Multimedia Image Processing Lab Experiment/Simulation

Md Mamunur Rashid Bsc.Student, Faculty of Engineering Electrical and Electronics Engineering Department Al-Madinah International University, Malaysia Email:mamunursiraj93@gmail.com

Abstract

Image Processing in Multimedia Applications treats a number of critical topics in multimedia systems, with respect to image and video processing techniques and their implementations. These techniques include the Image and video compression techniques and standards, and Image and video indexing and retrieval techniques. Image Processing is an important tool to develop a Multimedia system design.

Keywords: Multimedia, Image Processing, Lab Experiment/Simulation.

1. Introduction to Image Processing

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too. Image processing basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analyzing and manipulating the image;
- Output in which result can be altered image or report that is based on image analysis.

There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

1.1 Application of Image Processing

Digital image processing has become economical in many fields like signature recognition, iris recognition and face recognition, in forensics, in automobile detection and in military applications. Each of these applications has its basic requirements, which may be unique from the others. Some of the important applications of image processing in the field of science and technology include computer vision, remote sensing, feature extraction, face detection, forecasting, optical character recognition, finger-print detection, optical sorting, argument reality, microscope imaging, lane departure caution system, Non-photorealistic representation, medical image processing, and morphological imaging

1.1.1 Advantages of Digital Image

The processing of images is faster and more cost-effective. One needs less time for processing, as well as less film and other photographing equipment. It is more ecological to process images. No processing or fixing chemicals are needed to take and process digital images. However, printing inks are essential when printing digital images. When shooting a digital image, one can immidiately see if the image is good or not. Copying a digital image is easy, and the quality of the image stays good unless it is compressed. For instance, saving an image as jpg format compresses the image. By resaving the image as jpg format, the compressed image will be recompressed, and the quality of the image will get worse with every saving. Fixing and retouching of images has become easier. In new Photoshop 7, it is possible to smooth face wrinkles with a new Healing Brush Tool in a couple of seconds. The expensive reproduction (compared with restoring the image with a repro camera) is faster and cheaper. By changing the image format and resolution, the image can be used in a number of media.

1.1.2 Disadvantages of Digital Image

f Misuse of copyright is now easier than it earlier was. For instance, images can be copied from the Internet just by clicking the mouse a couple of times. f the value of the image will get worse? This has not necessarily happened everywhere. Images held in image banks still have reasonably good prices, inspite of the fact that downloading images through the net is fast and easy. The profitableness of digital photography has increased the number of images and photography in general. f Old professions (such as maker-up, repro cameraman) vanish, and new ones do not necessarily appear. For instance in mid-1990s, the newspaper Aamulehti started using computerised make-up, and the traditional makers-up were left unemployed. f Work has become more technical, which may not be a disadvantage for everyone. f A digital file of a certain size cannot be enlargened with a good quality anymore. For instance, a good poster cannot be made of an image file of 500 kb. However, it is easy to make an image smaller.

2. Research Objectives

To gain experience in processing digital images with point are processing and special processing to:-

- Improve its pictorial information for human interpretation,
- Render it more suitable for autonomous machine perception.
- To study basic image processing operation
- To understand image analyze algorithm
- Understand the basics of the human visual system as they relate to image processing; including spatial frequency resolution and brightness adaption.
- Understand why preprocessing is performed and know about image geometry, convolution masks, image algebra and basic spatial filters.

3. Theory/Procedure

Arithmetic operations: Fastly I have done arithmetic operations. These operations act by applying a simple function include adding or subtract or multiplying and division. Bellow shown the all figure

We can test this on the "blocks" image blocks.tif, which we have seen in figure . We start by reading the image in:

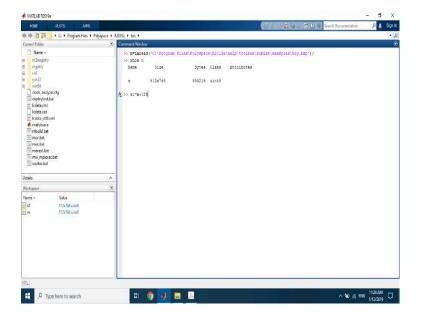


Figure: 1

The point of the second command was to find the numeric data type of b; it is uint8. The unit8 data type is used for data storage only; we can't perform arithmetic operations. If we try, we just get matrix:

>> b1=b+128

												(Inter					earch Do	comenta	000	2	1 SAD
= 🕸 🛐 🗾 + C: + Program Film + Polysp	ACK + R201	a > hin >										-						-	_	-	
urrent Folder		etmand Wie	rdow																		
Name -		223	255	255	255	222	255	255	171	197	146	255	1.00	246	255	157	285	197	255	246	246
milimipatry		255	240	255	255	194	255	255	240	255	197	255	100	244	285	197	255	244	240	197	255
registry		355	197	161	255	223	255	100	223	246	197	255	255	184	197	255	246	255	223	244	246
LIER.		197	255	255	197	255	255	246	246	255	197	255	255	255	197	255	223	255	246	296	255
win32		171	255	255	223	255	255	246	255	246	244	255	255	255	255	246	246	244	246	223	246
wood		255	255	255	255	223	246	140	235	244	244	255	255	146	255	246	255	223	223	246	255
crash_analyzer.cfg		161	255	255.	255	299	146	255	146.	255	246	255	255	197	146	246	246	246	246	246	246
deploytool.bat		224	255	265	255	255	146	255	246.	246	197	197	246	265	246	216	246	255	246	246	255
I cdeta.xvii		224	255	235	223	246	144	2.97	246	255	2.44	255	255	246	255	266	246	255	255	246	255
Coleta utf8.cml		161	255	255	255	255	255	255	255	246	146	255	255	255	246	223	244	246	246	296	255
matian eve		255	223	285	255	246	255	255	246	246	268	246	255	246	255	255	146	246	223	256	255
mbaild.htt		161	255	255	255	246	216	246	246	246	246	246	255	246	255	2.56	246	246	255	255	255
Timec.hat		255	255	255	255	255	246	246	255	246	255	255	194	255	255	255	246	246	255	255	255
max.bat		255	255	100	246	246	246	255	146	197	255	255	255	246	244	2.44	246	246	246	255	255
mmextbat		255	255	116	246	246	246	197	246	146	255	255	255	255	255	255	171	197	255	255	255
mw_mplexec.bat		255	246	246	146	255	255	255	246	246	255	224	255	171	246	255	255	223	255	255	255
worker.bat		255	255	255	255	246	244	197	246	255	255	255	255	255	223	255	244	255	255	246	161
		255	246	246	246	197	146	265	246	223	295	255	255	246	255	255	246	255	161	255	255
tails	-	255	171	216	246	246	246	255	197	255	255	255	255	188	171	2.64	171	255	194	255	171
phipace		246	255	255	255	246	194	255	255	217	255	246	255	255	255	246	255	255	255	255	255
		144	255	246	223		255	223	194	224	255	246	255	255	255	223	255	255	255	255	223
errie - Value		246	255	211	240	255	255	255	161	255	255	255	255	255	255	255	255	255	225	171	255
kt St2x/06 uinte		255	255	255	255	255	224	194	255	255	246	244	194	171	255	255	194	141	255	246	223
m S126768 oinnil		255	255	255	255	255	255	255	224	255	355	255	255	265	255	255	255	255	255	296	255
		255	255	255	263	224	255	217	255	354	255	255	145	246	154	161	255	255	255	255	255
		255	255	255	255	255	161	224	224	247	255	143	255	255	255	141	224	255	223	223	255
		217	255	255	255	255	217	255	155	255	365	355	255	224	255	351	255	255	255	255	355
		246	161	143	143	237	143	162	249	255	244	255	205	224	154	161	255	246	255	255	255
		255	255	162	143	16.2	25.5	152	285	249	255	224	143	255	255	161	255	255	255	255	255
		240	217	152	255	245	255	249	152	255	152	217	176	224	141	255	255	2.94	255	255	355
		255	255	255	255	255	255	255	255	206	245	217	181	194	265	255	255	255	255	255	255
	1.00	143	255	202	255	255	255	159	192	169	162	255	161	217	224	248	262	255	285	255	255
	14					-					-					_					-

Figure: 2

HONE PLOTS APPR														1.10.0		「二日本	김 만을	-carth Do	C LE		P	\$ filon	-
scient faider	(a)		and Win	daw																			1
- Name -			143	255	202	225	255	255	109	152	159	102	255	161	217	224	240	141	255	255	255	255	
and implementers			145	255	255	255	202	152	255	205	159	255	141	14.5	255	145	143	255	288	205	255	140	1
Inspiritry			182	255	140	143	255	255	183	249	255	255	152	255	255	255	217	255	288	255	255	246	
4/57			255	255	212	149	162	249	169	163	255	249	255	265	176	255	217	255	265	223	356	246	
em12			206	255	255	202	355	246	255	255	249	255	152	255	256	255	255	255	171	244	255	255	
winds.			205	255	255	255	255	241	255	255	352	255	150	266	255	161	255	255	144	1.44	255	1.8.6	
crash_analyzer.ctg			255	152	255	202	255	249	249	242	235	242	255	255	217	255	255	144	246	100	255	146	
deploytool.but			255	152	255	161	167	251	249	206	152	205	255	242	255	255	246	150	250	255	248	140	
tedata.xml			248	192	255	224	246	206	206	245	249	180	143	212	255	285	255	285	266	255	255	246	
lodata.xsd			182	255	152	286	249	2.6.9	245	245	162	143	265	265	265	246	265	146	256	246	146	255	
icdata_ut/E.am/			349	152	143	152	103	222	255	255	255	255	202	255	223	246	144	255	255	197	265	196	
🐔 matlab.exe			249	255	255	235	159	159	249	249	255	153	141	255	144	146	255	240	246	144	255	197	
E rebuild bat			249	255	255	183	103	269	157	204	255	224	255	255	255	146	255	245	296	285	246	197	
in mechat			249	152	159	255	206	206	159	249	142	225	255	146	146	255	255	166	255	244	246	246	
mesetbat			206	183	183	255	165	249	746	152	255	255	116	216	296	146	246	255	197	246	246	223	
max.mpierec.bat			183	255	100	18.5	169	206	215	25.5	255	265	255	246	255	255	265	255	246	255	223	255	
worker,bat			255	207	193	158	159	349	152	285	161	146	144	255	255	146	197	255	223	246	256	246	
LILL WORKER.Dat			354	222	253	159	249	248	249	255	255	246	142	255	197	246	246	223	255	255	246	246	
tails	~		237	103	183	zoe	255	152	255	143	244	255	144	107	246	244	255	255	255	244	223	244	
5a115	~		255	103	255	249	245	282	255	100	255	142	250	246	196	255	225	125	255	223	255	255	
okspace	0		183	103	206	242	245	224	355	255	255	240	110	210	255	255	255	255	210	256	240	255	
white - Walkie		1	255	18.8	164	246	355	223	146	146	255	146	246	255	255	285	255	246	223	255	246	255	
kt S12x766 upint0			103	206	1.52	162	246	246	255	246	246	246	255	223	265	266	246	255	255	255	250	255	
			103	159	266	255	265	255	144	255	246	223	255	255	255	223	255	255	246	246	255	197	
8rt 8122x7641 warnt0			159	255	255	223	255	222	197	255	255	255	205	255	255	244	255	171	246	197	255	246	
			159	255	255	255	255	266	144	255	194	255	223	255	223	255	223	255	187	144	235	246	
			255	265	246	172	246	158	255	255	255	246	255	355	255	246	296	216	14¢	197	255	255	
			255	255	246	246	146	285	265	255	255	171	295	285	246	246	265	246	197	246	255	255	
			285	223	246	225	365	194	255	255	255	0.66	255	222	246	246	246	255	246	255	297	246	
			255	246	246	255	355	455	255	255	355	255	255	246	146	255	244	255	255	255	246	246	
			255	240	171	244	246	223	255	225	255	255	246	255	246	225	146	255	255	244	297	290	
			255	223	255	255	255	296	225	255	255	255	255	246	246	246	197	255	197	296	197	255	
			255	255	255	140	244	255	255	255	255	146	2.97	222	244	197	265	154	246	244	246	255	
		族	1000	222		1.14	- 222			- 702	- 772	12.15	100	- 755		7.55				235		100	. 9

