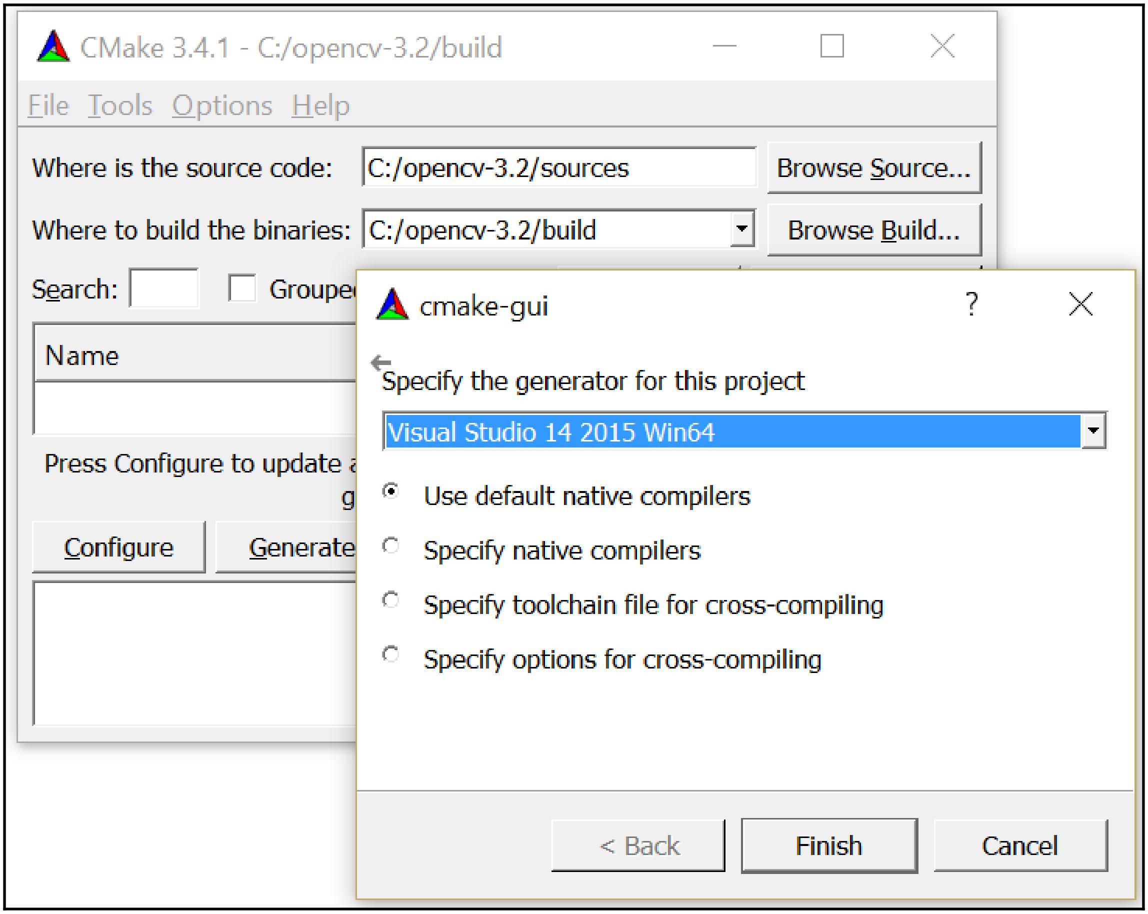
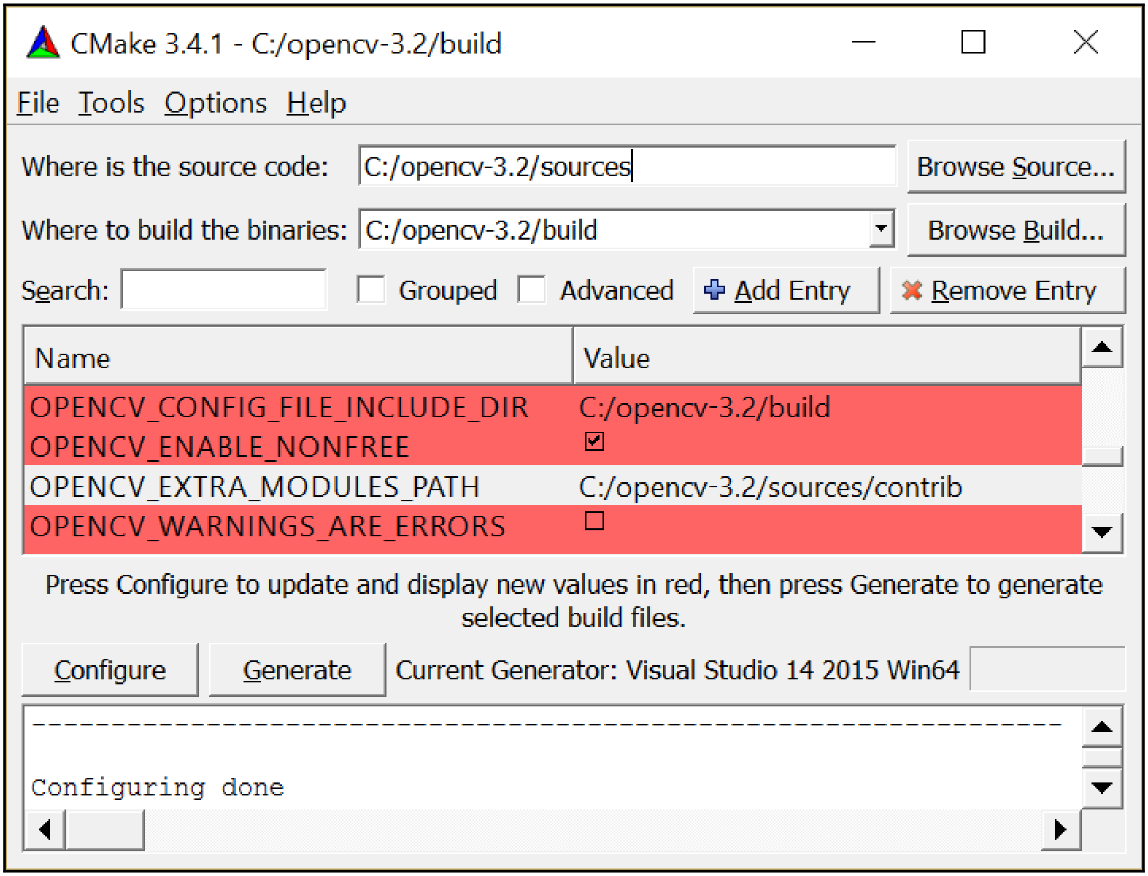
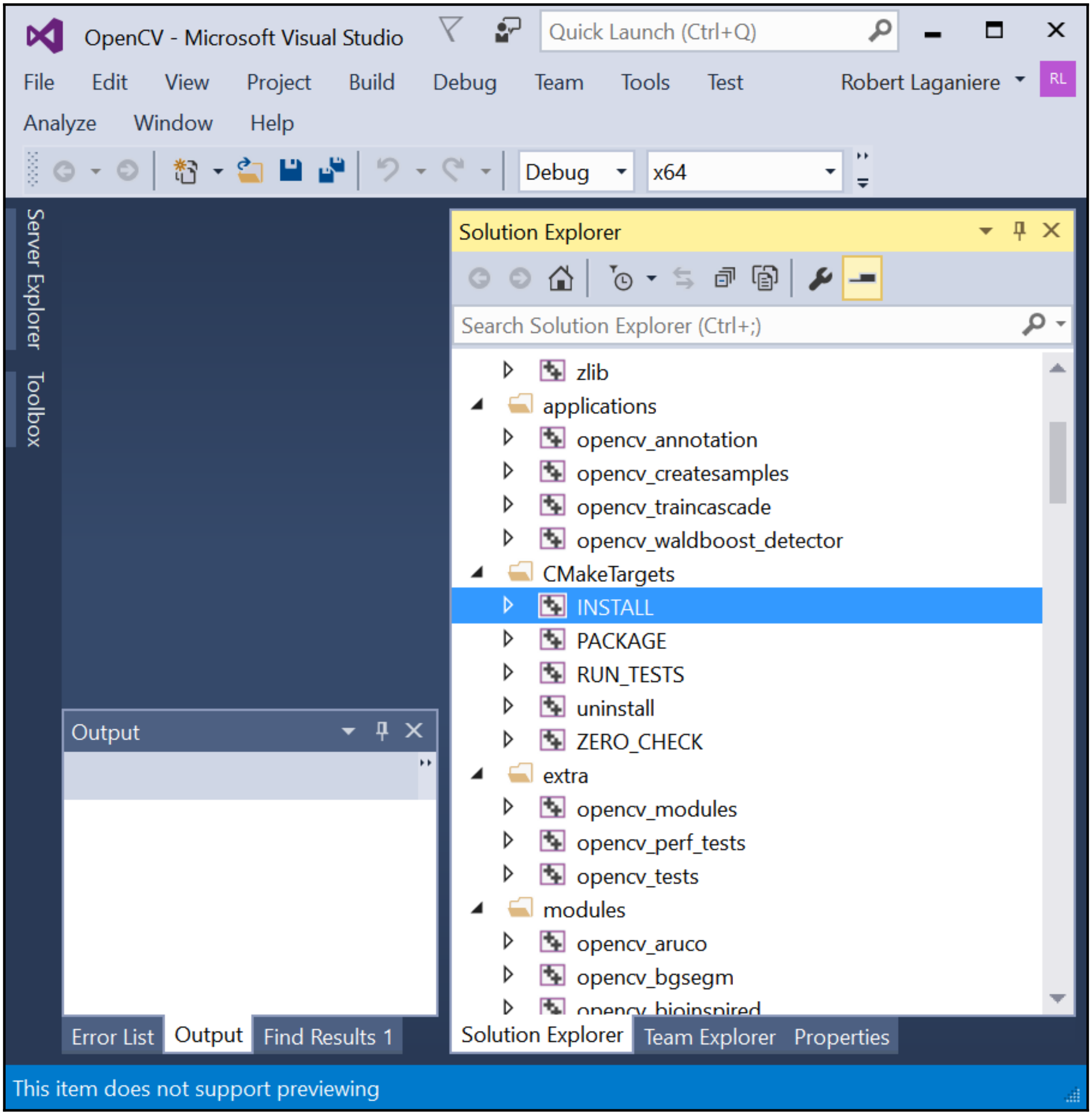
Chapter 1: Playing with Images




CMake 3.4.1 - C:/opencv-3.2/build
File Tools Options Help
Where is the source code:
C:/opencv-3.2/sources
Browse Source...
Where to build the binaries:
C:/opencv-3.2/build
Browse Build...
Search:
Grouped
Advanced
Add Entry
Remove Entry
Name
Value
OPENCV_CONFIG_FILE_INCLUDE_DIR
C:/opencv-3.2/build
OPENCV_ENABLE_NONFREE
OPENCV_EXTRA_MODULES_PATH
C:/opencv-3.2/sources/contrib
OPENCV_WARNINGS_ARE_ERRORS
Press Configure to update and display new values in red, then press Generate to generate selected build files.
Configure
Generate
Current Generator: Visual Studio 14 2015 Win64
Configuring done


OpenCV - Microsoft Visual Studio
Quick Launch (Ctrl+Q)
File Edit View Project Build Debug Team Tools Test
Robert Laganiere
RL
Analyze Window Help
Debug
x64
Server Explorer
Toolbox
Solution Explorer
Search Solution Explorer (Ctrl+;)
zlib
applications
opencv_annotation
opencv_createsamples
opencv_traincascade
opencv_waldboost_detector
CMakeTargets
INSTALL
PACKAGE
RUN_TESTS
uninstall
ZERO_CHECK
extra
opencv_modules
opencv_perf_tests
opencv_tests
modules
opencv_aruco
opencv_bgsegm
Output
Error List
Output
Find Results 1
Solution Explorer
Team Explorer
Properties
This item does not support previewing


Original Image


Output Image


Drawing on an Image
This is a dog.

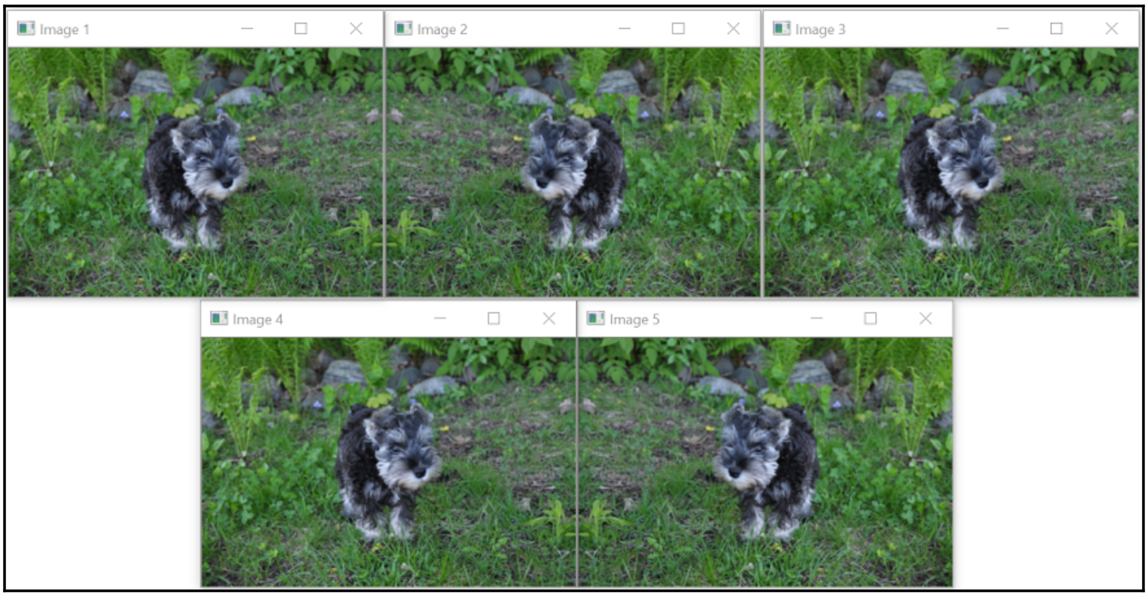
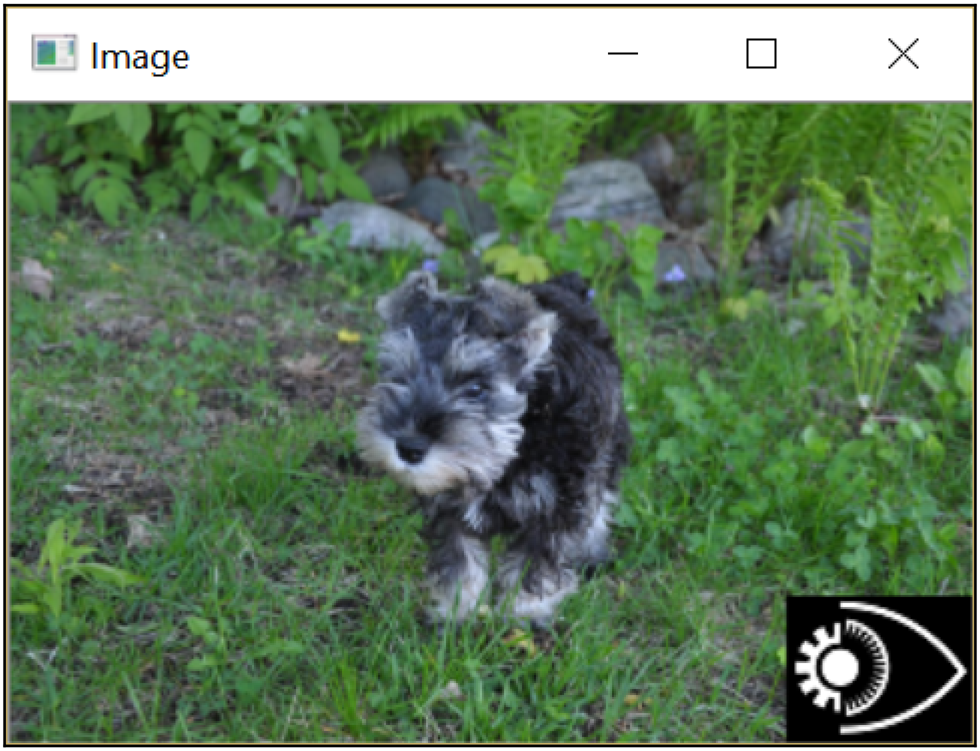
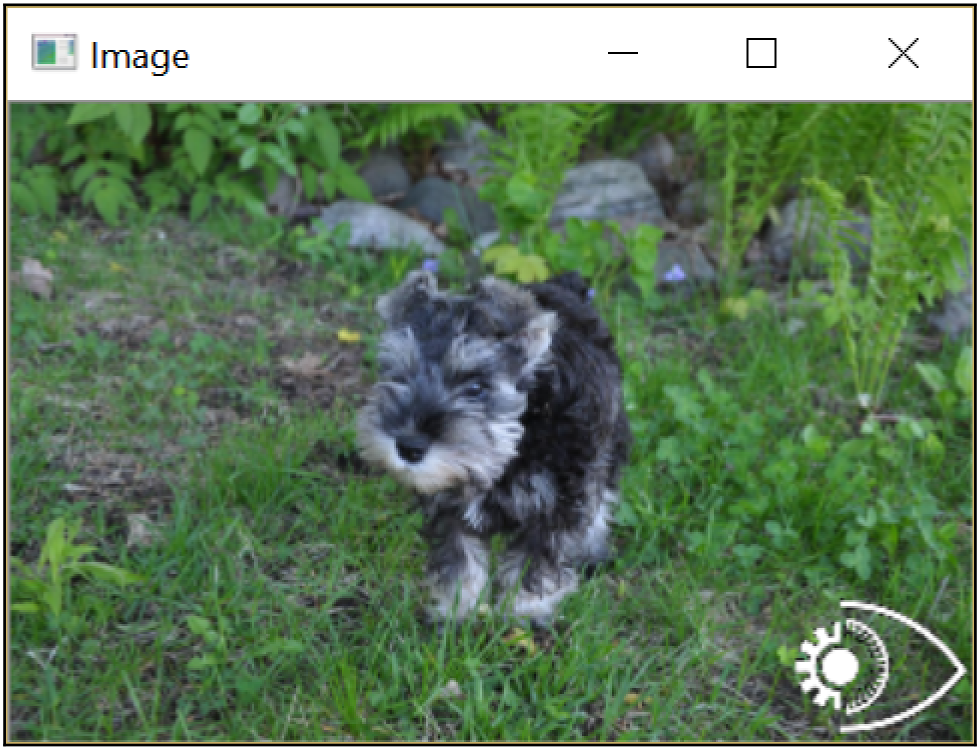


