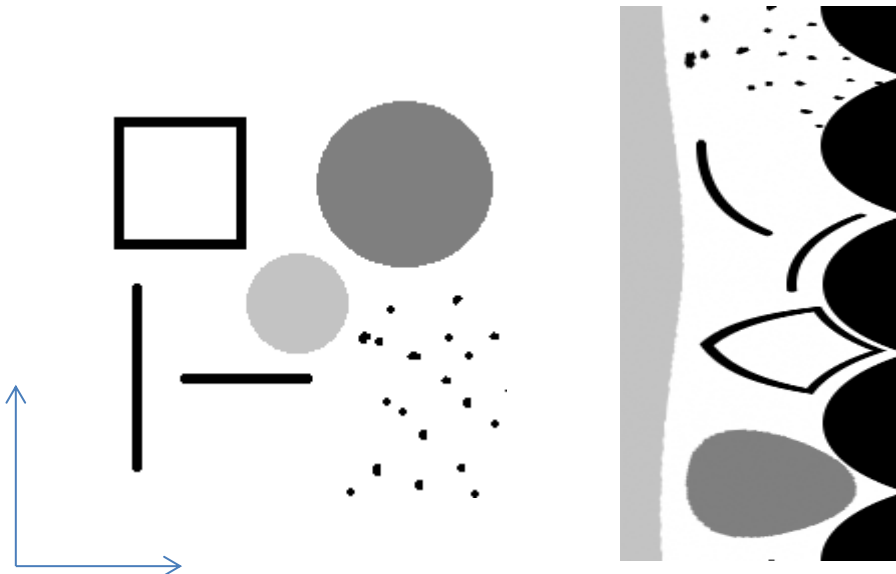
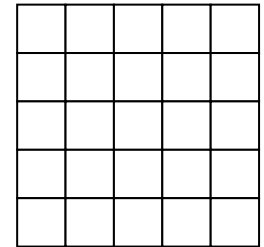
GRAFIKA RASTROWA (2D)

Najmniejszym elementem obrazu rastrowego jest **piksel**. (picture element)
Odpowiada on skwantyzowanej części widoku.



Organizacja pikseli:

- w zdecydowanej większości jest to siatka zbudowana z kwadratów,
 - rzadko heksagonalna;
- w zdecydowanej większości siatka jest odwzorowaniem rzeczywistości w układzie kartezyjskim,
 - rzadko: w układzie biegunowym, logarytmiczno-biegunowym



Metryka piksela (metadane):
-DPI (dots per inch)
- pixel spacing

3D ? -> voxel

GRAFIKA RASTROWA

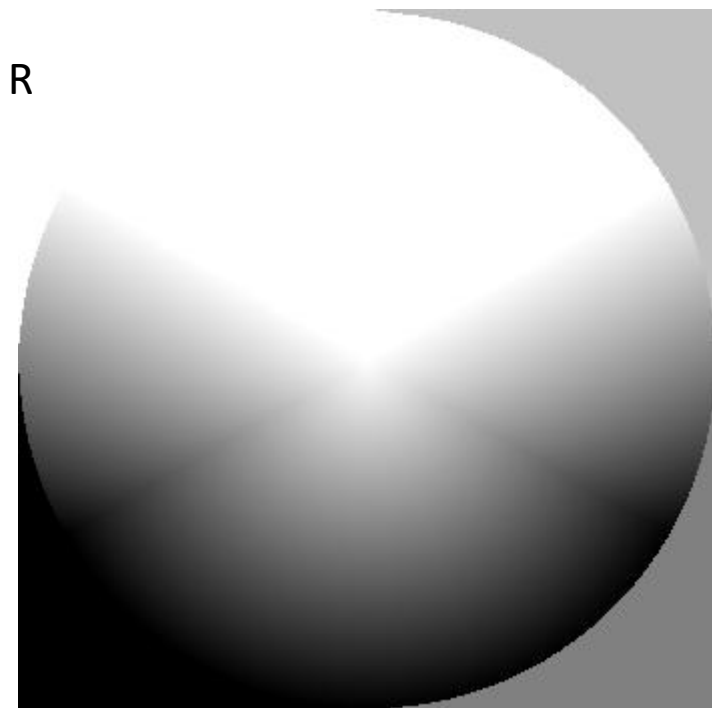
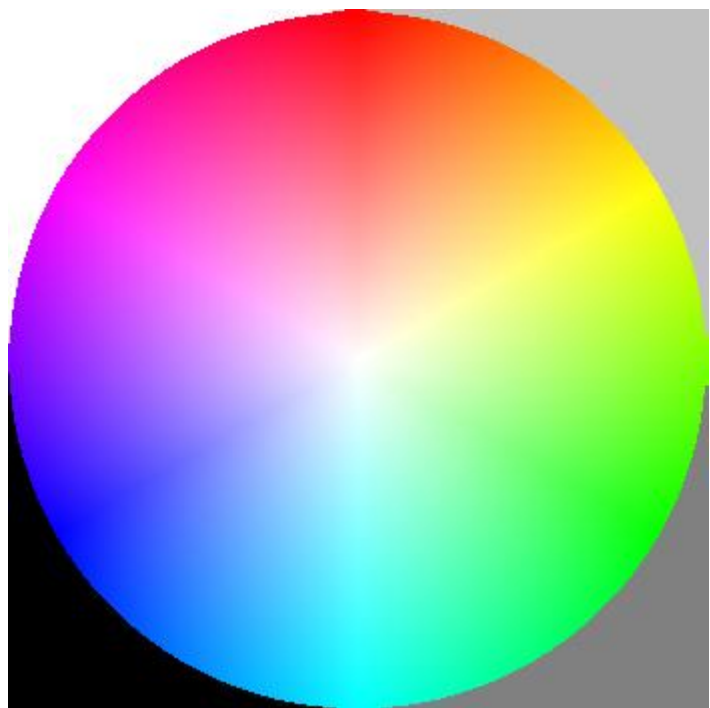
Głębina kolorów

- obraz monochromatyczny (jeden kolor, zmienna intensywność, najczęściej skala szarości):
 - 1 bit – (1bpp) 0/1, czarny/biały,
 - 2 bit – (2bpp) 4 stopnie jasności lub paleta,
 - 4 bit – (4bpp) 16 stopni jasności lub paleta,
 - 8 bit – (8bpp) 256 stopni jasności lub paleta
 - 16 bit – (16bpp) 65536 stopni szarości.
- obraz barwny (najczęściej przestrzeń barw RGB):
 - 1 bit – paleta - dwa zdefiniowane kolory,
 - 4 bit - paleta - 16 zdefiniowanych kolorów,
 - 8 bit – paleta – 256 zdefiniowanych kolorów,
 - 15/16 bit – high color – 5 bit dla R,G,B ew. 6 bit dla G,
 - 24 bit – 8bit R x 8bit G x 8bit B (true color),
 - 32 bit - 8bit R x 8bit G x 8bit B x kanał alfa (przezroczystość, ARGB albo RGBA).

opcjonalnie: wybór koloru oznaczającego przezroczystość

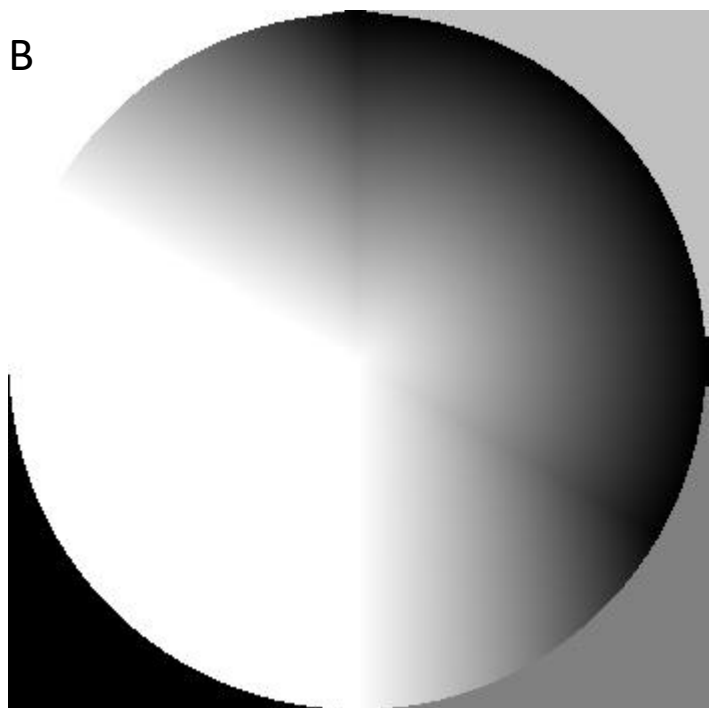
Przestrzenie barw

- RGB (Red-Green-Blue)
- CIE Lab (International Commission on Illumination)
- HSV (HSB) / HSL (Hue-Saturation-Brightness/Value - Lightness)
- CMYK (Cyan-Magenta-Yellow-black)
- YCbCr / YUV
- XYZ,
- LMS, ...

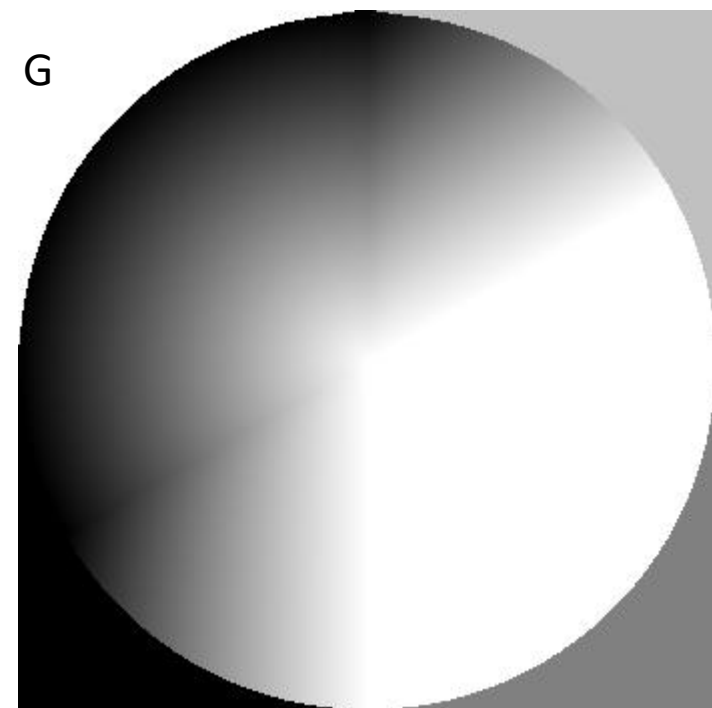


R

RGB



B



G

RGB – 24 bpp – 8b/8b/8b

0, 0, 0

128, 128, 128

255, 255, 255

255, 0, 0

0, 255, 0

0, 0, 255

255, 255, 0

0, 255, 255

255, 0, 255

255, 128, 0

0, 128, 255

255, 0, 128

64, 64, 64

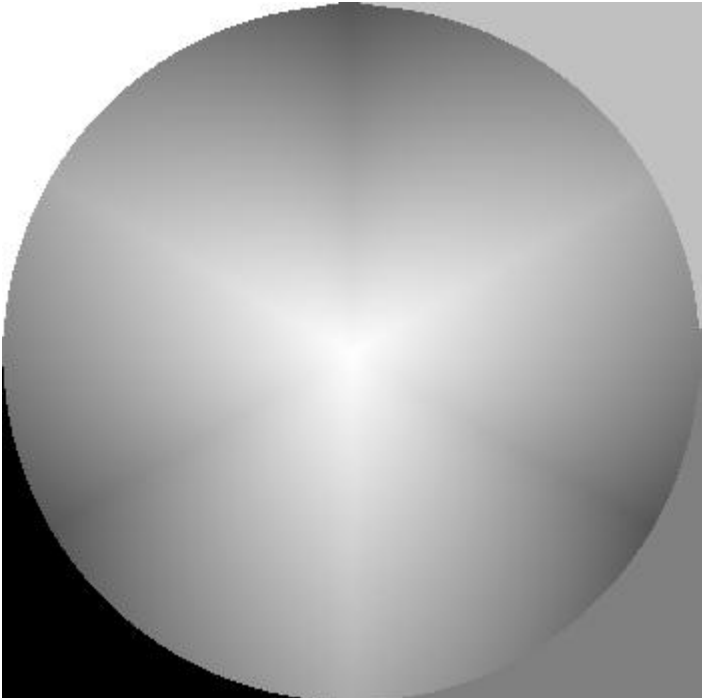
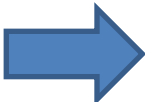
192, 192, 192

224, 224, 224

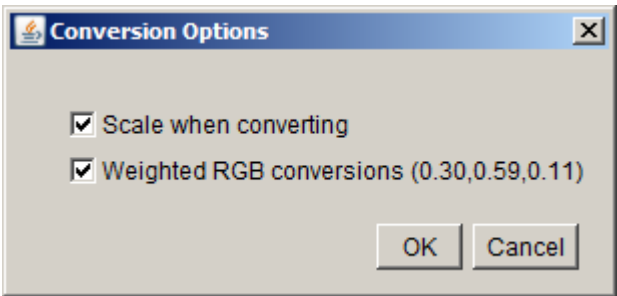
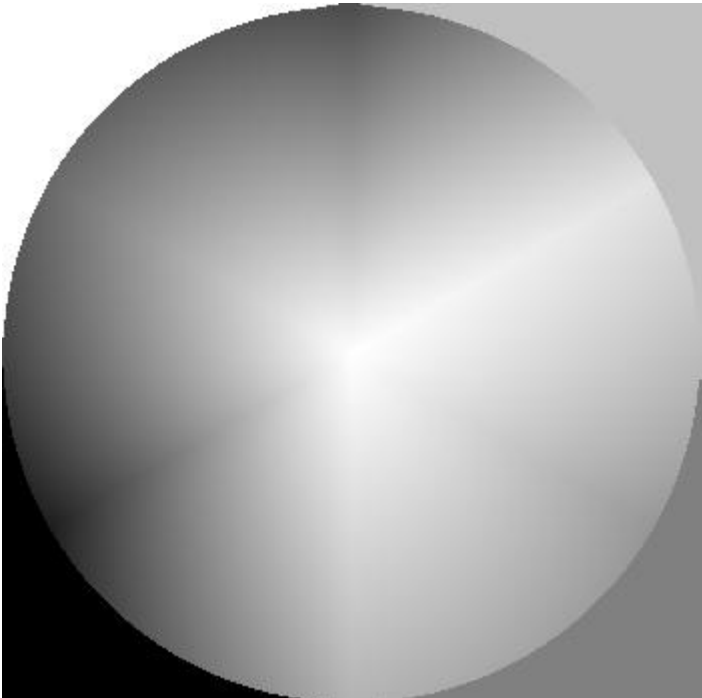
RGB – konwersja do skali szarości

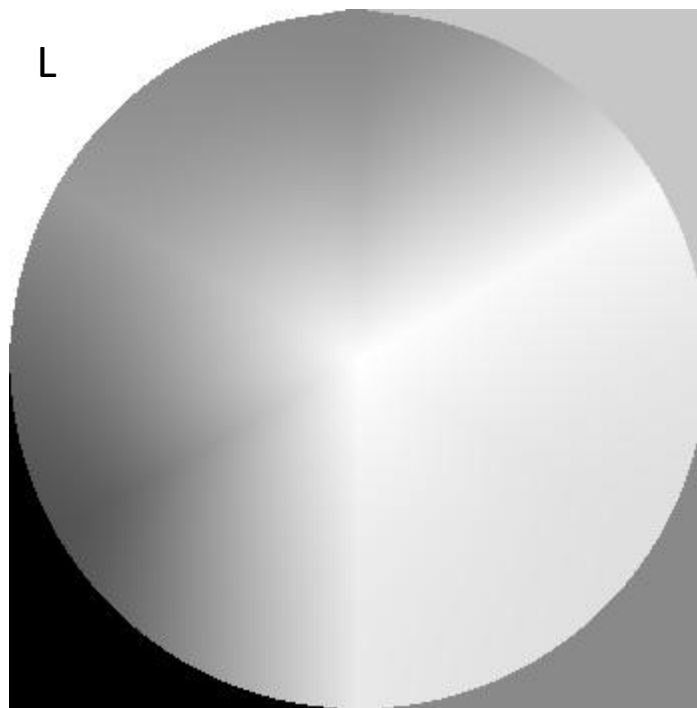
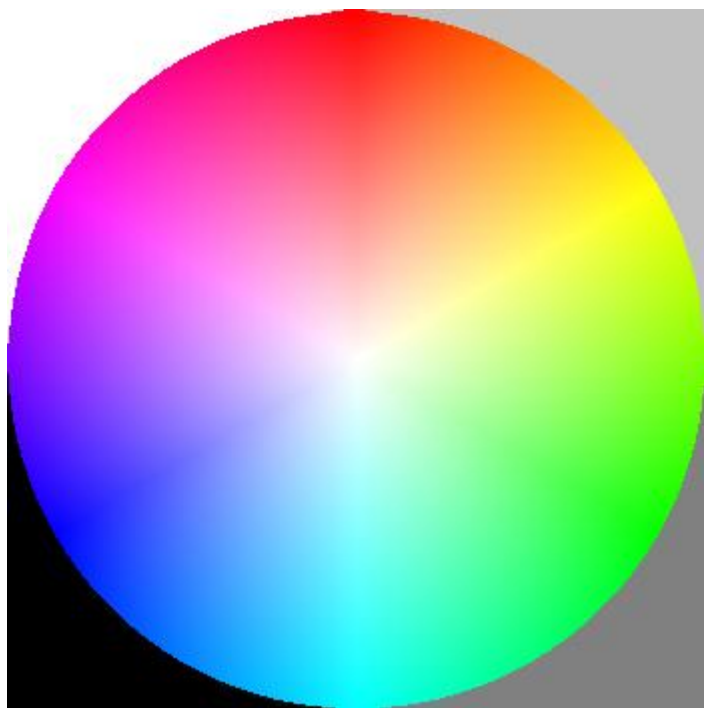


$I = (R+G+B)/3$
intensywność



$Y' = 0.299 * R + 0.587 * G + 0.114 * B$





(CIE) Lab

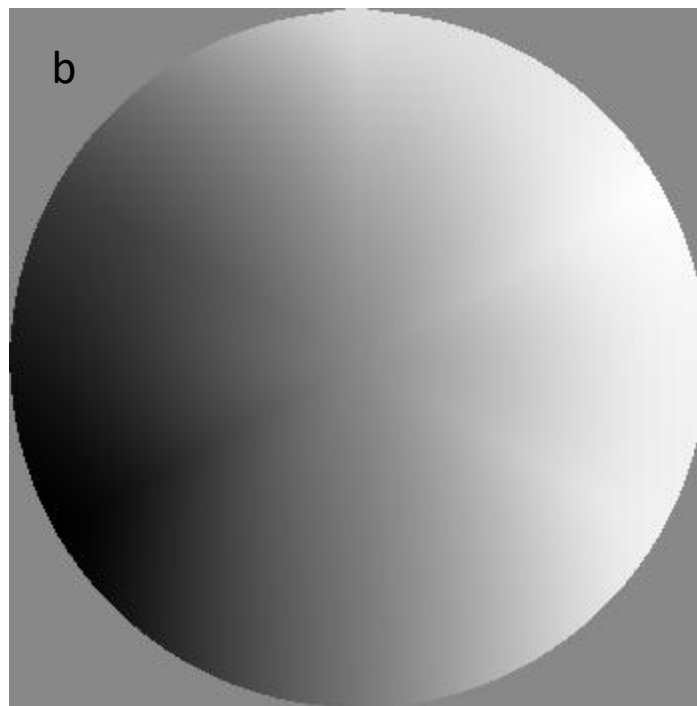
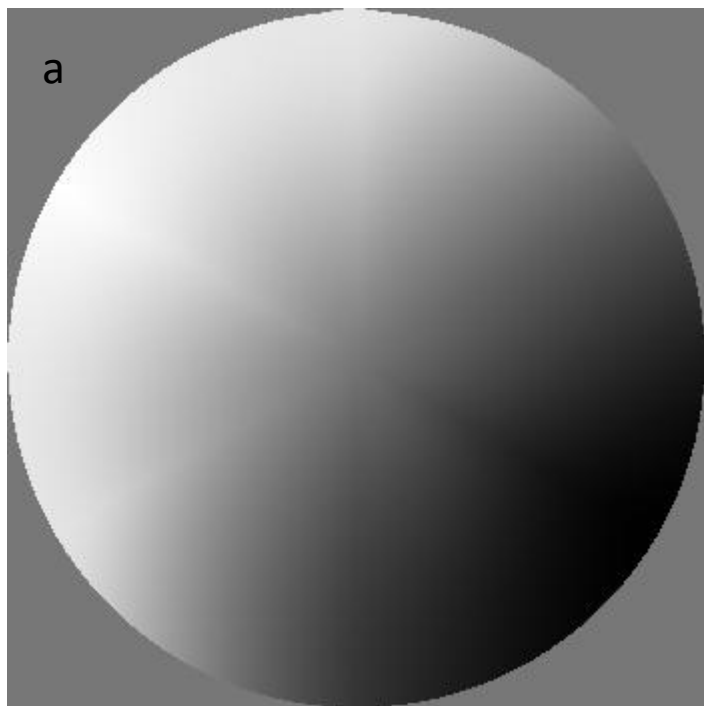
L

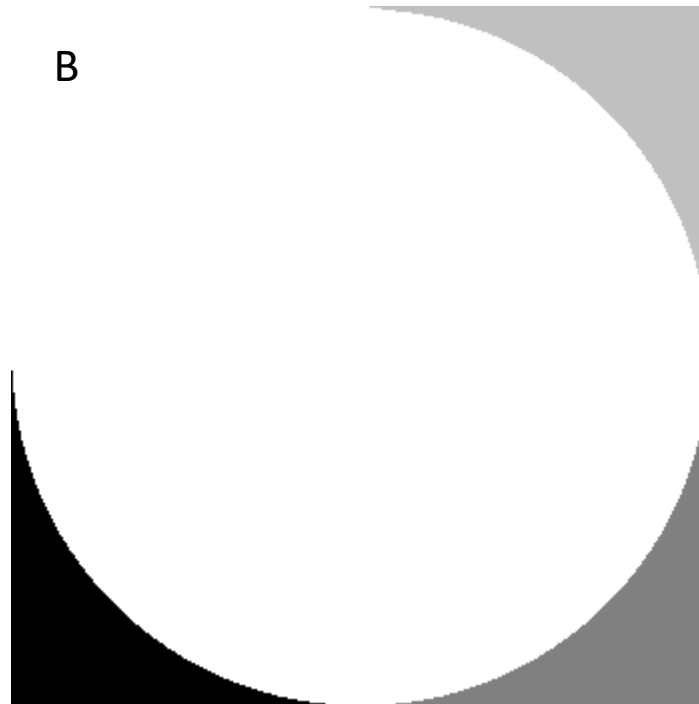
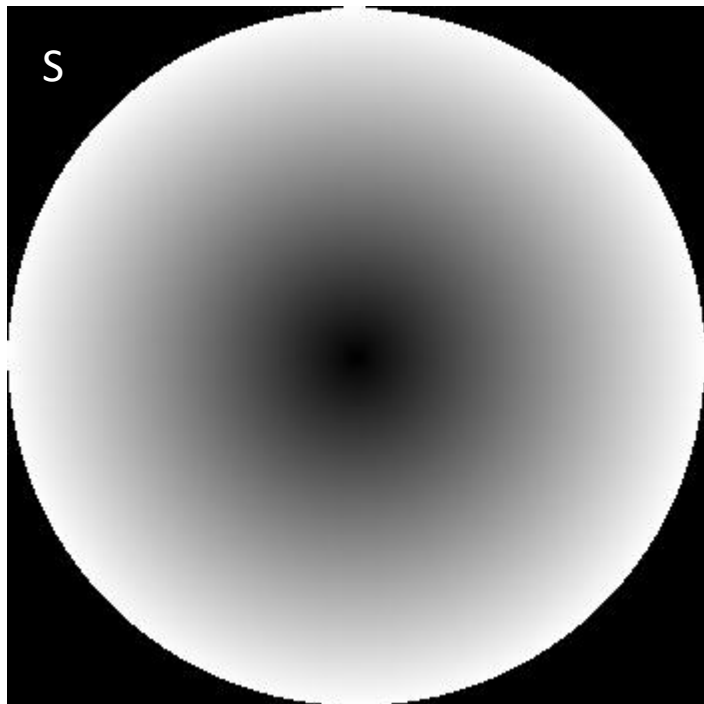
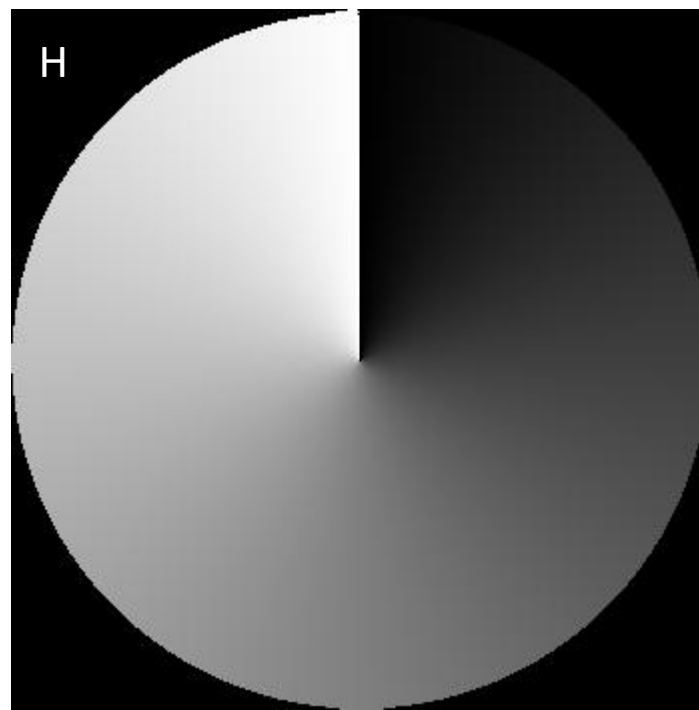
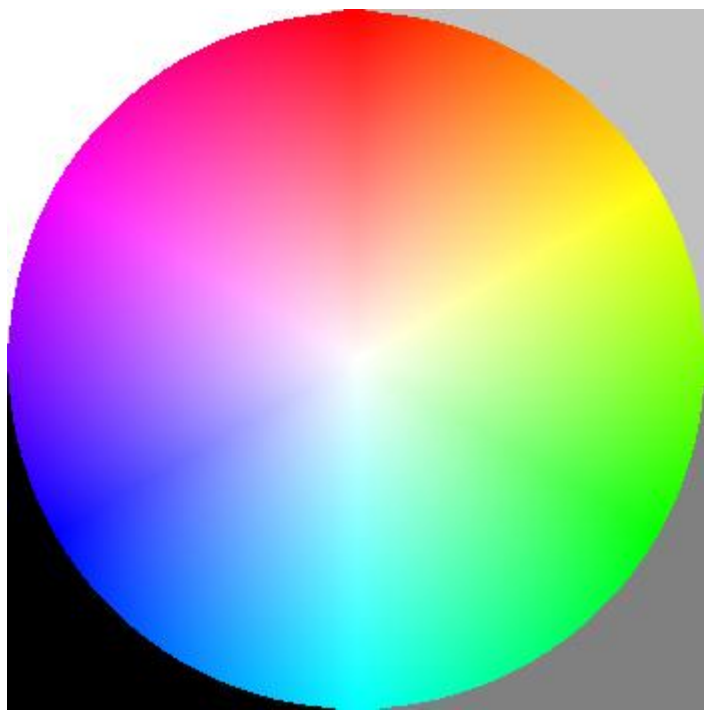
Zależności
(przybliżone!)