Figure: 3

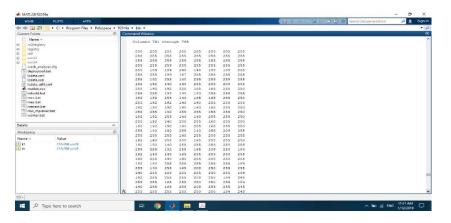


Figure: 4

I can get round this in two ways. I can first turn b into a matrix of type double, add the 128, and then turn back to uint8 for display:

wrrent Folder			Command Wi	ndow								
Name +		97.	200	255	255	255	205	255	255	255	- 0	×
			173	255	173	255	255	255	255	255		2
 E mBiregistry E registry 			255	255	255	255	255	173	255	173	File Edit View Insert Tools Desktop Window Help	
E util			255	255	255	255	255	255	255	255		
win32			255	255	255	255	173	255	255	255		
e win64			255	255	255	255	255	173	255	255		
Crash_enely	en da		173	255	255	255	255	255	255	255		
deploytool.			255	173	255	255	173	255	173	255		
E Icdata.xml			173	255	173	173	255	255	255	255		
C lcdata.xsd			255	255	173	255	255	173	255	255		
icdata_utf8.	cml		255	255	255	255	173	255	173	255		
🔺 matlab.exe			173	255	255	173	255	255	255	255		
mbuild.bat			255	173	173	255	255	173	255	255		
i mcc.bat			255	255	255	255	173	255	255	255		
imex.bet			255	173	173	255	255	255	255	173	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
In mexext.bat			255	255	255	173	255	173	255	255		
mw_mpiexe worker.bat	c.bet		255	173	173	255	173	255	173	173		
Tall worker.pat			173	255	255	255	255	173	255	255		
Details		-	255	255	255	173	255	255	255	255		
Details		^	255	255	255	255	255	255	255	255		
Workspace :		۲	255	255	255	255	255	255	173	255	The second second second second second second second	
Name *	Value		173	255	255	173	255	255	255	255		
	512x768 cint8		255	173	255	255	173	255	255	255		
k1	512x768 unit8 512x768 unit8		255	255	255	173	255	255	255	255		
m	512x268 unt8		255	255	173	255	173	255	173	255	1. 我们就是这些好的。你们的情况的你们。"	
71 1011	S ADA YOU MUTTO		232	232	255	255	173	255	255	255		
											[11] 19.15.15.15.15.15.15.15.15.15.15.15.15.15.	
			>> kl=u			m)+128	17					
			>> kl=1		,128)3							
			>> imsh Undefin					1001				
			under1.	eu run	nerou .	or var	innie					
			>> insh									
			A >>	OW (K1)								
			14.22									

Figure: Adding

Subtraction is similar; I can transform out matrix in and out of double, or use the imsubtract function:>> b2=imsubtract(b,128); and the results is seen in figure