Image 1
Image 2
Image 3
Image 4
Image 5

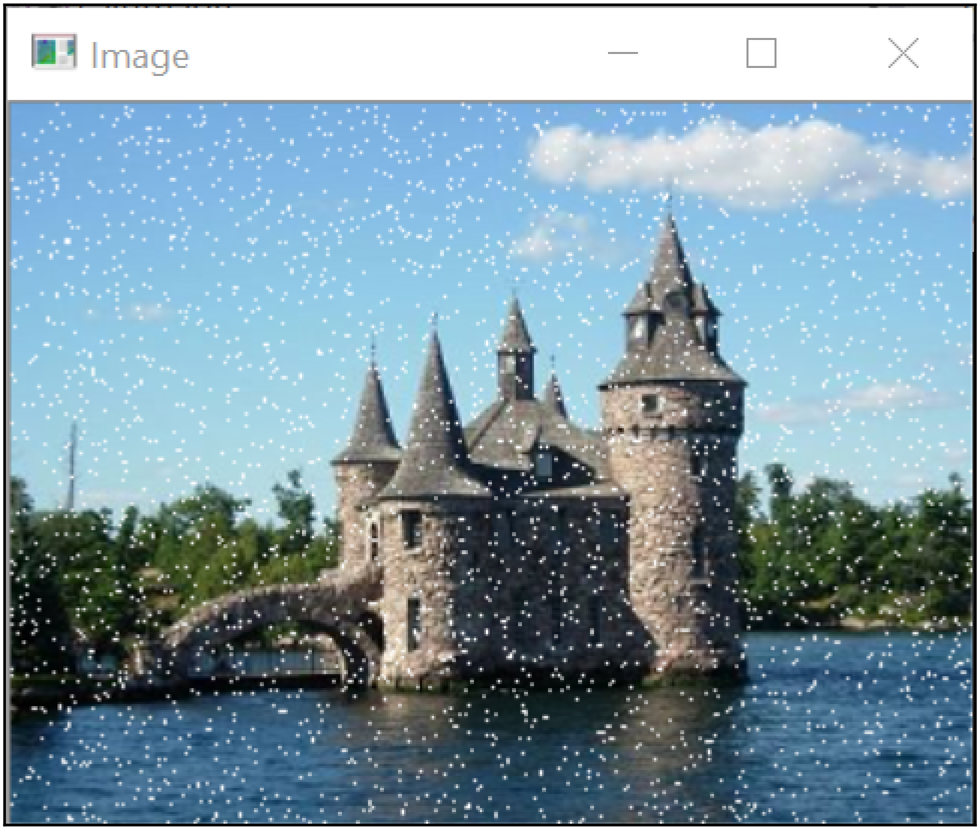


Image

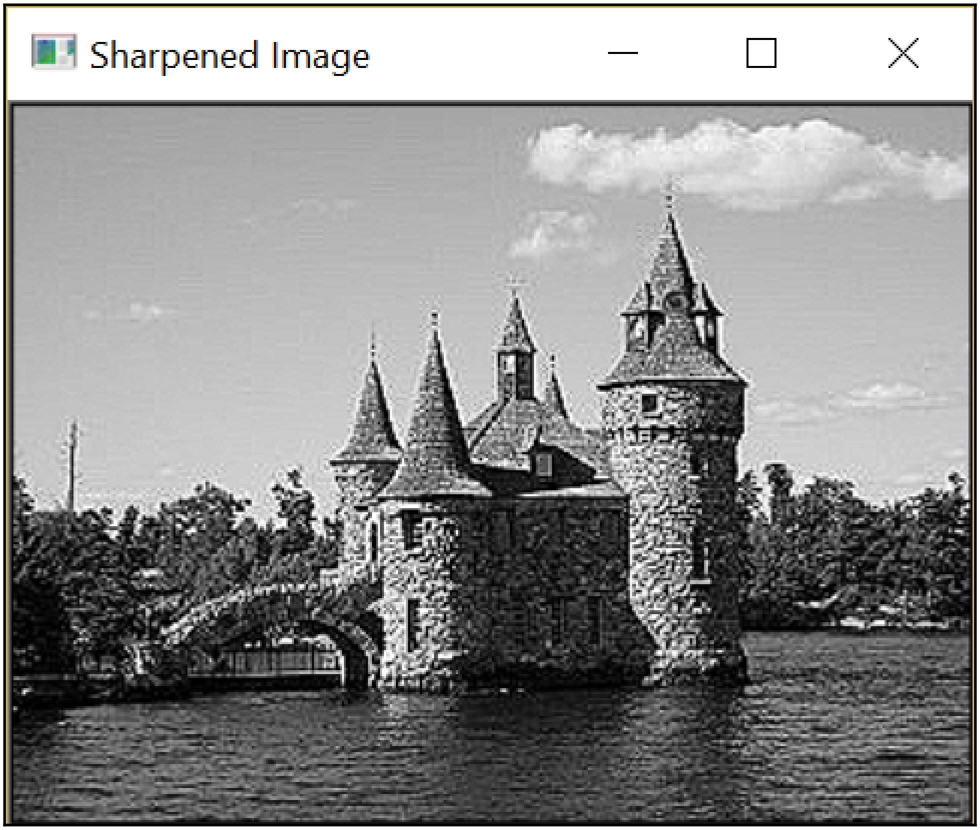


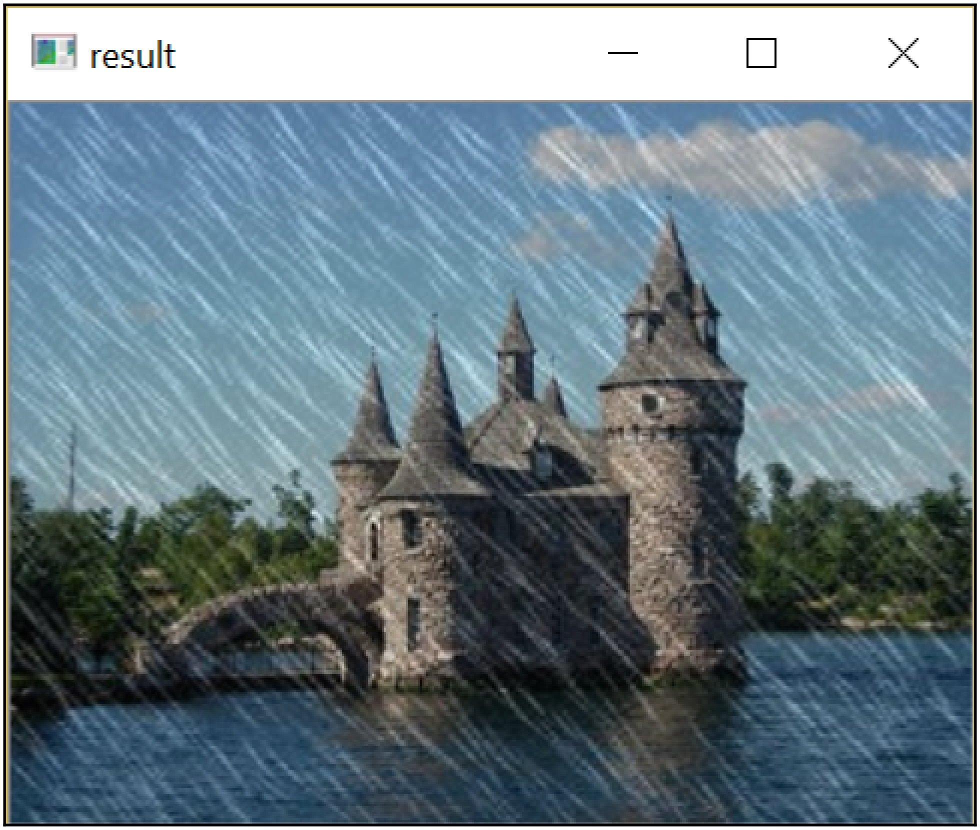
Image

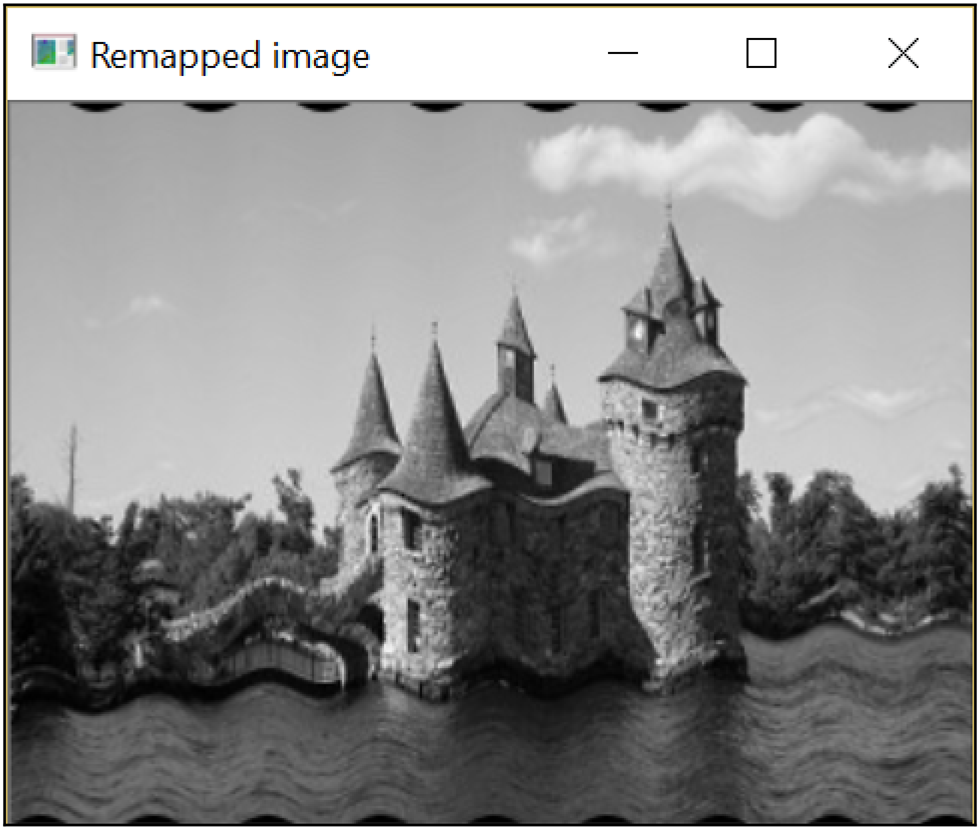
Chapter 2: Manipulating Pixels



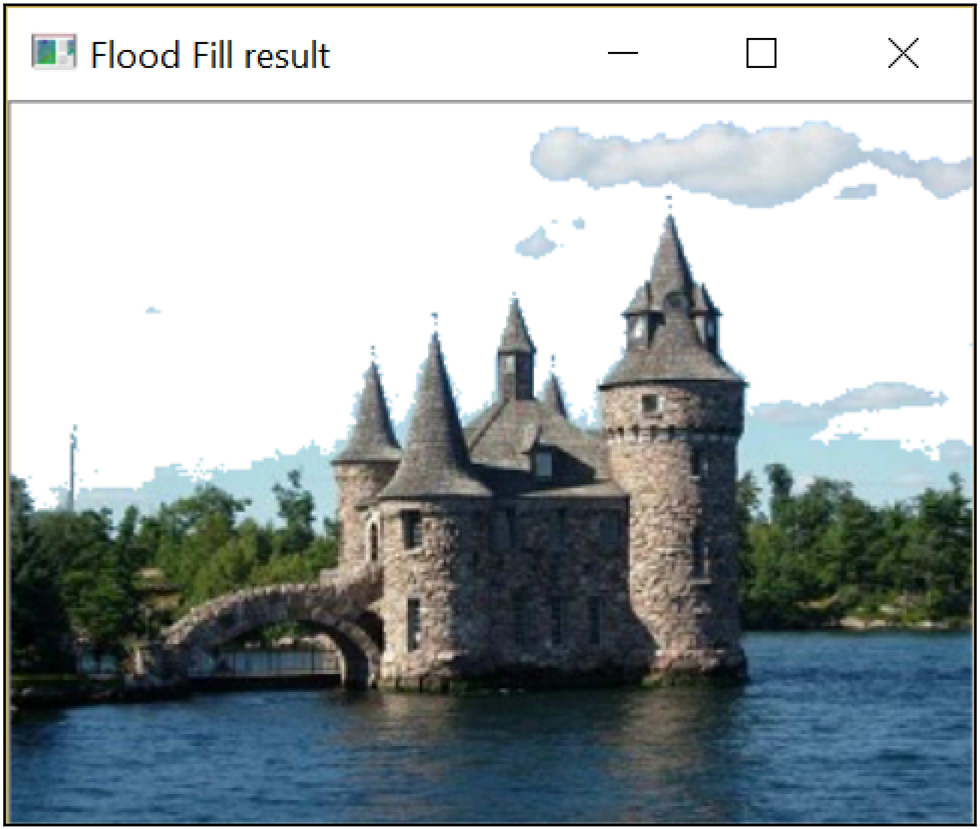
Image


Sharpened Image


result


Remapped image


result


Flood Fill result

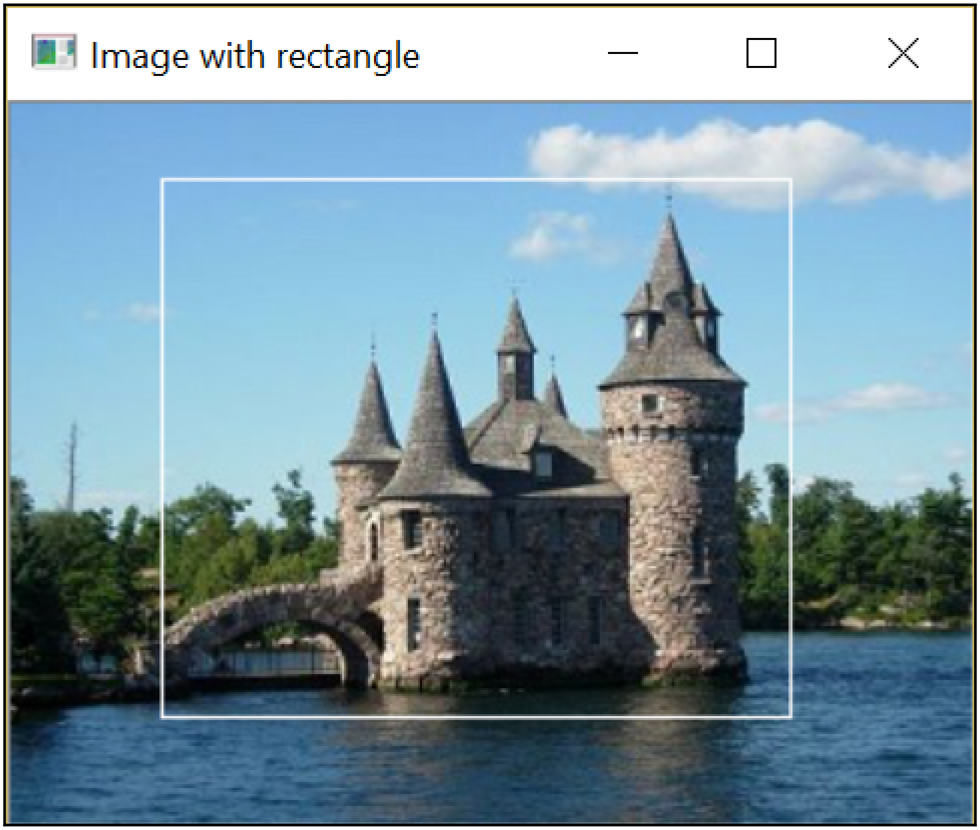
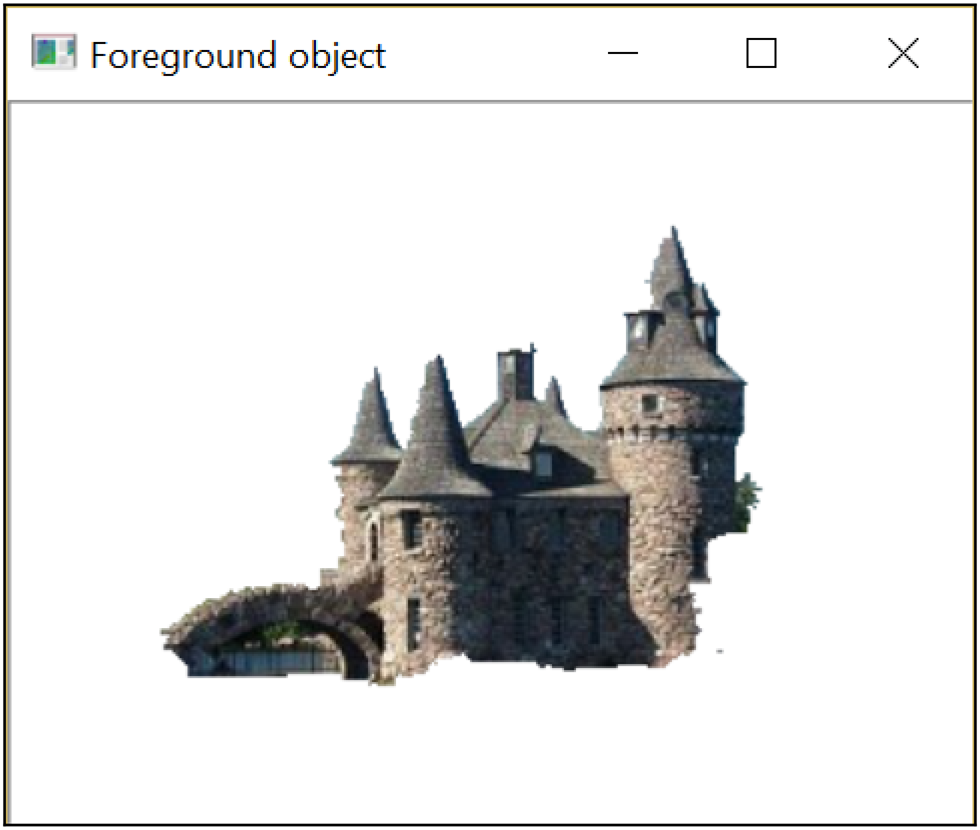
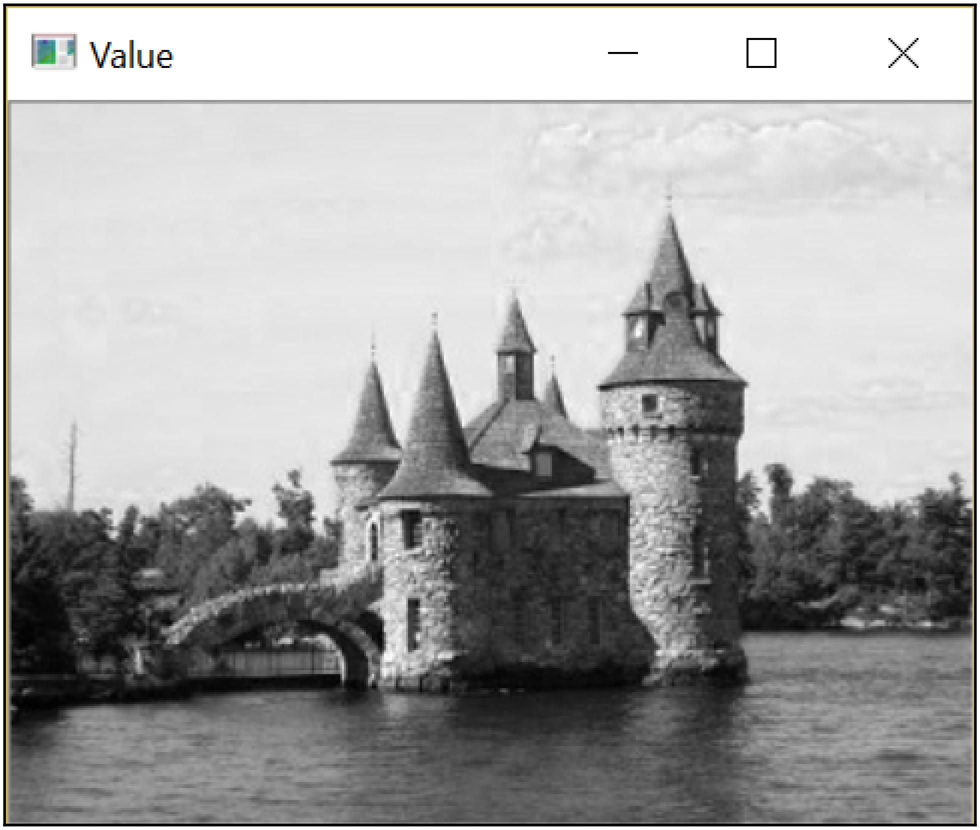
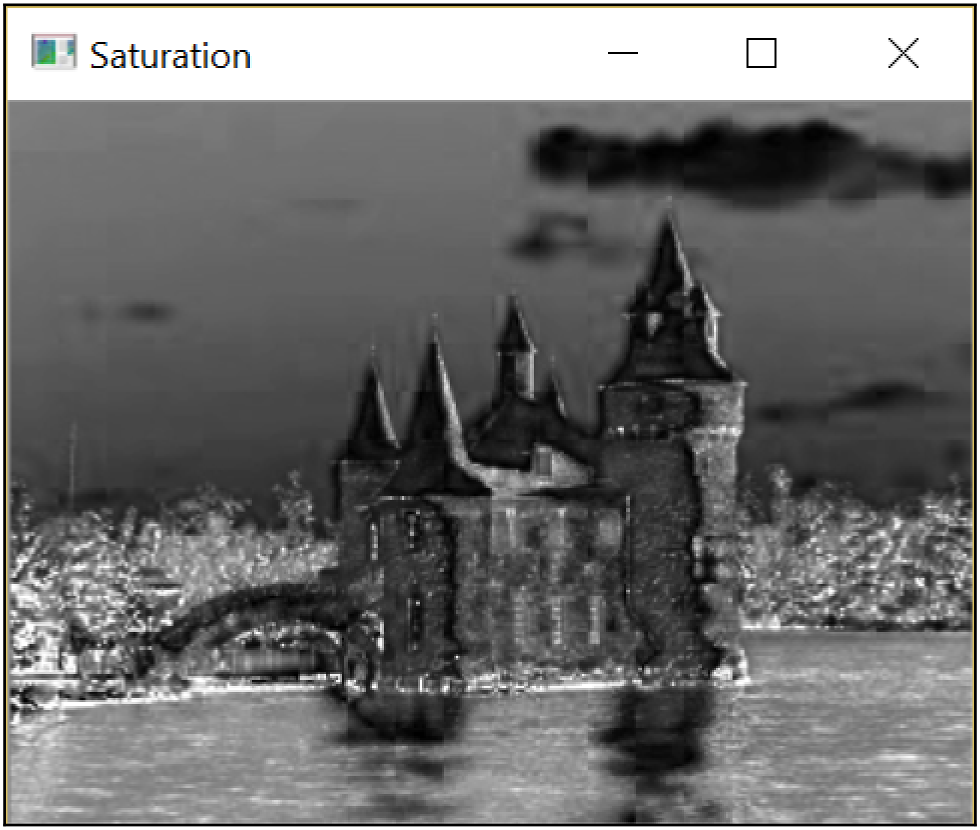
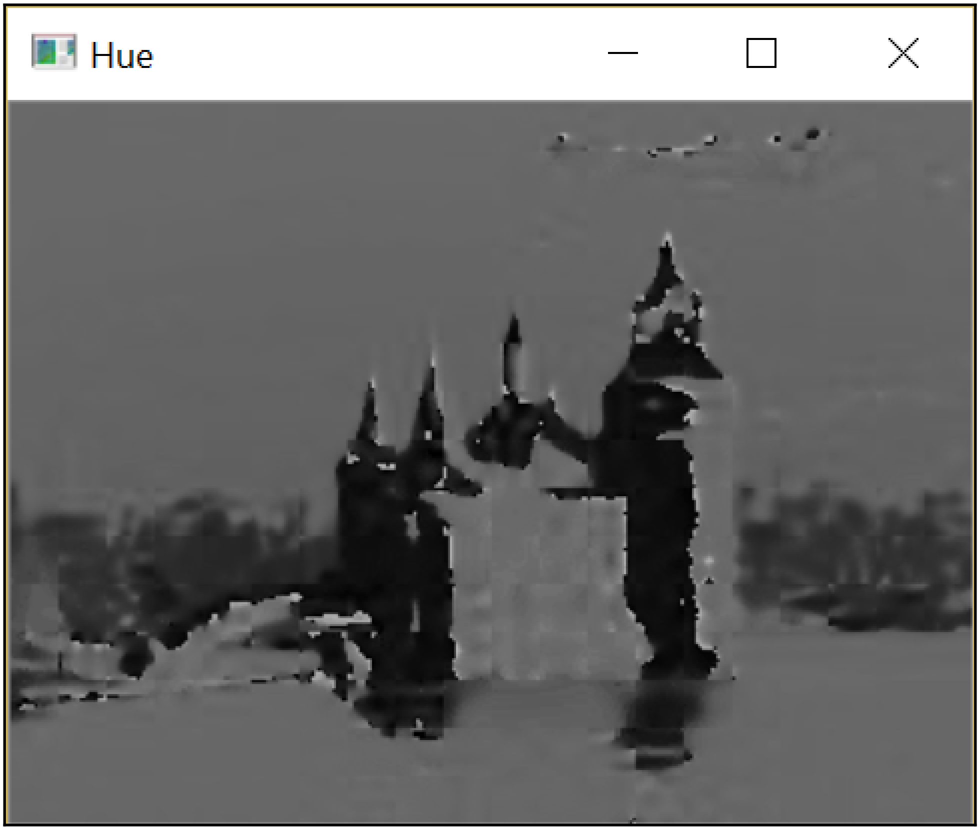