$L: R + G + B$

$\alpha: R+G-B$
(yellow-blue)

$\beta: R-G$
(red-green)





HSB

Hue
Saturation
Brightness

Hue:
odcień,
koło barw –
wartość kątowna

Saturation:
nasycenie

Brightness
Value
(max jest najjaśniejszym
kolorem)

a
Lightness
(max jest biały)

Konwersje między przestrzeniami barw

RGB -> XYZ -> LMS -> Lab

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} 0.5141 & 0.3239 & 0.1604 \\ 0.2651 & 0.6702 & 0.0641 \\ 0.0241 & 0.1228 & 0.8444 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

$$\begin{bmatrix} L \\ M \\ S \end{bmatrix} = \begin{bmatrix} 0.3897 & 0.6890 & 0.0787 \\ 0.2298 & 1.1834 & 0.0464 \\ 0.0000 & 0.0000 & 1.0000 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}$$

$$l = \log(L)$$

$$m = \log(M)$$

$$s = \log(S)$$

$$\begin{bmatrix} L \\ a \\ b \end{bmatrix} = \begin{bmatrix} \frac{1}{\sqrt{3}} & 0 & 0 \\ 0 & \frac{1}{\sqrt{6}} & 0 \\ 0 & 0 & \frac{1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & -2 \\ 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} l \\ m \\ s \end{bmatrix}$$

Konwersje między przestrzeniami barw

$$\begin{aligned}r &= R/255 \\g &= G/255 \\b &= B/255\end{aligned}$$

RGB -> HSV

$$\begin{aligned}M &= \max(r, g, b) \\m &= \min(r, g, b) \\d &= M - m &= 2(V - L)\end{aligned}$$

$$V = M$$

$$S = \begin{cases} \frac{d}{M} & M \neq 0 \\ 0 & M = 0 \end{cases}$$
$$H = \begin{cases} 0^\circ & d = 0 \\ 60^\circ \times \left(\frac{g - b}{d} \bmod 6 \right) & M = r \\ 60^\circ \times \left(\frac{b - r}{d} + 2 \right) & M = g \\ 60^\circ \times \left(\frac{r - g}{d} + 4 \right) & M = b \end{cases}$$

Czasem się przydaje ...



HSB: S

Czasem się przydaje ...

HSB: H

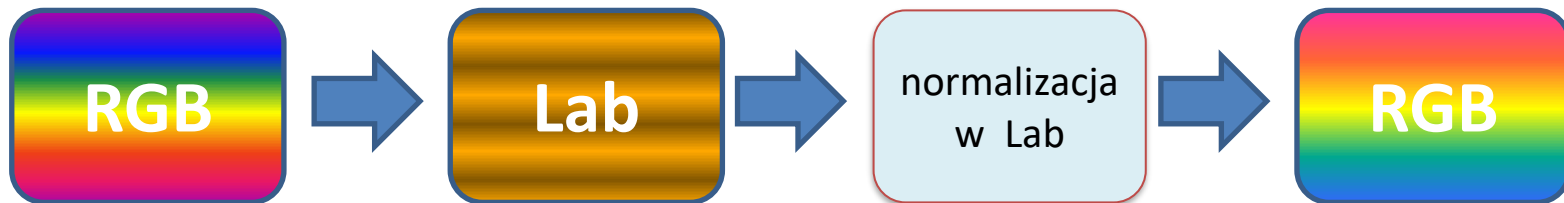




A czasem nie ...

HSB: H

Transfer Kolorów



$$\mu = \frac{1}{N} \sum_{i=1}^N A_i$$

$$s = \sqrt{\frac{1}{N-1} \sum_{i=1}^N |A_i - \mu|^2}$$

$$L^* = L - \langle L \rangle$$

$$a^* = a - \langle a \rangle$$

$$b^* = b - \langle b \rangle$$

$$L' = \frac{\sigma_t^L}{\sigma_s^L} L^*$$

$$a' = \frac{\sigma_t^a}{\sigma_s^a} a^*$$

$$b' = \frac{\sigma_t^b}{\sigma_s^b} b^*$$

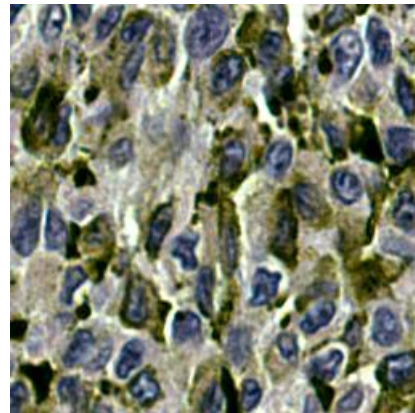
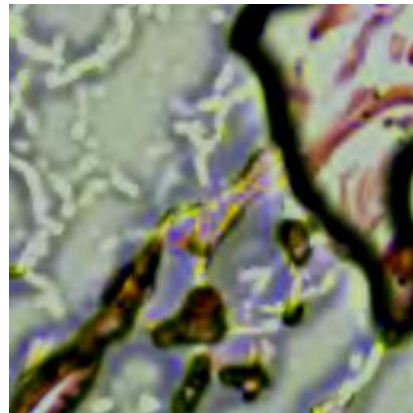
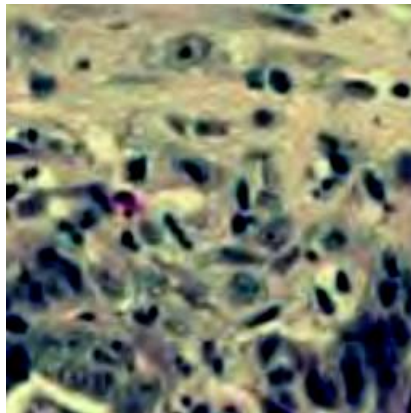
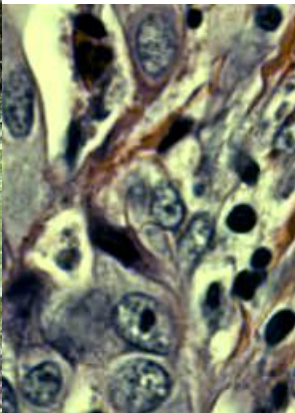
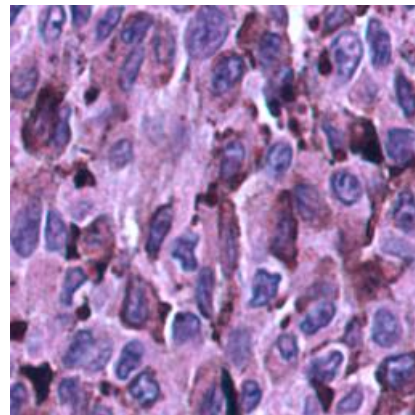
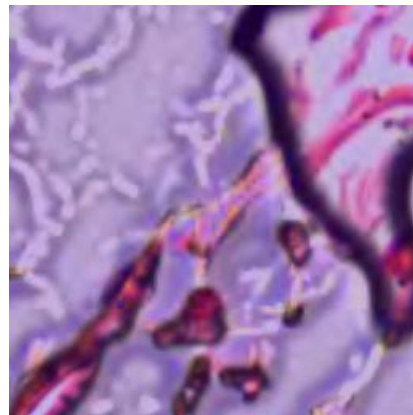
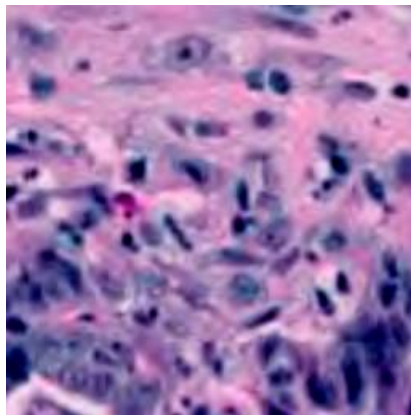
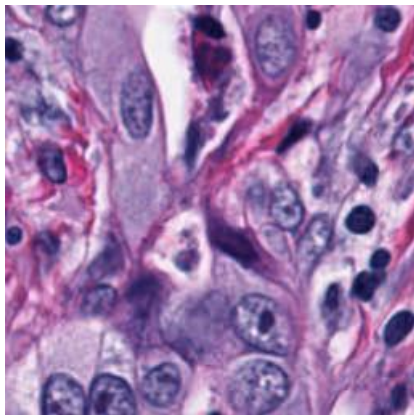
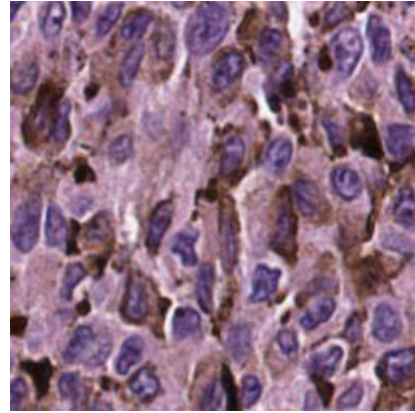
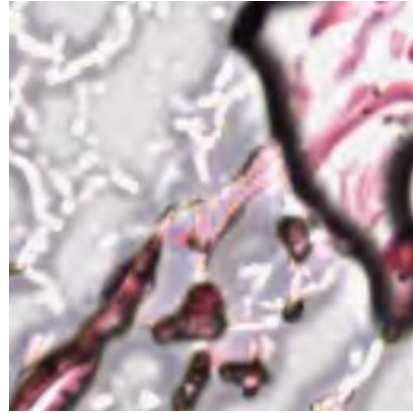
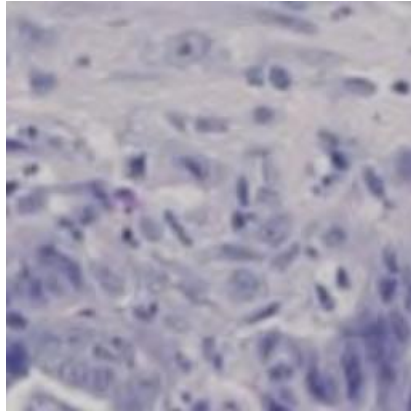
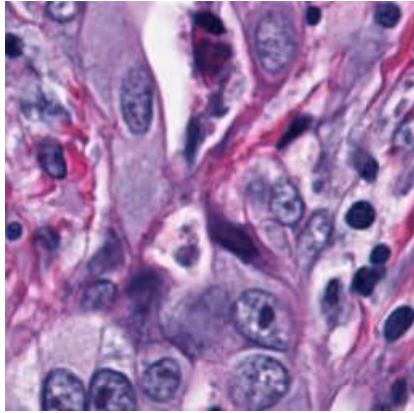
Normalizacja parametrów Lab obrazu docelowego (target) do parametrów Lab obrazu źródłowego (source)

Reinhard, E., Adhikhmin, M., Gooch, B., & Shirley, P. (2001):

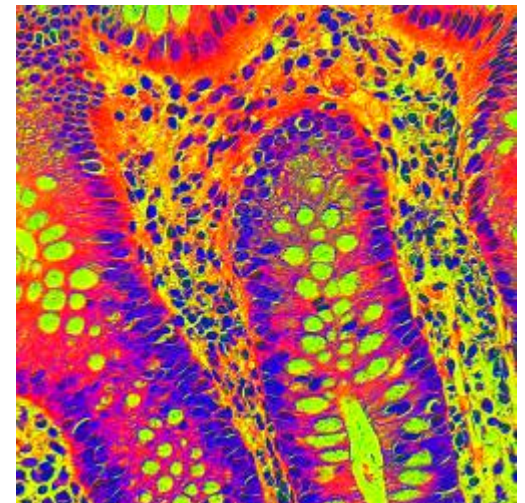
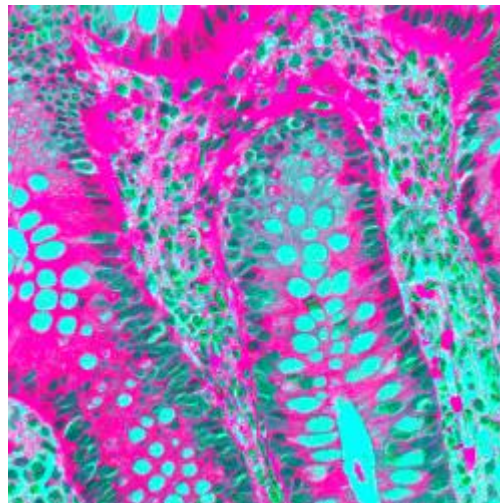
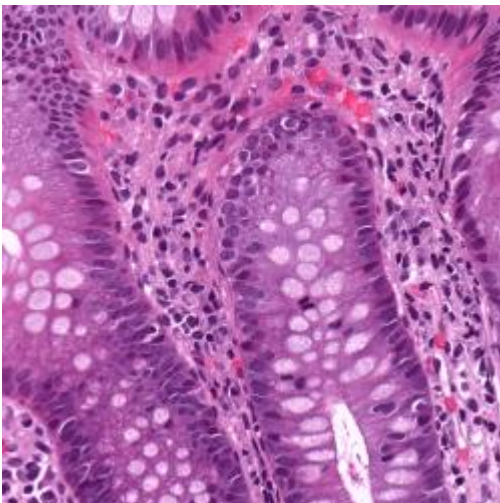
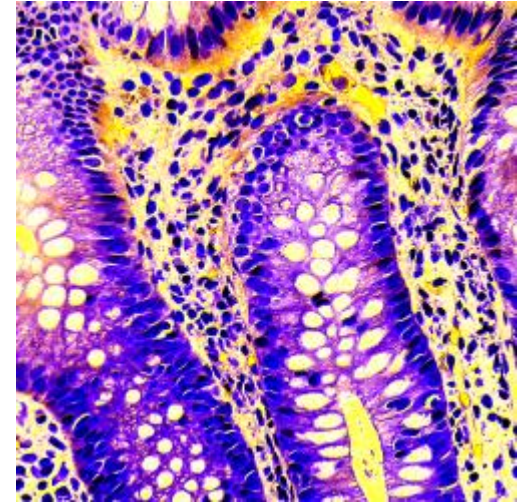
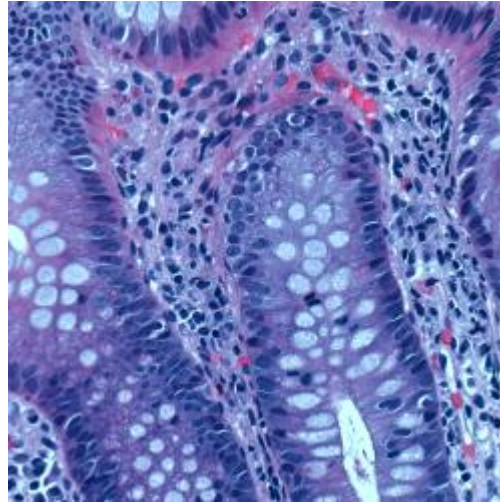
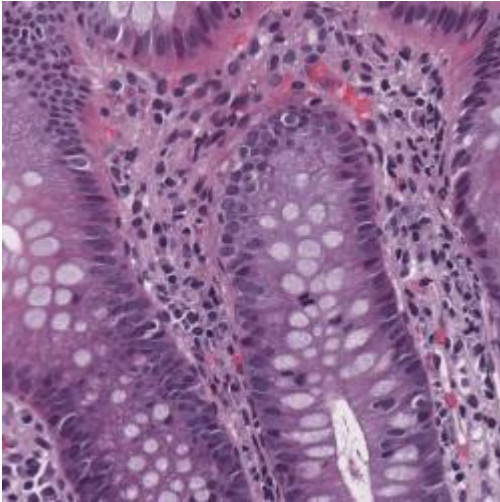
Color transfer between images. IEEE Computer graphics and applications, 21(5), 34-41.

Onder, D., Zengin, S., and Sarioglu, S. (2014) A review on color normalization and color deconvolution methods in histopathology. Applied Immunohistochemistry & Molecular Morphology 22.10 (2014): 713-719.

Transfer Kolorów



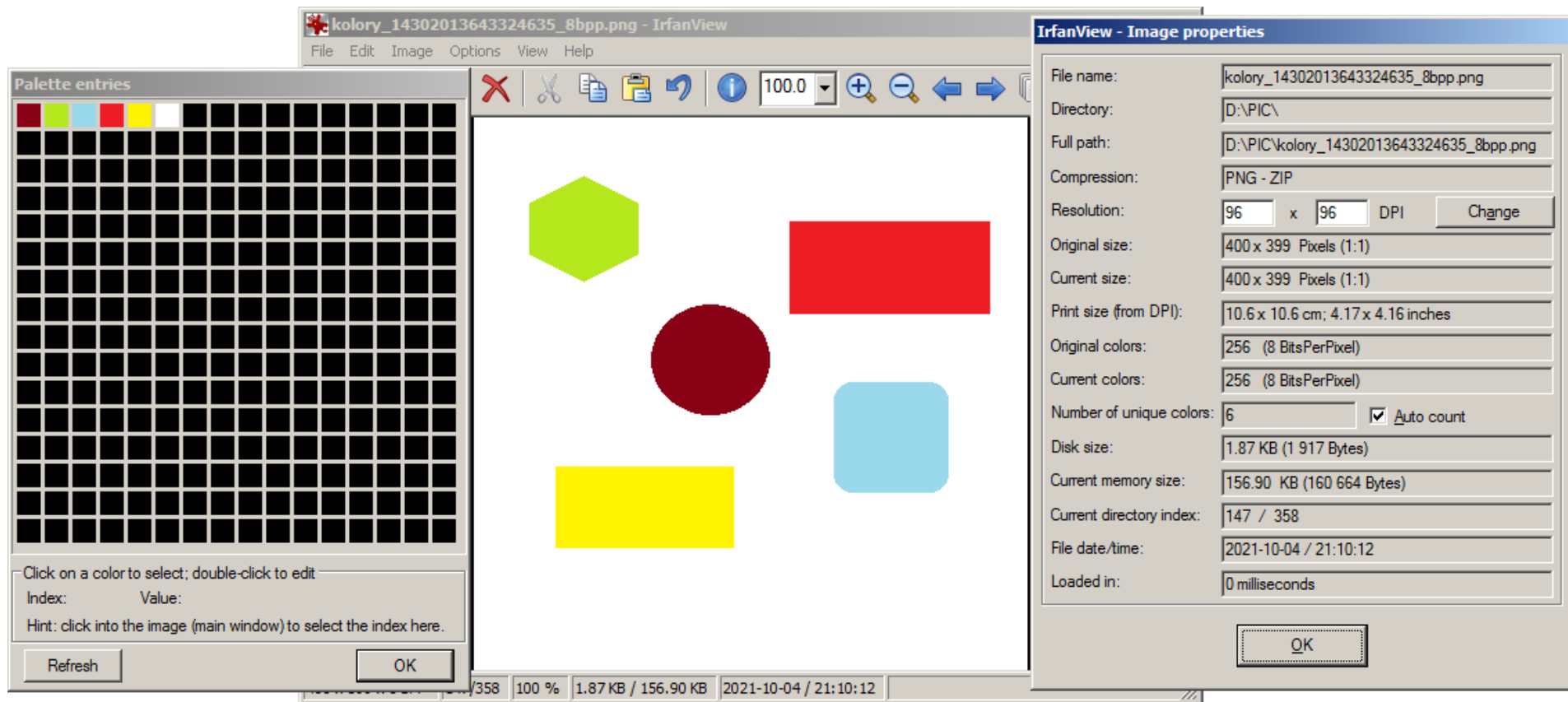
Transfer Kolorów



GRAFIKA RASTROWA

Paleta kolorów

Przykład: 256 (8bit)

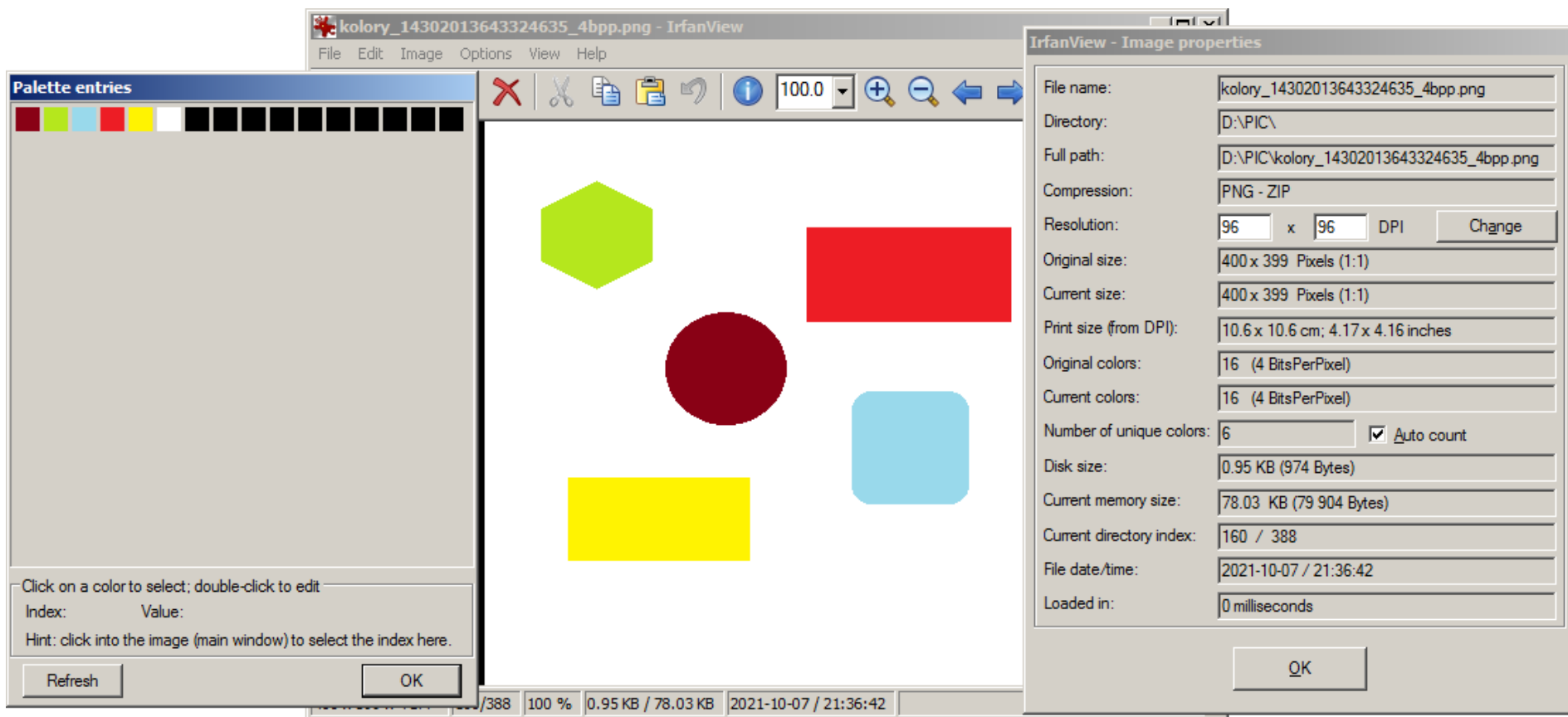


1.87KB

GRAFIKA RASTROWA

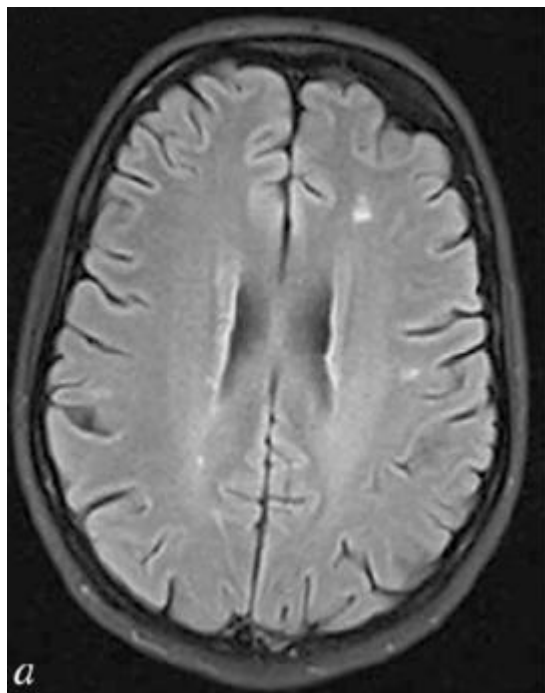
Paleta kolorów

Przykład: 16 (4bit)

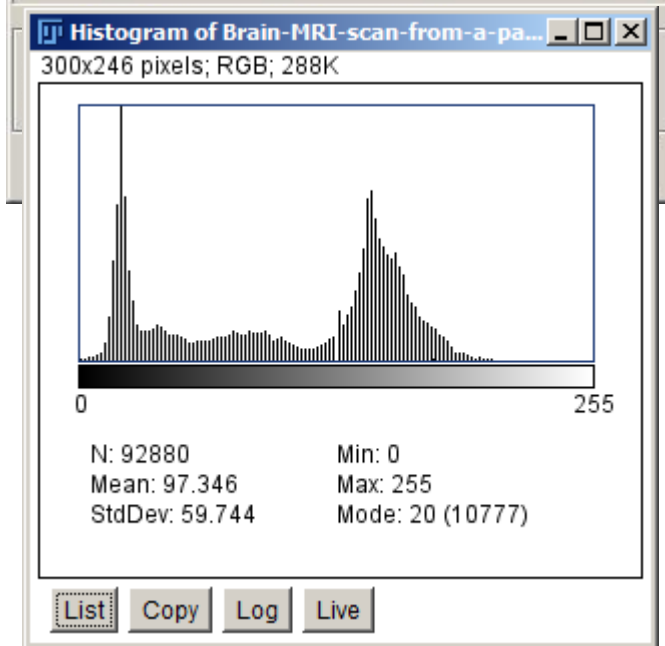
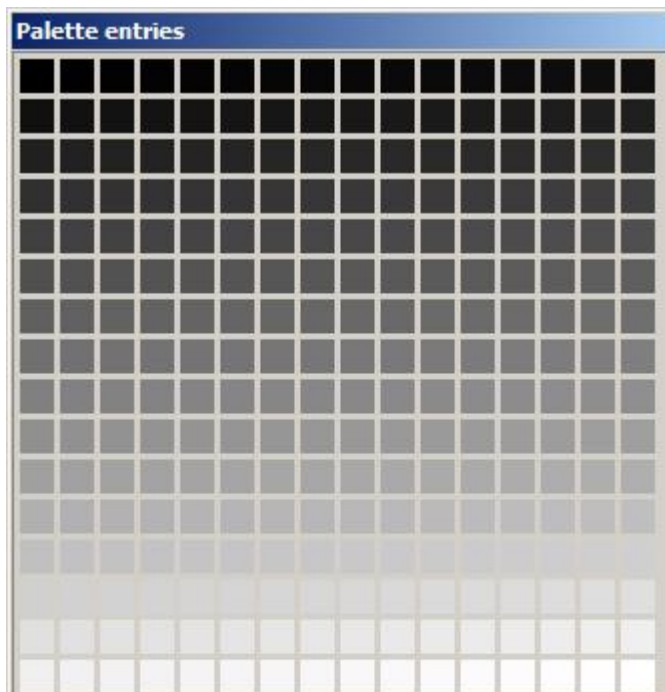
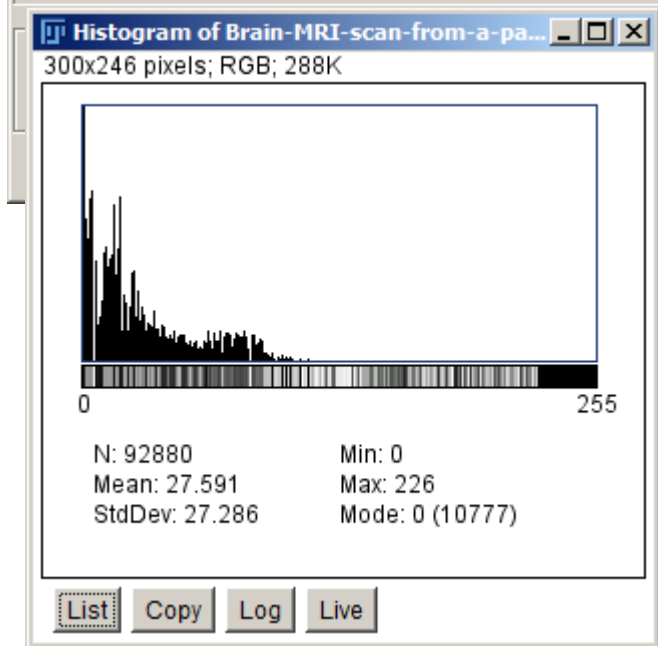
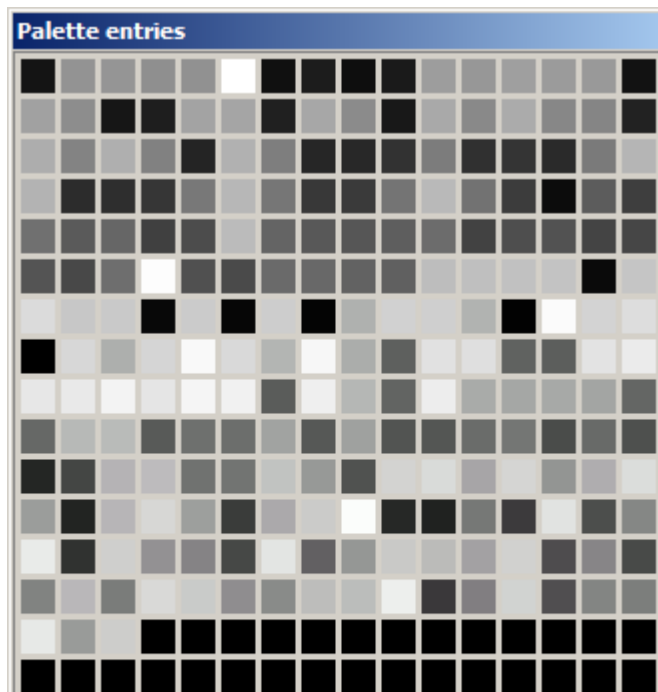


