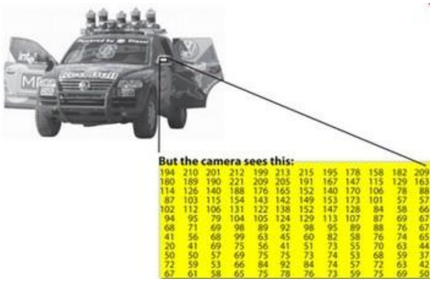
Solution Chapter 1: Grayscale

Excursion:

Additional knowledge of cv::Mat



But the camera sees this:

194	210	201	212	199	213	215	195	178	158	182	209
180	189	190	221	209	205	191	167	147	115	129	163
114	126	140	188	176	165	152	140	170	106	78	88
87	103	115	154	143	142	149	153	173	101	57	57
102	112	106	131	122	138	152	147	128	84	58	66
94	95	79	104	105	124	129	113	107	87	69	67
68	71	69	98	89	92	98	95	89	88	76	67
41	56	68	99	63	45	60	82	58	76	74	65
20	41	69	75	56	41	51	73	55	70	63	44
50	50	57	69	75	75	73	74	53	68	59	37
72	59	53	66	84	92	84	74	57	72	63	42
67	61	58	65	75	78	76	73	59	75	69	50

OpenCV

Mat – The Basic Image Container

- Real world images are transformed into digital images e.g via digital cameras, scanners
- Every real world information (intensity) is stored in a list (called array)
- This “Container” is called Mat in OpenCV

Line by line representation:

4x10 image

each pixel intensity

0	134	135	255	255	136	128	142	60	42
60	60	67	128	254	136	128	70	30	0
10	34	16	15	0	13	35	78	56	22
5	68	203	181	164	142	100	42	30	8

- Every single row is saved as individual object in memory

Continuous representation: → stored as single obj in mem → fast operation.

0	134	135	255	255	136	128	142	60	42	60	60	67	128	254	136	128	70	30	0	. . .

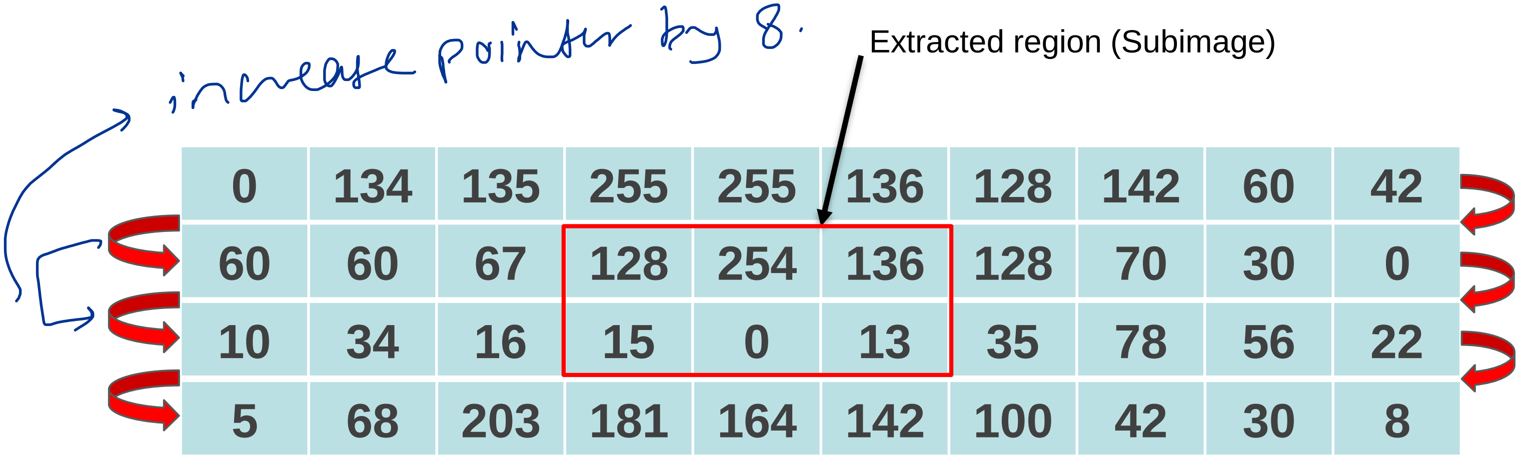
- The whole picture is saved as a single object in memory why image should be Continious? → in mem.

↳ if not Continious → wrong result

To access the image in one row & several Cols it should be Continuous.

Mat – The Basic Image Container

- Why is it important to check for continuity?
  - Extracted image is not continuous in cv::Mat



increase pointer by 8.