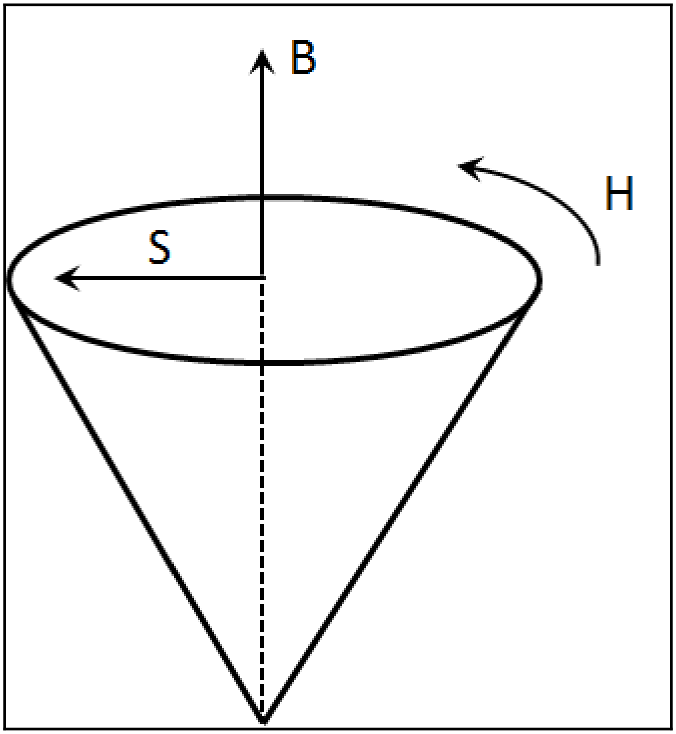
Image with rectangle

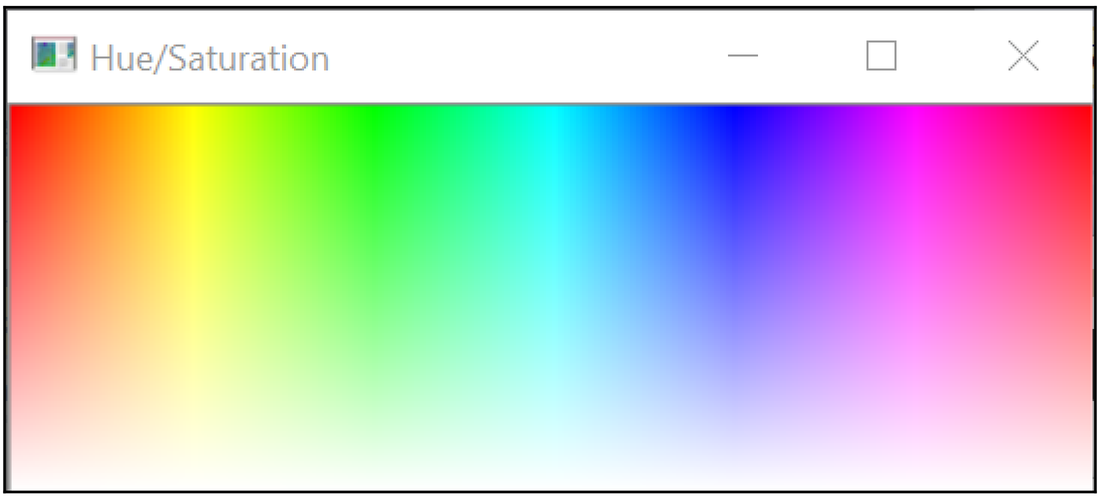

Foreground object

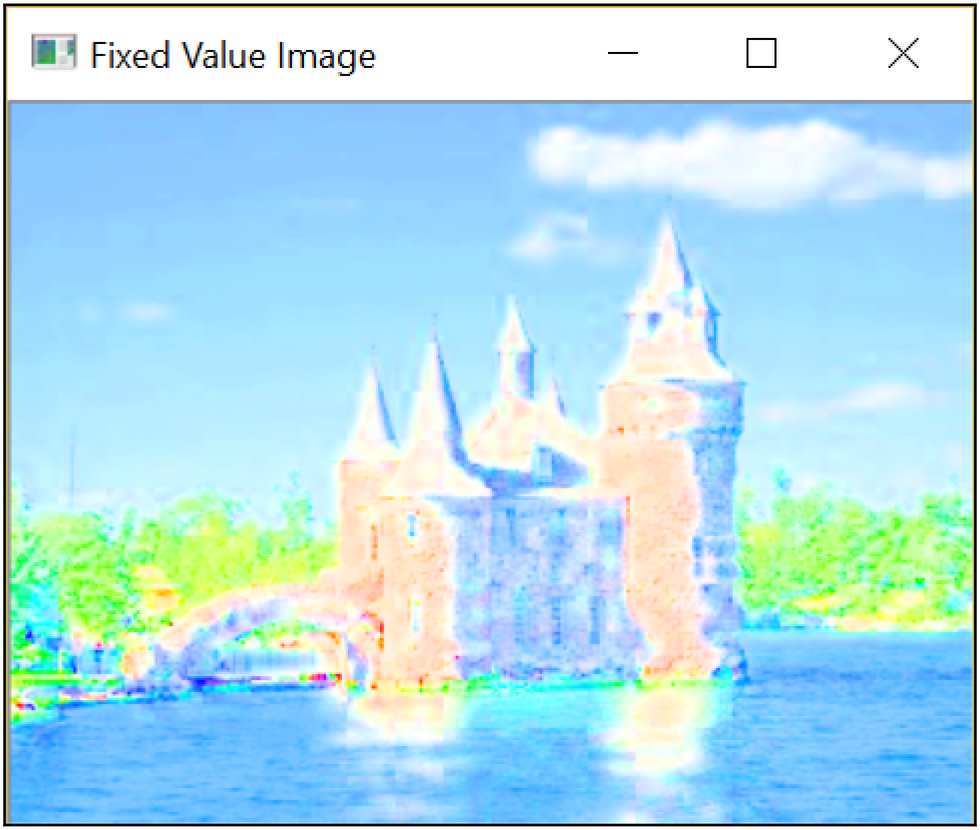

Value

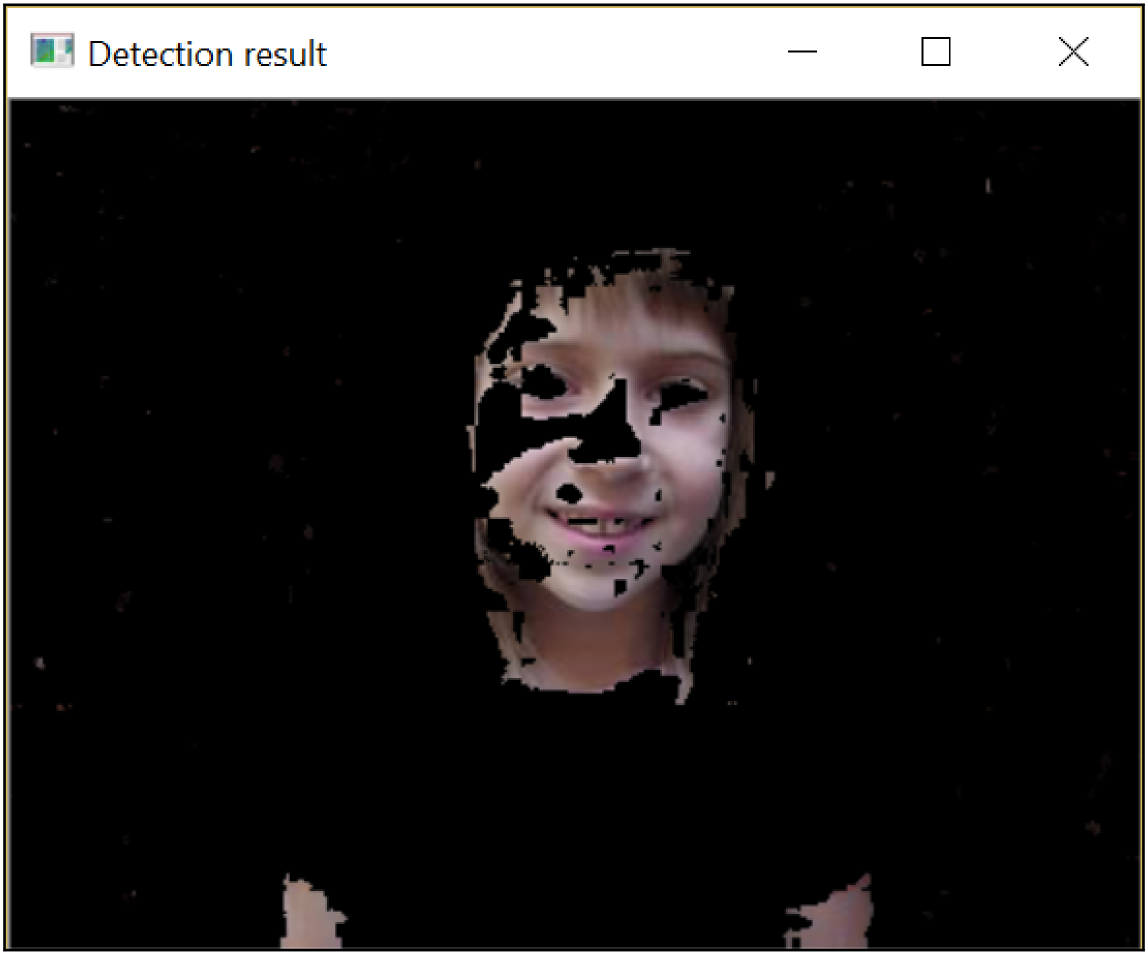

Saturation


Hue

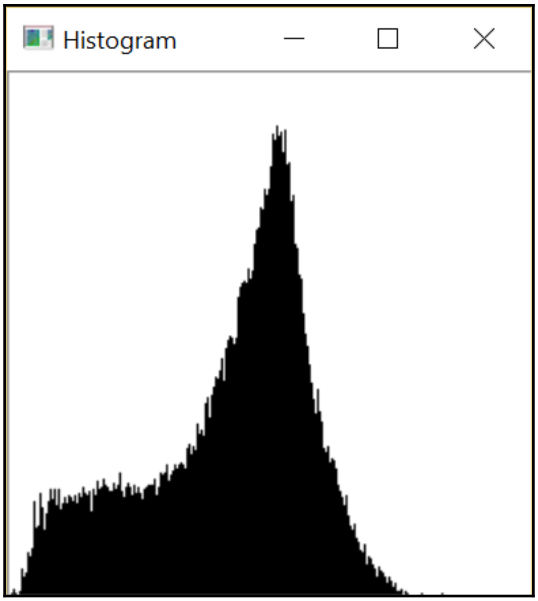

B
H
S

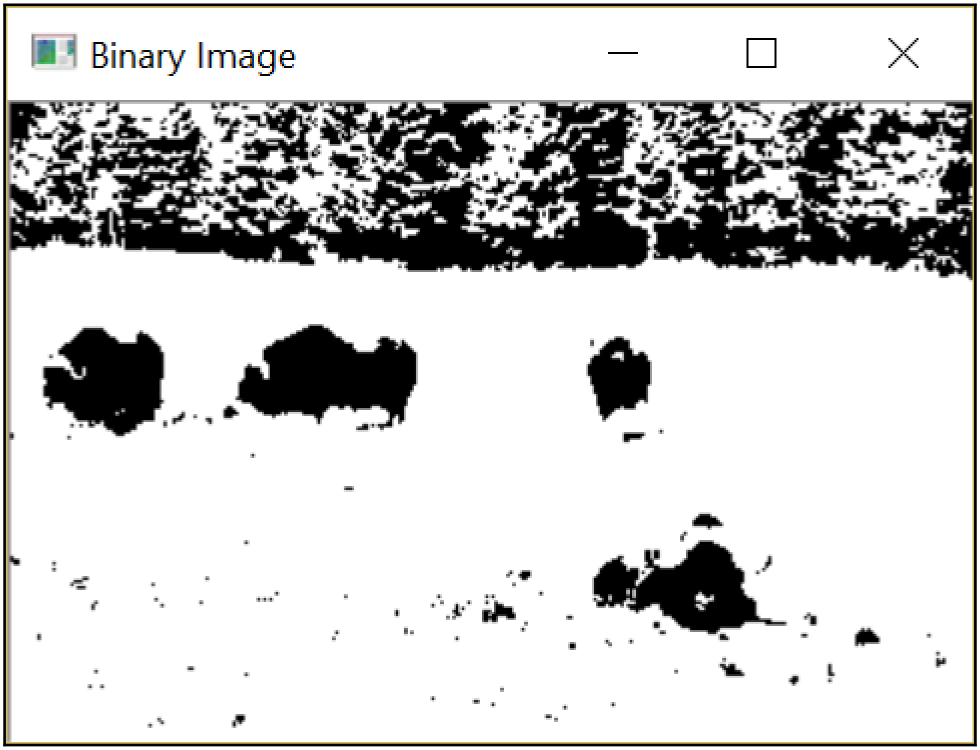

Hue/Saturation


Fixed Value Image


Detection result

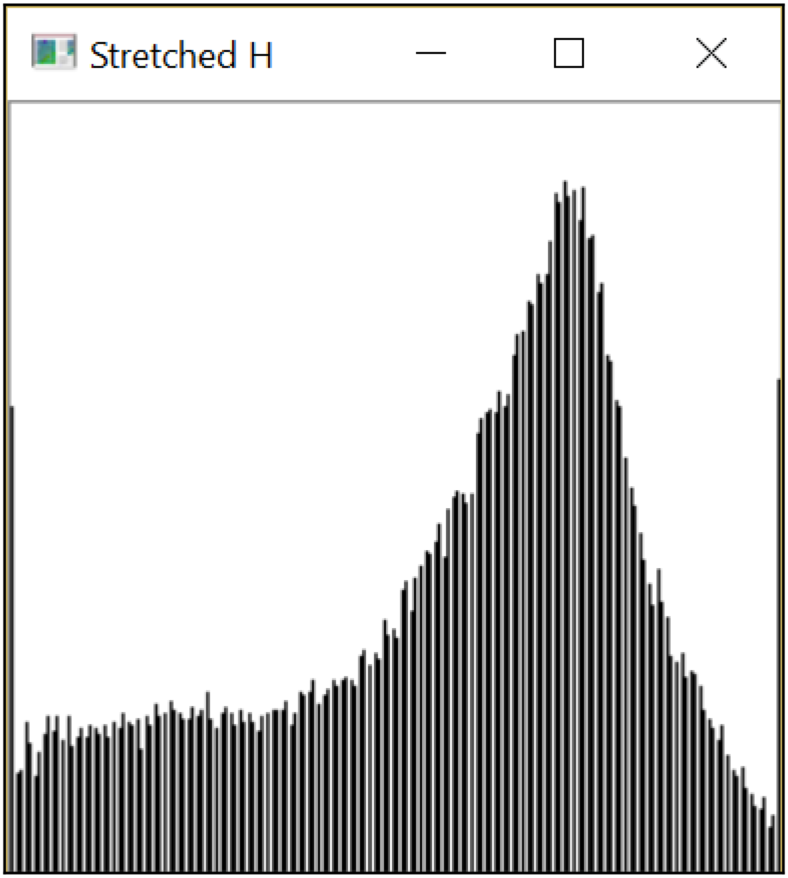
Chapter 4 : Counting the Pixels with Histograms