0.95KB

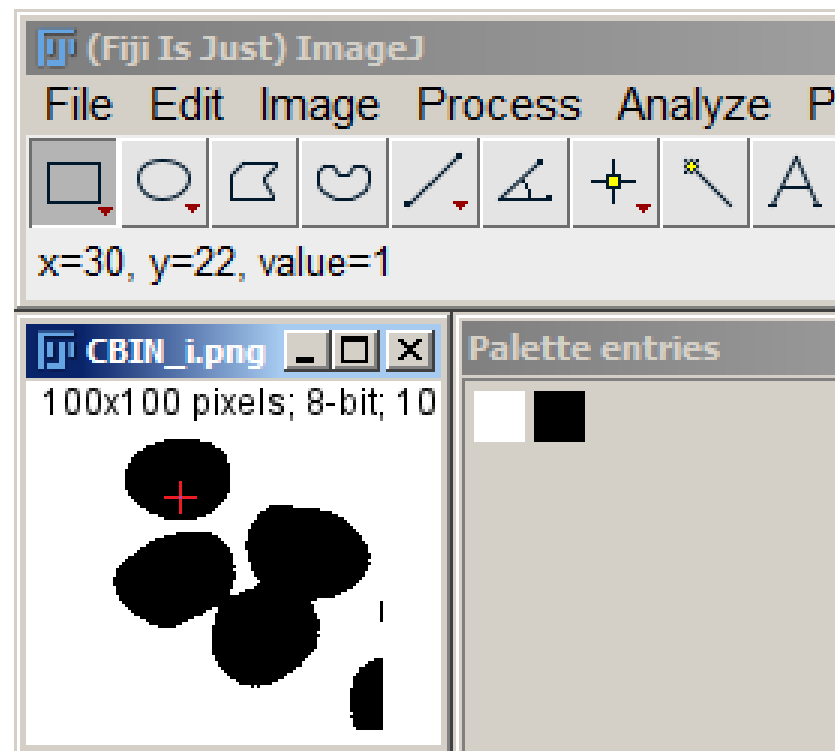
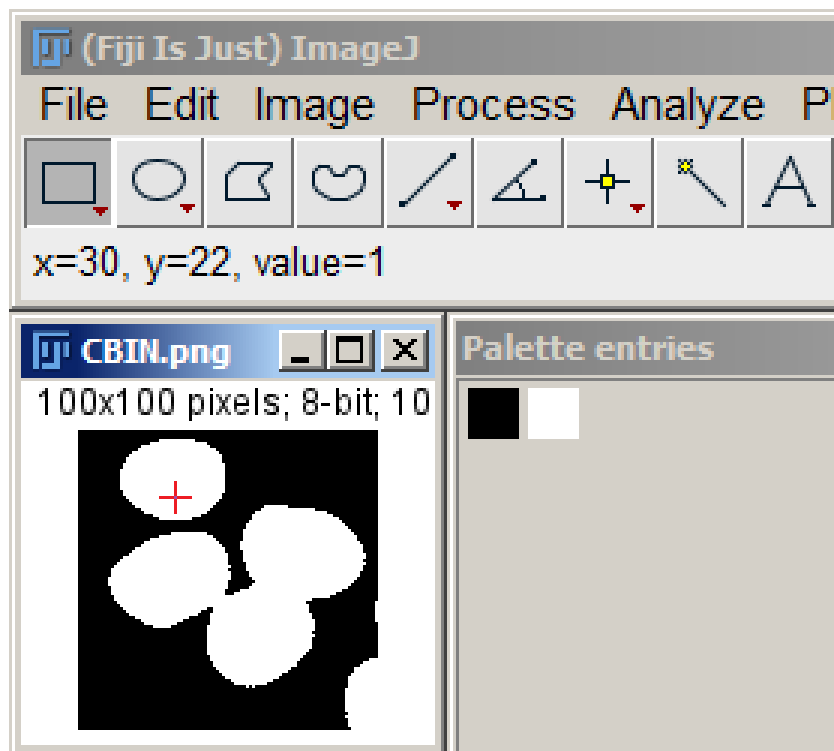
Ostrożność podczas przetwarzania i interpretacji obrazów z paletą



10.1007/s11055-018-0618-0

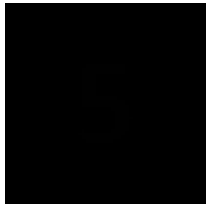


Ostrożność podczas przetwarzania i interpretacji obrazów z paletą



Głębia

Skala szarości, 8bit



0, 1



0, 10



0, 20



0, 30



0, 40



0, 50



0, 100



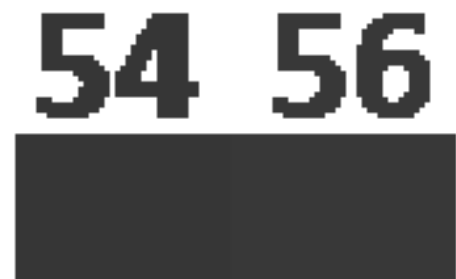
0, 128



0, 192



0, 255

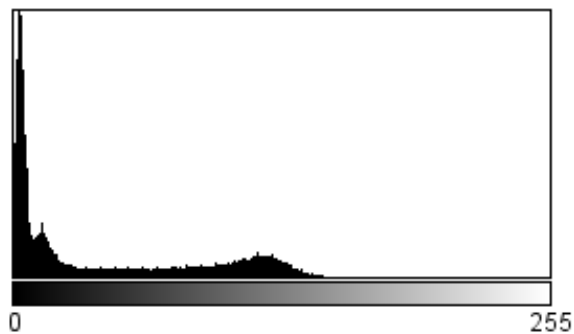


Głębina

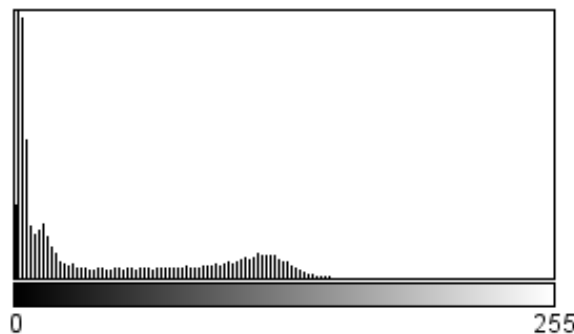
oryginał

/2, normalizacja

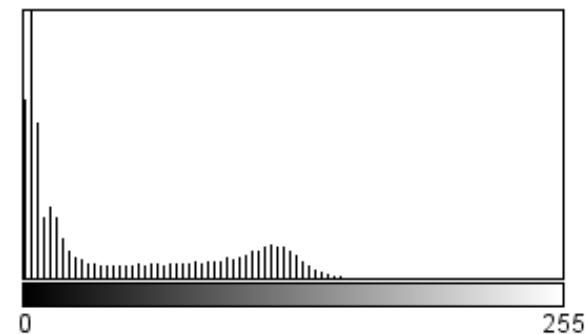
/3, normalizacja



N: 147456
Mean: 42.847
StdDev: 47.686
Value: 216
Min: 0
Max: 255
Mode: 2 (11387)
Count: 3



N: 147456
Mean: 42.376
StdDev: 47.660
Value: 118
Min: 0
Max: 255
Mode: 1 (20643)
Count: 0



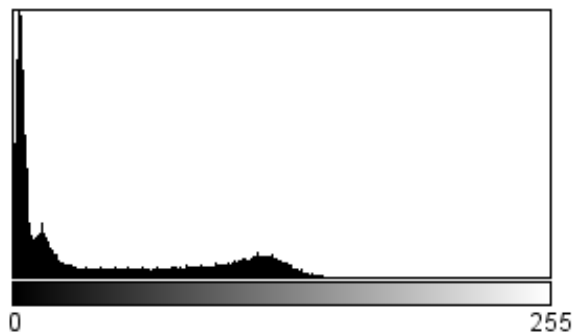
N: 147456
Mean: 42.834
StdDev: 47.707
Value: 3 (31389)
Min: 0
Max: 255
Mode: 3 (31389)

Głębina

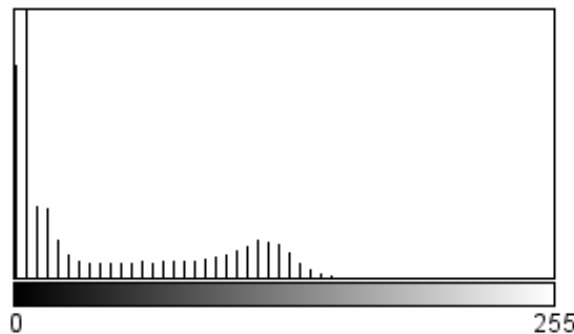
oryginał (u:244)

/5, normalizacja

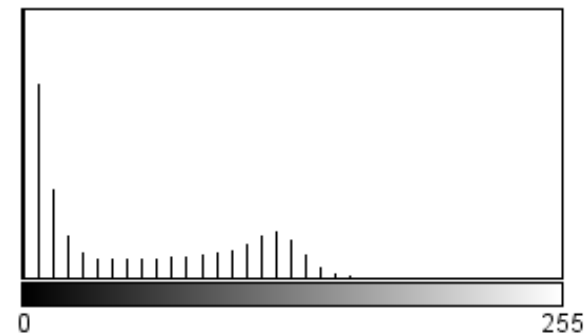
/7, normalizacja



N: 147456
Mean: 42.847
StdDev: 47.686
Value: 216
Min: 0
Max: 255
Mode: 2 (11387)
Count: 3



N: 147456
Mean: 42.805
StdDev: 47.738
Mode: 5 (33151)
Min: 0
Max: 255



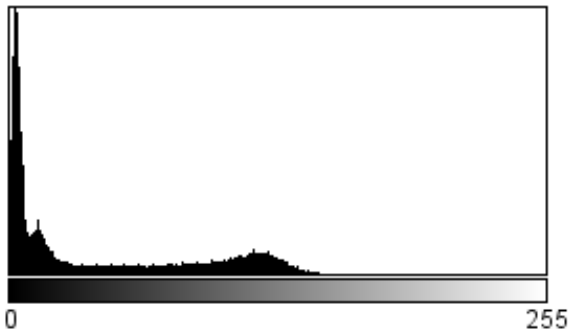
N: 147456
Mean: 42.981
StdDev: 48.310
Mode: 0 (37563)
Min: 0
Max: 255

Głębina

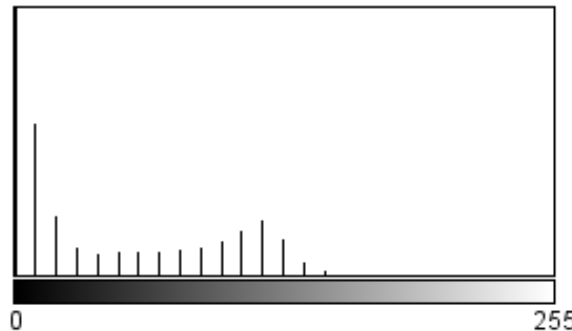
oryginał (u:244)

/10, normalizacja

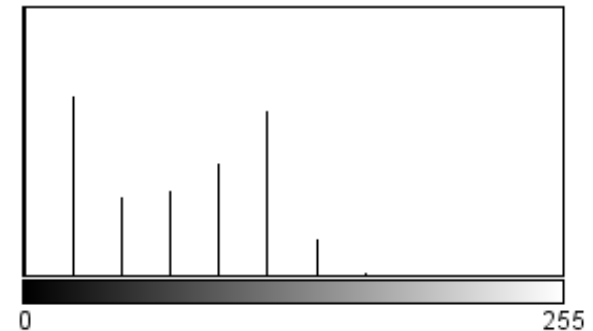
/24, normalizacja



N: 147456
Mean: 42.847
StdDev: 47.686
Value: 216
Min: 0
Max: 255
Mode: 2 (11387)
Count: 3



N: 147456
Mean: 41.585
StdDev: 47.218
Value: ---
Min: 0
Max: 255
Mode: 0 (46412)
Count: ---



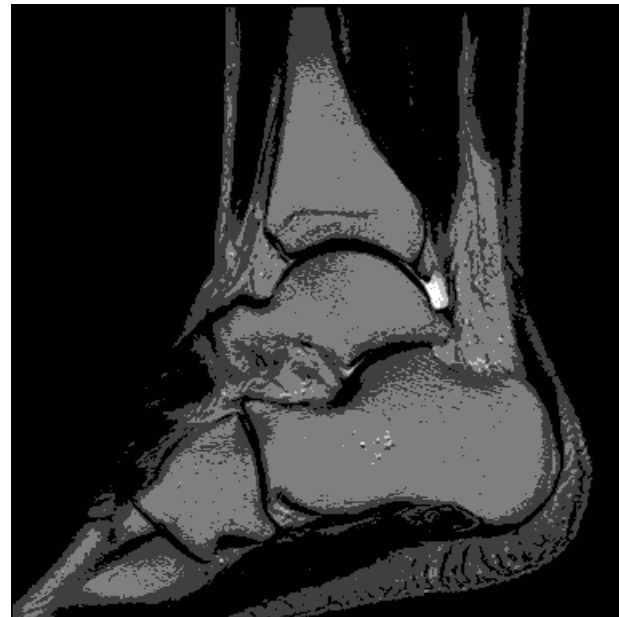
N: 147456
Mean: 40.437
StdDev: 47.082
Value: ---
Min: 0
Max: 255
Mode: 0 (66616)
Count: ---

9 kolorów



Głębia

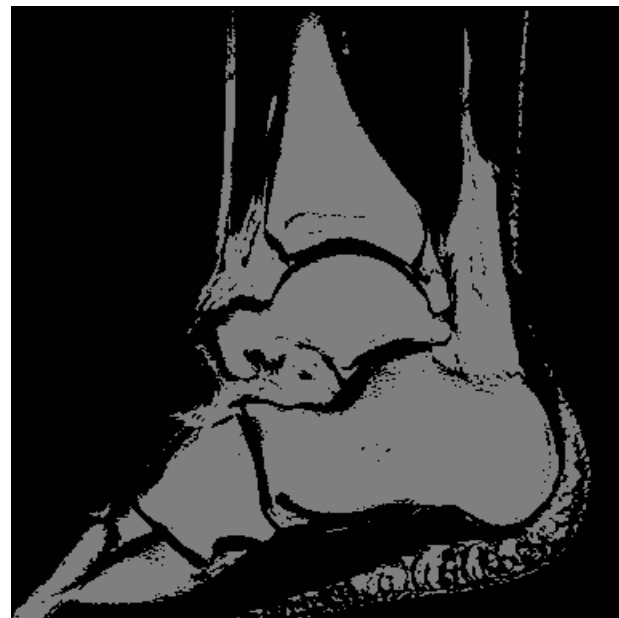
5 kolorów



3 kolory



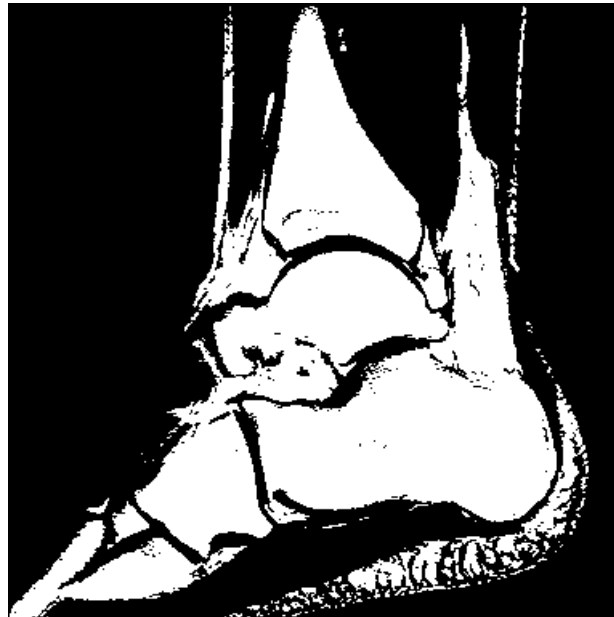
2 kolory



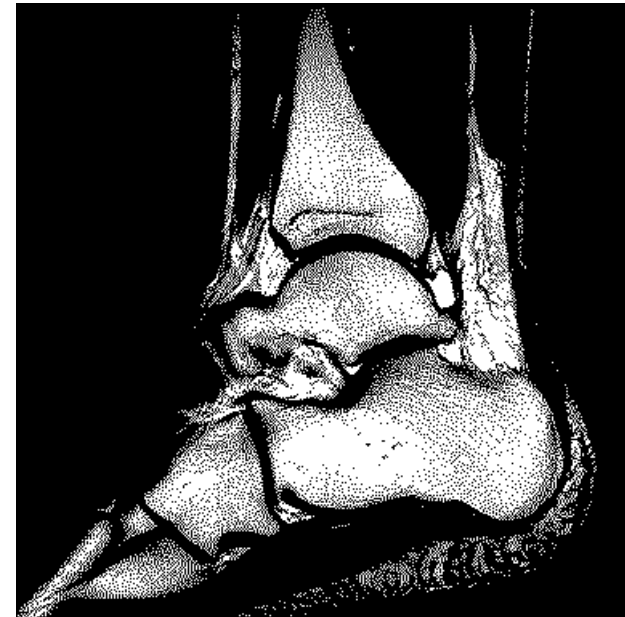
Dithering



oryginał



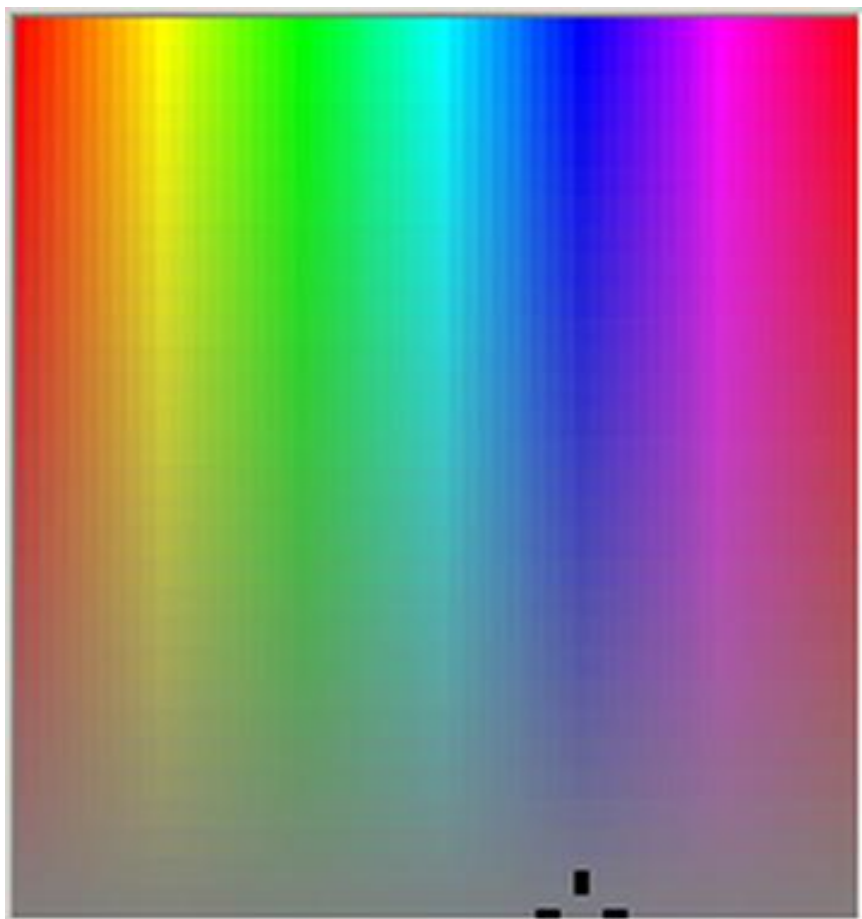
2 kolory - binaryzacja



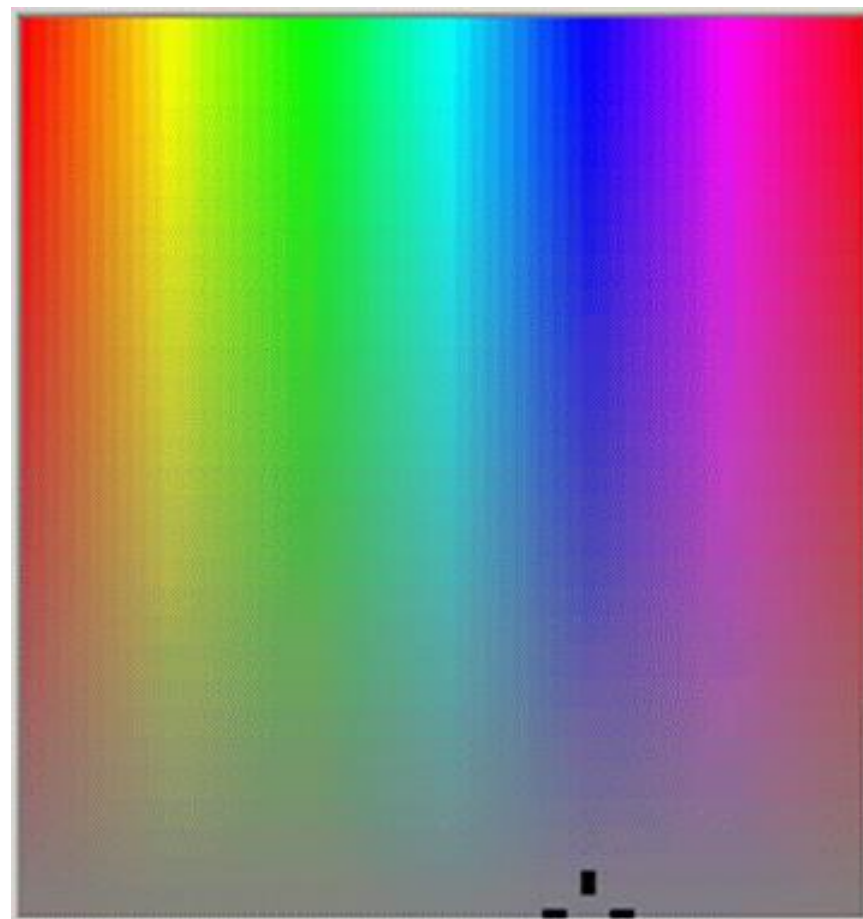
2 kolory - dithering

Dithering

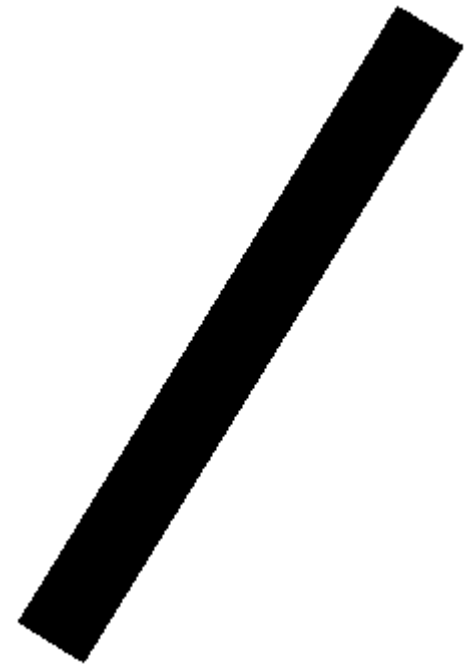
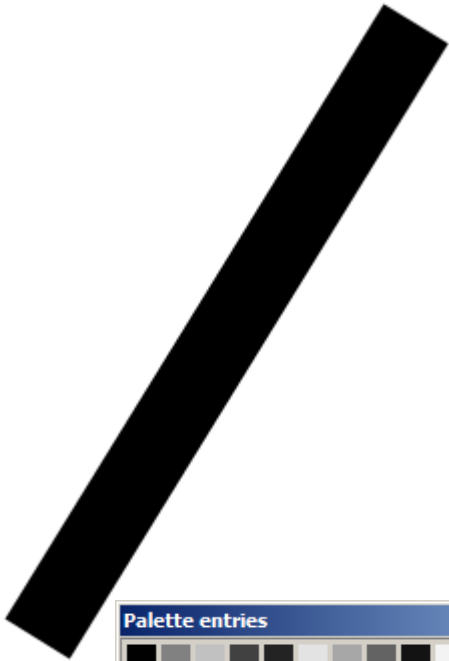
Src, 24335 unikalnych kolorów



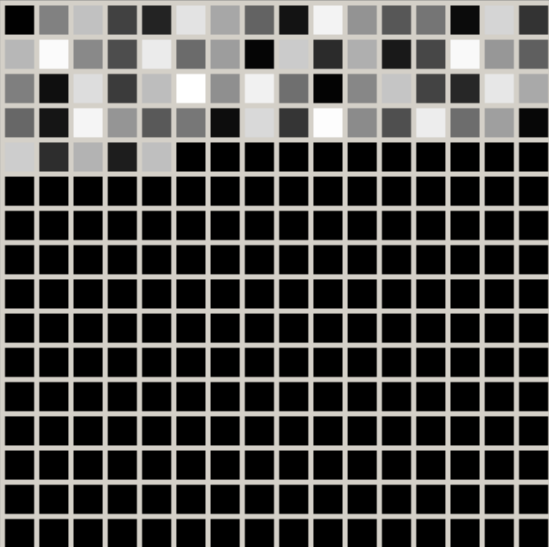
gif, 256 unikalnych kolorów



Antyaliasing



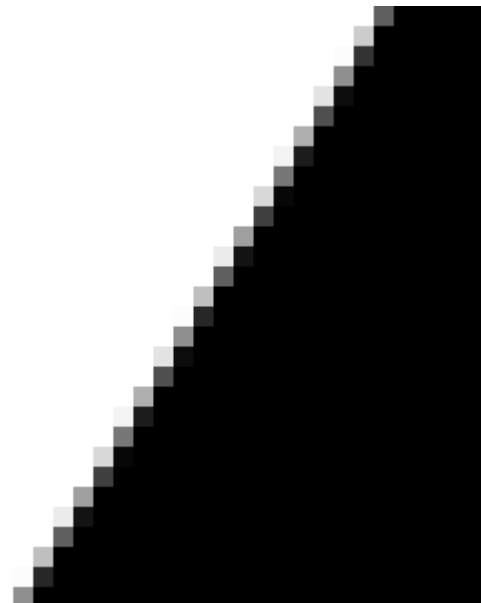
Palette entries



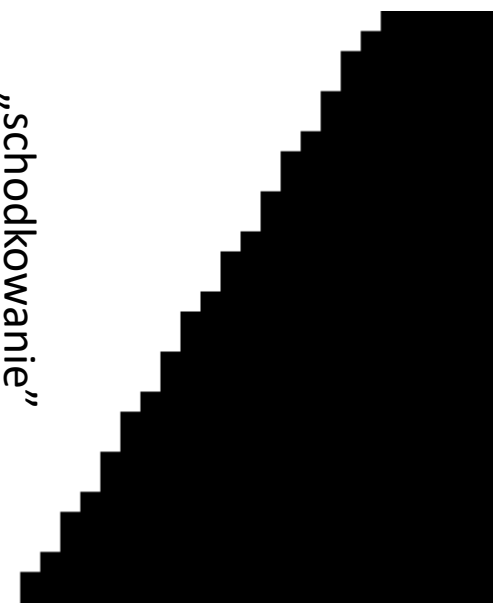
Click on a color to select; double-click to edit
Index: Value:
Hint: click into the image (main window) to select the index here.