Extracted region (Subimage)

0	134	135	255	255	136	128	142	60	42
60	60	67	128	254	136	128	70	30	0
10	34	16	15	0	13	35	78	56	22
5	68	203	181	164	142	100	42	30	8

- Processing the extracted image needs pointer algorithms to get the first cell of the next row
- To get the next pixel after the cell with the value 136 the pointer has to be increased by 8 in this example

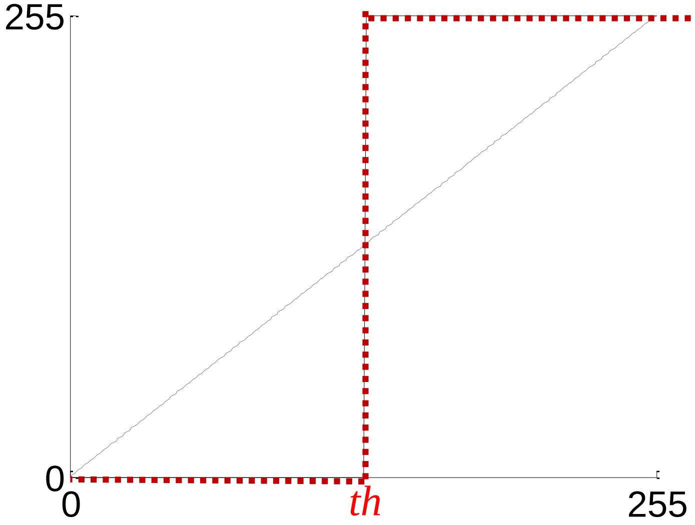
Some knowledge of cv::Mat and OpenCV is assumed, please brief yourself on the following website:

http://docs.opencv.org/2.4/doc/tutorials/core/mat_the_basic_image_container/mat_the_basic_image_container.html

Chapter 2:
Thresholding

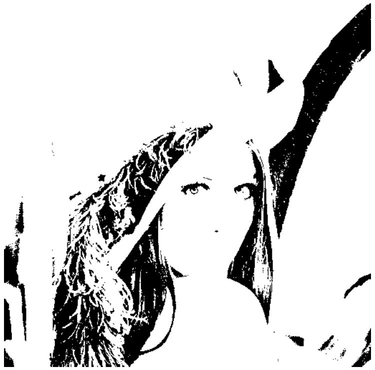
Repetition Thresholding

$$J(m,n) = \begin{cases} 0, & \text{if } I(m,n) < th \\ 255, & \text{if } I(m,n) \geq th \end{cases}$$

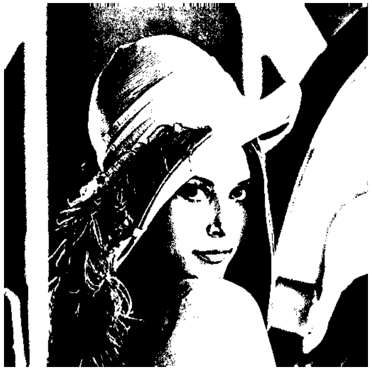


- The result of thresholding an image is a binary image
- It can be used for simple segmentation tasks