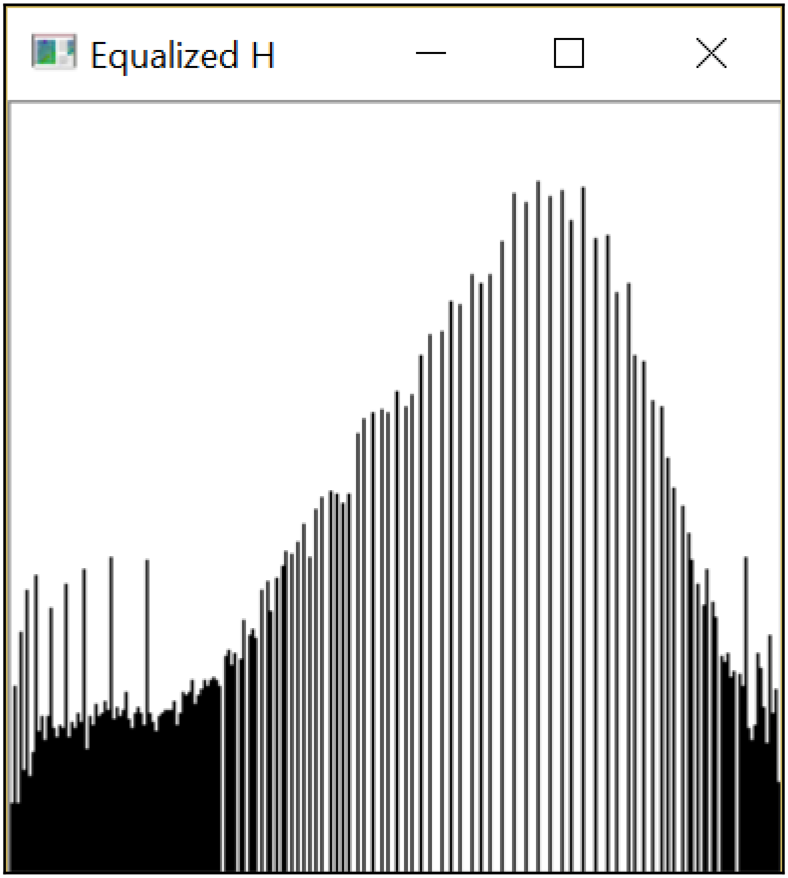

Binary Image


Negative image

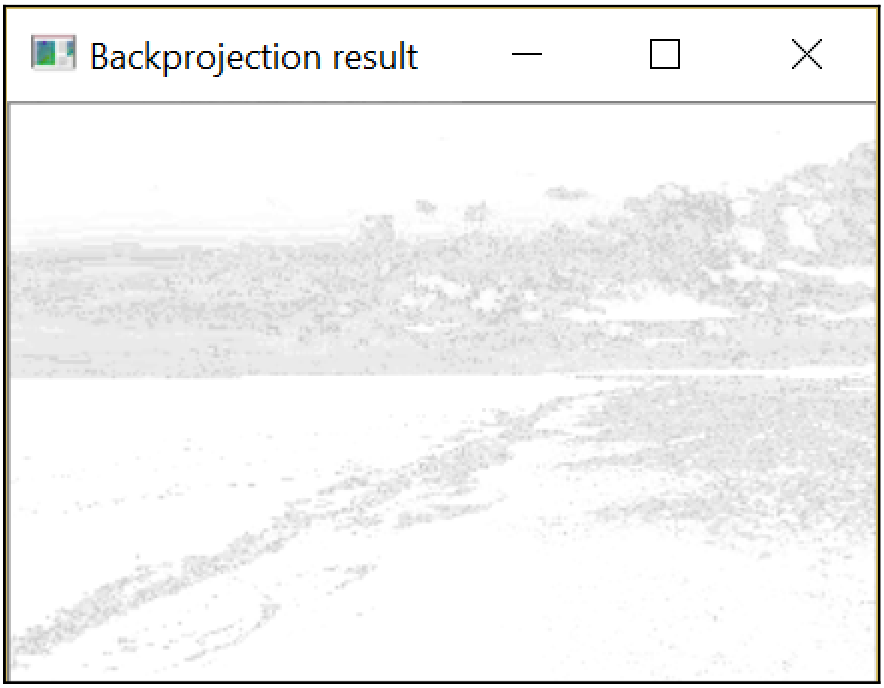

Stretched Image

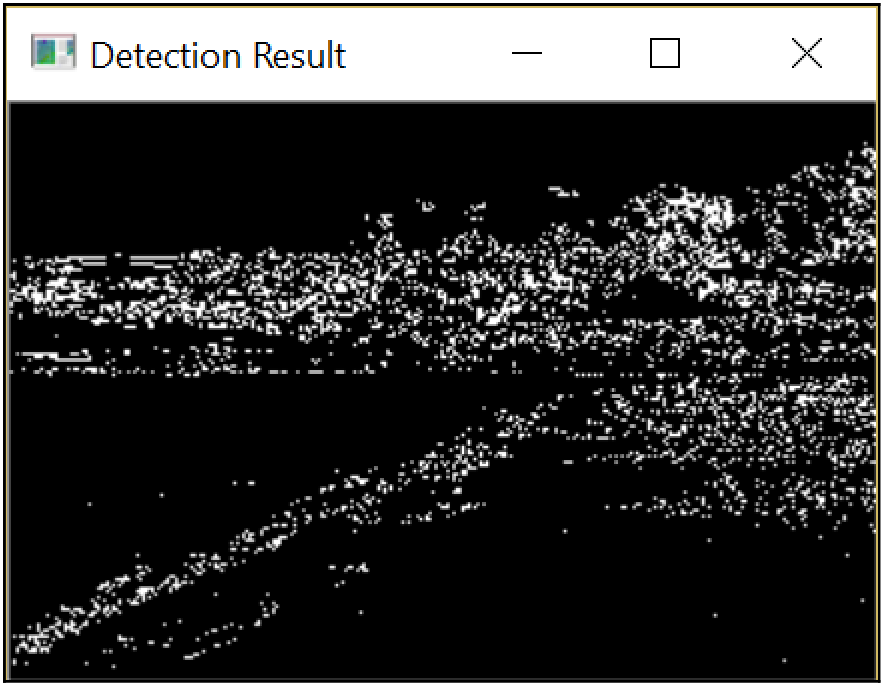

Stretched H

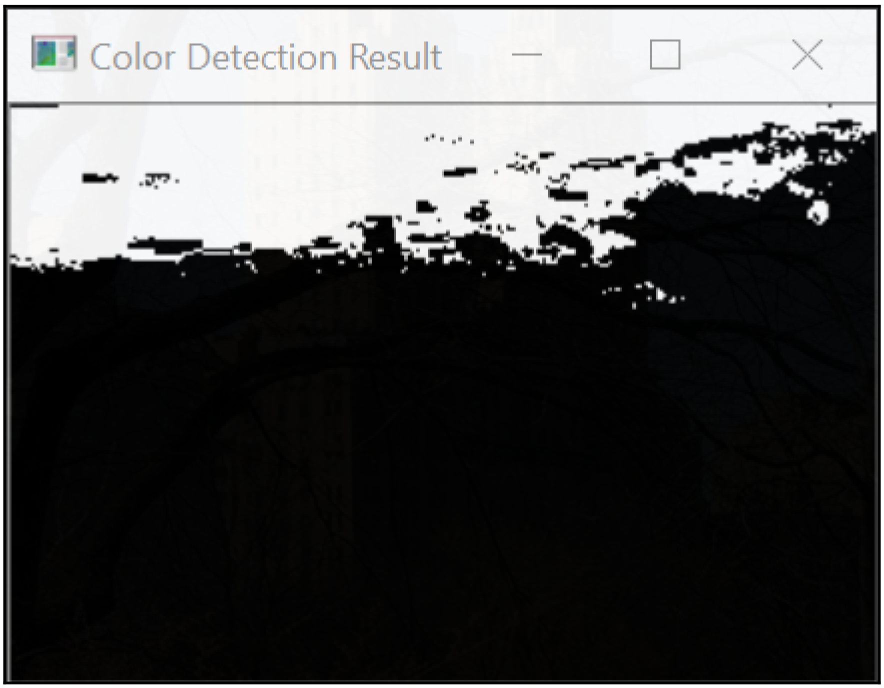

Equalized Image


Equalized H


Image


Backprojection result


Detection Result


Color Detection Result

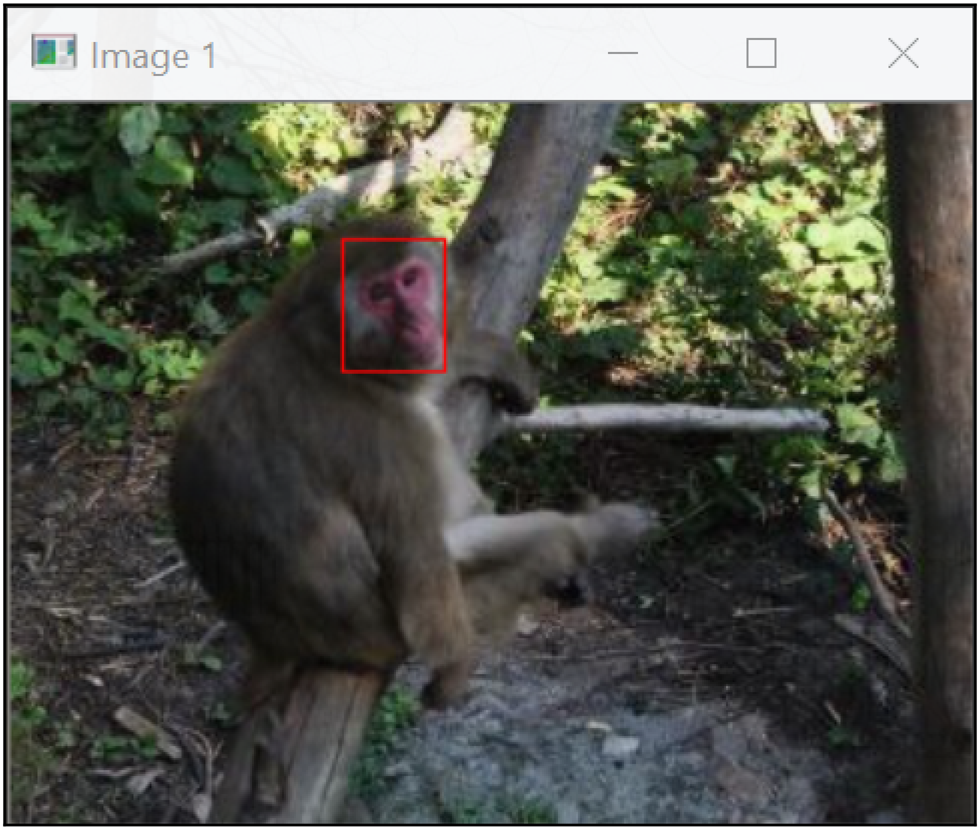


Image 1

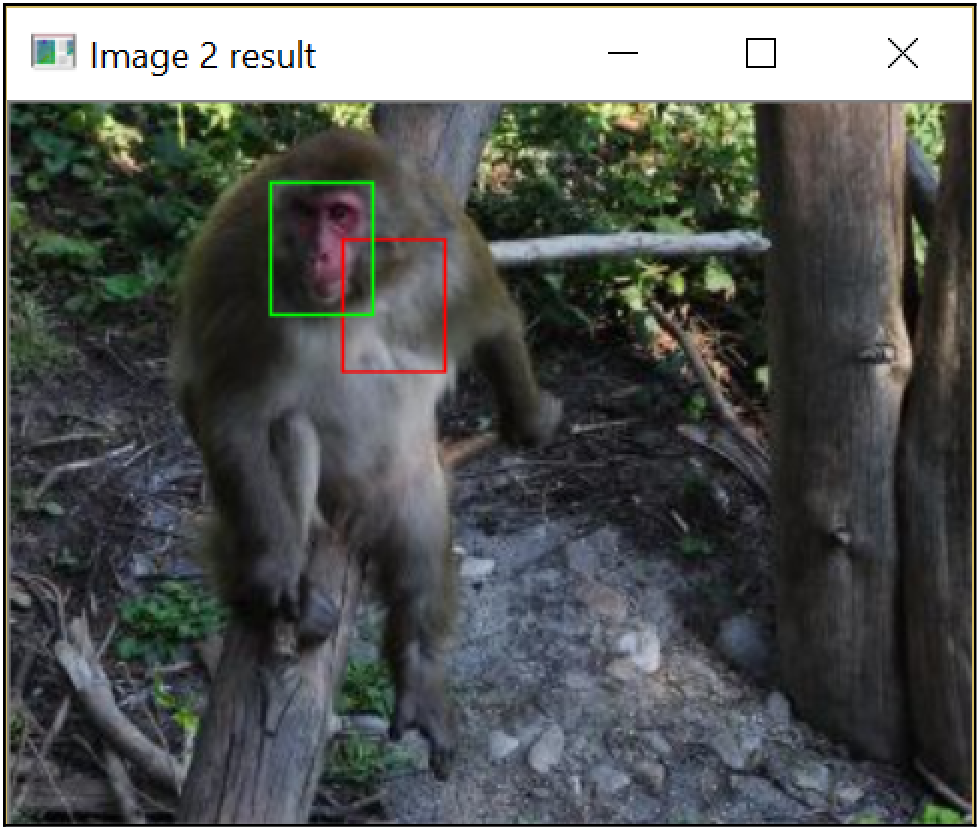
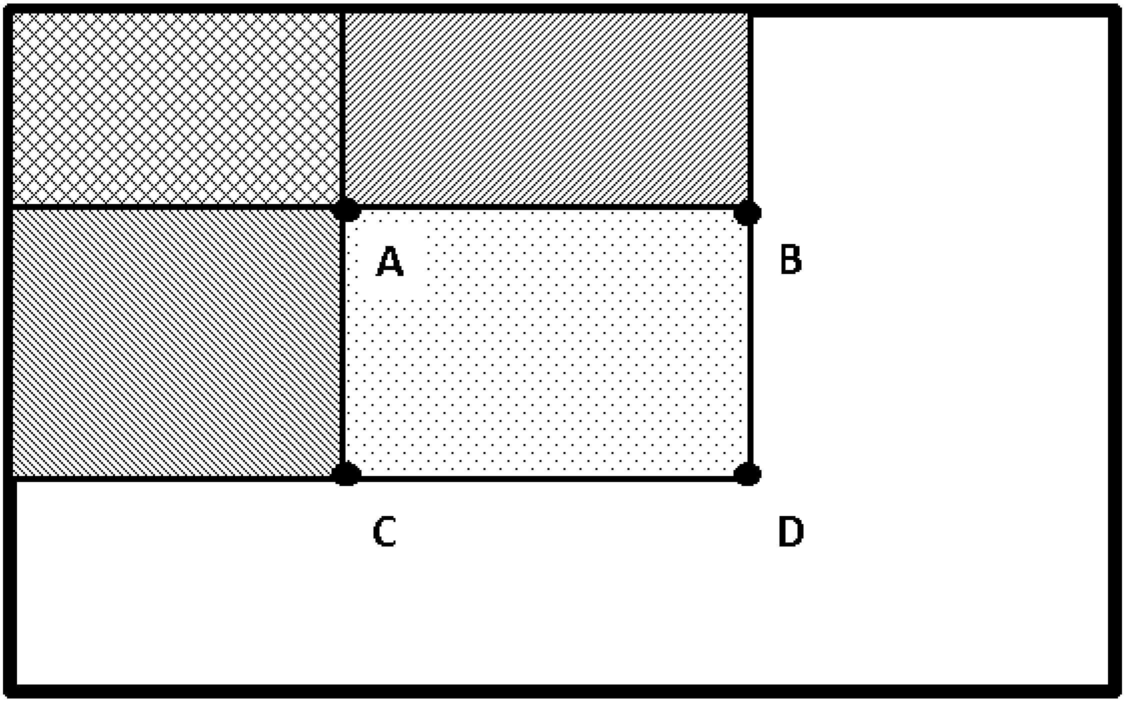
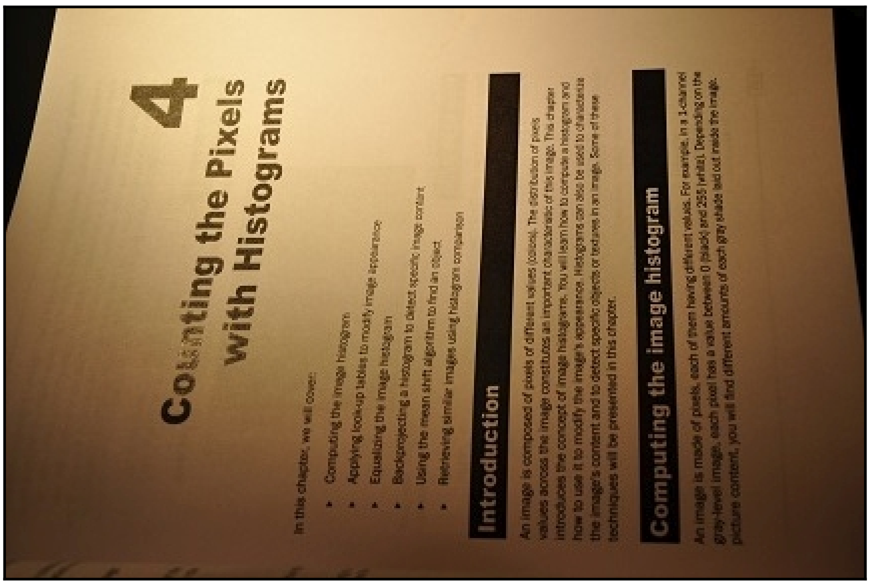
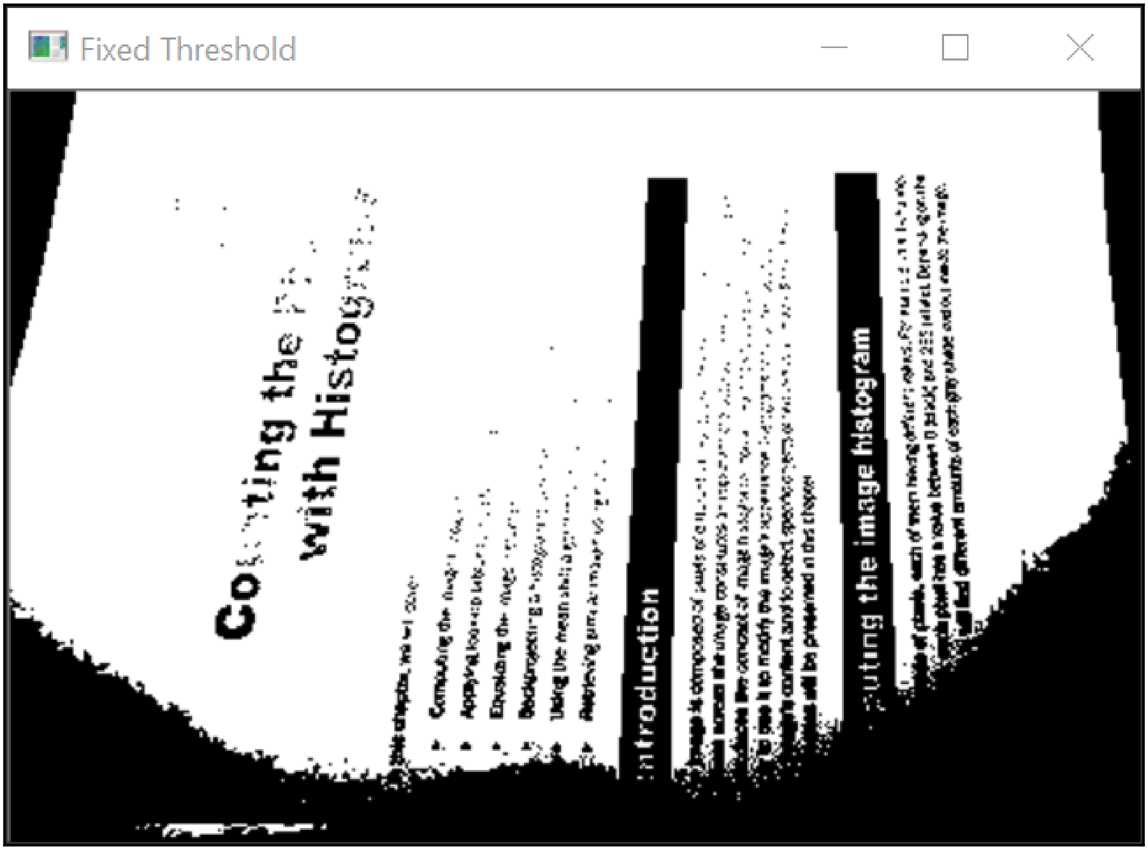