Refresh OK

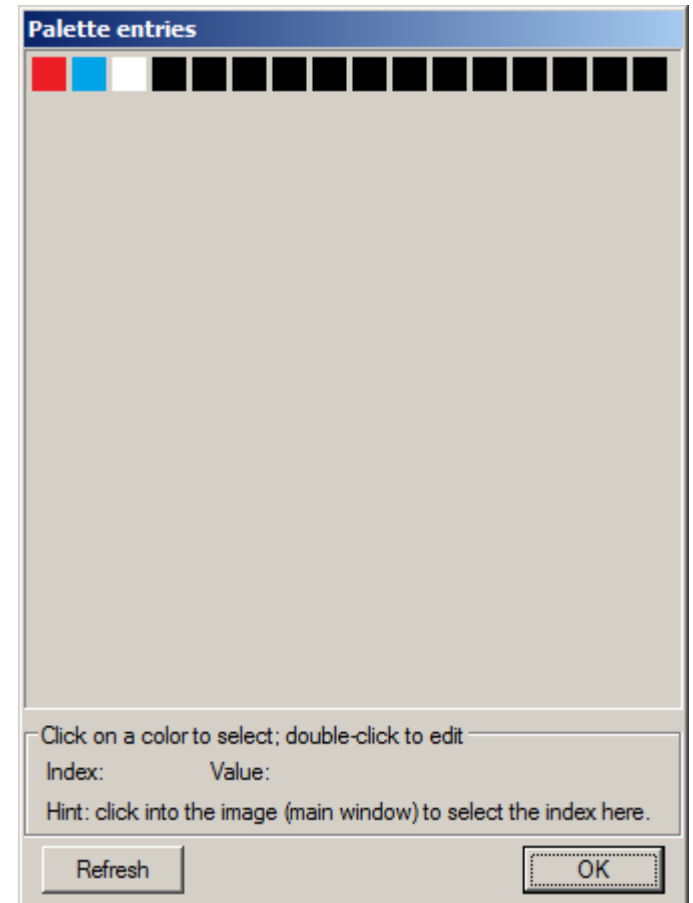
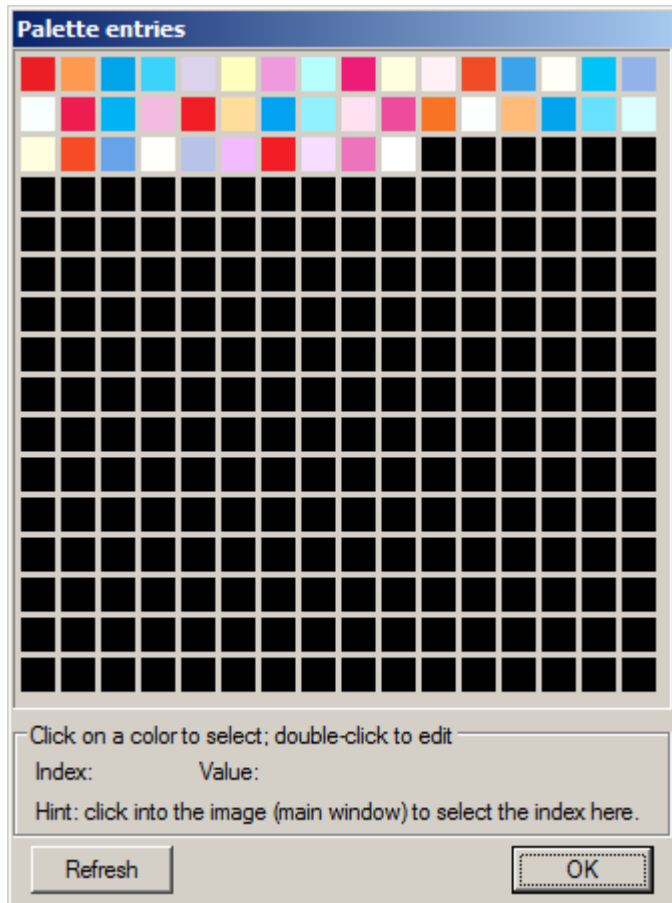
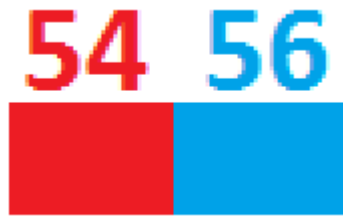
Number of unique colors: 2



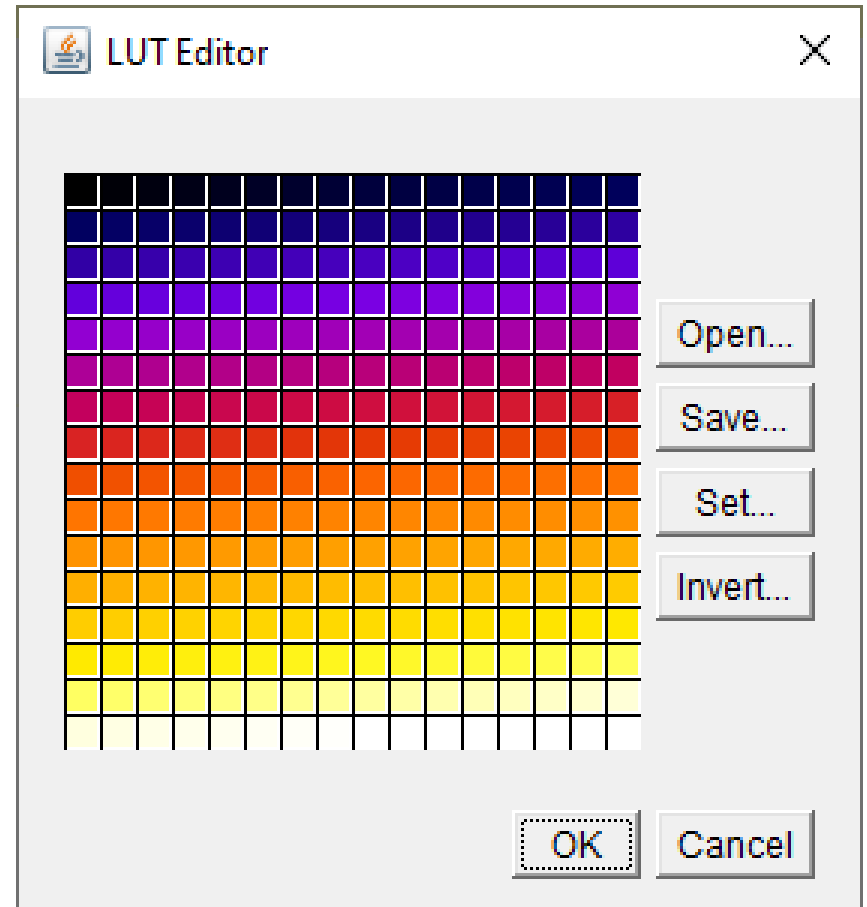
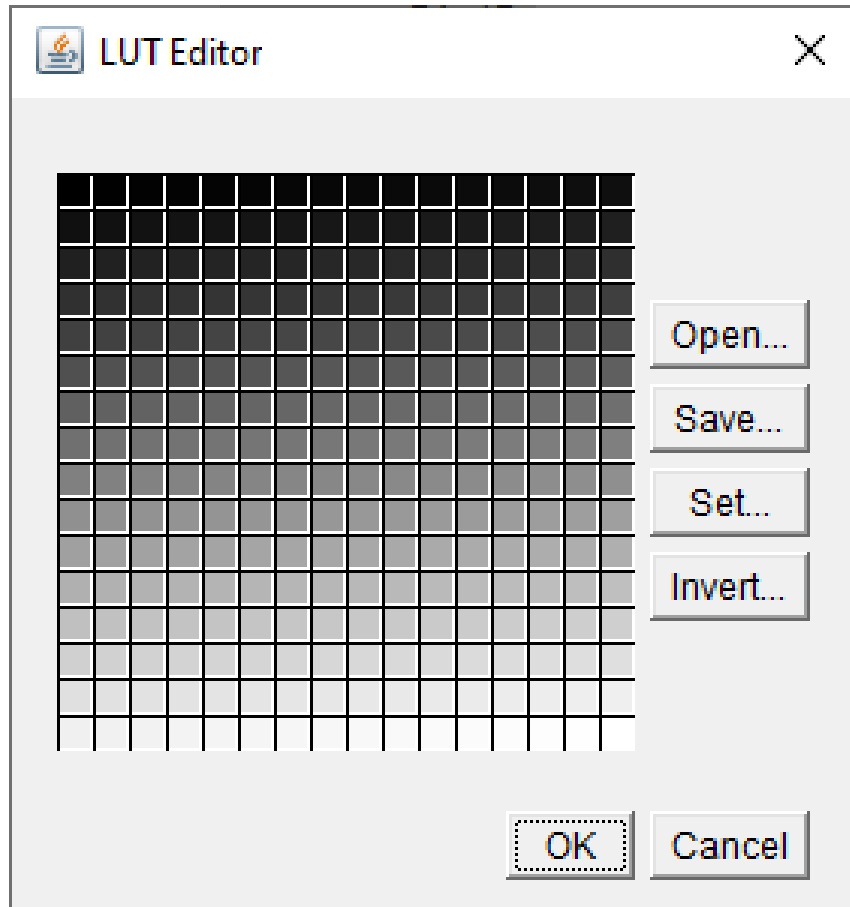
„schodkowanie”



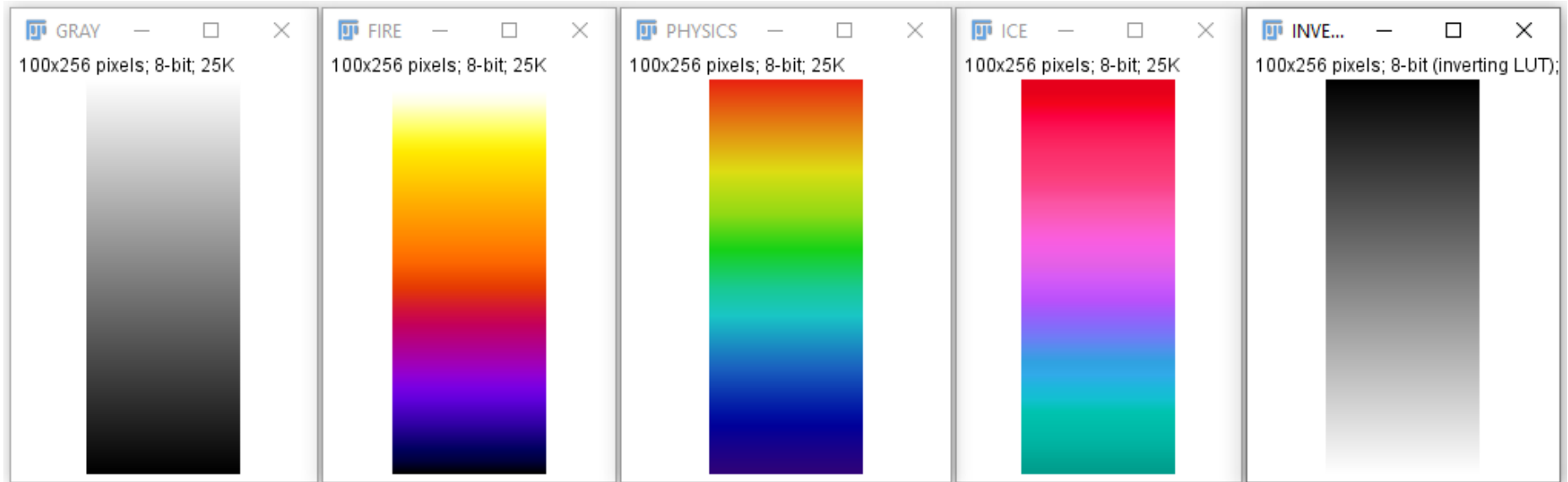
Antyaliasing



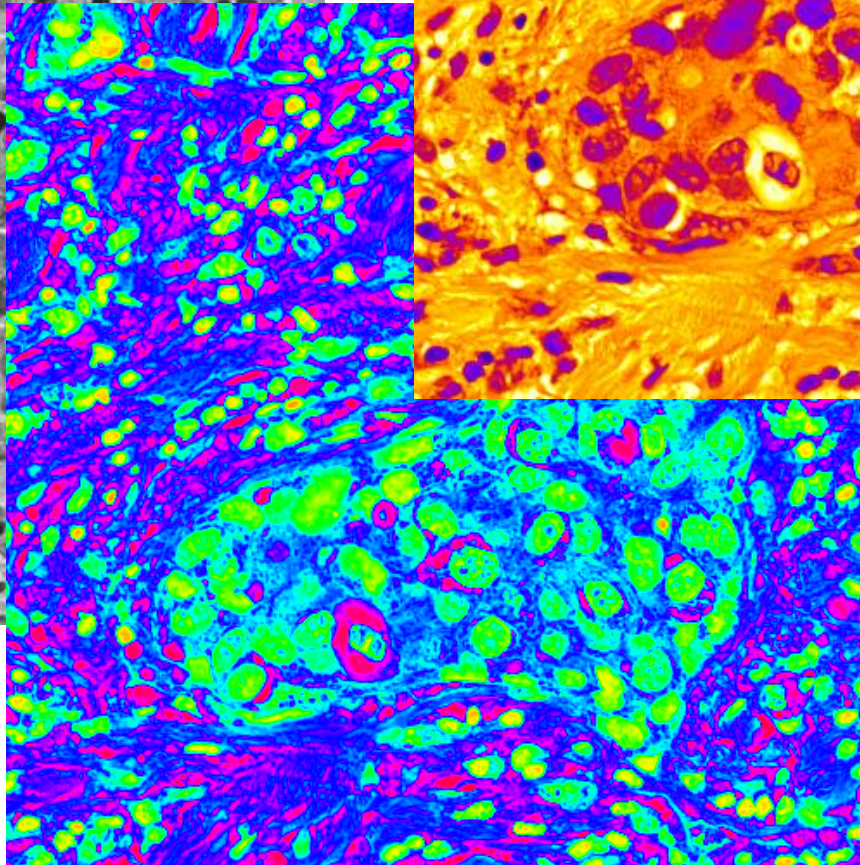
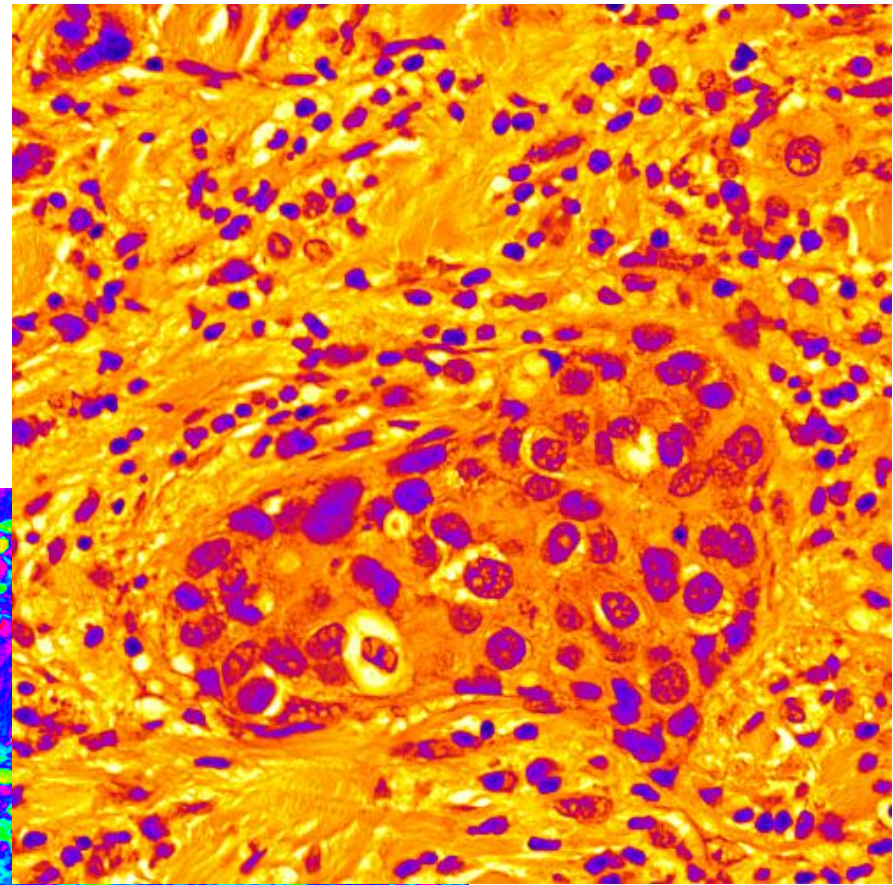
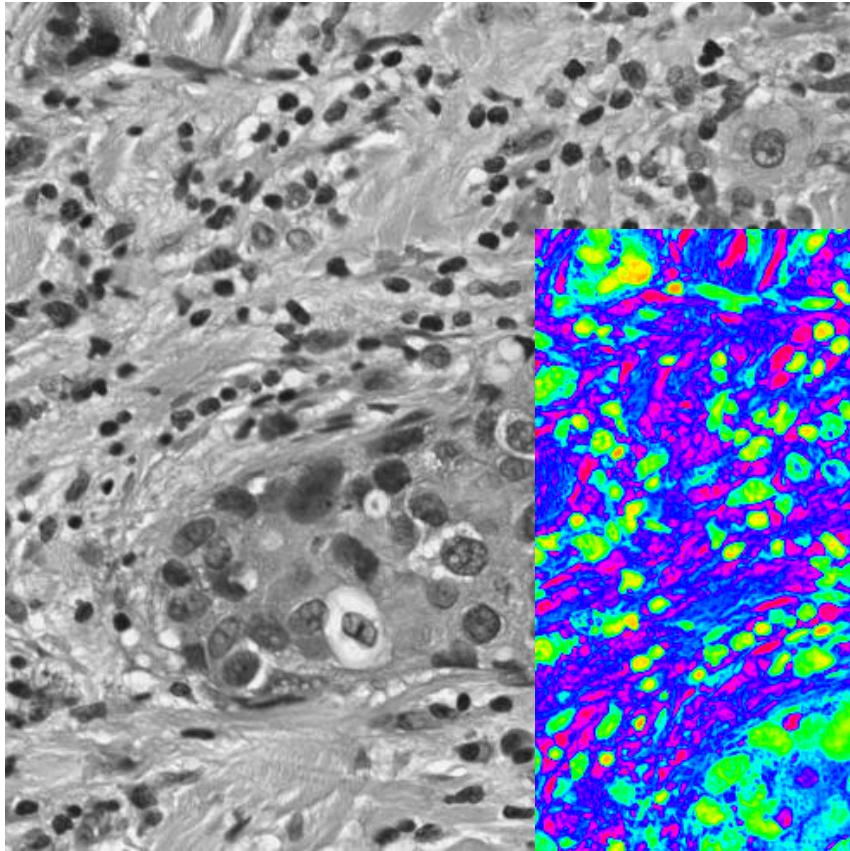
Lookup Tables



Lookup Tables



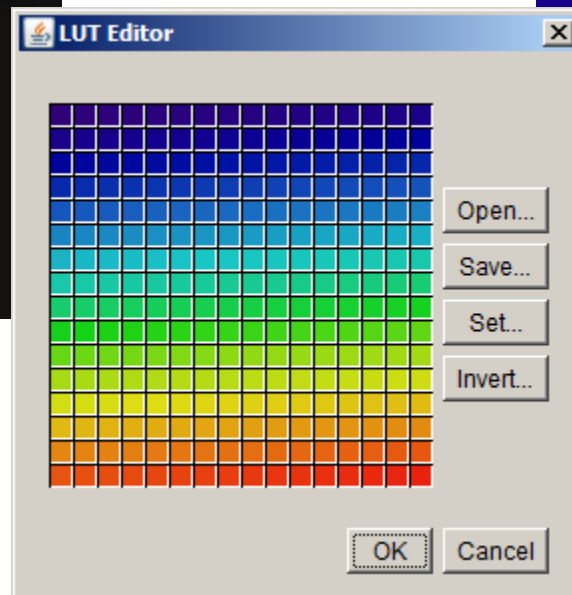
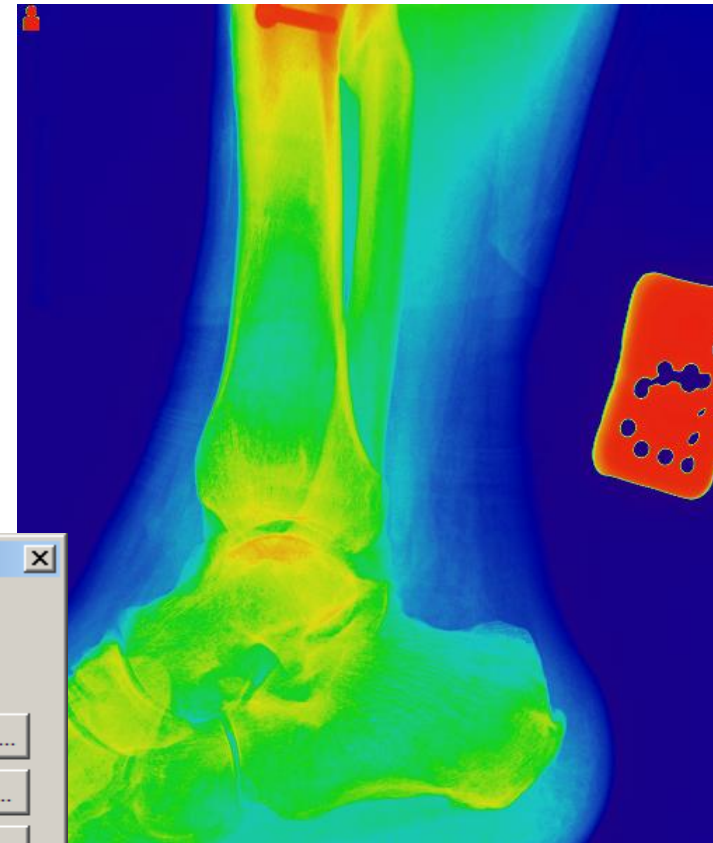
Lookup Tables