Correct folds	Current Folder	C: Program Files Program Files	.(9)										
1 125 225			۲			12040	- 2 h h	255	1.04	255	()	1000	- 202
 											5 Figure 2	- 0	×
0 0				255	255	255	255	175	255	255	5 File Edit View Jaset Tools Desiston Window Hale		
Open Open <th< td=""><td></td><td></td><td></td><td></td><td>255</td><td></td><td></td><td></td><td></td><td></td><td>5 and the set of the set of the set</td><td></td><td></td></th<>					255						5 and the set of the set of the set		
Outlet Outlet<				173	255	255	255	255	255	255			
Open-Ampleting Control				255	173	258	255	17.3	255	173	5		
Betward 150 250 250 250 250 250 250 In Markan 175 250 250 250 250 250 250 In Markan 125 250 250 250 250 250 250 In markan 126 250 250 250 250 250 250 In markan 126 250 250 250 250 250 In markan 126 250 250 250 250 250 In markan 126 250 250 250 250 250 In markan 125 250 250 250 250 250 In markan 125 250 250 250 250 In markan 125 250 250 250 250 In markan 125 250 250 250 250 In dial 150 250 250 250 250 <t< td=""><td></td><td>and the</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>		and the											
Listandi Historia 225 226 226 225				255	255	173	255			255			
interaction 285 123 213 285 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>													
metalas 255 255 275	ledata.xsd										5	日間回日前	
Impactation 255 173 173 265 265 173 Impactation 255 253 253 255 255 255 255 Impactation 255 253 253 255 255 255 255 Impactation 255 255 255 255 255 255 255 Impactation 255 255 255 255 255 255 255 Impactation 255 255 255 255 255 255 255 255 Impactation 255 </td <td></td> <td>cmi</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>100 10 100</td> <td></td>		cmi										100 10 100	
Impackat Operation Operation <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1011</td><td></td></th<>												1011	
metalat metalat												dote 5 and	
Immediat 272 252 253 253 255 255 immediates.htm 275 255 255 255 255 255 immediates.htm 255 255 255 255 255 255 ist 352 252 252 255 255 255 255 ist 352 252 252 252 252 255 255 ist 352 252 252 252 252 252 255 ist 352 252 252 252 252 252 252 ist 352 252 252 252 252 252 252 ist 352												如何认为这个	
Important 205 2													
Instructure 255 226 245 255 255 255 Maik												14.2 M.	
Mark A 255 255 255 255 255 255 Obstrater Op 225 255 255 255 255 255 255 Mark Op 225 255 <td></td> <td>C.L.M.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1998</td> <td></td>		C.L.M.										1998	
Details	Lin worker.but											· 我们的~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
Original OP 255 173 253 173 253 255	let ails		~										
Mark O 255 256												中国的 的专用	
Line Value 255 255 173 255 173 255 10 3.10/Moundi 222 228 258 173 255 255 255 m 3.10/Moundi 222 228 258 255 255 255 m 3.10/Moundi 225 22.25 255 255 255 min 3.10/Moundi 255 255 255 255 255 initiation 20.27 20.28 255 255 255 255 initiation 20.27 20.25 20.27 255 255 255 initiation 20.27 20.27 20.27 20.27 20.27 20.27 20.27 initiation 20.27 20	Vorkspace :		۲									の 過数 言 三派	
1 350/Neurof 222 222 253 255 173 255 255 255 255 255 255 255 255 255 25	- ame	Value											
20 43.07.06 und >> k1.40.050 (und k100) 22017 31.07.06 und >> k1.40.050 (dial k100) 22017 >> kate-sec(k1) >> kate-sec(k1)	11	\$12v76RountR	1									1998 (M. 1998)	
m 310/20/umf >> k1=asce(doilste(p):129); > k1=asce(doilste(p):129); > ascention(f); > as													
<pre>[m1 300/dsueff >> ki=mad(m,121); >> immov(h) Doperime function of versenie "bl". >> immov(h) >> immov(h) >> immov(h) >> immov(h), fapre, immov(20)</pre>	erra			>> \$1=0	ints (d	oubled	a) +128	12			III and a construction of the second second second second	《理论》 人 湖南	
>> image(Ei) Depending functions or vertable 'hit. >> image(Ei) >> image(Ei) >> image(Ei) fpg(Ei), fmg(Ei) filt	m1	512x768 wint8										語会会が	
<pre>>> imshow(k1) >> s2=mmuheraet(n, 120); >> imshow(k1), fsprey, handow(k2)</pre>												1000	
>> k2=inaubtrane (m, 120) r >> inabo((k) / £ giure, janahow(k2)						05108	or yer	table	103.1 v				
>> k2=inaubtrane (m, 120) r >> inabo((k) / £ giure, janahow(k2)													
>> imshow(ki),figure,imshow(k2)				>> imsh	ow(kl)								
				>> k2=s	maubtr	act (m,	128)7						
A >>					ow(k1)	,figur	e, imah	osr (k2)					
				R >>									

Figure: subtracting

I can obtain an understanding of how these operations affect an image by looking at the graph of old grey values against new values. I see that in general adding a constant will lighten an image, and subtracting a constant will darken it

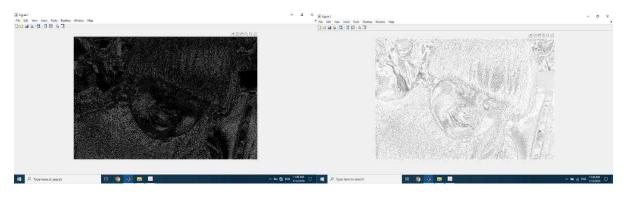


Figure: Subtracting 128

Figure: Adding 128

I can also perform lightening or darkening of an image by multiplication Compare the results of darkening b3 and b4. Note that b3, although darker than the original. All these images can be viewed with imshow, they are shown in figure