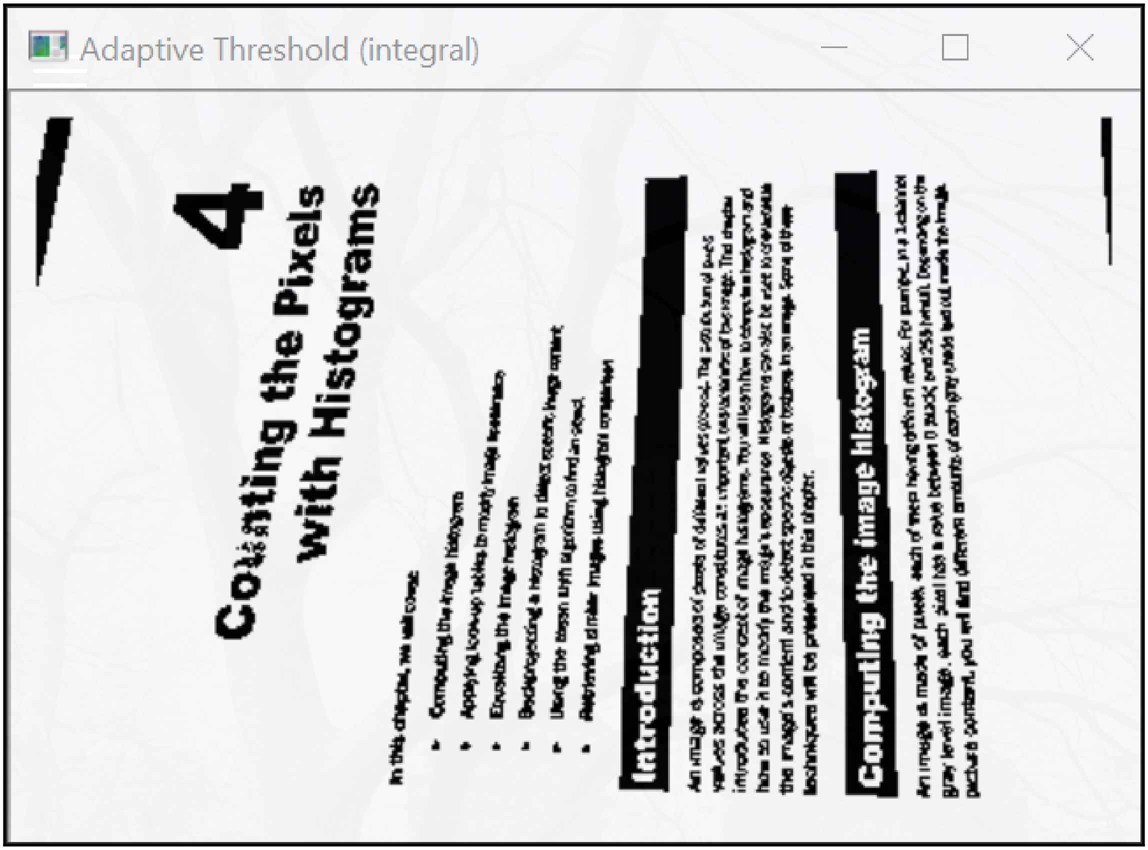
Image 2 result


Initial Image


A
B
C
D

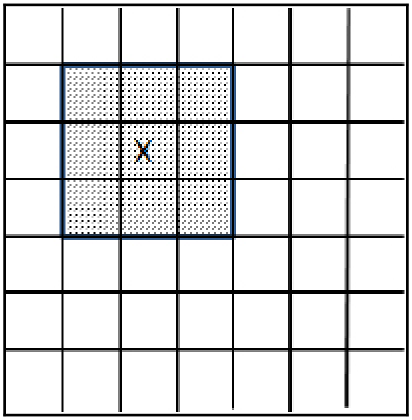

4
Counting the Pixels with Histograms
In this chapter, we will cover:
Computing the image histogram
Applying look-up tables to modify image appearance
Equalizing the image histogram
Backprojecting a histogram to detect specific image content
Using the mean shift algorithm to find an object
Retrieving similar images using histogram comparison
Introduction
Computing the image histogram

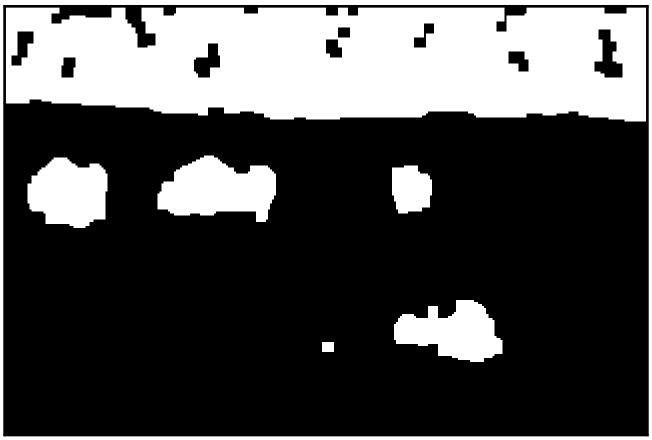

Fixed Threshold

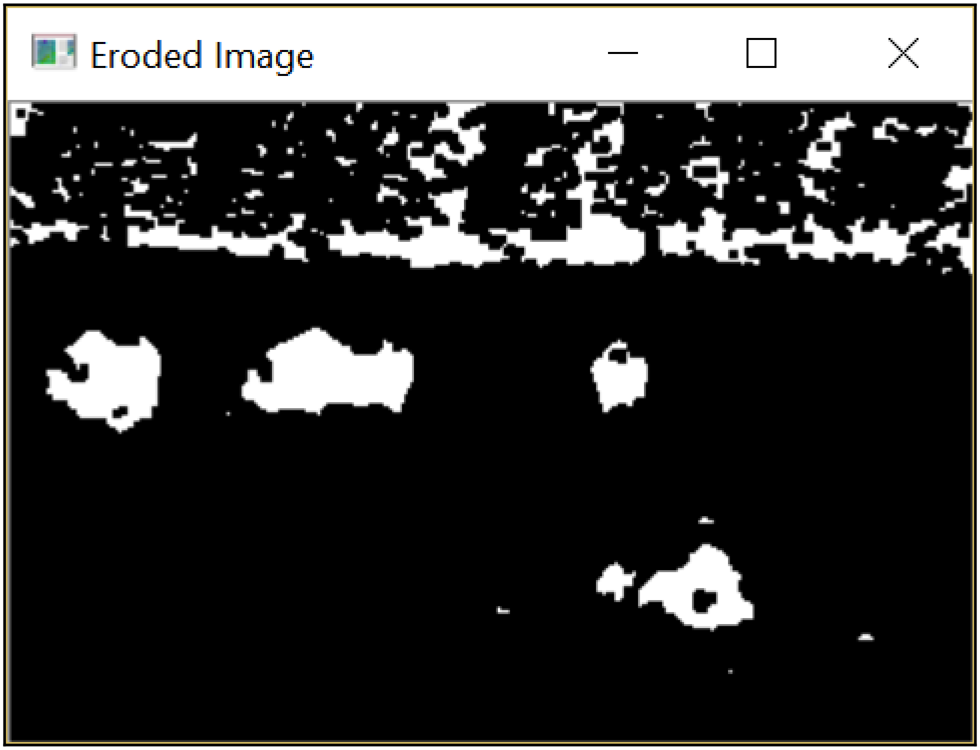

Adaptive Threshold (integral)
4
Counting the Pixels with Histograms
Introduction
Computing the image histogram