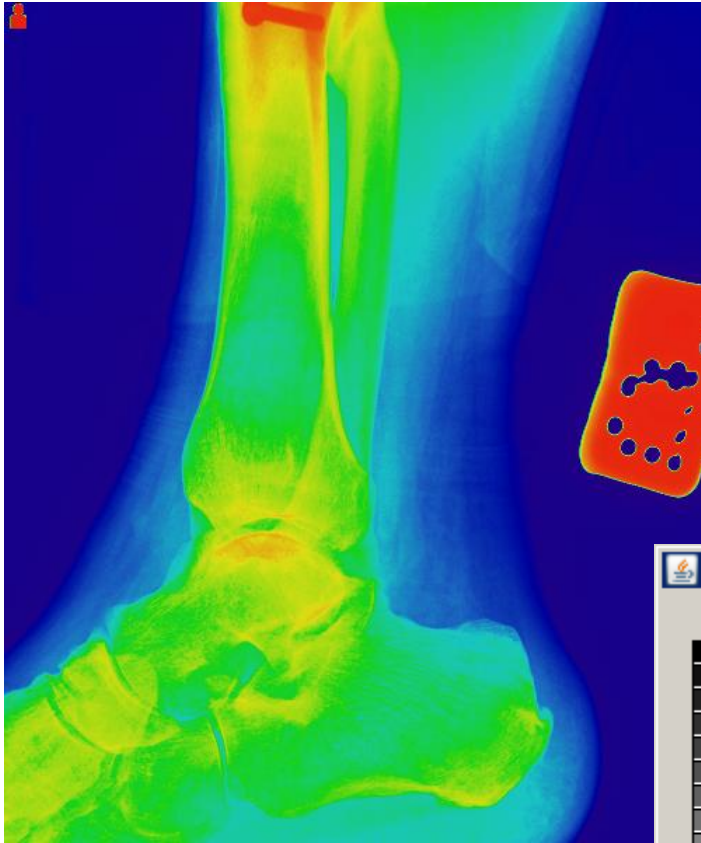
LUT a paleta - zaleta



physics

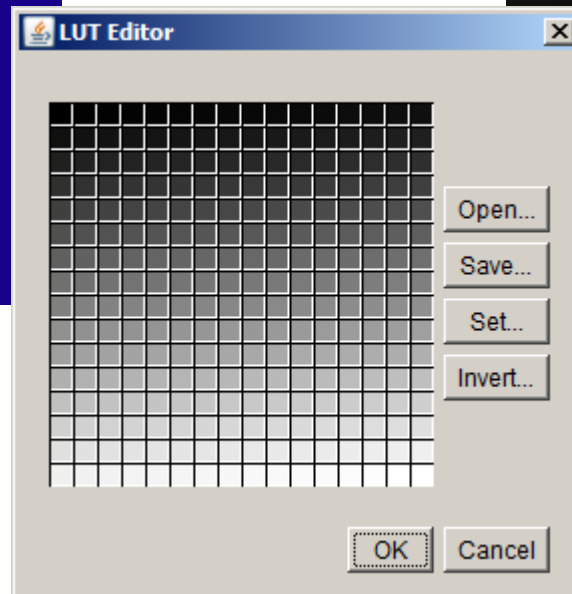


LUT a paleta - zaleta

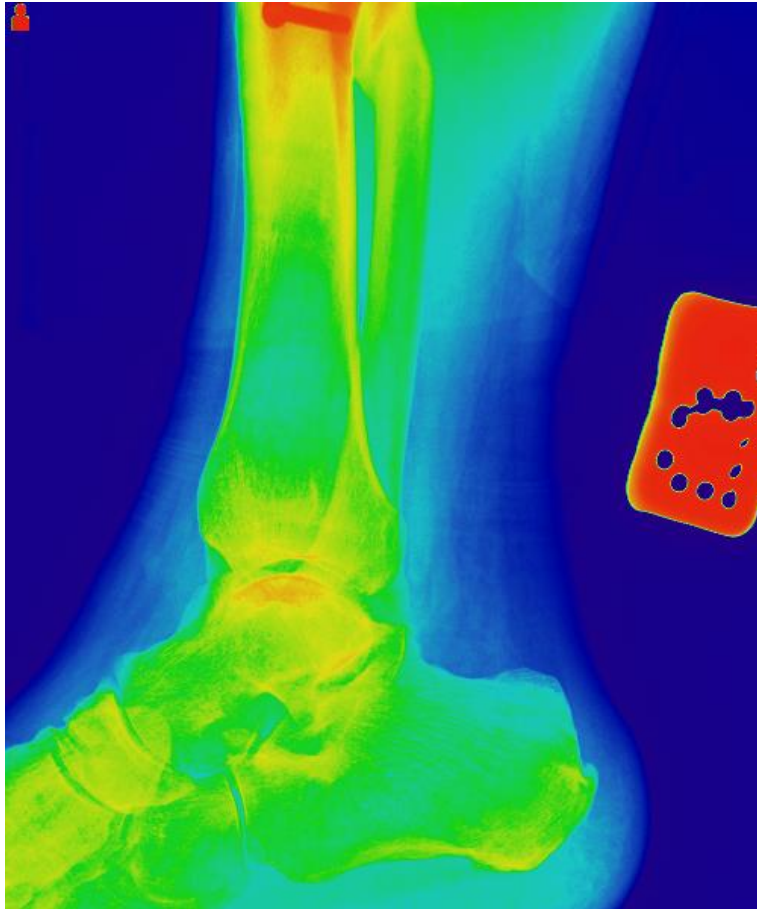


RGB 8-bit (paleta)

gray



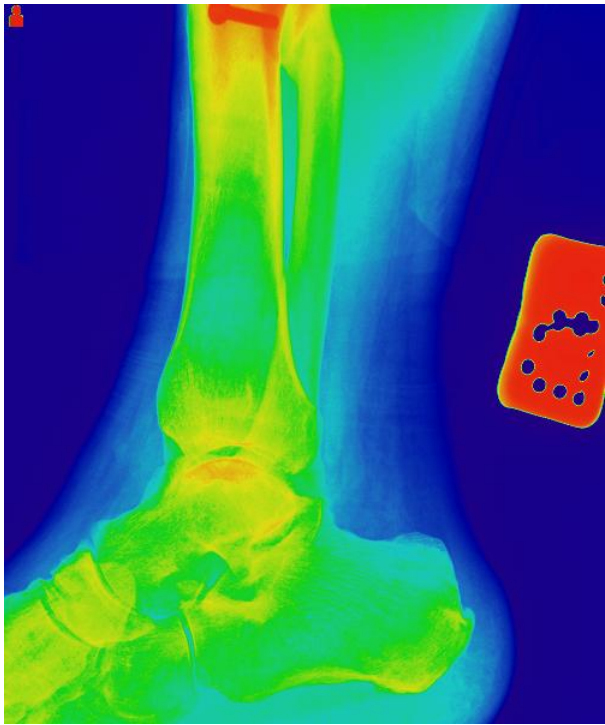
A przejście do RGB 24 bit?



RGB 24-bit

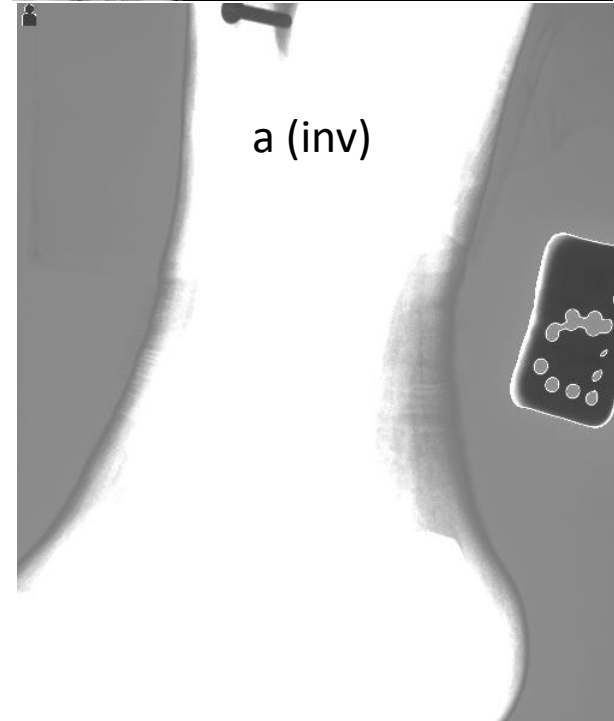
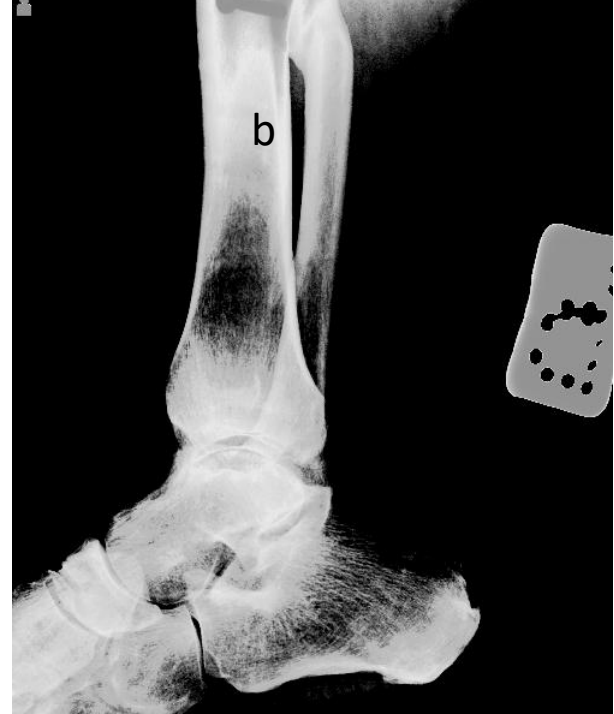
$$(R+G+B)/3$$

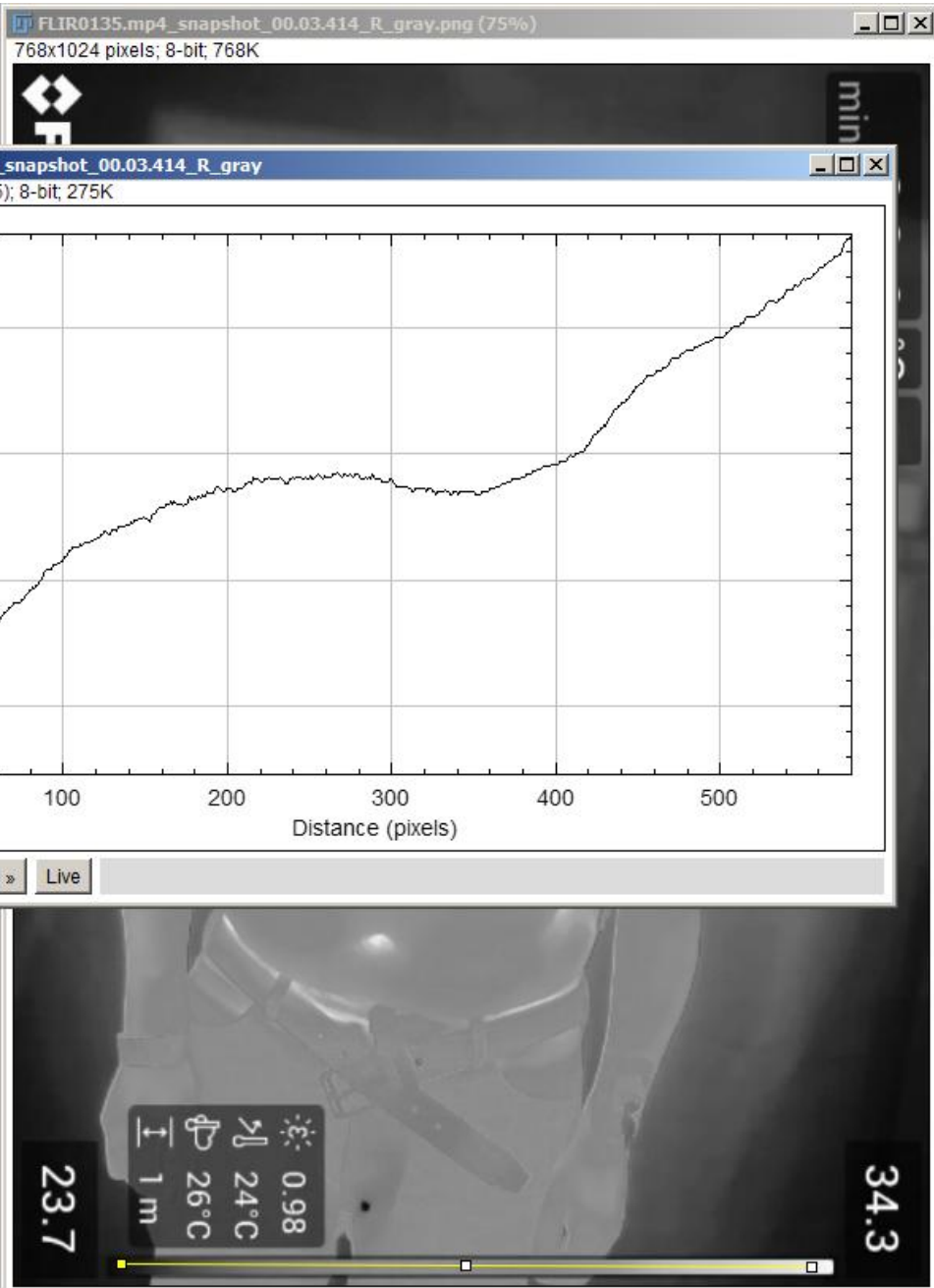
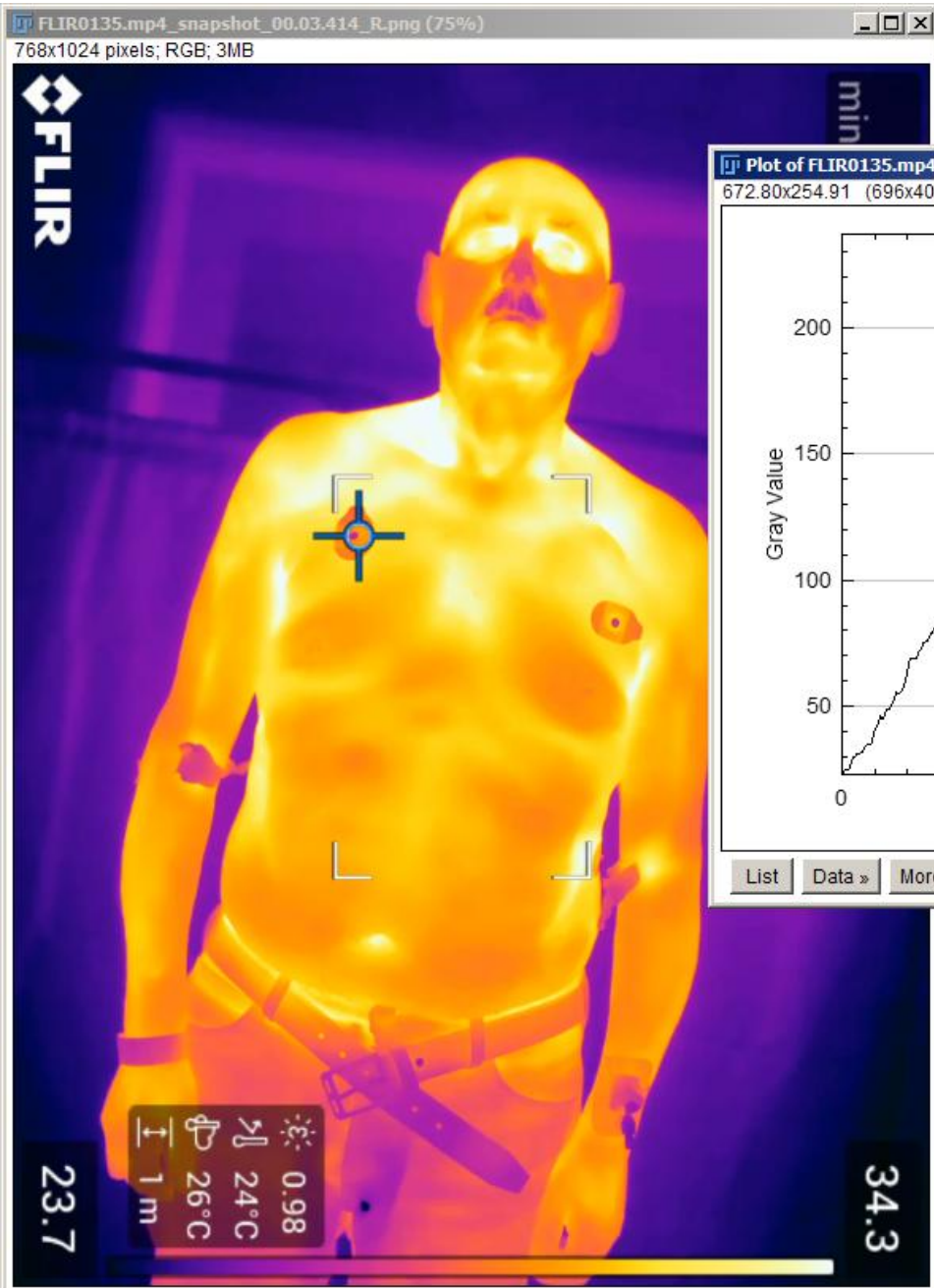




RGB 24-bit

Lab?

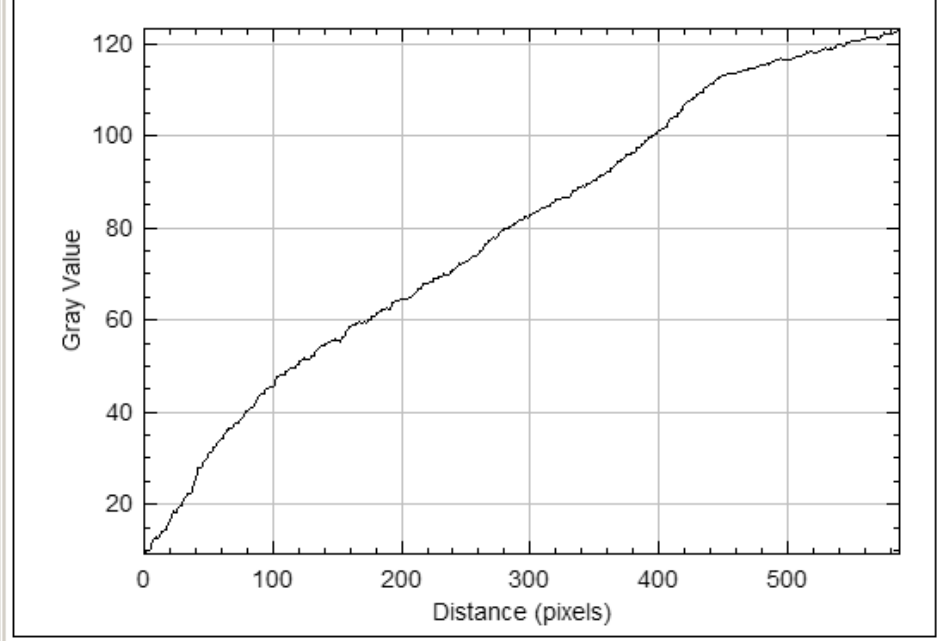






Plot of FLIR0135.mp4_snapshot_00.03.414_R-2.png Lab

715.36x138.32 (535x370); 8-bit; 193K



List Data » More » Live X=154, Y(X)=56.2



Format: BMP (bitmap)

Właściwości:

- formaty:

- paleta: 1bpp, 2bpp, 4bpp, 8bpp, (z RGB)
- HighColor: 16bpp, B-5b, G-6b, R-5b,
- TrueColor: 24bpp, B-8b, G-8b, R-8b
- RGBA: 32bpp, B-8b, G-8b, R-8b + kanał alfa

Kompresja:

- brak,
- opcjonalna, bezstratna: RLE / Huffman 1D (palety), RLE (24bpp)

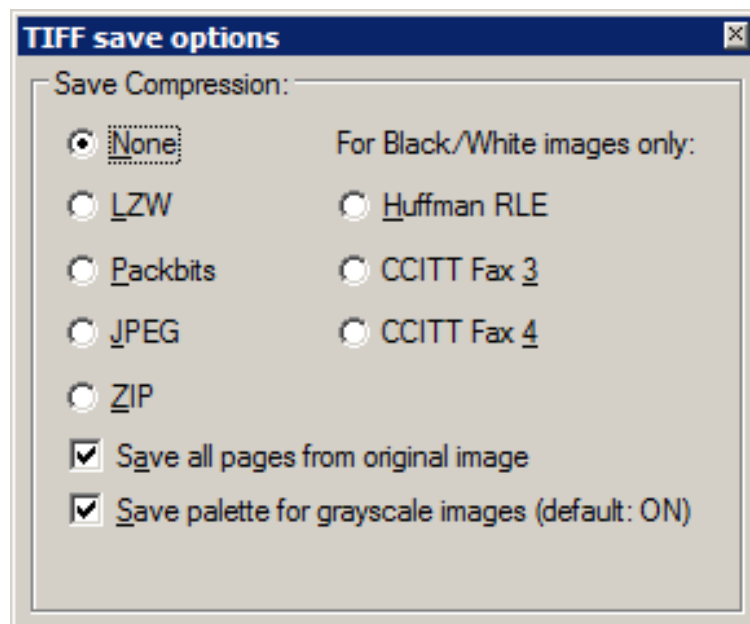
Wada: duże pliki

Format: TIFF (Tagged Image File Format)

Właściwości:

- formaty:

- dwa kolory (cz/b),
- skala szarości 8bpp/**16bpp**
- paleta,
- RGB,
- kontener obrazów (JPG).



Kompresja:

- brak, RLE, LZW, JPEG, JPEG2000, CCITT, Deflate PKZIP, ...

TIFF pozwala na zapisywanie wielu obrazów (stos).

Format: PNG (Portable Network Graphic)

Właściwości:

- formaty:

- paleta: 1bpp, 2bpp, 4bpp, 8bpp,
- monochromatyczny (grayscale): 1bpp, 2bpp, 4bpp, 8bpp, **16bpp**
- monochromatyczny + alfa: 8bpp, 16bpp
- TrueColor: 24bpp, R-8b, G-8b, B-8b
- RGBA: 32bpp, R-8b, G-8b, B-8b + kanał alfa

Kompresja:

- bezstratna, deflate (LZ77+Huffman), poprzedzona filtrami*,

Opcjonalna definicja przezroczystości

* Wyszukiwanie w przestrzeni parametrów filtrów może dać różny rozmiar wynikowy przy braku zniekształceń; `optipng -o7 plik.png`

```
D:\PIC>optipng -o7 obraz_testowy.png
** Processing: obraz_testowy.png
299x280 pixels, 4x8 bits/pixel, RGB+alpha
Input IDAT size = 116997 bytes
Input file size = 117222 bytes
```

Trying:

zc = 9	zm = 9	zs = 0	f = 0	IDAT size = 113153
zc = 9	zm = 8	zs = 0	f = 0	IDAT size = 111965
zc = 7	zm = 9	zs = 0	f = 0	IDAT size = 111850
zc = 7	zm = 8	zs = 0	f = 0	IDAT size = 111331
zc = 6	zm = 9	zs = 0	f = 0	IDAT size = 111203
zc = 6	zm = 8	zs = 0	f = 0	IDAT size = 110698
zc = 5	zm = 8	zs = 0	f = 0	IDAT size = 110582
zc = 4	zm = 9	zs = 0	f = 0	IDAT size = 110165
zc = 3	zm = 9	zs = 0	f = 0	IDAT size = 109784
zc = 3	zm = 8	zs = 0	f = 0	IDAT size = 109661
zc = 2	zm = 9	zs = 0	f = 0	IDAT size = 107461
zc = 1	zm = 8	zs = 0	f = 0	IDAT size = 106305
zc = 1	zm = 8	zs = 1	f = 0	IDAT size = 106305
zc = 9	zm = 9	zs = 0	f = 1	IDAT size = 15391
zc = 9	zm = 8	zs = 0	f = 1	IDAT size = 15391
zc = 9	zm = 9	zs = 1	f = 1	IDAT size = 15350
zc = 9	zm = 8	zs = 1	f = 1	IDAT size = 15350

Selecting parameters:

zc = 9 zm = 8 zs = 1 f = 1 IDAT size = 15350

Output IDAT size = 15350 bytes (101647 bytes decrease)
Output file size = 15407 bytes (101815 bytes = 86.86% decrease)

optipng.exe -preserve -o7 -zm1-9 plik.png

Wydajne dla:

- MS Paint,
- ImageJ,
- Matlab

BEZSTRATNE!

(ew. redukcja palety)

Ultra, ale
zysk to ~ 1%

Format: GIF (Graphic Interchange Format)

Właściwości:

- formaty:

- paleta: 8bpp, z RGB, może być skala szarości 0-255 (8bpp),

Kompresja:

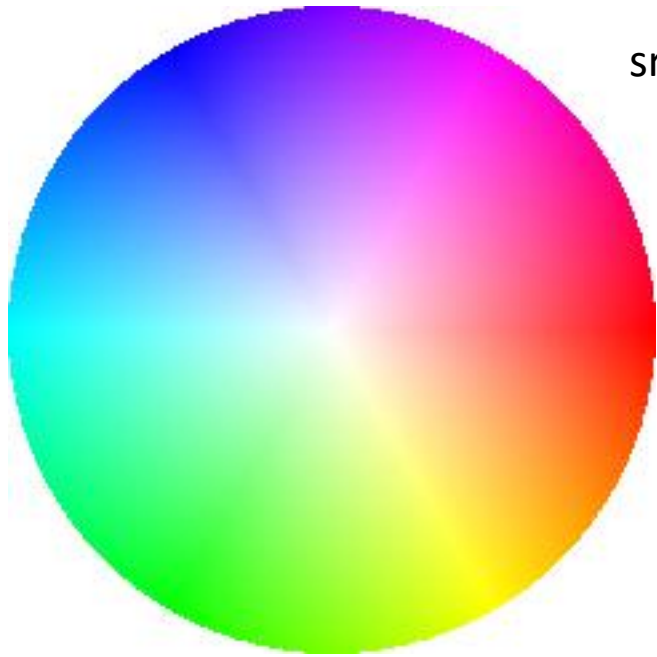
- bezstratna, LZW (opatentowana, patent wygasł),

Opcjonalna definicja przezroczystości

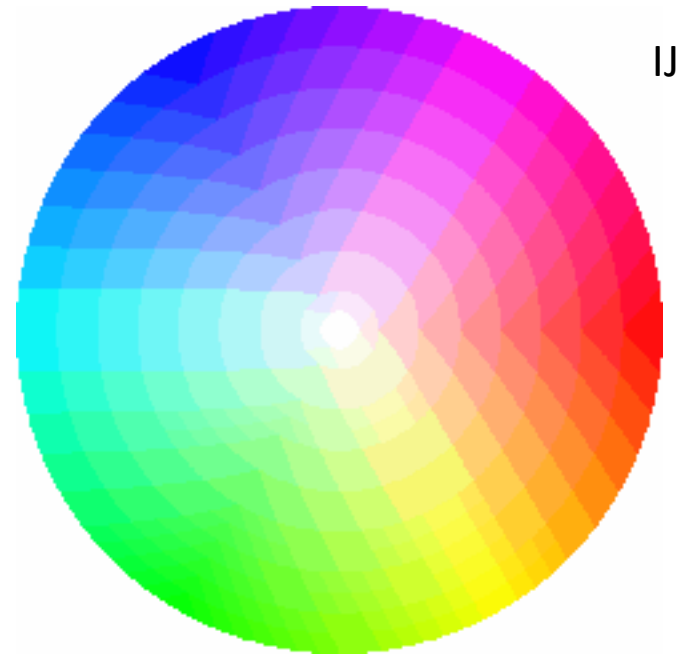
Możliwość animacji

Wady: redukcja liczby kolorów wpływa na jakość,
ew. zastosowanie do obrazów grayscale 8bit.