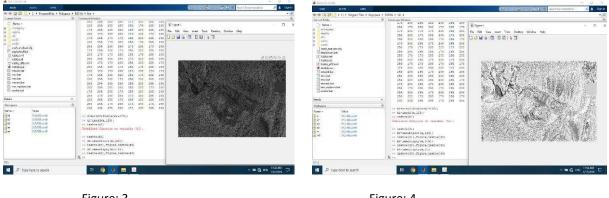


Figure: 3

Figure: 4

A similar loss of information has occurred in the images k4 and k5. Note in particular the edges of the light coloured block in the bottom centre; in both k1 and k5 the right hand edge has disappeared. However, the edge is quite visible in image k5.

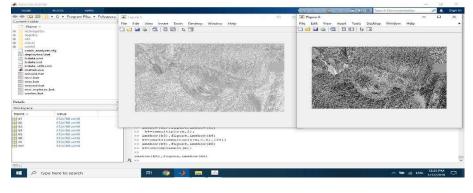


Figure: k5

3.1 Complements

The complement of a greyscale image is its photographic negative. If an image matrix m is of type double and so its grey values are in the range 0.0 to 1.0, we can obtain its negative with the command >> 1-m.

		🕐 👘 👘 🖓 🕐 🖉 Search Documentation 🛛 🕫 🔅 Orga
🕪 🕸 🛐 🚰 🔸 C. + Program Files + Polyspace Correct Falder	Figure 5 - 11	 ✓ Figure 6 – □ × File Edit View Insert Tools Desktop Window Hetp
Nence + Neccity registry solution solution solution		
minki manki,misekeerdig manki,misekeerdig	A A CONTRACT	
Details		And the second second second second
Workspace Name – Value		AND
K1 S12x208 uset8 K2 S12x208 uset8 K2 S12x208 uset8 K3 S12x208 uset8		
44 512-2788 unet 45 512-3788 unet 46 512-3788 unet 66 512-3788 unet 97 97 97 97 97 97 97	>> Kernamuliculy (m, 2) / >> Instruct (K), figure, Instruct (K) >> Kernamuliculy (m, 2), figure, Instruct (K) >> Kernamuliculy (m, 2), figure >> Kernamuliculy (m	
20 a l		

Figure: complement function

3.2 Histograms

Its histogram consists of the histogram of its grey levels; that is, a graph indicating the number of times each grey level occurs in the image.

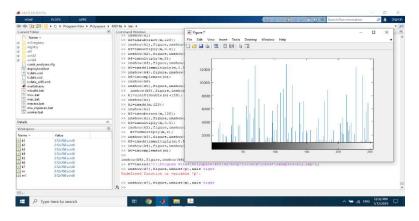
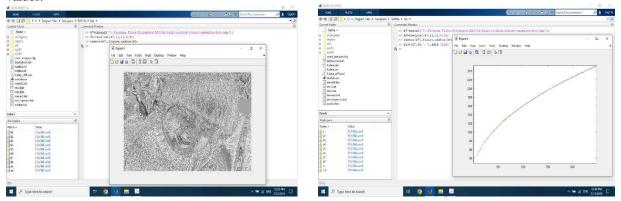


Figure: Histograms

3.2.1 Histogram Stretching and Plotting

Suppose i have an image with the histogram shown in figure, associated with a table of the numbers (ni)of the grey values.







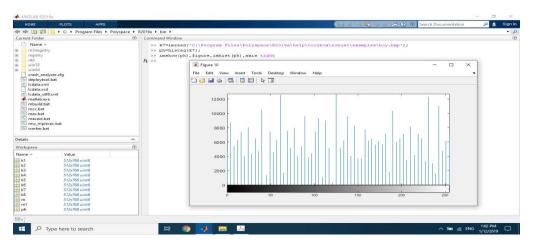


Figure: the histogram stretching

3.2.2 Histogram equalization

The trouble with any of the above methods of histogram stretching is that they require user input. Sometimes a better approach is provided by histogram equalization, which is an entirely automatic procedure.

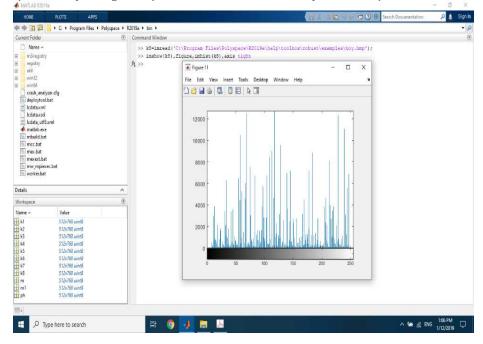


Figure: the histogram of figure after equalization.

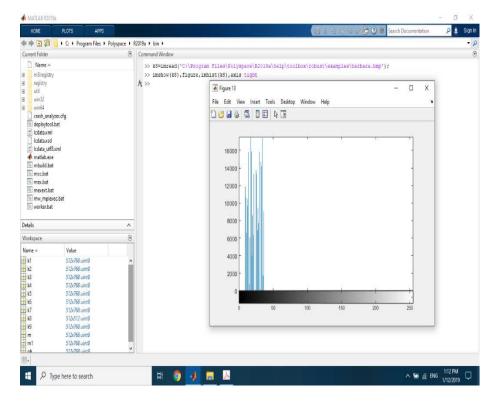


Figure: Histragram Stratching

3.3 Thresholding

Single thresholding: A greyscale image is turned into a binary (black and white) image by first choosing a grey level in the original image, and then turning every pixel black or white according to whether its grey value is greater than or less than T.