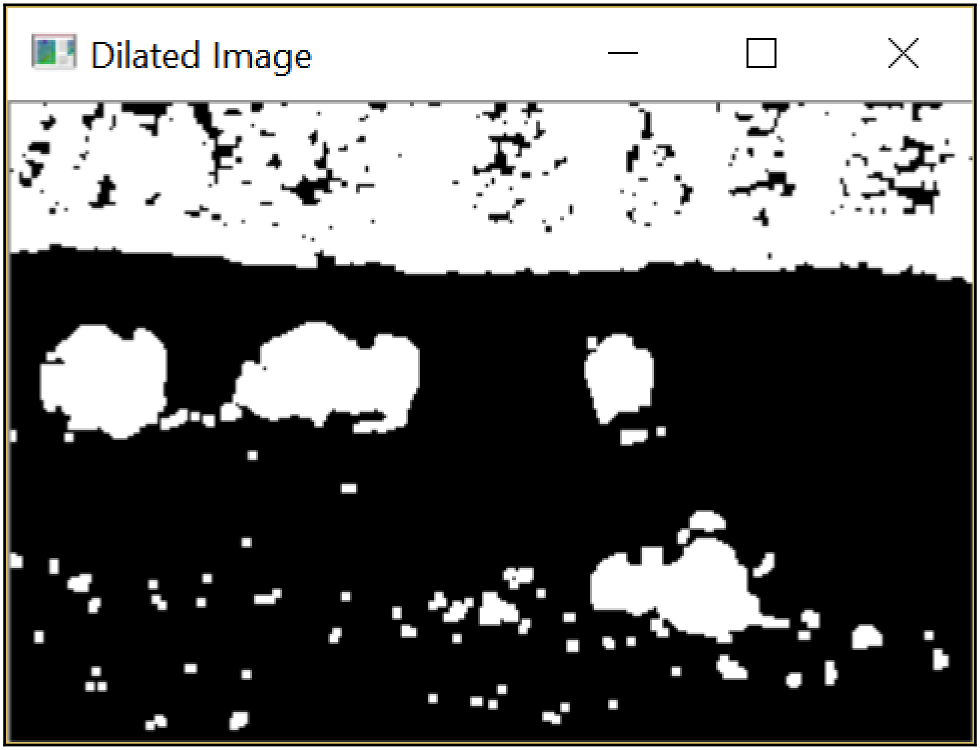

Object location

Chapter 5: Transforming Images with Morphological Operations

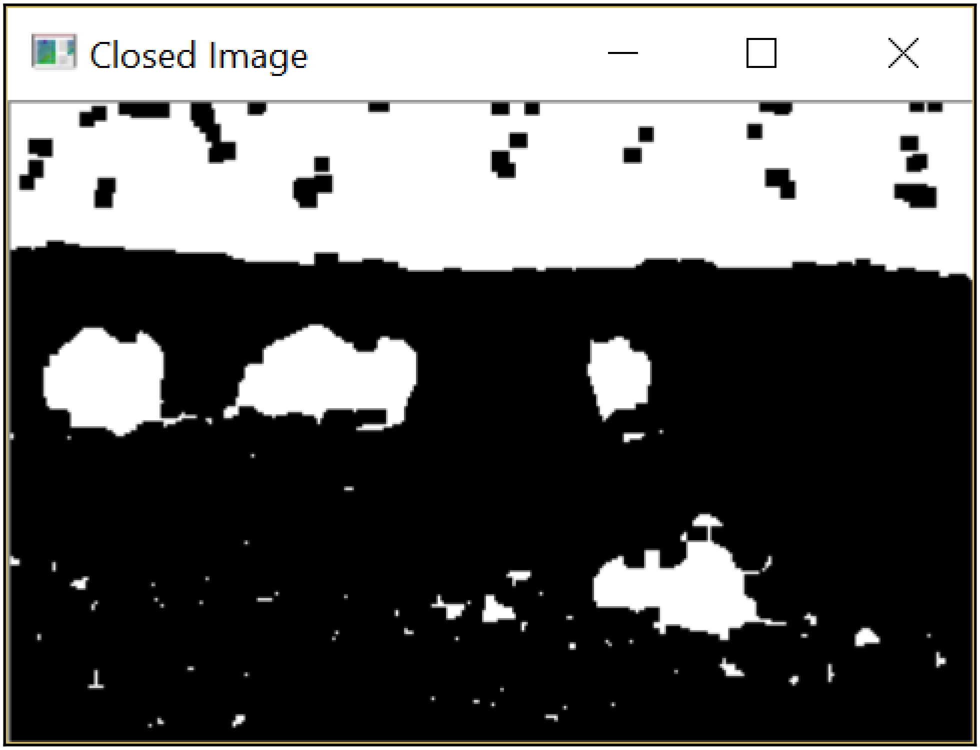


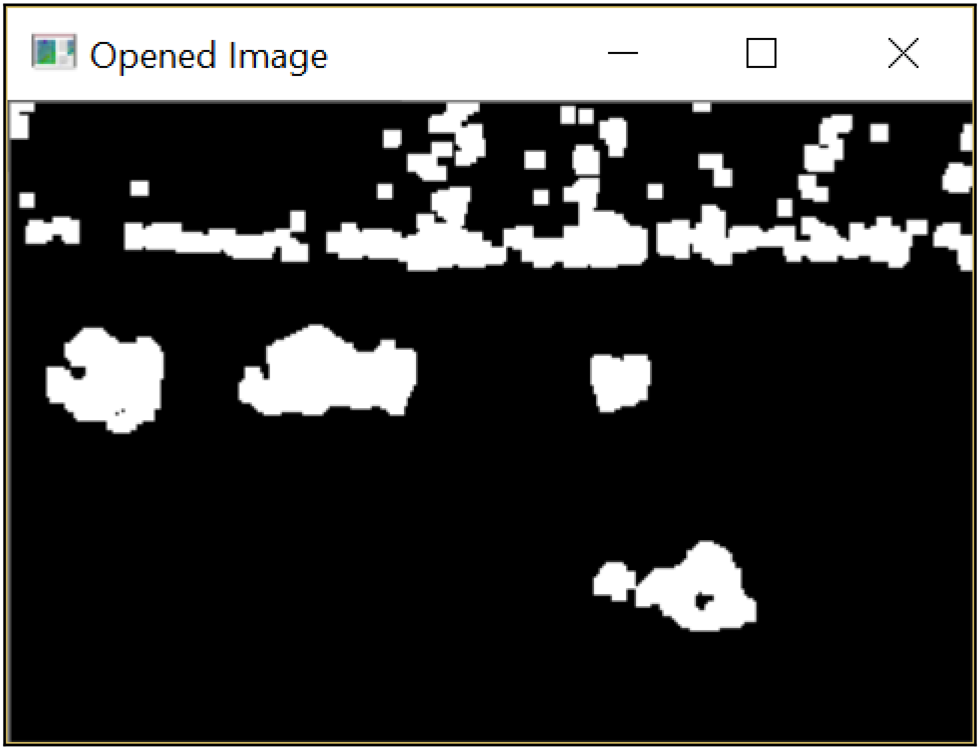


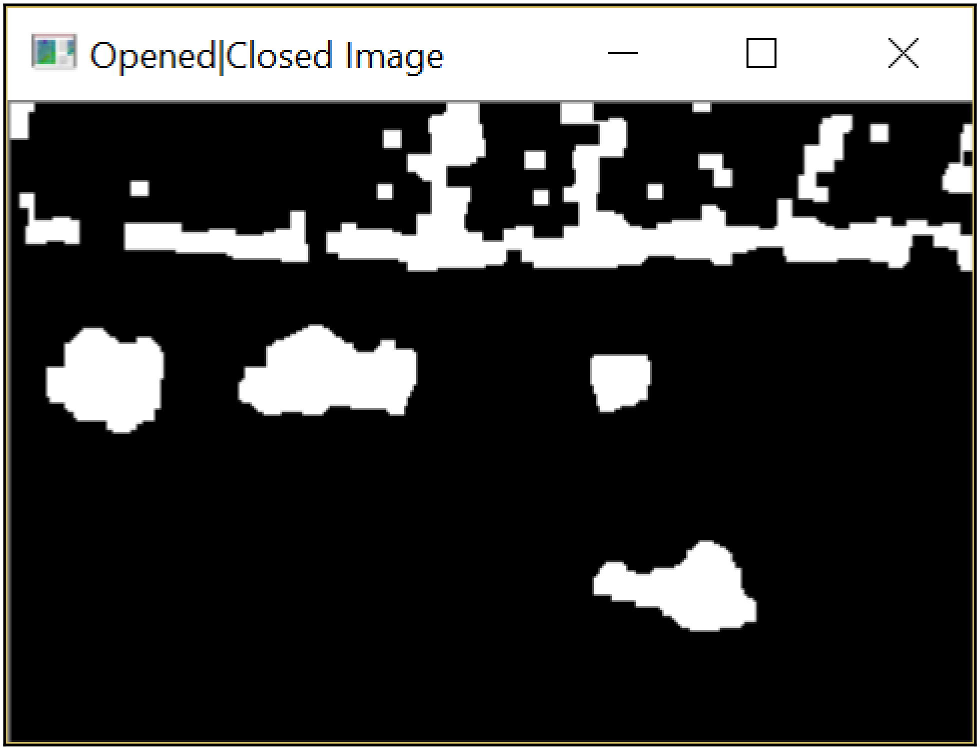

Eroded Image

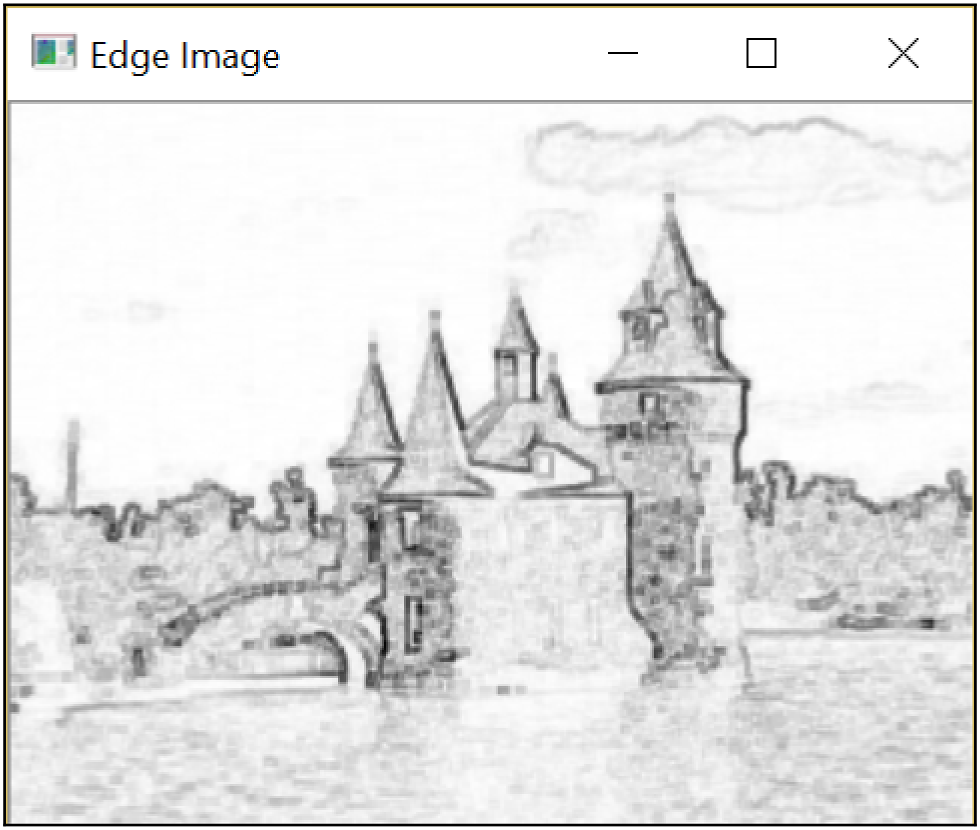

Dilated Image

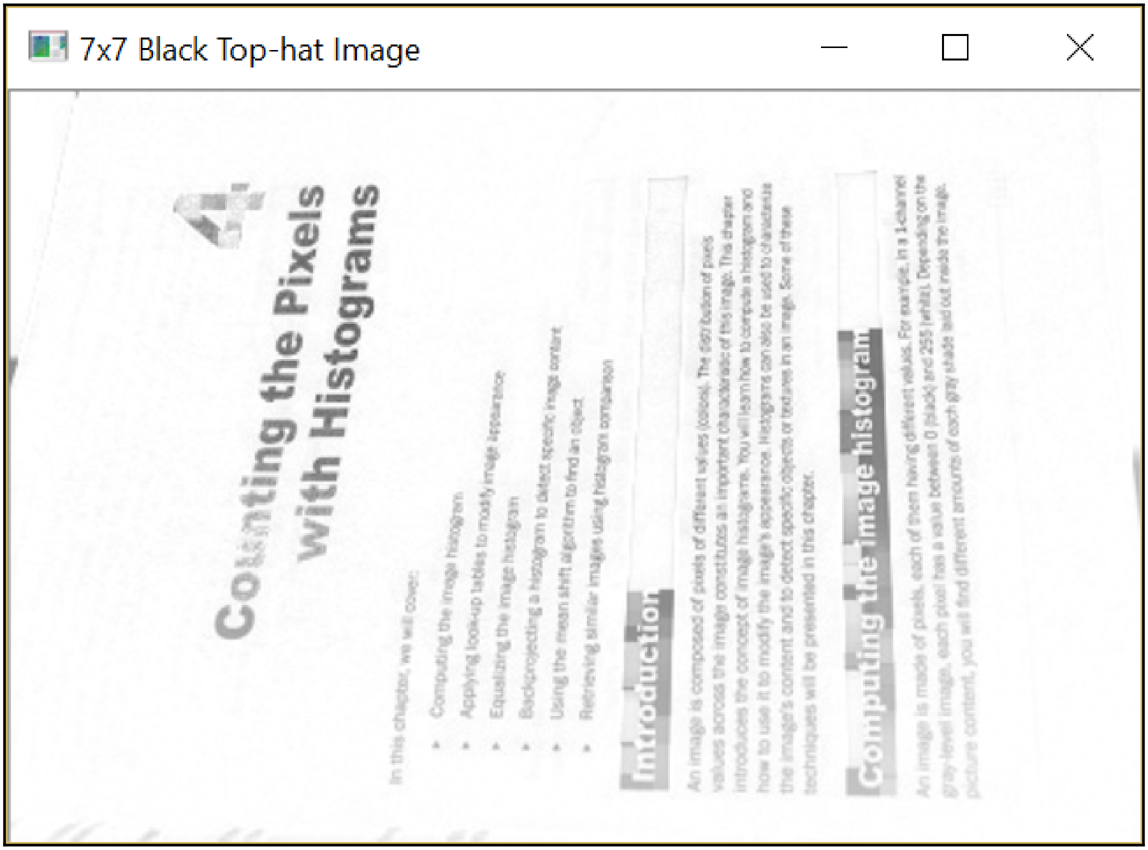

Eroded Image (7x7)


Closed Image

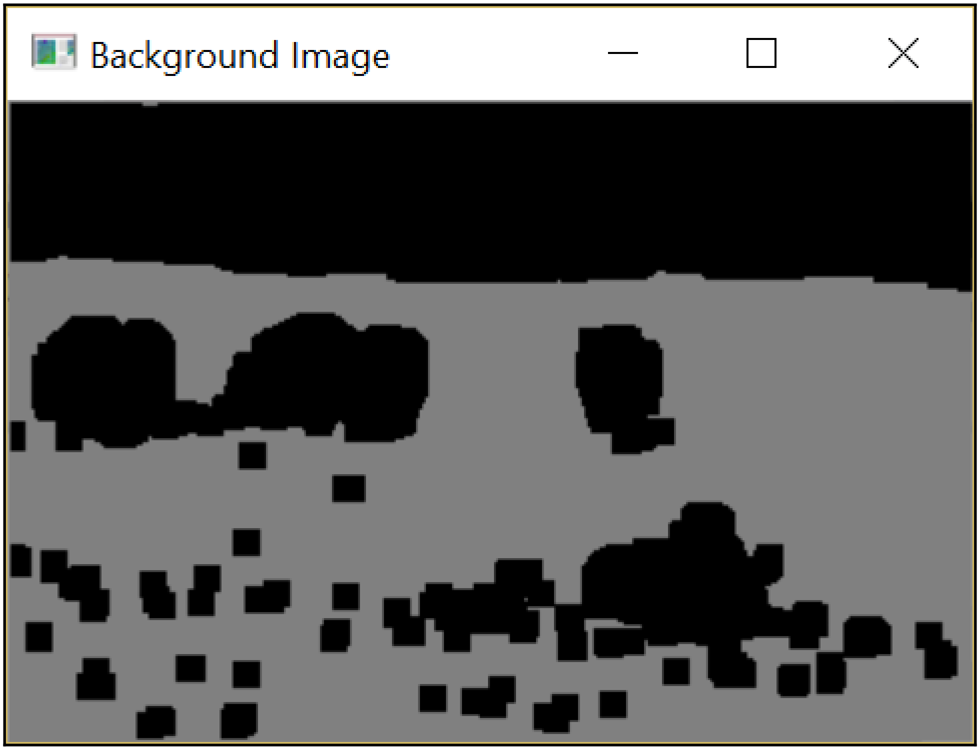

Opened Image

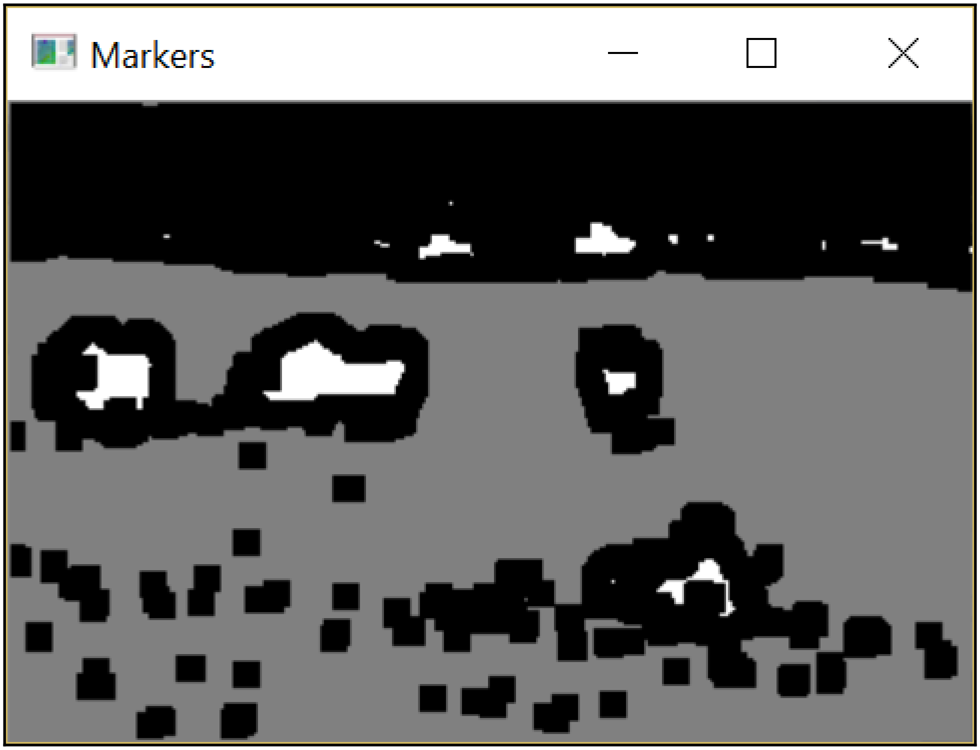

Opened|Closed Image


Edge Image

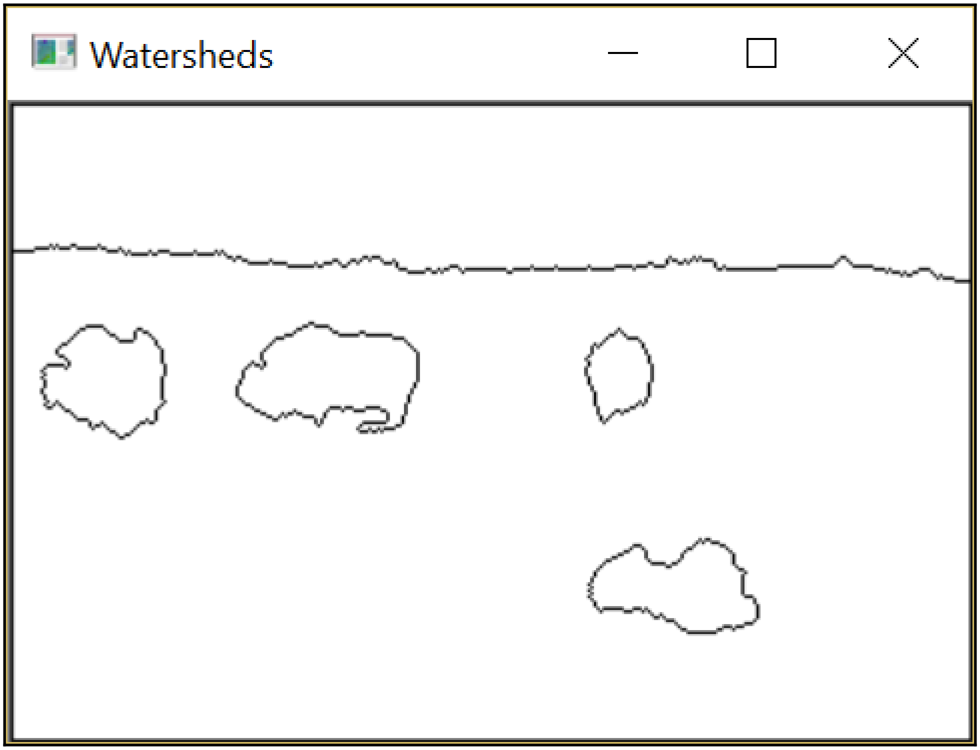

7x7 Black Top-hat Image
4
Counting the Pixels with Histograms
Introduction
Computing the image histogram


Foreground Image


Background Image


Markers


Segmentation


Watersheds

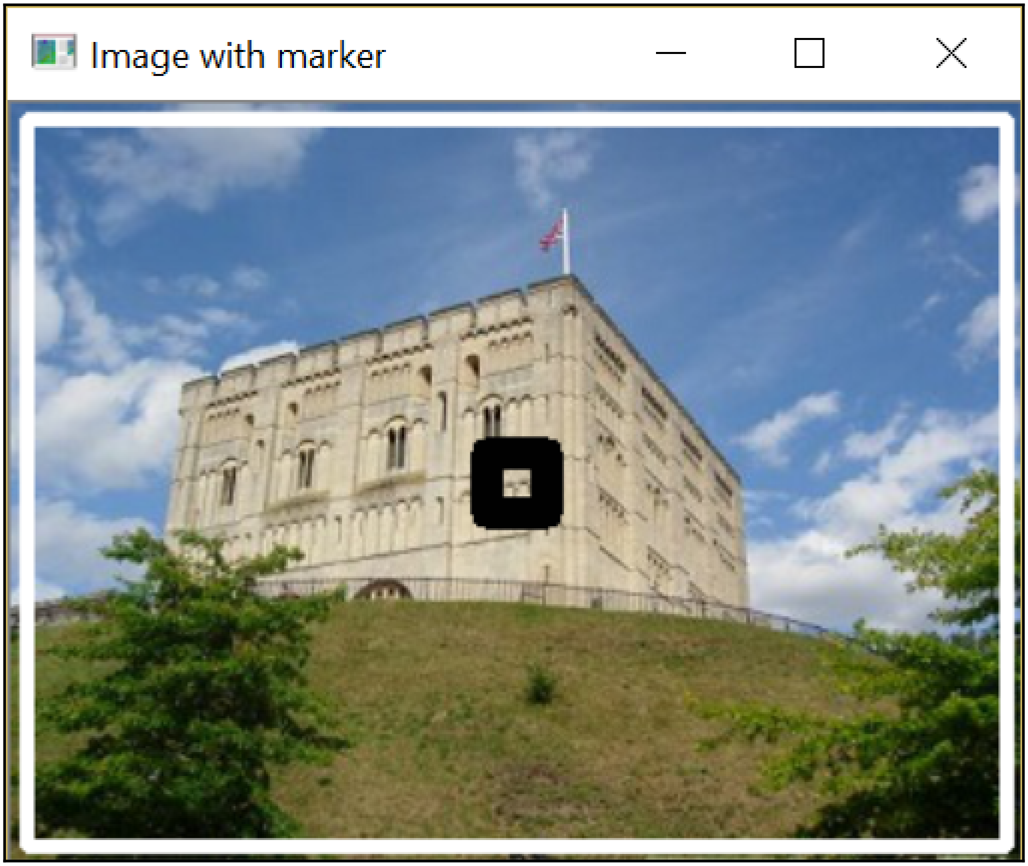
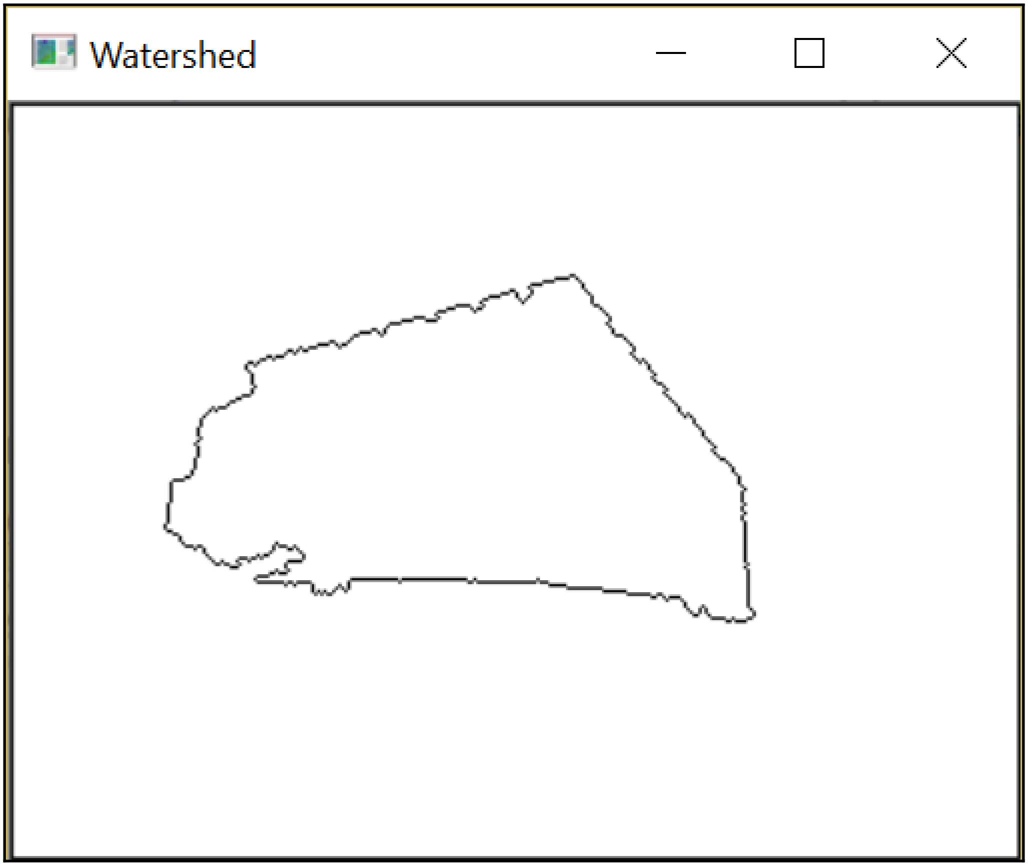
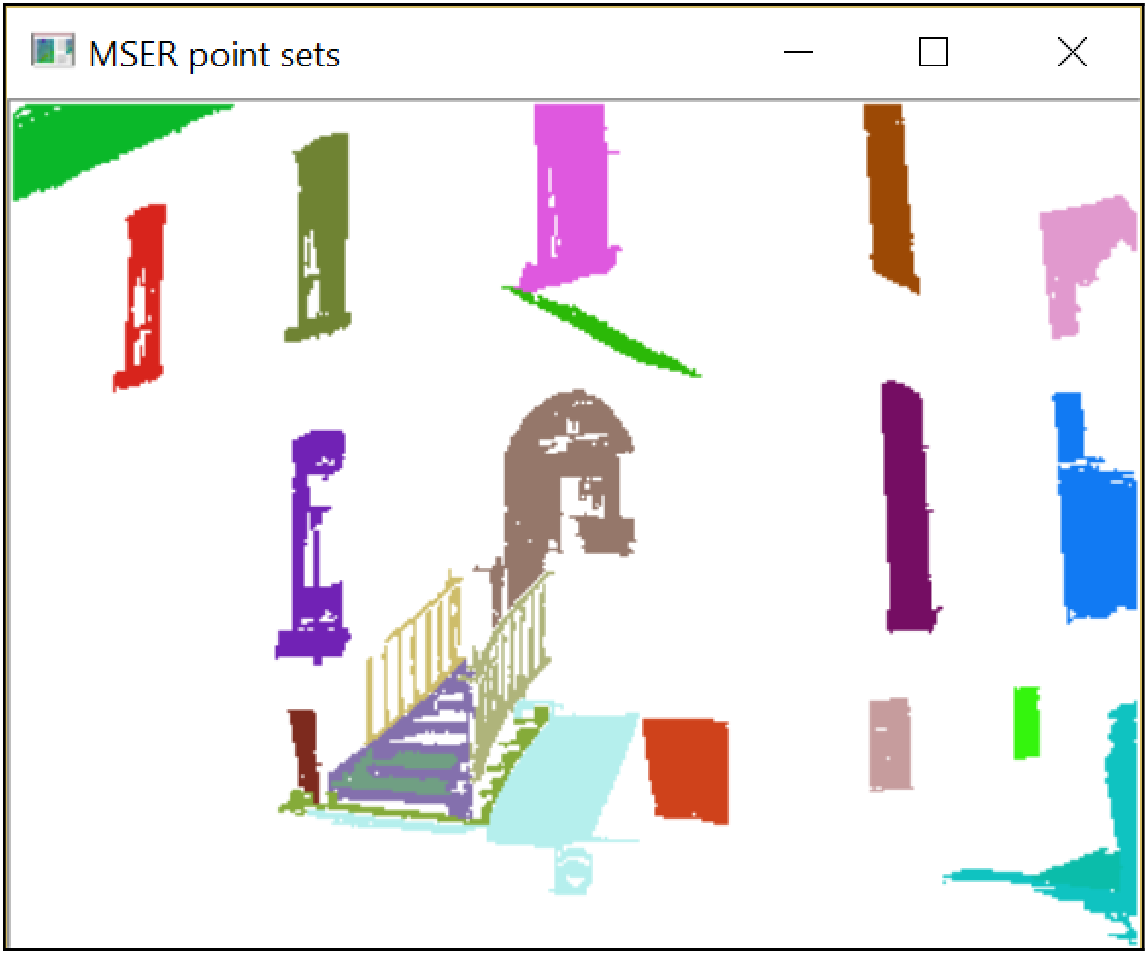