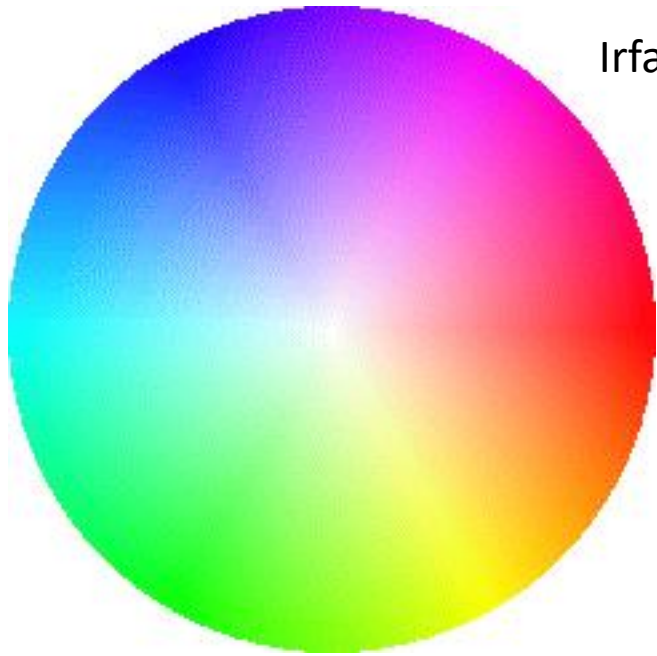
GIF



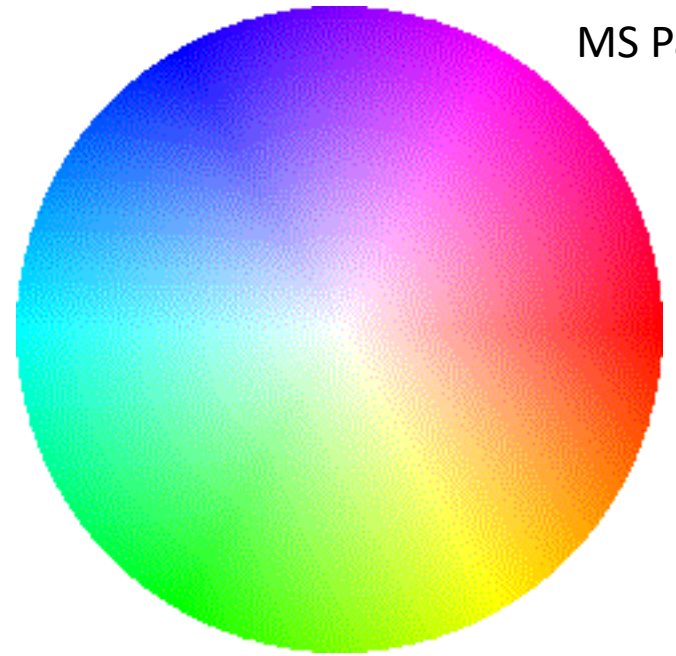
src



IJ



IrfanView



MS Paint

GIF



Format: JPEG (Joint Photographic Experts Group)

Właściwości:

- formaty:

- paleta: 24bpp RGB lub 8bit grayscale

Kompresja:

- stratna, zawsze!! Nawet przy jakości 100% !!!,

- w przestrzeni YCb(blue)Cr(red), DCT,

- bloki 8x8 pikseli

Wady:

-Kompresja stratna

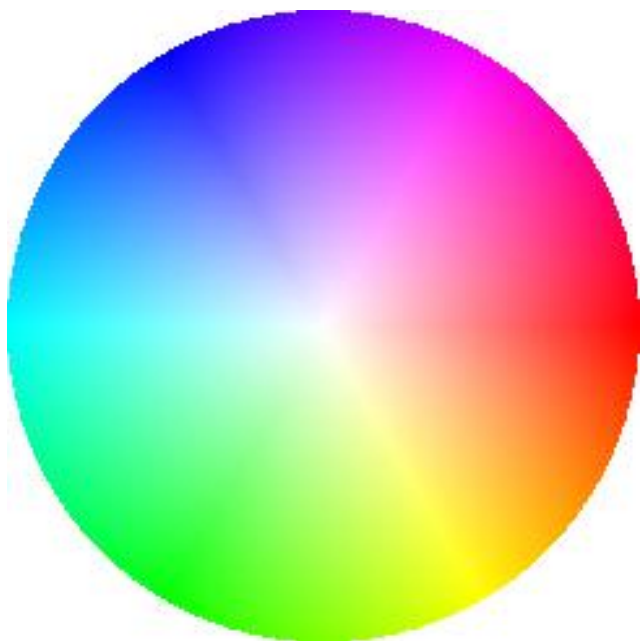
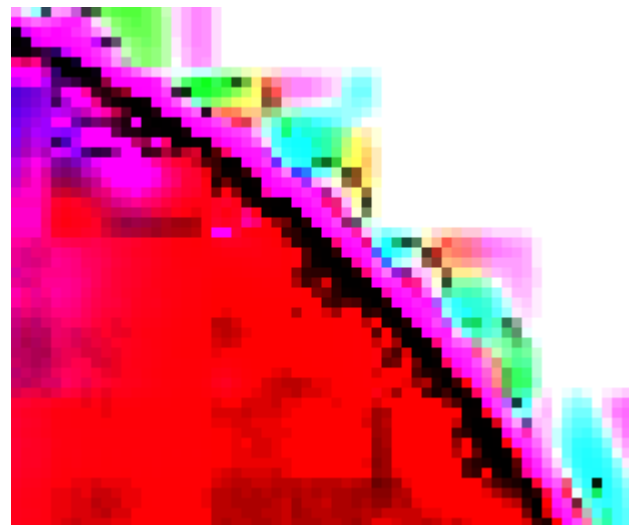
Zastosowania:

Fotografia!!!!

JPEG2000 - (DWT) – format z wyborem bezstratny/stratny, głębia 1-38 bit, różne przestrzenie kolorów (sRGB, CMYK, Lab, YCbCr, ...)

Format: JPEG

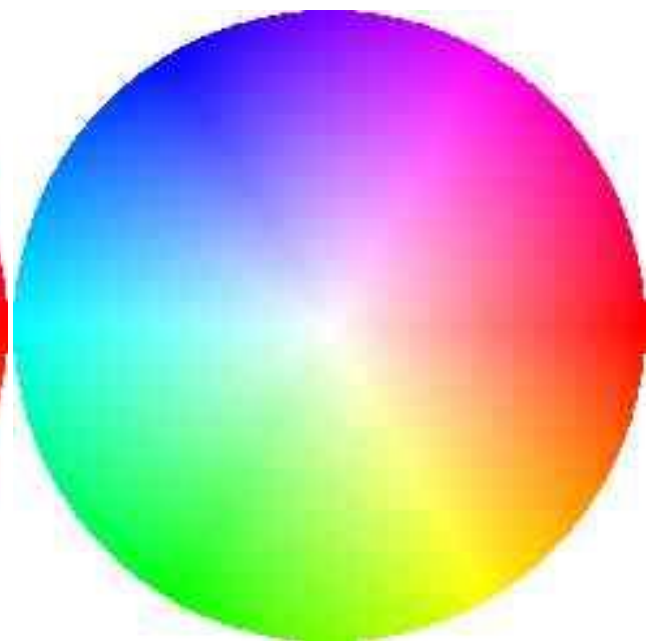
(kiedy nie należy stosować JPG)



SRC



JPG 40%



JPG 30%

src

JPG 10%

JPG 20%

Format: JPEG (kiedy nie należy stosować JPG)

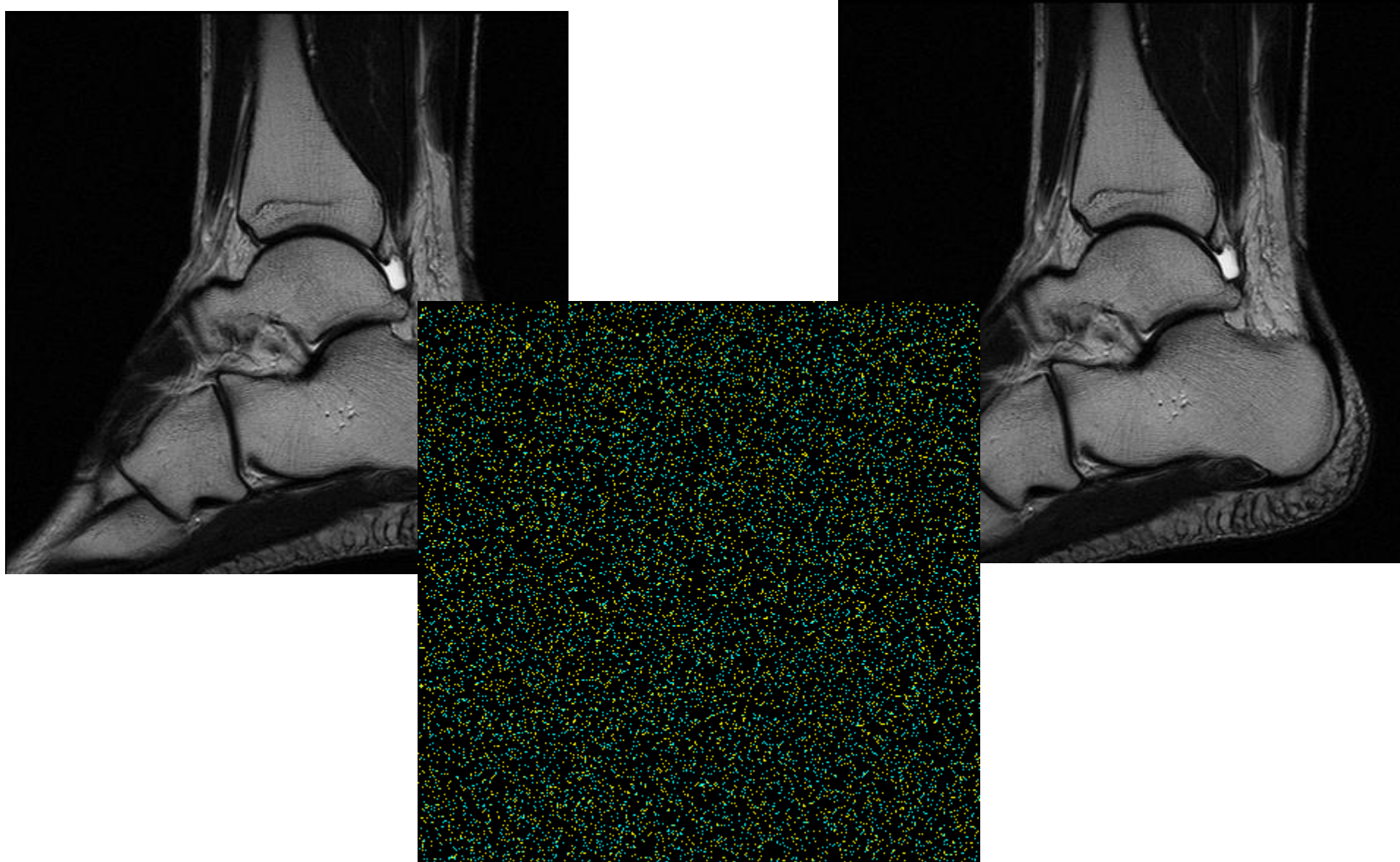


src

RÓŻNICA

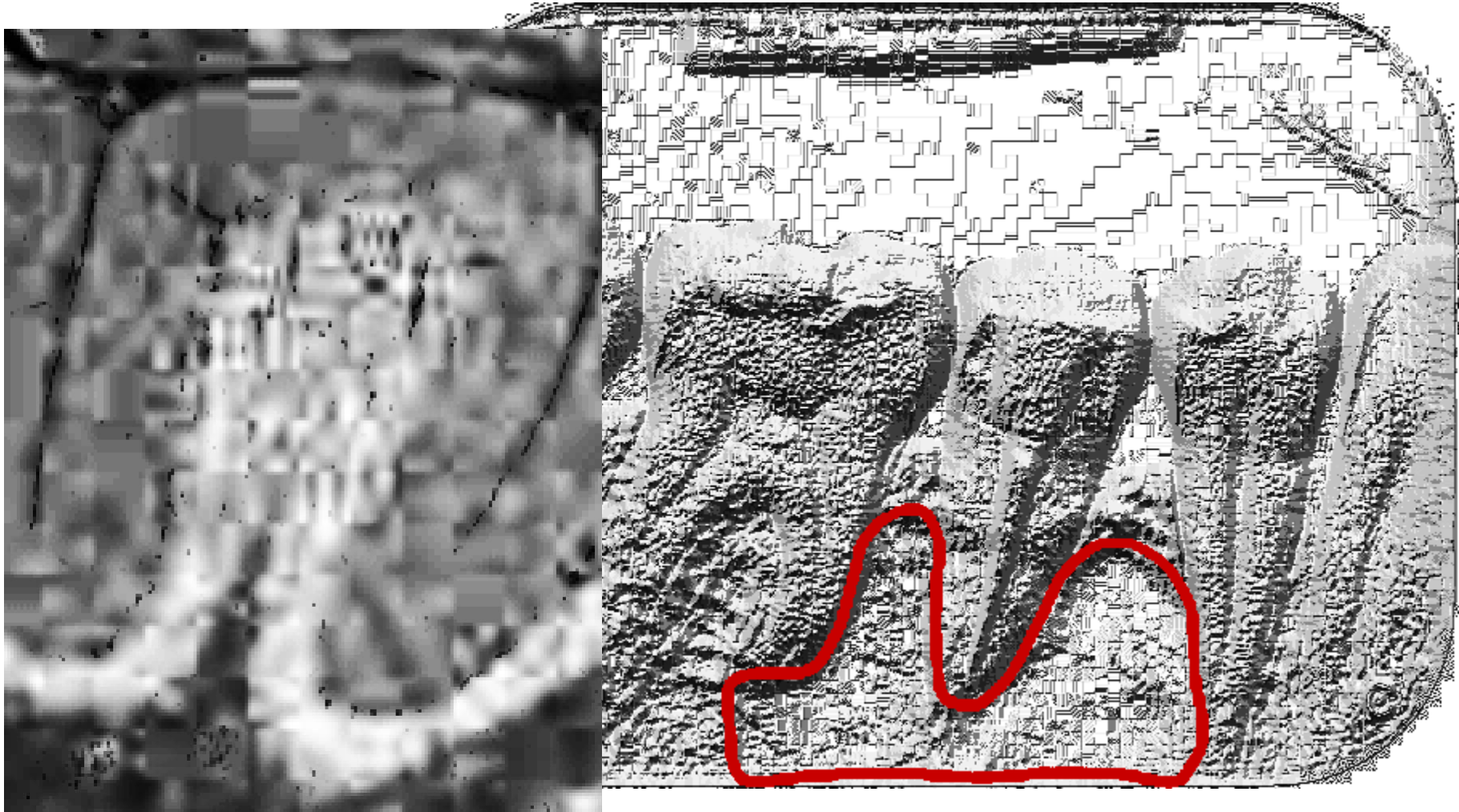
JPG 100%

Format: JPEG (kiedy nie należy stosować JPG)



Format: JPEG (kiedy nie należy stosować JPG)

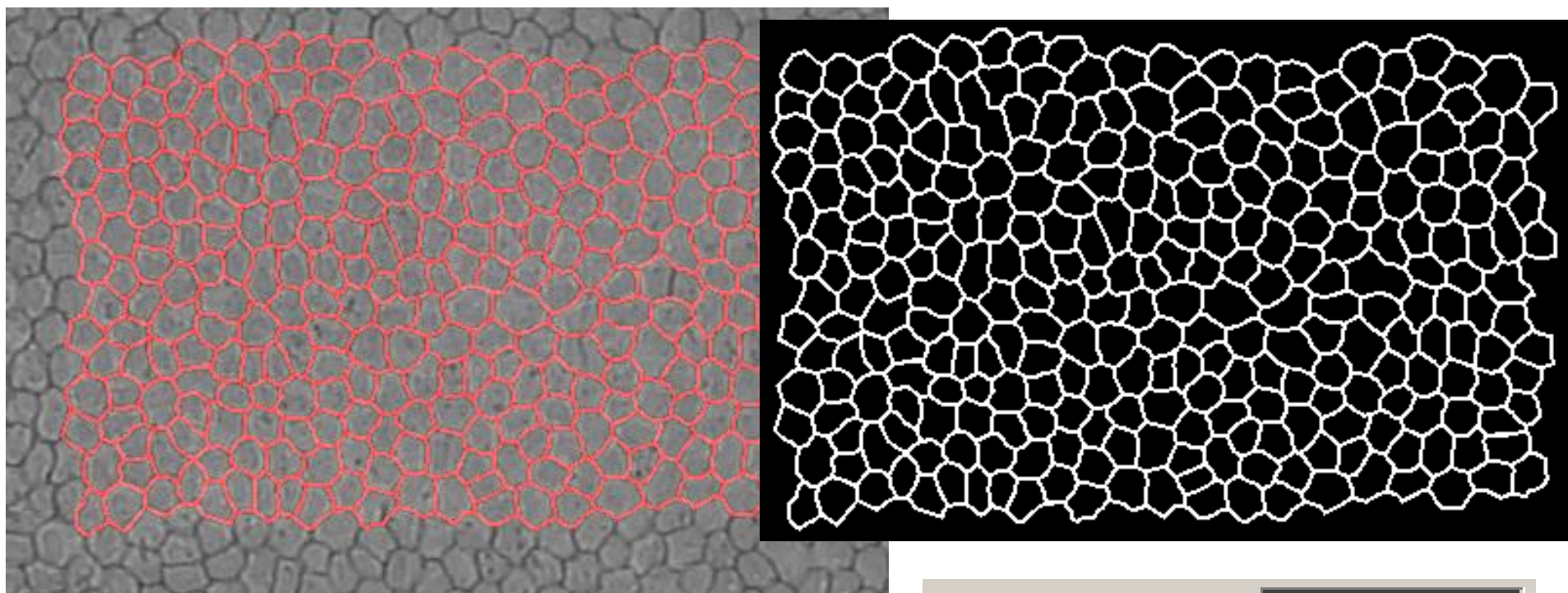
Problemy pojawiają się podczas przetwarzania obrazów



Format: JPEG (kiedy nie należy stosować JPG)

Dataset prof. Alfredo Ruggeri

A. Ruggeri, F. Scarpa, M. De Luca, C. Meltendorf, J. Schroeter. "A system for the automatic estimation of morphometric parameters of corneal endothelium in alizarine red stained images", Br J Ophthalmol, 94:643-7, 2010.



Number of unique colors:

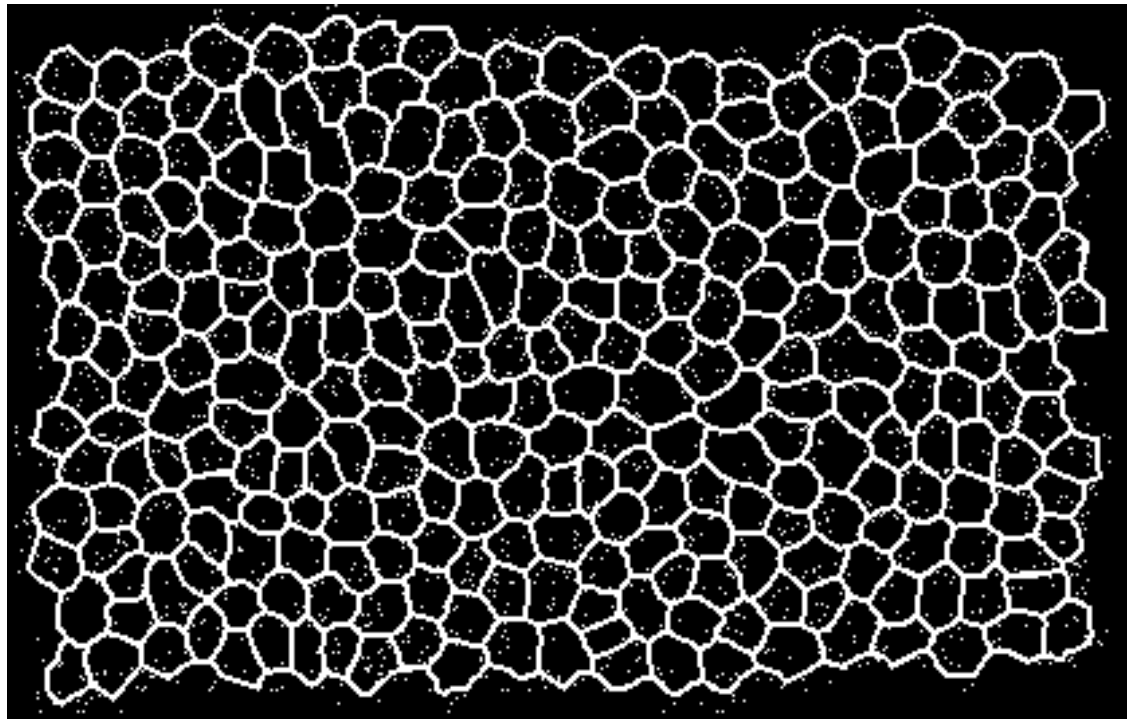
Format: JPEG (kiedy nie należy stosować JPG)

Dataset prof. Alfredo Ruggeri

progowanie $t=1$



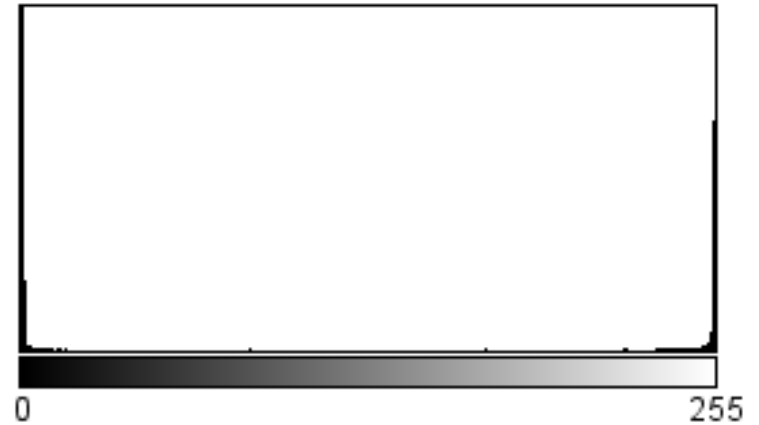
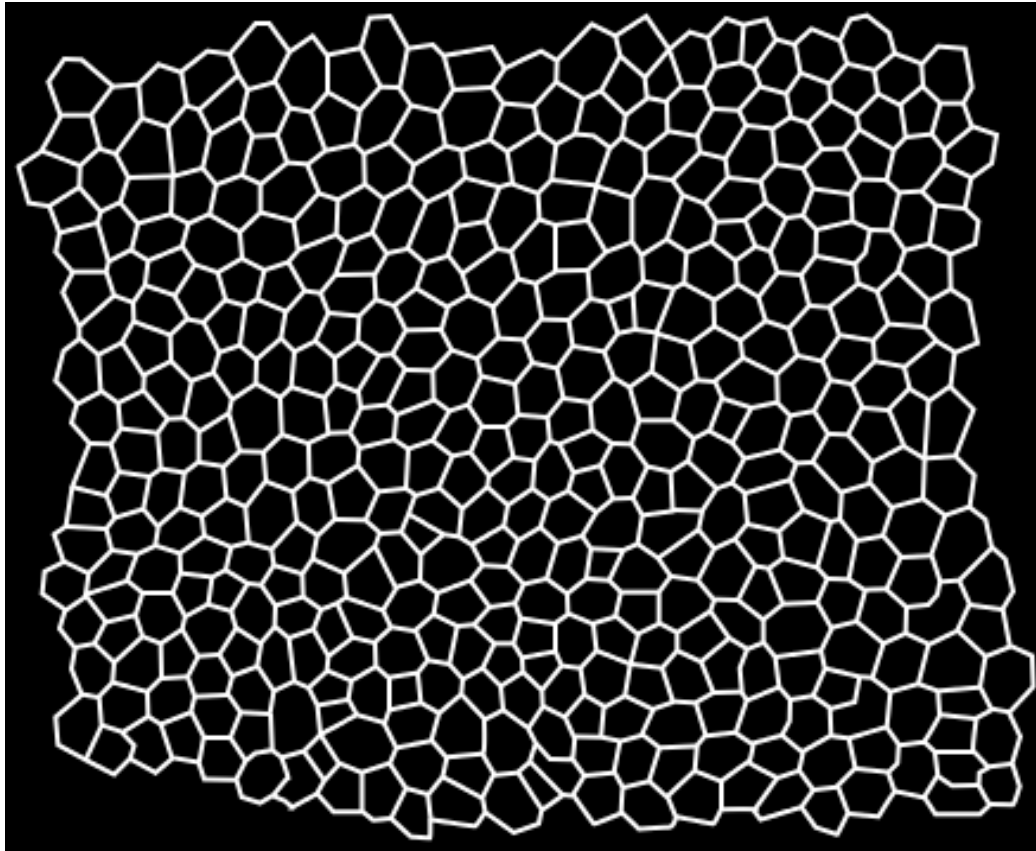
N: 111339	Min: 0
Mean: 46.349	Max: 255
StdDev: 98.311	Mode: 0 (89050)
Value: 223	Count: 0



Number of unique colors:

Obraz 2

offtopic



N: 157242
Mean: 43.358
StdDev: 86.724
Value: 235
Min: 0
Max: 255
Mode: 0 (113592)
Count: 139

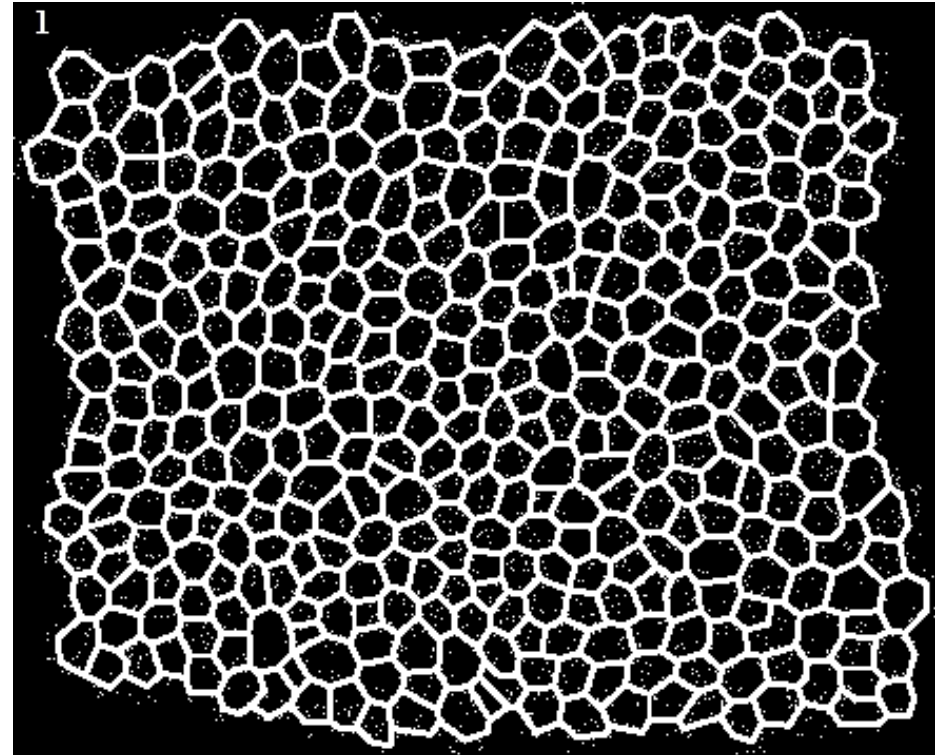
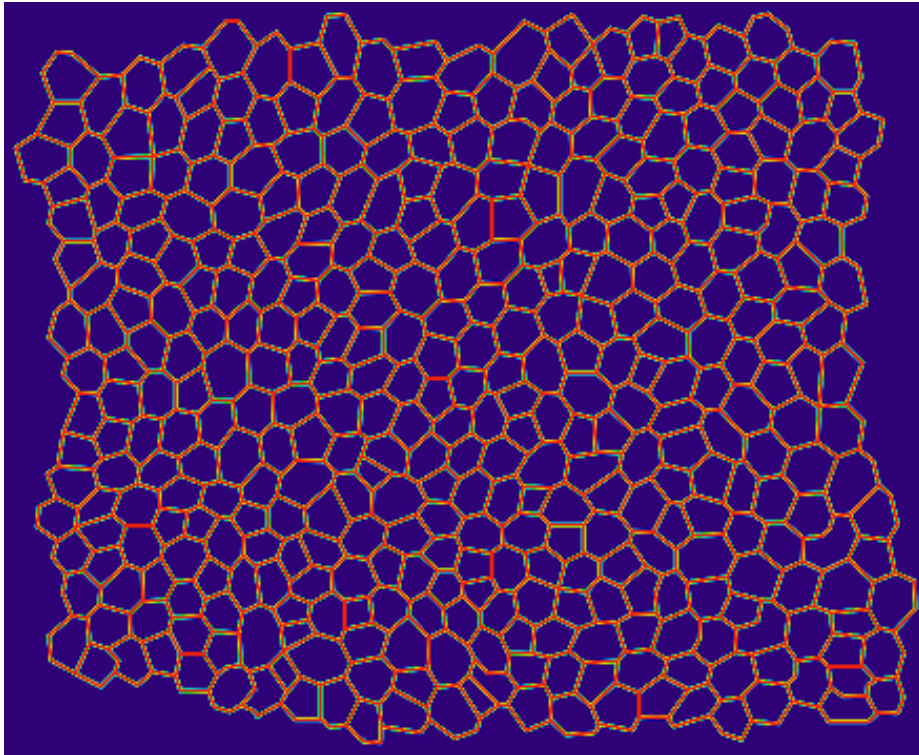
Original colors: 256 (8 BitsPerPixel)