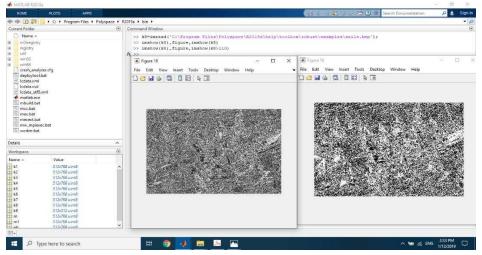


Figure: Thresholded image of sails.BMP

As well as isolating objects from the background, thresholding provides a very simple way of showing hidden aspects of an image. For example, the image appears Sails.bmp all white, as nearly all the grey values are very high. However, thresholding at a high level produces an image of far greater interest. provide the images shown in figure.

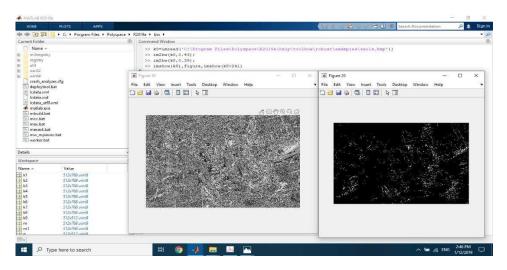


Figure 5.25: The paper image and result after thresholding

3.3.1 Double Thresholding

Here we choose two values T1 and T2 and apply a thresholding operation as: X>T1 & X<T2.

HOME	PLOTS APPS			Search Documentation 🖉 🔔	Sign
節回合金	📒 🕨 C: 🕨 Program Files 🕨 P	olyspace + R2019	> bin >		•
Current Folder		Co	mend Window		(
Name + m3iregistry util win54 crash_anab 6 deploytool 6 lcdata.xxd cdata.xxd mbuild.bat mc.bat mex.bat 6 mex.bat 6 mex.bat 7 mex.bat	yrer cfg Ibat Ismi E E E E E E E E E E	File	punt 17 - X Figure 21 Edit View Incet Tools Dektop Window Help • File Edit View Incet Tools Dektop I I I I I I I I I I I I I I I I I I I	- Uwindow Help	
)etails		~	the second state of the se		
Norkspace		۲			
Name + k1 k2 k3 k4 k5 k5 k6 k7 k8 k7 k8 k7 k8 k7 k8 k6 k7 k8 k8 k7 k8 k8 k7 k8 k7 k8 k7 k7 k8 k7 k8 k8 k8 k8 k8 k8 k8 k8 k8 k8 k8 k8 k8	Value 512/768 uint8 512/768 uint8 512/768 uint8 512/768 uint8 512/768 uint8 512/768 uint8 512/768 uint8 512/768 uint8 512/768 uint8	Î	> [x,map]=imread('Ci\Program Files\Folypace\R2019a\heip\toolBow\robust\examples\sails.bmg	2 ¹ } <i>x</i>	
k9 m m1 man	512x512 vint8 512x768 vint8 512x768 vint8 512x768 vint8 256x3 double		> s=uint8(256*ind2gray(x,map)); > imshow(s),figure,imshow(s>115 & s<125)		

Figure: The image sails.bmp an the result after double thresholding

3.4 Spatial Filtering

I have seen in chapter 5 that an image can be modified by applying a particular function to each pixel value. Spatial filtering may be considered as an extension of this, where we apply a function to a neighborhood of each pixel. The idea is to move a "mask": a rectangle (usually with sides of odd length) or other shape over the given image. I see that spatial filtering requires three steps:

- Position the mask over the current pixel,
- Form all products of filter elements with the corresponding elements of the neighborhoods,
- Add up all the products

To apply this to an image, consider the 5 x 5"image" obtained by this image:

中回回 🕴 V + Poyan Res + Polyseece		KONE ITLDTS ATTS	(1) in the second
netlade	Gammed Uniter (K	中中 道 🛱 📒) C) Papanilie) Polytate	e F (1200a + tan F
Nine+	>> wminite(ix/mepic(6))	Current Finder	9 Convertibus
monthlah	15	🗋 Nama +	
waith	z	B nilistry	>> fflsel(a,x,'ana')
with	3-d until same	B mösste	1975
mir(4		199 - 18 2010 - 18	en •
unit, induce of g	116 146 15 16 150	8	N.467 N.226 G.013 7.779 12.004
l dap nytersi bet	EN 10 /0 150 160	Contemporary	17.7778 111.111 109.8889 120.8989 109.998
logrami	41 47 130 330 330	🗍 depisytaalited	47,4627 115,4000 131,0001 125,0000 106,4527
Interved Interventions	101 110 100 111 30	E Indexcel	67.7778 131.1111 191.1111 198.9909 10.7998
militare	101 105 206 20 90	T lobre ufflani	25.667 10.526 10.779 0.779 10.010
ministrat		🖸 matti ese	
modul	>> start(s(1:3,1:3))	🔟 edu, Juliost	>> files(a,s, 'min')
nuthal	103 ×	II worker II worker	co •
mouths. my prostable	No. 7	I nontar	
ecrositat	115,2111	I no open bit	101.1111 101.0000 120.0000
	CONFICTION (1990) 137	III woons hat	110,000 190,009 189,000
Ň j	> 3> 394872 (#) (3,314)		10.111 15.111 145.003
1947		Cent	A >> advascus(7,7):
	2. and *	Хаболун	10 >> +2(1)+,2(0)**
en ida	100, 1009	Name - Value	
johntonntanni johnn	200 COL		, x:-
e 101888 Madeil	>> avenue (1,2)/0	ana Qu'ilà muAnne.	
	2010 Disaure Wenters	0.0000000000000000000000000000000000000	0 0 0 0 0 0 0 0 0 170 240 10 00 120 0
	14	11 20 20 20 20 20 20 20 20 20 20 20 20 20	1 20 20 20 20 20 20 20
	83.000 30.000 MC.000	a Subt and a	0 00 00 100 200 220 0
	6110 8311 6110	gi intraducte	n 169 126 126 226 26 0
	clini stutti clini	a Shift and k	0 110 120 290 20 00 0
	9.111 9.111 9.111	matt2 101 matt2 -100	
	H 10		g So fflixed(a, x), (units)
		A STADLAR	

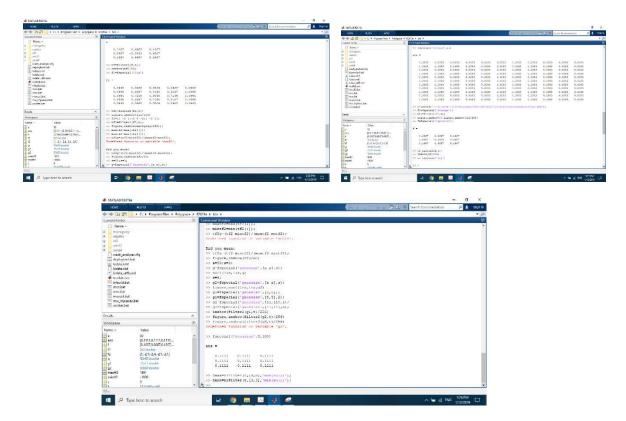
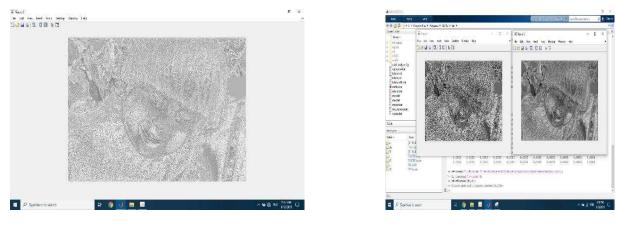


Figure: All figure about matrix

Fspecial('average',11) will return an averaging filter of size 11 x 11. If we leave out the final number or vector, the 3 x3 averaging filter is returned. For example, suppose we apply the 3 x3 averaging filter to an image as follows:



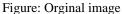


Figure: Averasing image

Frequencies; low and high pass filters: Fundamentally, the frequencies of an image are the amount by which grey values change with distance. high pass filter if it "passes over" the high frequency components, and reduces or eliminates low frequency components, low pass filter if it "passes over" the low frequency components, and reduces or eliminates high frequency components.

The images are shown in figure high pass filter. 1st Image is the result of the Laplacian filter; 2nd image shows the result of the Laplacian of Gaussian ("log") filter.

	015 APR				📋 🖉 🔁 🕐 🛞 Search Darstreambalion 🔎	🎄 Digit li
	C 🔸 Program Files	Normano - Statistic - Line - Management - Statistic - Line - Management - Statistic - Statistic - Statistic - Statistic - Statistic -	Water Tep	- • ×	- 12	
2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	VALUE (0.1111_0.1111_0.1111 17471 exclude (0.166/Listed 2.0.1667 555 exclude 555 exclude 5	0.0445 0.7 0.0564 0.7 0.0564 0.7 0.0565 0.0 0.0565 0.0 0.0565 0.0 0.0565 0.0 0.0565 0.0 0.0565 0.0 0.0565 0.0 0.0565 0.7 0.0565 0.7 0.056 0.7000 0.7000 0.700 0.7000 0.700 0.7000 0.7000 0.7000 0.7000 0.700 0.7000	146 -4.9045 0.71 167 0.7148 0.31 165 0.0564 0.04 (t)/	6 0.0564 7 0.0465 8 0.0110	∧ M ∉ 0.00 m	

Figure: High pass filtering

We can generally obtain a better result by dividing the result of the filtering by a constant before displaying it. This is also shown in figure.

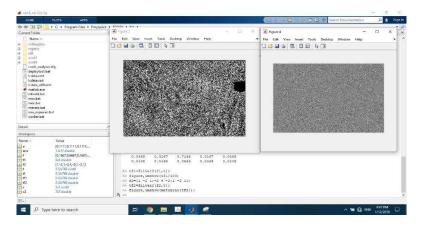


Figure: Using a high pass filter and displaying the result

Gaussian filters: Gaussian filters are a class of low-pass filters, all based on the Gaussian probability distribution function.