Image with marker

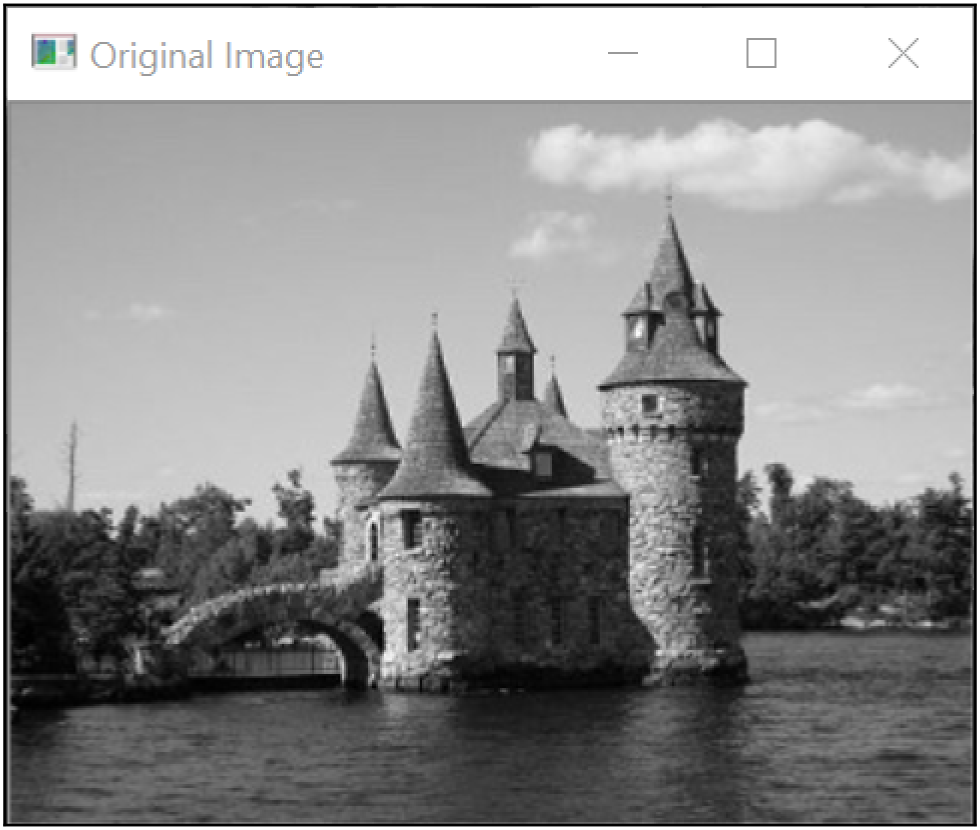

Watershed

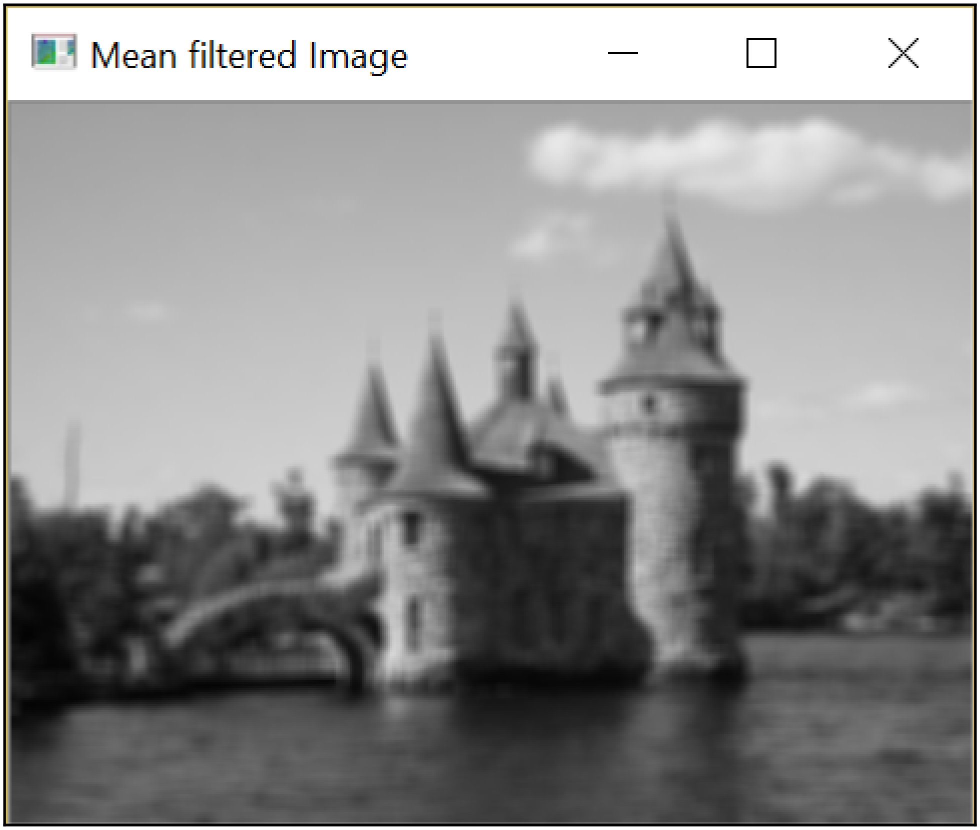

52

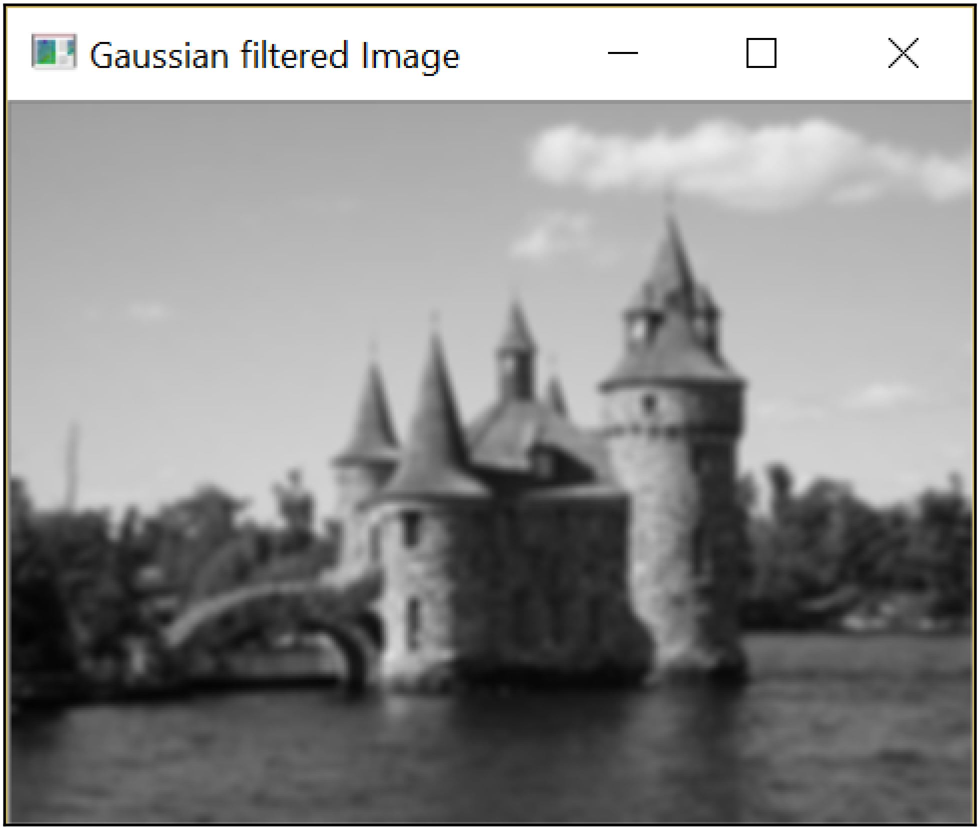

MSER point sets

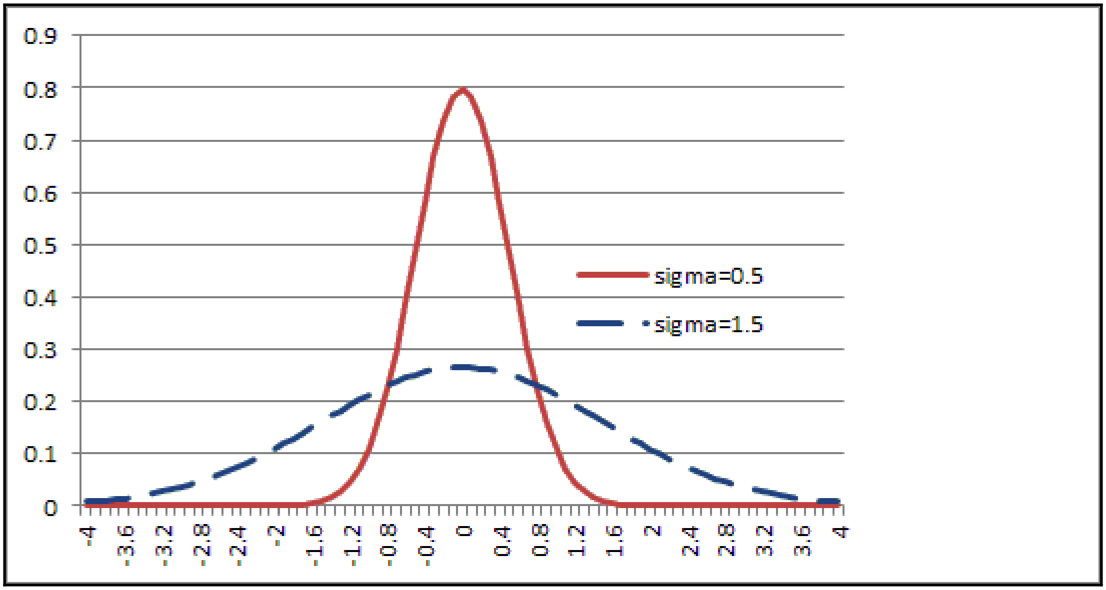

Rectangular MSERs
52


MSER ellipses
52

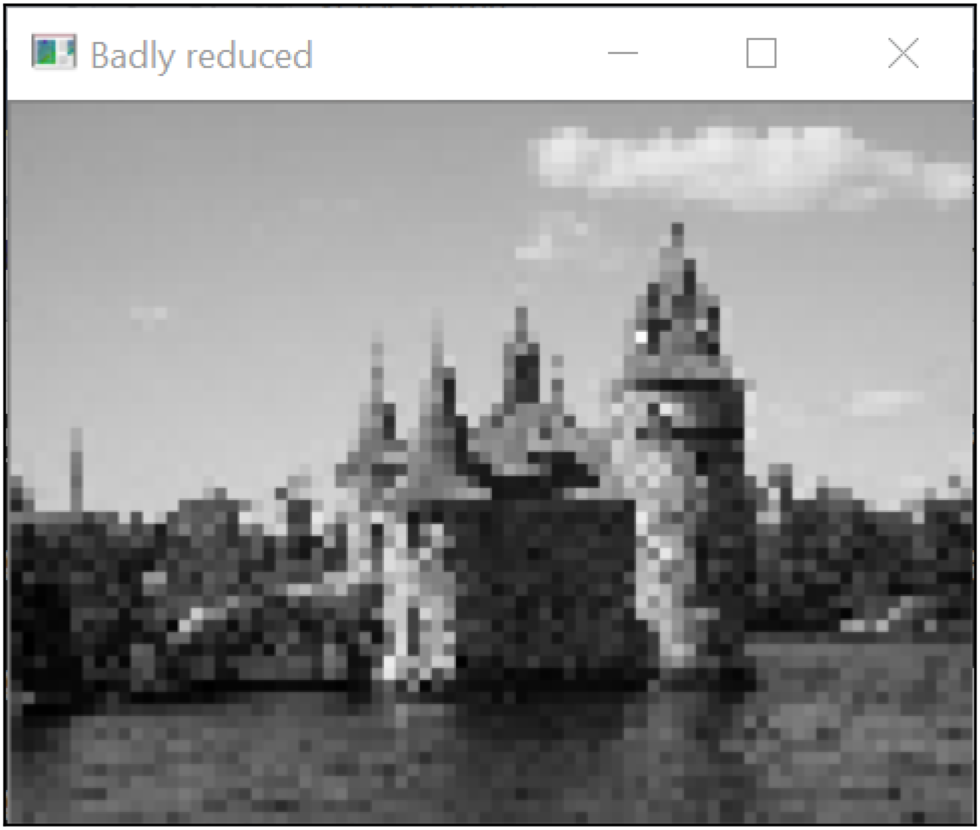

Original Image

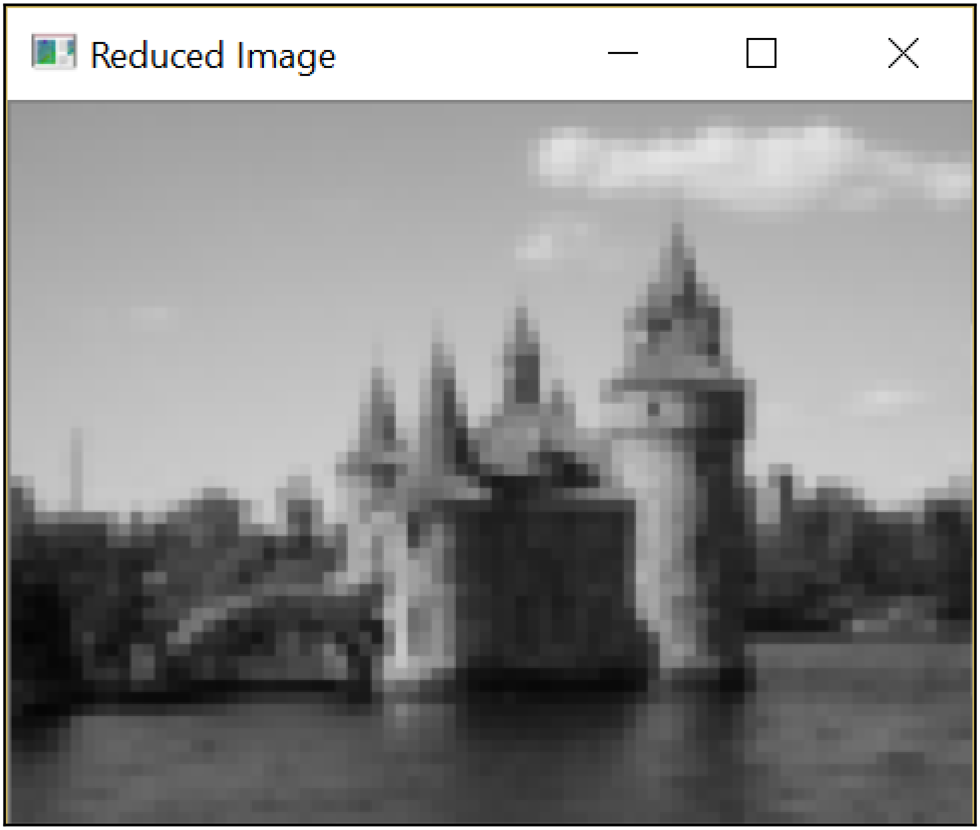

Mean filtered Image


Gaussian filtered Image

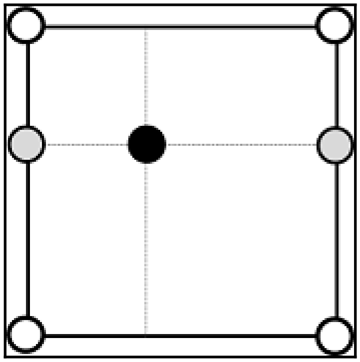


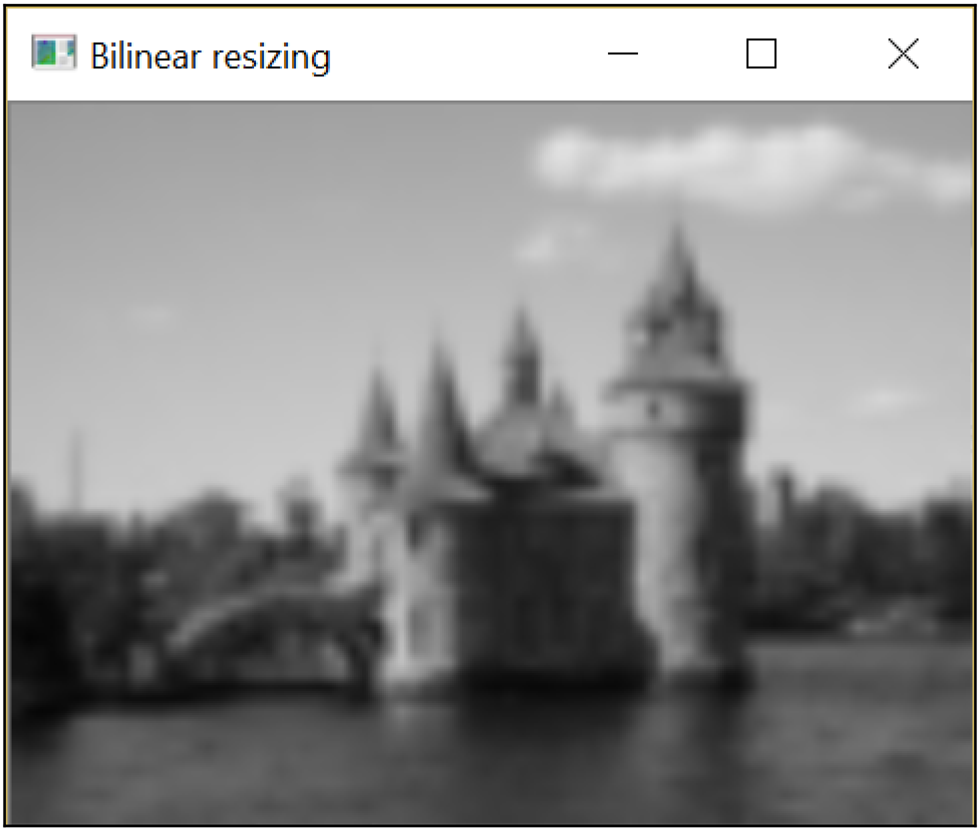
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
sigma=0.5
sigma=1.5
-4
-3.6
-3.2
-2.8
-2.4
-2
-1.6
-1.2
-0.8
-0.4
0
0.4
0.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4