Current colors: 256 (8 BitsPerPixel)

Number of unique colors: 256

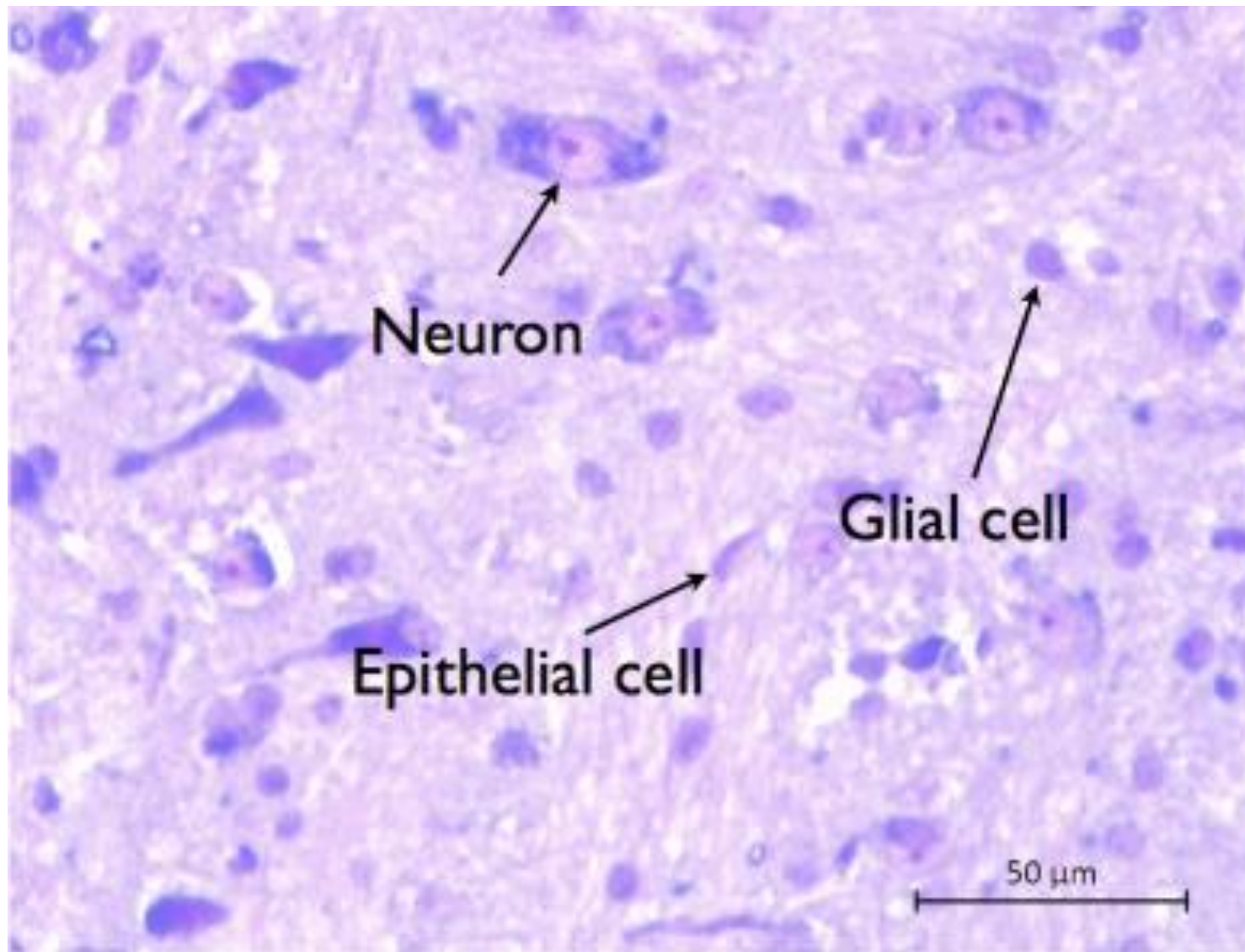
Obraz 2

offtopic

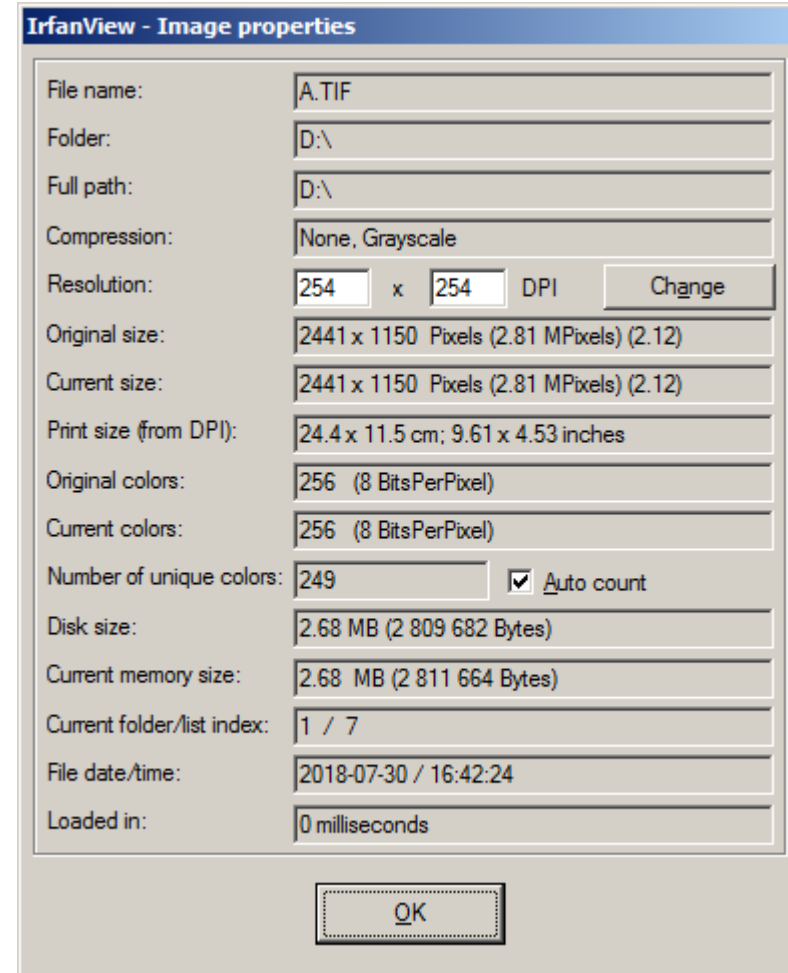
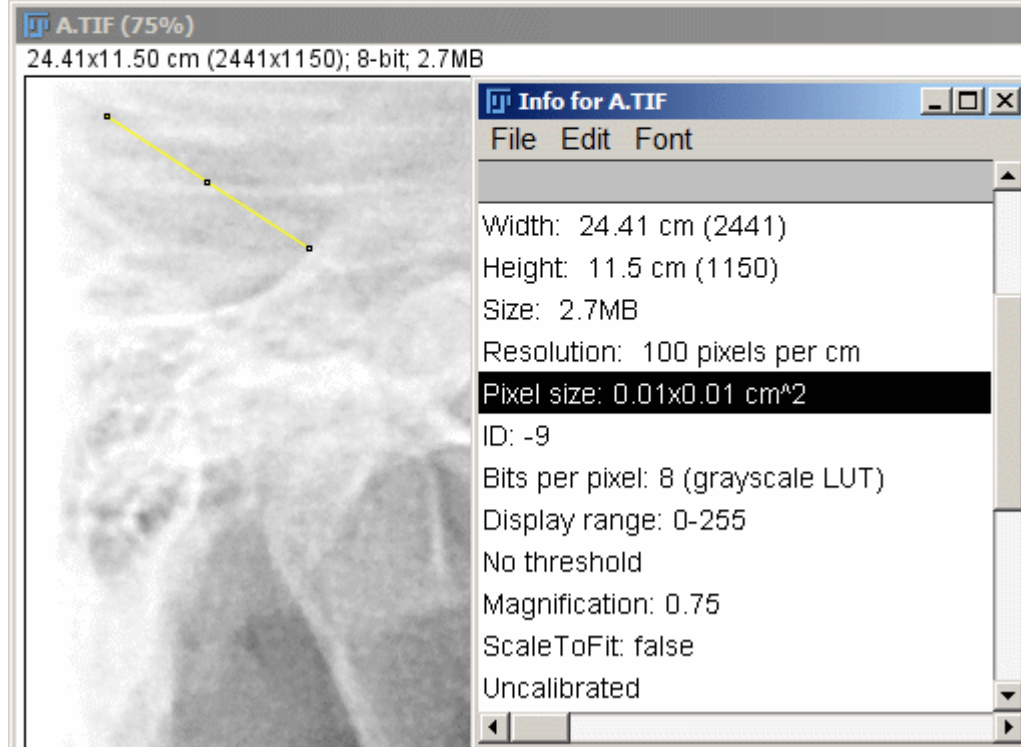
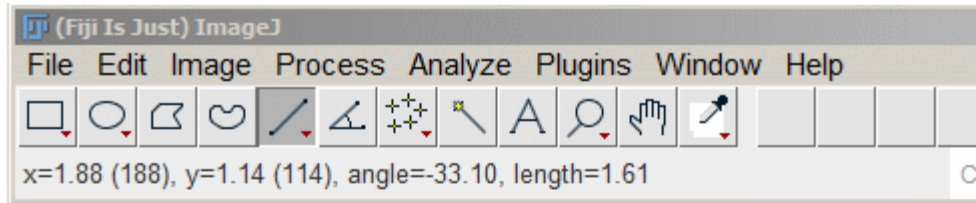


[animacja gif]

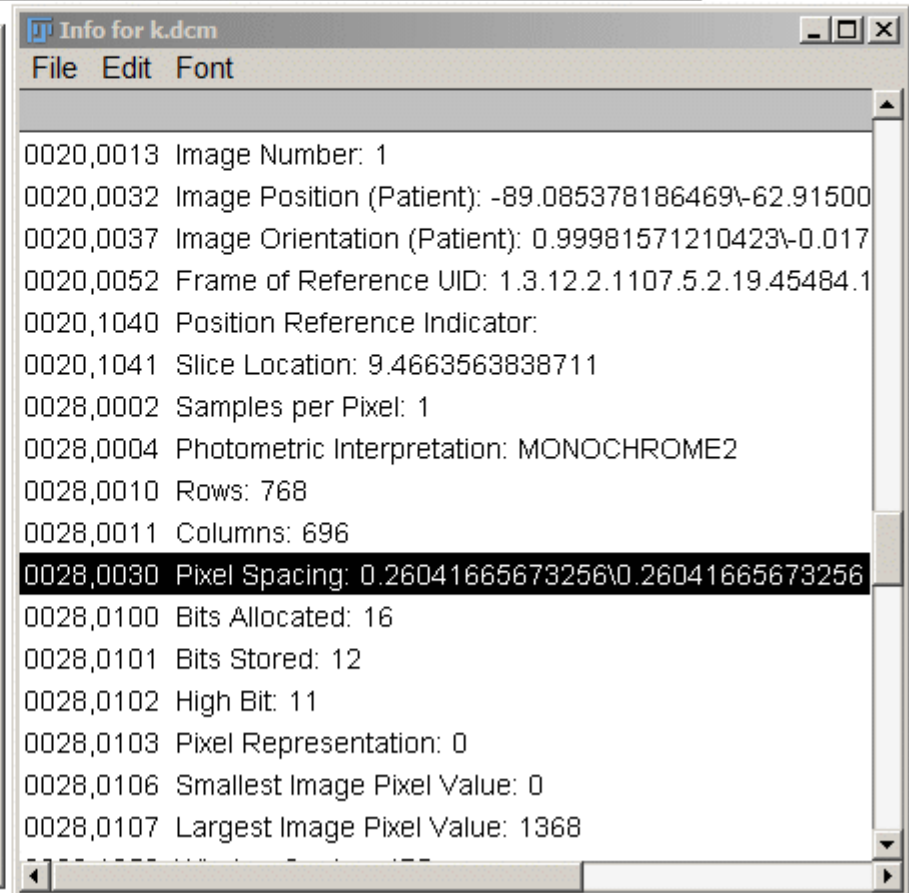
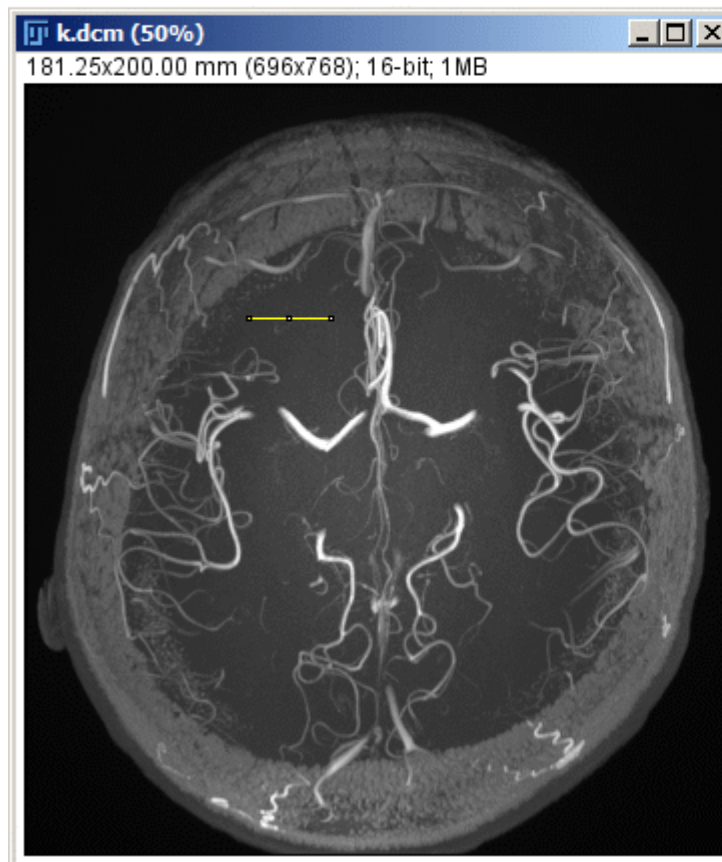
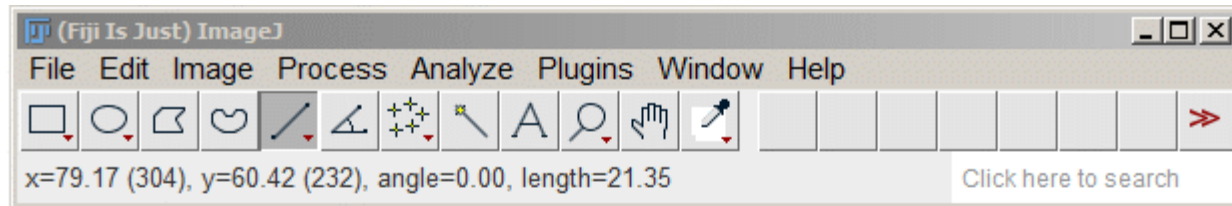
Parametry metryczne



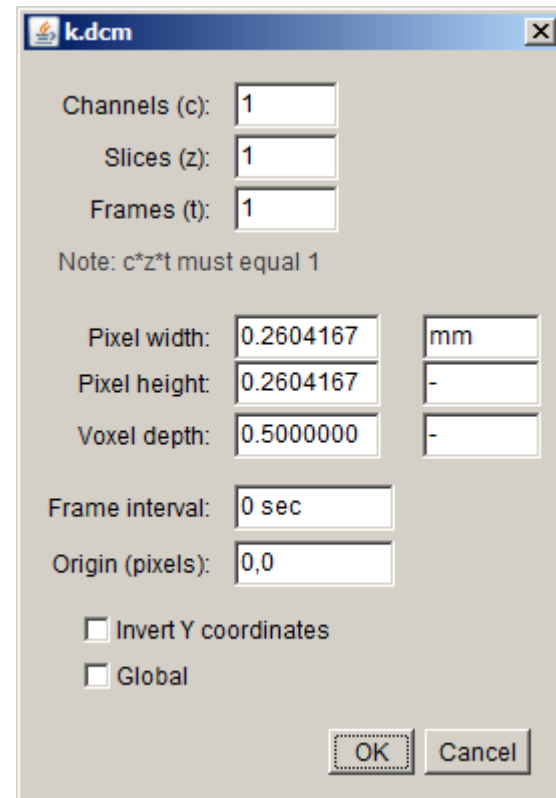
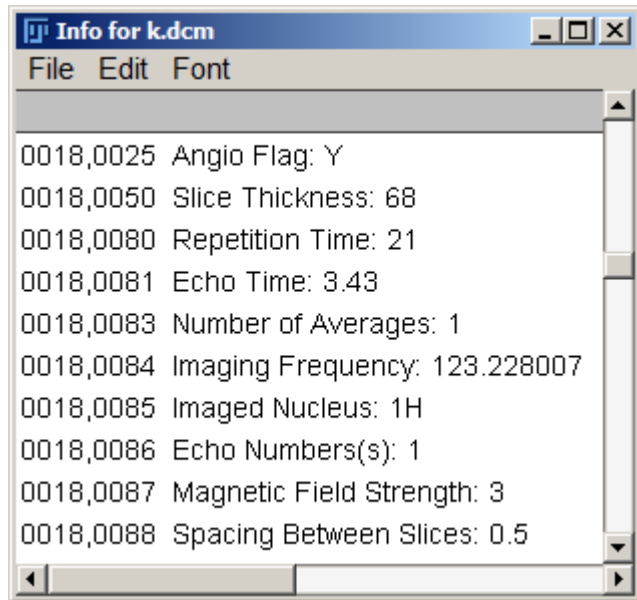
Parametry metryczne

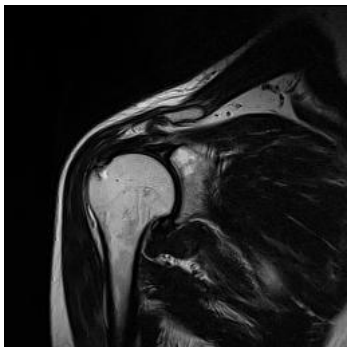


Parametry metryczne

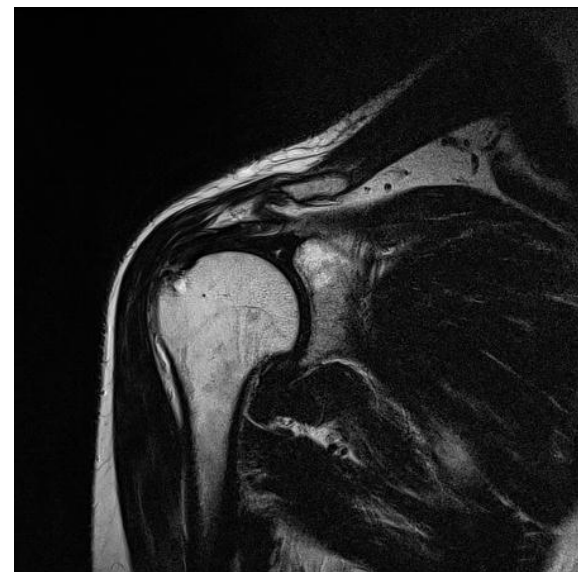


Parametry metryczne

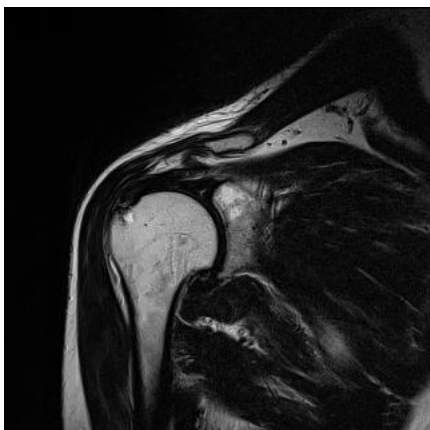




256x256



448x448

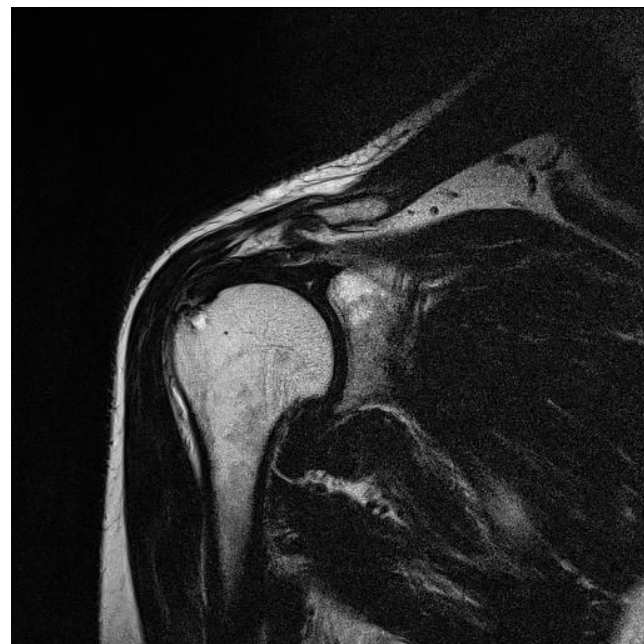


320x320

matryca	pix spc
256x256	0.78125
320x320	0.625
384x384	0.520833
448x448	0.446429
512x512	0.390625



384x384



512x512

DICOM – struktura pliku

Struktura pliku:

- nagłówek (DICM)
- lista elementów

Struktura elementu:

- nr grupy
- nr elementu
- typ
- długość danych
- dane

Rozszerzenia:

- *.dcm, *.ima, ... , brak ;)
- wielkość pliku – kilka KB - ...

```
"AE": // Application Entity
"AS": // Age String
"AT": // Attribute Tag
"CS": // Code String - ASCII
"DA": // Date
"DS": // Decimal String
"DT": // Date Time
"FL": // Floating Point Single
"FD": // Floating Point Double
"IS": // Integer String
"LO": // Long String
"LT": // Long Text
"PN": // Person Name
"SH": // Short String
"SL": // Signed Long
"SS": // Signed Short
"ST": // Short Text
"TM": // Time
"UI": // Unique Identifier (UID)
"UL": // Unsigned Long
"US": // Unsigned Short znaku
"SQ": // Sequence of Items
"UN": // Unknown -
"UT": // Unlimited text
"OF": // Other Float String
"OB": // Other Byte String
"OW": // Other Word String
```

DICOM – przykładowe elementy

(Group, Ele...	TAG Description	VR	VM	Length	Value
(0020,0032)	ImagePositionPatient	DS	3	50	-96.601323900254\ -94.609693681597\105.55752563635
(0020,0037)	ImageOrientationPatient	DS	6	94	0.99949387313145\0.0058343566481\0.03127231771382\1.905
(0020,0052)	FrameOfReferenceUID	UI	1	52	1.3.12.2.1107.5.2.40.49107.2.20190222124507437.0.0.0
(0020,1040)	PositionReferenceIndicator	LO	0	0	
(0020,1041)	SliceLocation	DS	1	16	89.444826991438
(0028,0002)	SamplesPerPixel	US	1	2	1
(0028,0004)	PhotometricInterpretation	CS	1	12	MONOCHROME2
(0028,0010)	Rows	US	1	2	384
(0028,0011)	Columns	US	1	2	336
(0028,0030)	PixelSpacing	DS	2	34	0.59895831346512\0.59895831346512
(0028,0100)	BitsAllocated	US	1	2	16
(0028,0101)	BitsStored	US	1	2	12
(0028,0102)	HighBit	US	1	2	11
(0028,0103)	PixelRepresentation	US	1	2	0
(0028,0106)	SmallestImagePixelValue	US	1	2	0
(0028,0107)	LargestImagePixelValue	US	1	2	1315
(0028,1050)	WindowCenter	DS	1	4	633
(0028,1051)	WindowWidth	DS	1	4	1340
(0028,1055)	WindowCenterWidthExplana...	LO	1	8	WINDOW1
(0029,0010)	PrivateCreator	LO	1	18	SIEMENS CSA HEADER
(0029,0011)	PrivateCreator	LO	1	22	SIEMENS MEDCOM HEADER2
(0029,1000)	Unknown Tag 9: Data	CS	1	12	IMAGE NUM 1

Export Close

parametry obrazu

DICOM Inspector.NET - D:\tmp\86542858

File Options Help

Property	Value
Attribute Tag	0028,0004
Description	Photometric Interpretation
Value Representation (VR)	CS
Tag Offset	00000838 : (2104)
Data Offset	00000840 : (2112)
Data Length	0000000C : (12)
Undefined Length in File	False
Value	MONOCHROME2

0018,1310 : Acquisition Matrix	
0018,1312 : In-plane Phase Encoding	
0018,1314 : Flip Angle	
0018,1315 : Variable Flip Angle Flag	
0018,1316 : SAR	
0018,1318 : dB/dt	
0018,5100 : Patient Position	
0020,000D : Study Instance UID	
0020,000E : Series Instance UID	
0020,0010 : Study ID	
0020,0011 : Series Number	
0020,0012 : Acquisition Number	
0020,0013 : Instance Number	
0020,0032 : Image Position (Patient)	00000830 02 00 55 53 02 00 01 00 28 00 04 00 43 53 0C 00 ..US.... (...CS..
0020,0037 : Image Orientation (Patient)	00000840 4D 4F 4E 4F 43 48 52 4F 4D 45 32 20 28 00 10 00 MONOCHROME2 (...
0020,0052 : Frame of Reference UID	00000850 55 53 02 00 C0 01 28 00 11 00 55 53 02 00 C0 01 US.... (...US....
0020,1040 : Position Reference Indicator	00000860 28 00 30 00 44 53 22 00 30 2E 33 35 37 31 34 32 (.0.DS".0.357142
0020,1041 : Slice Location	00000870 38 35 37 31 34 32 38 36 5C 30 2E 33 35 37 31 34 85714286\0.35714
0020,4000 : Image Comments	00000880 32 38 35 37 31 34 32 38 36 20 28 00 00 01 55 53 285714286 (...US
0028,0002 : Samples per Pixel	00000890 02 00 10 00 28 00 01 01 55 53 02 00 0C 00 28 00 (...US.... (.
0028,0004 : Photometric Interpretation	000008A0 02 01 55 53 02 00 0B 00 28 00 03 01 55 53 02 00 ..US.... (...US..
0028,0010 : Rows	000008B0 00 00 28 00 06 01 55 53 02 00 00 00 28 00 07 01 .. (...US.... (...
0028,0011 : Columns	000008C0 55 53 02 00 D5 04 28 00 50 10 44 53 04 00 35 38 US.... (.P.DS..58
0028,0030 : Pixel Spacing	000008D0 36 20 28 00 51 10 44 53 04 00 31 32 32 33 28 00 6 (.Q.DS..1223(.
0028,0100 : Bits Allocated	000008E0 55 10 4C 4F 06 00 41 6C 67 6F 31 20 29 00 10 00 U.LO..Algo1)...
0028,0101 : Bits Stored	000008F0 4C 4F 12 00 53 49 45 4D 45 4E 53 20 43 53 41 20 LO..SIEMENS CSA
0028,0102 : High Bit	00000900 48 45 41 44 45 52 29 00 11 00 4C 4F 16 00 53 49 HEADER)...LO..SI
0028,0103 : Pixel Representation	00000910 45 4D 45 4E 53 20 4D 45 44 43 4F 4D 20 48 45 41 EMENS MEDCOM HEA
0028,0106 : Smallest Image Pixel Value	00000920 44 45 52 20 29 00 12 00 4C 4F 16 00 53 49 45 4D DER)...LO..SIEM
0028,0107 : Largest Image Pixel Value	00000930 45 4E 53 20 4D 45 44 43 4F 4D 20 48 45 41 44 45 ENS MEDCOM HEADE
0028,1050 : Window Center	00000940 52 32 29 00 08 10 43 53 0C 00 49 4D 41 47 45 20 R2)...CS..IMAGE
0028,1051 : Window Width	00000950 4E 55 4D 20 34 20 29 00 09 10 4C 4F 08 00 32 30 NUM 4)...LO..20
0028,1055 : Window Center & Width	00000960 31 36 30 35 32 38 29 00 10 10 4F 42 00 00 4C 19 160528)...OB..L.
	00000970 00 00 53 56 31 30 04 03 02 01 38 00 00 00 4D 00 ..SV10....8...M.
	00000980 00 00 45 63 68 6F 4C 69 6E 65 50 6F 73 69 74 69 ..EchoLinePositi

DICOM Inspector.NET - D:\tmp\86542858

File Options Help

Property	Value
Attribute Tag	7FE0,0010
Description	Pixel Data
Value Representation (VR)	OW
Tag Offset	0000E5B2 : (58802)
Data Offset	0000E5BE : (58814)
Data Length	00062000 : (401408)
Undefined Length in File	False
Value	<other word array>

0000E5B0	0F 12 E0 7F 10 00 4F 57 00 00 00 20 06 00 00 00	.....OW.....
0000E5C0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E5D0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E5E0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E5F0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E600	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E610	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E620	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E630	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E640	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E650	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E660	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E670	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E680	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E690	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E6A0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E6B0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E6C0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E6D0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E6E0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E6F0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0000E700	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....