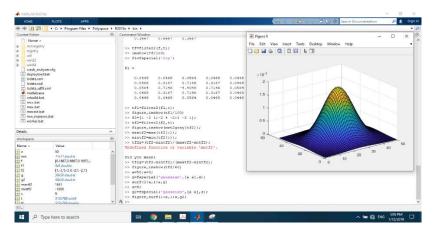


Figure: Two dimensional gaussians

4. Results and Discussion

4.1 Point Processing

A pixel's grey value is changed without any knowledge of its surrounds. Although point operations are the simplest, they contain some of the most powerful and widely used of all image processing operations. They are especially useful in image pre-processing, where an image is required to be modified before the main job is attempted. For point processing I have done many operations such as,

Arithmetic operations: These operations act by applying a simple function y = f(x). to each grey value in the image. Simple functions include adding or subtract or multiply and division a constant value to each pixel.

4.2 Complements

The complement of a greyscale image is its photographic negative. If an image matrix m is of type double and so its grey values are in the range 0.0 to 1.0, we can obtain its negative with the command.

4.3 Histograms

Given a greyscale image, its histogram consists of the histogram of its grey levels; that is, a graph indicating the number of times each grey level occurs in the image. as the following examples indicate:

- In a dark image, the grey levels (and hence the histogram) would be clustered at the lower end.
- In a uniformly bright image, the grey levels would be clustered at the upper end.

4.4 Histogram Stretching (Contrast Stretching)

Suppose we have an image with the histogram, associated with a table of the numbers (ni) of grey values.

4.5 Histogram Equalization

The trouble with any of the above methods of histogram stretching is that they require user input. Sometimes a better approach is provided by histogram equalization, which is an entirely automatic procedure. Notice the far greater spread of the histogram. This corresponds to the greater increase of contrast in the image.

4.6 Thresholding

Thresholding is a vital part of image segmentation, where we wish to isolate objects from the background. It is also an important component of robot vision. Thresholding can be done very simply in MATLAB. Suppose I have an 8 bit image, stored as the variable X. it has two types such as,

Single thresholding. b) Double thresholding

4.7 Spatial Filtering

I have seen in point processing that an image can be modified by applying a particular function to each pixel value. Spatial filtering may be considered as an extension of this, where I apply a function to a neighborhood of each pixel. The idea is to move a "mask": a rectangle (usually with sides of odd length) or other shape over the given image. As i do this, i create a new image whose pixels have grey values calculated from the grey values under the mask, The combination of mask and function is called a filter. I see that spatial filtering requires three steps:

- Position the mask over the current pixel,
- Form all products of filter elements with the corresponding elements of the neighborhood,
- Add up all the products.

In this project I have done some operation in spatial filter using MATLAB. Such as,

To apply this to an image, consider the 5 x 5"image" obtained by MATLAB. Function.

4.8 Notation

It is convenient to describe a linear filter simply in terms of the coefficients of all the grey values of pixels within the mask. This can be written as a matrix.

4.9 Filtering in MATLAB

The filter2 function does the job of linear filtering the result is a matrix of data type double. The parameter shape is optional, it describes the method for dealing with the edges. filter2(filter, image,'valid') applies the mask only to "inside" pixels. We can see that the result will always be smaller than the original. filter2(filter, image,'full') returns a result larger than the original image.

4.10 Frequencies; Low and High Pass filters

Fundamentally, the frequencies of an image are the amount by which grey values change with distance. high pass filter if it "passes over" the high frequency components, and reduces or eliminates low frequency components, low pass filter if it "passes over" the low frequency components, and reduces or eliminates high frequency components.

4.11 Gaussian Flters

Gaussian filters are a class of low-pass filters, all based on the Gaussian probability distribution function and has one dimensional gaussian, two dimensional gaussian.

5. Conclusion

The Image processing tool boxes i.e. "Corel Paint Shop Pro Photo X2", Adobe Photoshop 7.0 and MATLAB 2019 are state of art tool having very effective enhancement algorithms for cartridge case head stamp mark and bullet striation images. Digital image processing plays a vital role in enhancement of poor-quality images. Especially data obtained from Automated Image Acquisition Systems, which is in the digital form, can best be utilized with the help of digital image processing. Image enhancement is an important components of digital image Processing. Image enhancement techniques help in improving the visibility of any portion or feature of the image suppressing the information in other portions or features.

References

Baxes, G. A. (1994). Digital image processing: principles and applications (pp. I-XVIII). New York: Wiley.

- Blanchet, G., & Charbit, M. (2006). Digital signal and image processing using MATLAB (Vol. 4). London: Iste.
- McAndrew, A. (2004). An introduction to digital image processing with matlab notes for scm2511 image processing. School of Computer Science and Mathematics, Victoria University of Technology, 264(1), 1-264.

Pratt, W. K. (2013). Introduction to digital image processing. CRC press.

Qidwai, U., & Chen, C. H. (2009). *Digital image processing: an algorithmic approach with MATLAB*. Chapman and Hall/CRC.

Schalkoff, R. J. (1989). Digital image processing and computer vision (Vol. 286). New York: Wiley.

Sandberg, K. (2007). Introduction to image processing in Matlab. Dept. of Applied Mathematics, Colorado. BIODATA.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal. This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/)