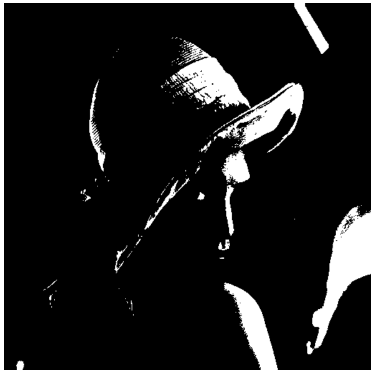
$th = 64$



$th = 128$



$th = 192$

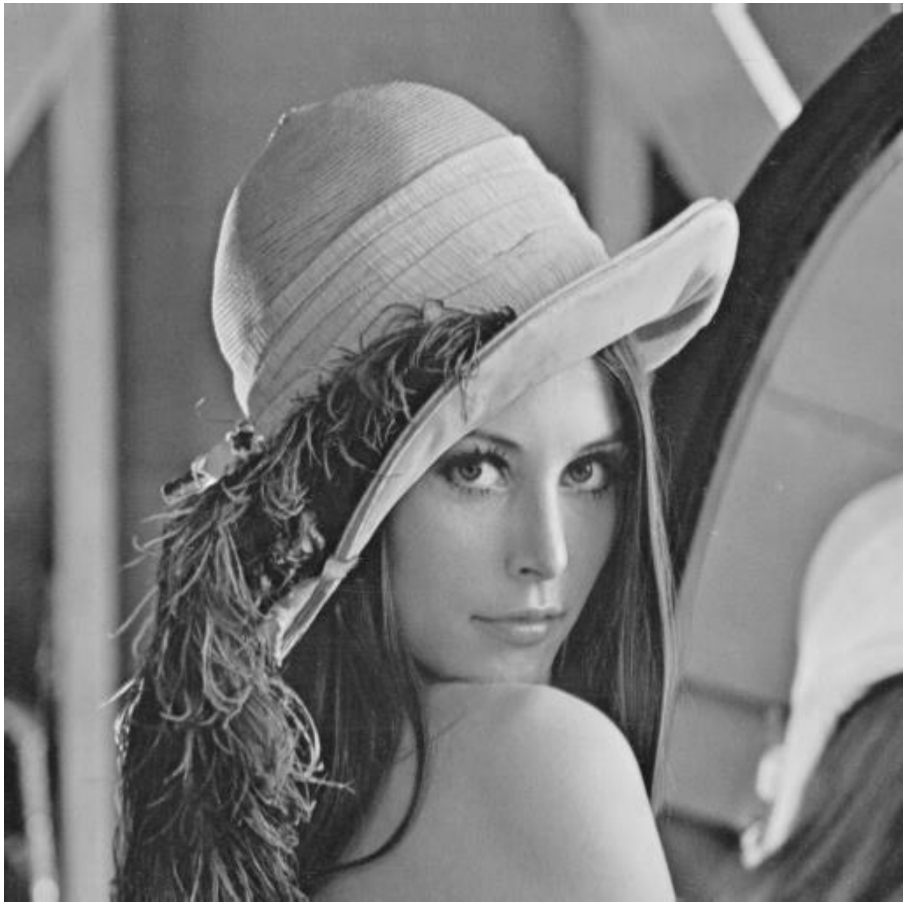


Second exercise

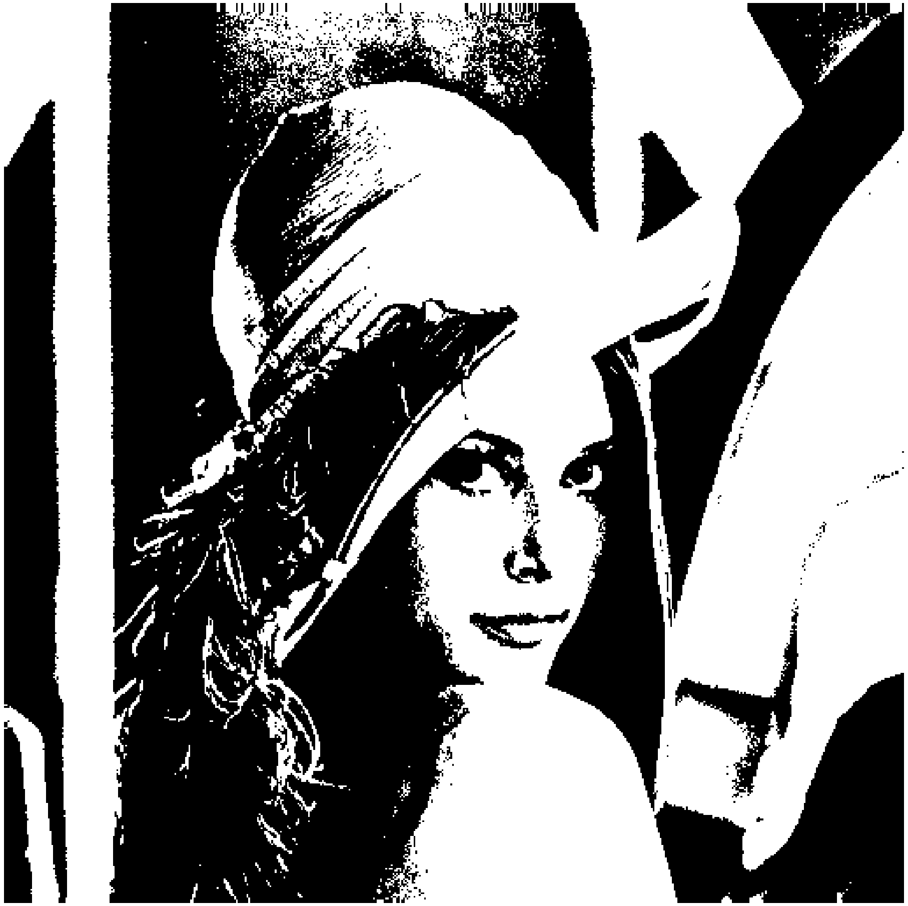
- Implement an image thresholding program

Expected Output

Original Grayscale Image



Thresholded Images (e.g. th = 128)



Goodbye

That is all for today.