0028,0100 : Bits Allocated

0028,0101 : Bits Stored

0028,0102 : High Bit

0028,0103 : Pixel Representation

0028,0106 : Smallest Image Pixel Value

0028,0107 : Largest Image Pixel Value

0028,1050 : Window Center

0028,1051 : Window Width

0028,1055 : Window Center & Width

0029,0010 : <Private>

0029,0011 : <Private>

0029,0012 : <Private>

0029,1008 : <Private>

0029,1009 : <Private>

0029,1010 : <Private>

0029,1018 : <Private>

0029,1019 : <Private>

0029,1020 : <Private>

0029,1131 : <Private>

0029,1132 : <Private>

0029,1133 : <Private>

0029,1134 : <Private>

0029,1260 : <Private>

0032,1060 : Requested Procedure Description

0032,4000 : Study Comments

0040,0244 : Performed Procedure Step

0040,0245 : Performed Procedure Step

0040,0253 : Performed Procedure Step

0040,0254 : Performed Procedure Step

0088,0140 : Storage Media File-set UID

0088,0200 : Icon Image Sequence

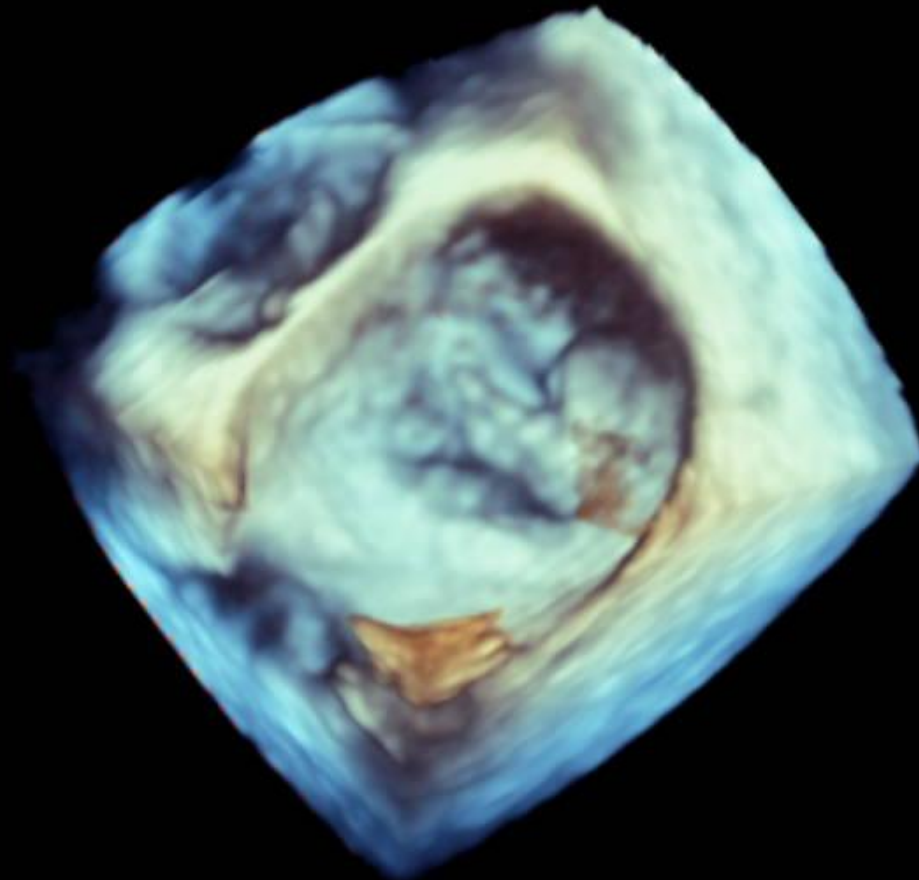
7FE0,0010 : Pixel Data

FR 9Hz
11cm

3D Beats 1

M4

3D
3D 52%
3D 40dB

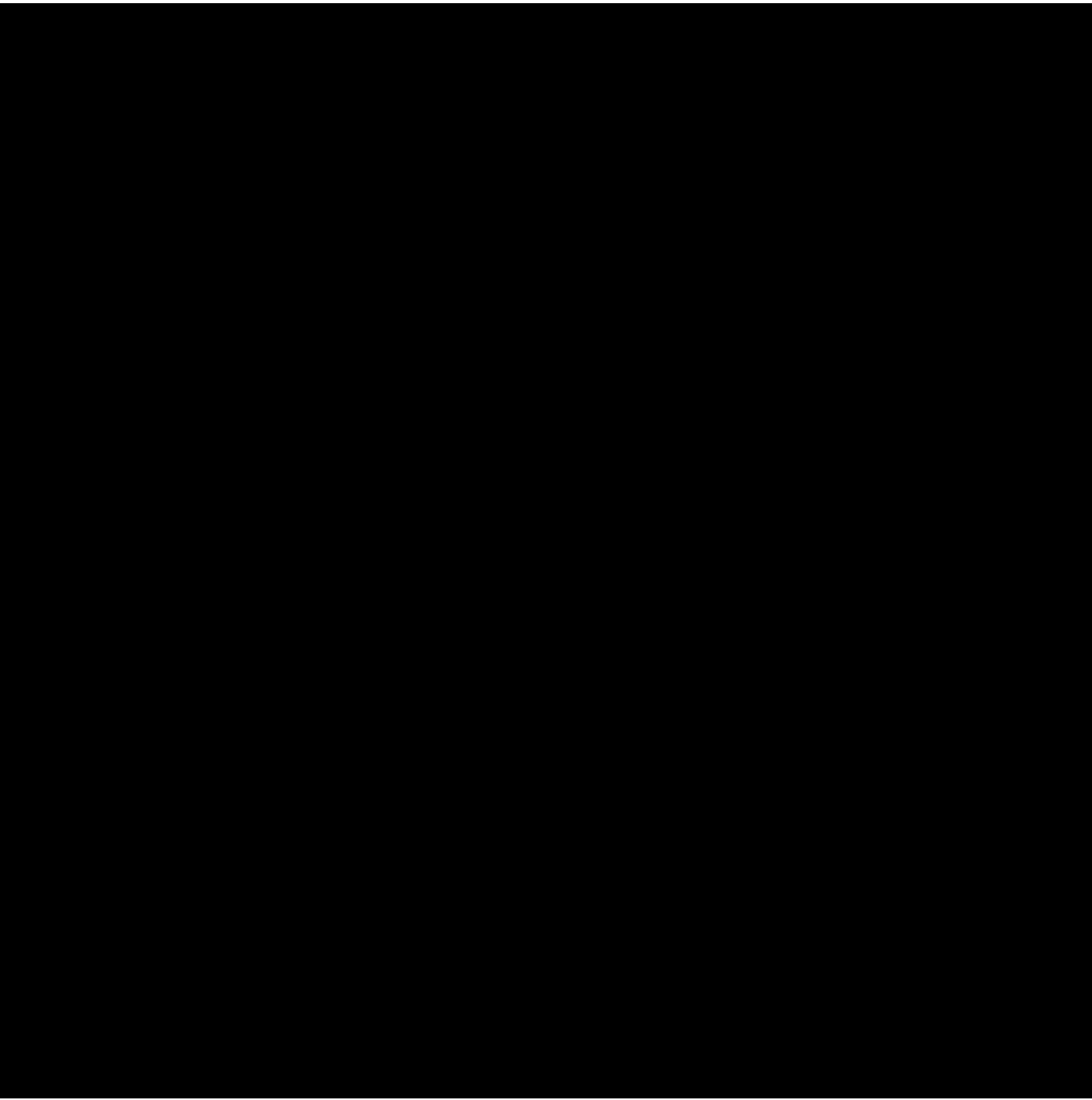


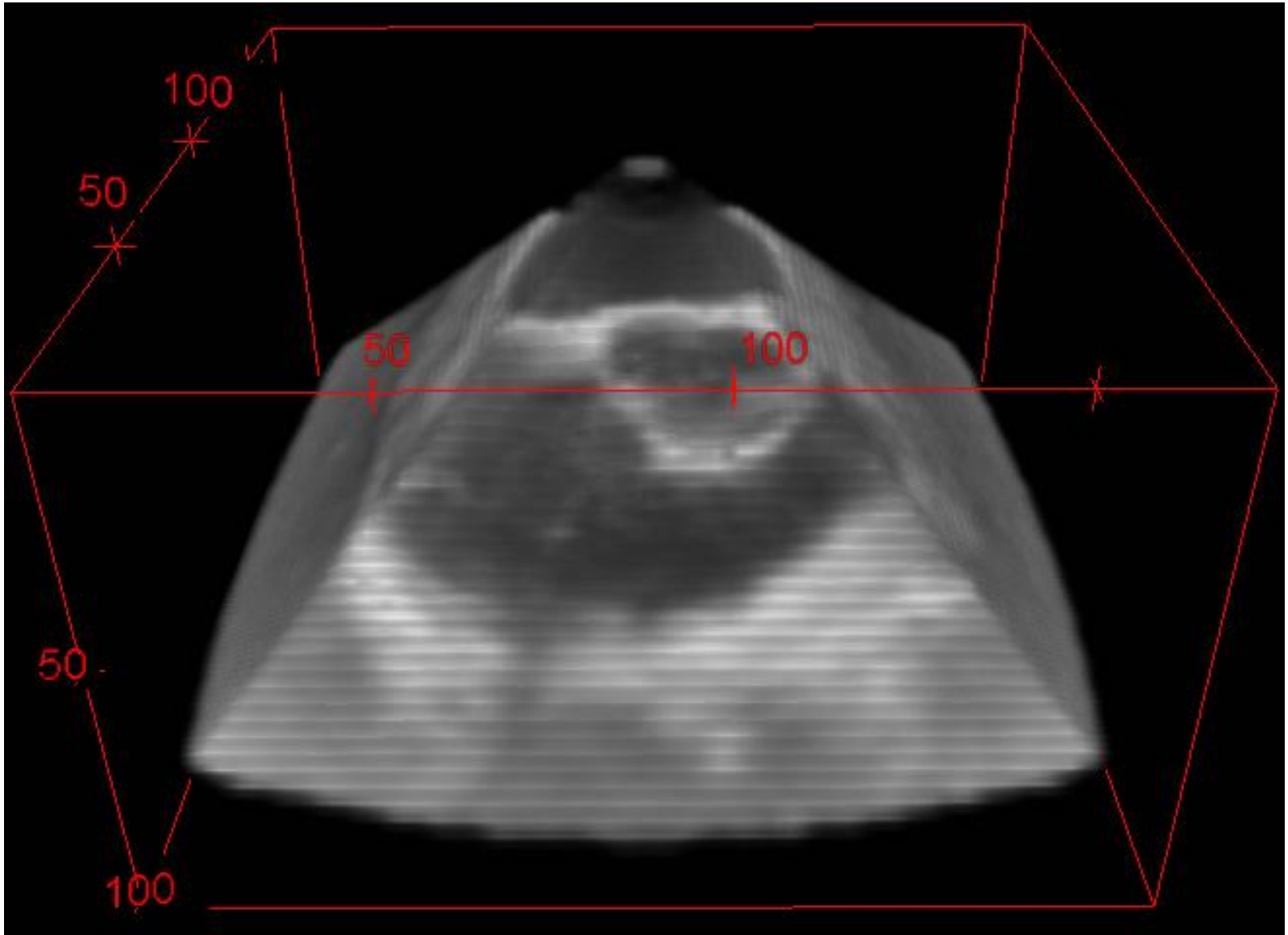
PAT T: 37.0C
TEE T: 40.1C

JPEG

98 bpm

[animacija gif]





ImageJ – 3D Viewer



DICOM Tags

(Group,Elem...	TAG Description	Value
(0020,0010)	Study ID	1
(0020,0011)	Series Number	5
(0020,0012)	Acquisition Number	1
(0020,0013)	Instance Number	64
(0020,0032)	Image Position Patient	-107.46507210286\ -142.89410754904\ -4
(0020,0037)	Image Orientation Patient	0.9993205442521\ 0.03383256768023\ 0.
(0020,0052)	Frame Of Reference UID	1.3.12.2.1107.5.2.30.159046.2.20210820
(0020,1040)	Position Reference Indicator	
(0020,1041)	Slice Location	19.50261581859
(0028,0002)	Samples Per Pixel	1
(0028,0004)	Photometric Interpretation	MONOCHROME2
(0028,0010)	Rows	448
(0028,0011)	Columns	448
(0028,0030)	Pixel Spacing	0.51339286565781\ 0.51339286565781
(0028,0100)	Bits Allocated	16
(0028,0101)	Bits Stored	12
(0028,0102)	High Bit	11
(0028,0103)	Pixel Representation	0
(0028,0106)	Smallest Image Pixel Value	0
(0028,0107)	Largest Image Pixel Value	2454
(0028,1050)	Window Center	804
(0028,1051)	Window Width	1736
(0028,1055)	Window Center Width Expl...	WINDOW1
(0029,0010)	Private Creator	SIEMENS CSA HEADER
(0029,0011)	Private Creator	SIEMENS MEDCOM HEADER2
(0029,1008)	Unknown Tag & Data	IMAGE NUM 4
(0029,1009)	Unknown Tag & Data	20210820



DICOM Tags

Search...

(Group,Elem...)	TAG Description	Value
(0019,10FC)	Unknown Tag & Data	320
(0019,10FD)	Unknown Tag & Data	NO
(0019,10FE)	Unknown Tag & Data	MED
(0020,000D)	Study Instance UID	1.2.124.113532.12.10699.12127.20...
(0020,000E)	Series Instance UID	1.3.51.0.7.12707346244.14092.456...
(0020,0010)	Study ID	000008980151
(0020,0011)	Series Number	1
(0020,0013)	Instance Number	1
(0020,0020)	Patient Orientation	L\F
(0020,0062)	Image Laterality	U
(0028,0002)	Samples Per Pixel	1
(0028,0004)	Photometric Interpretati...	MONOCHROME1
(0028,0010)	Rows	1825
(0028,0011)	Columns	1364
(0028,0030)	Pixel Spacing	0.139\0.139
(0028,0100)	Bits Allocated	16
(0028,0101)	Bits Stored	15
(0028,0102)	High Bit	14
(0028,0103)	Pixel Representation	0
(0028,0300)	Quality Control Image	NO
(0028,0301)	Burned In Annotation	NO
(0028,1040)	Pixel Intensity Relations...	DISP
(0028,1041)	Pixel Intensity Relations...	1
(0028,1052)	Rescale Intercept	0
(0028,1053)	Rescale Slope	1
(0028,1054)	Rescale Type	PVAL
(0028,2110)	Lossy Image Compression	00
(0028,3010)	VOILUT Sequence	
(FFFE,E000)	Item	
(0028,3002)	LUT Descriptor	14149\8217\16
(0028,3003)	LUT Explanation	
(0028,3006)	LUT Data	6\6\6\6\6\7\7\7\8\9\10\11\12\13\1...

Patient information | All Tags | Favorite Tags

DICOM Inspector.NET - D:\DICOM\USG_sda\USG_dcm_org\IM_0022.dcm

File Options Help

Property	Value
Attribute Tag	0028,0004
Description	Photometric Interpretation
Value Representation (VR)	CS
Tag Offset	000004DA : (1242)
Data Offset	000004E2 : (1250)
Data Length	00000004 : (4)
Undefined Length in File	False
Value	RGB

000004D0	28 00 02 00 55 53 02 00 03 00	28 00 04 00 43 53	(...US... (...CS
000004E0	04 00 52 47 42 20 28 00 06 00	55 53 02 00 00 00	..RGB (...US...
000004F0	28 00 10 00 55 53 02 00 1A 04	28 00 11 00 55 53	(...US... (...US
00000500	02 00 90 06 28 00 14 00 55 53	02 00 01 00 28 00	... (...US... (.
00000510	00 01 55 53 02 00 08 00 28 00	01 01 55 53 02 00	..US... (...US..
00000520	08		
00000530	55		
00000540	53		
00000550	51		
00000560	02		
00000570	30		
00000580	31		
00000590	32		
000005A0	04		
000005B0	69		
000005C0	20		
000005D0	57		
000005E0	69		
000005F0	20		
00000600	50		
00000610	6E		
00000620	1A		
00000630	67		
00000640	4C		

0008,1010 : Station Name
 0008,1070 : Operators' Name
 0008,1090 : Manufacturer's Model Name
 0008,1111 : Referenced Performed Procedure Step
 0008,2111 : Derivation Description
 0010,0010 : Patient's Name
 0010,0020 : Patient ID
 0010,0030 : Patient's Birth Date
 0010,0040 : Patient's Sex
 0018,1000 : Device Serial Number
 0018,1020 : Software Version(s)
 0018,1030 : Protocol Name
 0018,1088 : Heart Rate
 0018,5010 : Transducer Data
 0018,5020 : Processing Function
 0020,0000 : Study Instance UID
 0020,000E : Series Instance UID
 0020,0010 : Study ID
 0020,0011 : Series Number
 0020,0013 : Instance Number
 0028,0002 : Samples per Pixel
 0028,0004 : Photometric Interpretation
 0028,0006 : Planar Configuration
 0028,0010 : Rows
 0028,0011 : Columns
 0028,0014 : Ultrasound Color Data Parameters
 0028,0100 : Bits Allocated
 0028,0101 : Bits Stored
 0028,0102 : High Bit
 0028,0103 : Pixel Representation
 0028,0301 : Burned In Annotation
 0028,1050 : Window Center
 0028,1051 : Window Width
 0028,2110 : Lossy Image Compression
 0040,0244 : Performed Procedure Step
 0040,0245 : Performed Procedure Step

RGB

PHILIPS NNN 27/09/2018 17:12:55 TIS0.2 MI 0.5
 11121720180927 ULTRAGEN KRAKOW L17-5/MSK Gen

FR 31Hz
 RS

2D
 85%
 C-59
 P Med
 Res

M4
 0
 1
 2
 3

F#511

Cine

Z uprzejmości prof. R. Obuchowicza
 - dziękuję ☺

DICOM – dane osobowe

(0010,0010)	Patient Name
(0010,0020)	Patient ID
(0010,0030)	Patient Birth Date
(0010,0040)	Patient Sex
(0010,1010)	Patient Age
(0010,1020)	Patient Size
(0010,1030)	Patient Weight

0008,0090	Referring Physician's Name
0008,1010	Station Name
0008,1030	Study Description
0008,103E	Series Description
0008,1050	Performing Physician's Name
0008,1070	Operators' Name
0008,1090	Manufacturer's Model Name
0008,1140	Referenced Image Sequence
0010,0010	Patient's Name
0010,0020	Patient ID
0010,0030	Patient's Birth Date
0010,0040	Patient's Sex
0010,1010	Patient's Age
0010,1030	Patient's Weight
0018,0020	Scanning Sequence
0018,0021	Sequence Variant
0018,0022	Scan Options
0018,0023	MR Acquisition Type
0018,0024	Sequence Name
0018,0025	Angio Flag
0018,0050	Slice Thickness
0018,0080	Repetition Time
0018,0081	Echo Time
0018,0083	Number of Averages
0018,0084	Imaging Frequency
0018,0085	Imaged Nucleus
0018,0086	Echo Number(s)
0018,0087	Magnetic Field Strength
0018,0088	Spacing Between Slices
0018,0089	Number of Phase Encodes
0018,0091	Echo Train Length

Description	Patient's Sex
Value Representation (VR)	CS
Tag Offset	00000492 : (1170)
Data Offset	0000049A : (1178)
Data Length	00000002 : (2)
Undefined Length in File	False
Value	M

00000490	30 37 10 00 40 00 43 53 02 00 4D 20 10 00 10 10 07 ..@.CS..M
000004A0	41 53 04 00 30 33 39 59 10 00 30 10 44 53 02 00 AS..039Y..0.DS...
000004B0	37 35 18 00 20 00 43 53 02 00 53 45 18 00 21 00 75.. .CS..SE..!
000004C0	43 53 0A 00 53 4B 5C 53 50 5C 4F 53 50 20 18 00 CS..SK\SP\OSP ..
000004D0	33 00 43 53 00 00 18 00 23 00 43 53 02 00 32 44 ".CS....#.CS..2D
000004E0	2A 74 73 65 32 64 31 5F ..\$.SH..*tse2d1
000004F0	02 00 4E 20 18 00 50 00 15 ..\$CS..M..P.
00000500	80 00 (0010,0010) Patient Name .. 43
00000510	02 00 (0010,0020) Patient ID
00000520	84 00 (0010,0030) Patient Birth Date .. 53
00000530	18 00 (0010,0040) Patient Sex
00000540	02 00 (0010,1010) Patient Age
00000550	18 00 (0010,2160) Ethnic Group
00000560	49 53 (0010,2180) Occupation
00000570	31 35 (0010,21B0) Additional Patient History
00000580	44 53 (0010,2203) Patient Sex Neutered
00000590	31 31 (0010,2203) Patient Sex Neutered
000005A0	38 20 18 00 20 10 4C 4F LO..23978 ..LO
000005B0	4D 52 20 32 30 30 34 41 ..syngo MR 2004A
000005C0	20 34 56 41 32 35 41 20 18 00 30 10 4C 4F 0E 00 4VA25A ..0.LO..
000005D0	74 32 5F 74 73 65 5F 63 6F 72 5F 33 6D 6D 18 00 t2_tse_cor_3mm..
000005E0	00 12 44 41 08 00 32 30 31 36 30 35 31 31 18 00 ..DA..20160511..

(0031,0010)	Private Creator
(0031,1020)	Unknown Tag & Data
(0032,000A)	RETIRED_ Study Status ID
(0032,1032)	Requesting Physician
(0032,1033)	Requesting Service
(0032,1060)	Requested Procedure De...
(0032,4000)	RETIRED_ Study Comments
(0033,0010)	Private Creator
(0033,1004)	Unknown Tag & Data
(0033,1013)	Unknown Tag & Data
(0038,0300)	Current Patient Location
(0038,0500)	Patient State

(0010,0010)	Patient Name
(0010,0020)	Patient ID
(0010,0030)	Patient Birth Date
(0010,0040)	Patient Sex
(0010,1010)	Patient Age
(0010,2160)	Ethnic Group
(0010,2180)	Occupation
(0010,21B0)	Additional Patient History
(0010,2203)	Patient Sex Neutered

DICOM Tags	
Search...	
Patient Name	...
PatientID	(...
Patient Birth Date	...
Patient Sex	...
Patient Age	(...
Patient Weight	...
Patient Address	...
Study Date	4...
Study Time	...
Study ID	(...
Study Modality	...
Study Description	...
Series Date	4...
Series Time	...
Series Description	...
Patient information	

DICOM – dane osobowe

0008,0050 - AccessionNumber
0008,0080 - InstitutionName
0008,0081 - InstitutionAddress
0008,0090 - ReferringPhysicianName
0008,0096 - ReferringPhysician ID
0008,009C - ConsultingPhysicianName
0008,009D - ConsultingPhysicianName
0008,1040 - InstitutionalDepartmentName
0008,1048 - PhysiciansOfRecord
0008,1050 - PerformingPhysicianName
0008,1060 - NameOfPhysiciansReadingStudy
0008,1070 - Operator
0008,1010 - StationName
0008,1030 - StudyDescription
0008,103E - SeriesDescription
0010,0010 - PatientName (Nazwisko^Imie)
0010,0020 - PatientID
0010,0030 - PatientBirthDate
0010,1000 - PatientID_other,RETIRED_OtherPatientIDs
0010,4000 - Patient Comments
0018,0024 - SequenceName
0018,1000 - DeviceSerialNumber
0018,1030 - ProtocolName
0033,1013 - UnknownTag&Data - AGFA - imie nazw
0031,1020 - Unknown Tag & Data pesel
0031,1101 - Unknown Tag & Data nr ??
0038,0300 - CurrentPatientLocation
0032,1032 - Requesting_Physician
0032,1033 - Requesting_Service
0032,0080 - osrodek
0032,0080 - osrodek
0040,3001 - ConfidentialityConstraintOnPatientDataDescription
0137,1010 - imie_nazwisko_netraad
0137,1020 - ???_netraad
0137,1030 - data_ur_netraad

DICOM - DCMTK: OFFIS DICOM Toolkit

zamiana JPEG2000 na RAW

```
dcmdjpeg plik plik_raw.dcm
```

pobranie danych DCM

```
dcmdump +P 0028,0030 %t >>pixelspacing.txt
```

```
D:\>dcmdump +P 0028,0030 P86542499.dcm
```

```
(0028,0030) DS [0.68359375\0.68359375] 22, 2 PixelSpacing
```

ANONIMIZACJA

-- wykasowywanie tagu (wykasowanie całego bloku z wewnętrznymi danymi)

```
dcmodify -e "(0010,1000)" plik.dcm
```

-- zmiana danych w tagu

```
dcmodify -m "(0010,0010)=anon" plik.dcm
```

Dodaj do archiwum



Archiwum: D:\
DICOM.7z

Format archiwum: 7z

Tryb aktualizacji: Dodaj i zamień pliki

Stopień kompresji: Ultra

Tryb ścieżek: Relative pathnames

Metoda kompresji: PPMd

- Opcje
- Utwórz archiwum SFX
 - Kompresuj pliki współdzielone
 - Delete files after compression

Rozmiar słownika: 1024 MB

Rozmiar słowa: 32

Rozmiar bloku ciągłego: 4 GB

Liczba wątków: 1 / 16

Użycie pamięci dla kompresji: 1055 MB

Użycie pamięci dla dekompresji: 1026 MB

Rozmiar woluminów (bajty):

- Szyfrowanie
- Wprowadź hasło:
- Pokaż hasło
- Metoda szyfrowania: AES-256
- Zasyfruj nazwy plików

Parametry:

OK

Anuluj

Pomoc

~38%

Praktyka ...