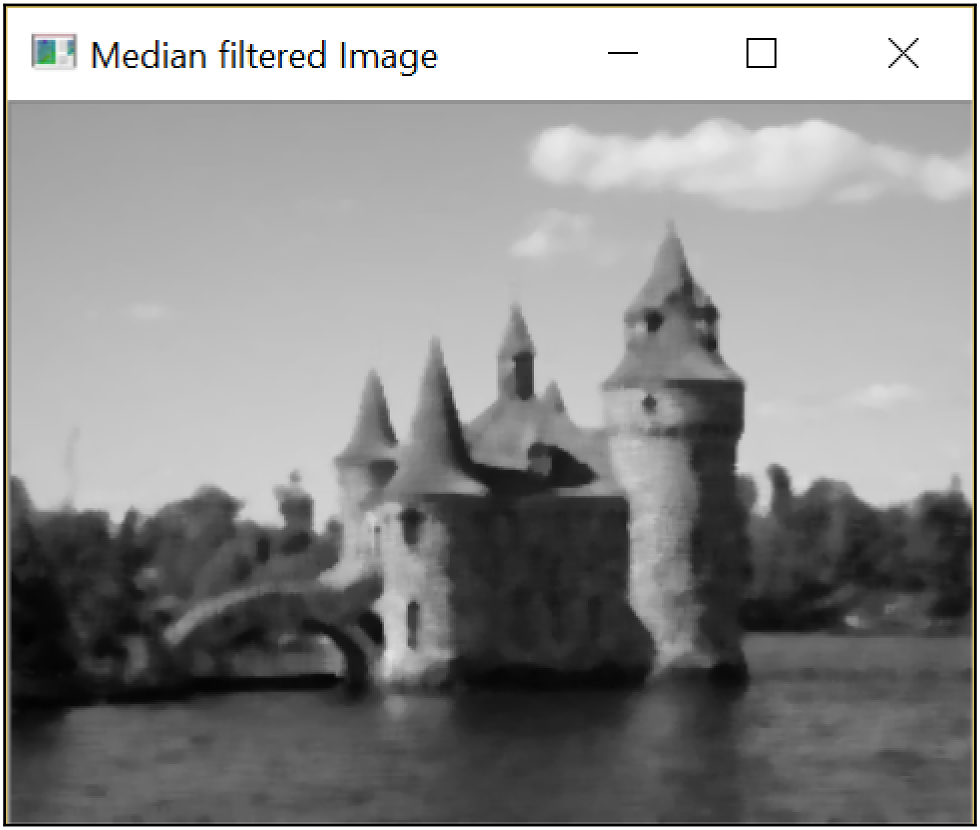

Badly reduced

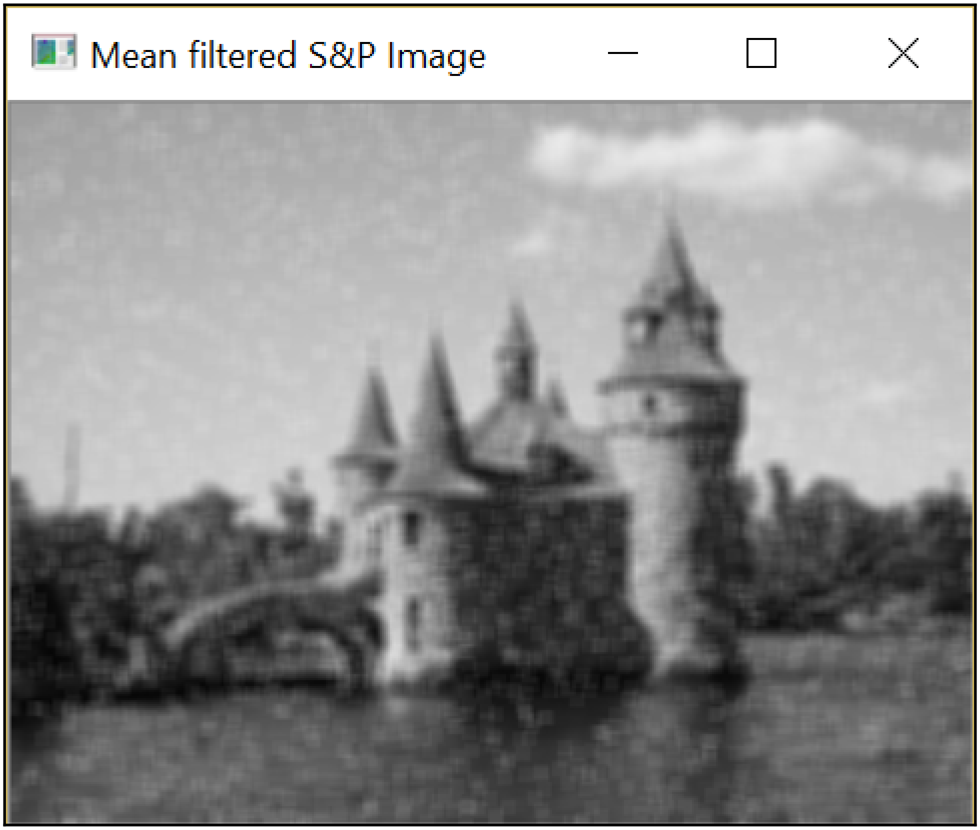

Reduced Image


Pyramid of images

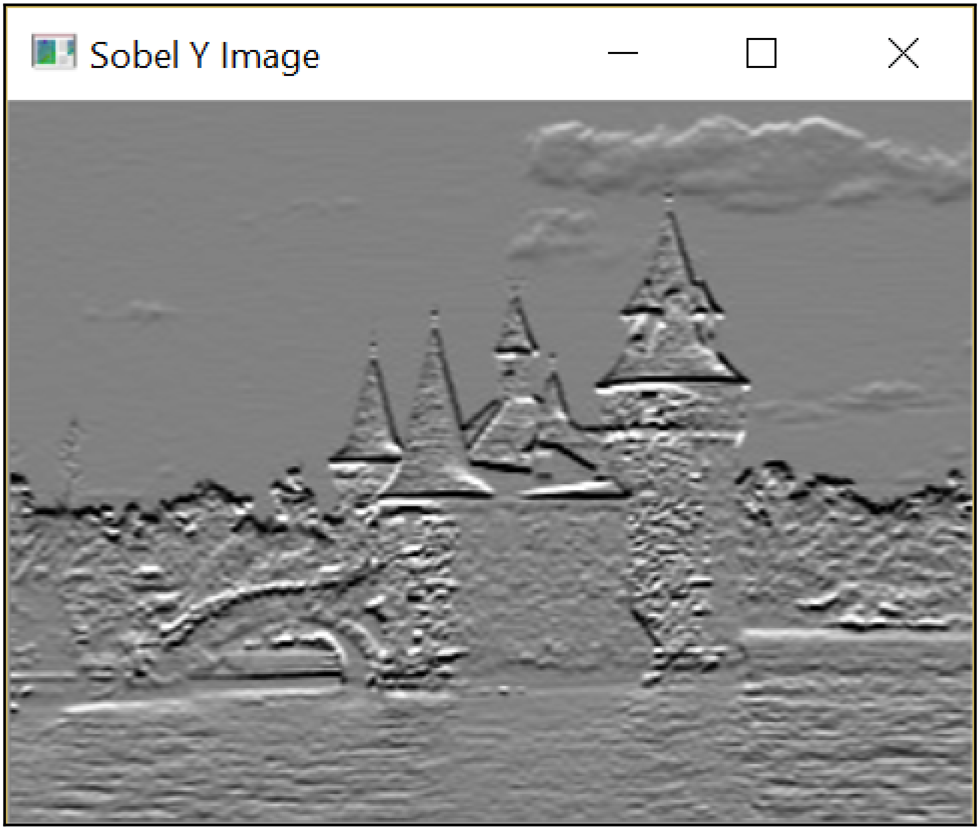


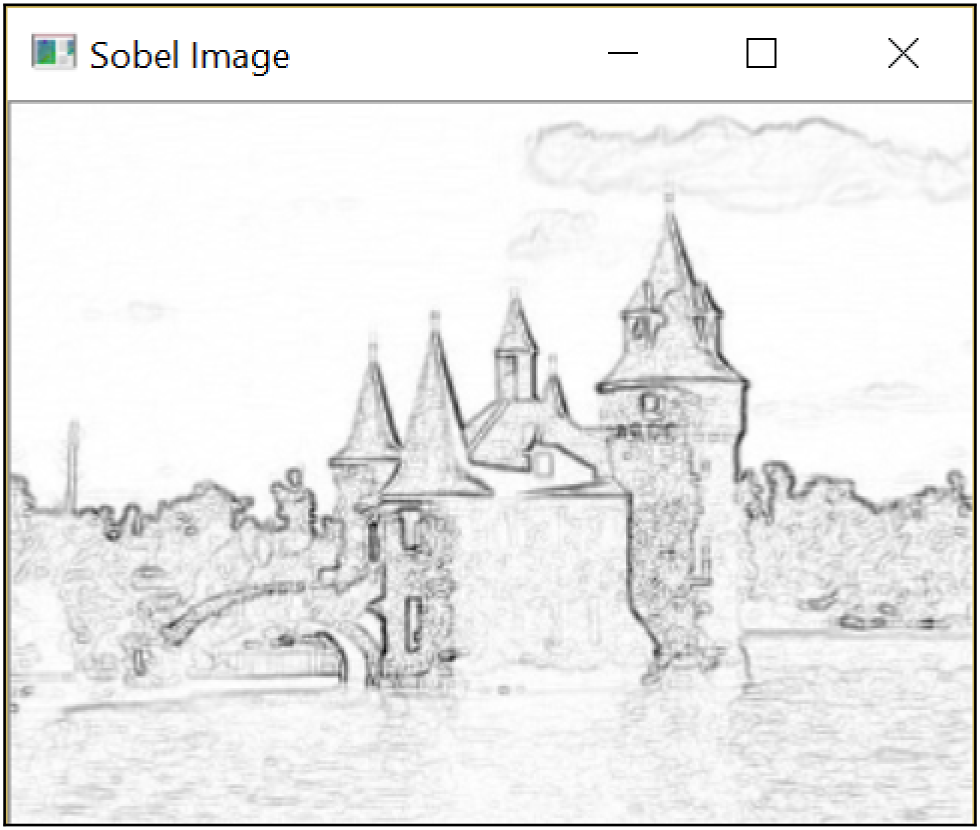

Bilinear resizing


Median filtered Image


Mean filtered S&P Image


Sobel X Image

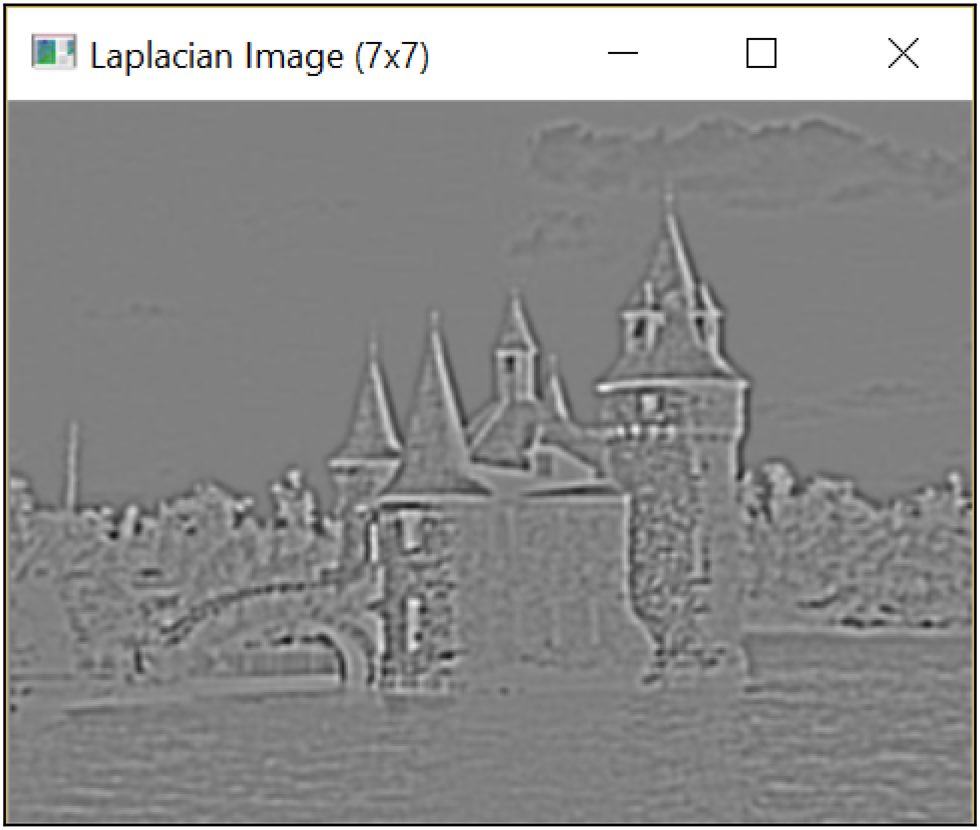

Sobel Y Image

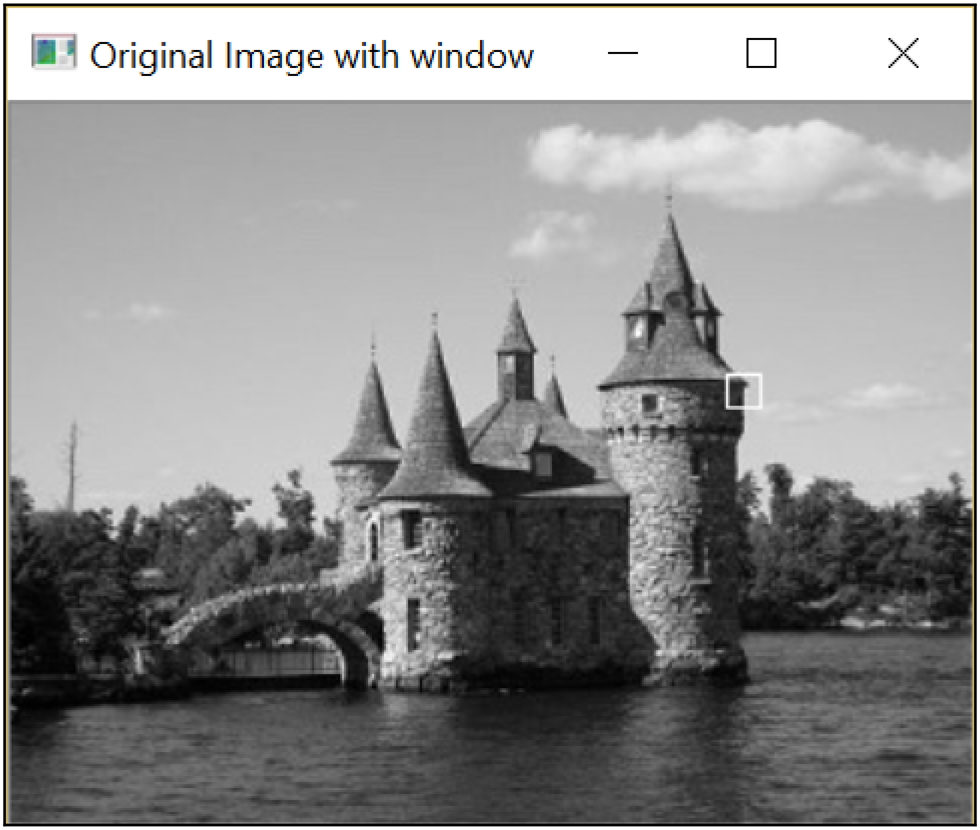

Sobel Image


Binary Sobel Image (low)


Binary Sobel Image (high)

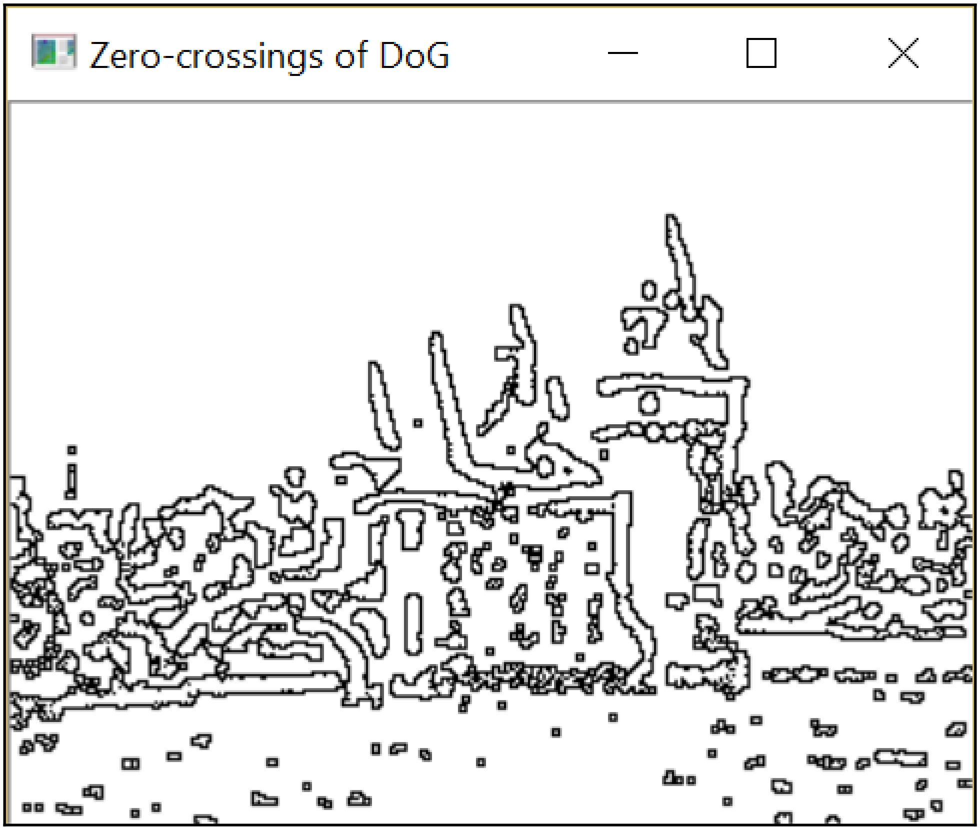

Sobel X Image (7x7)


Laplacian Image (7x7)

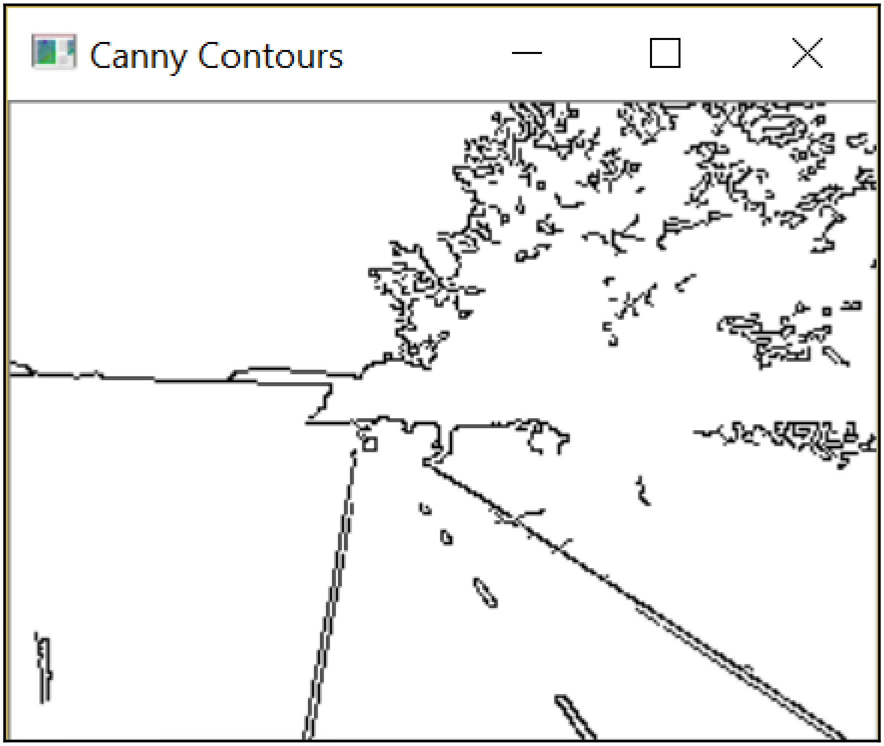


-142	-64	-24	-56	-141	-203	-179	-99	-35	-5	5	4
-225	-180	-85	-17	-33	-129	-205	-181	-97	-25	3	3
17	6	42	118	212	200	41	110	-123	-51	-4	0
188	176	185	246	397	474	297	23	-93	-59	-11	0
129	128	147	214	357	375	143	-76	-104	-48	-9	1
43	37	48	125	250	133	-203	-301	-140	-26	-1	1
-4	-9	-9	85	227	54	-327	-354	-114	-4	-1	0
-32	-47	-46	87	268	92	-292	-300	-70	6	-5	-3
-24	-59	-56	121	331	133	-274	-285	-59	14	3	2
8	-36	-24	172	382	162	-264	-279	-50	28	18	13
33	-10	18	205	380	150	-261	-268	-46	22	3	-7
32	-1	38	196	318	81	-288	-270	-53	-1	-32	-45


Zero-crossings

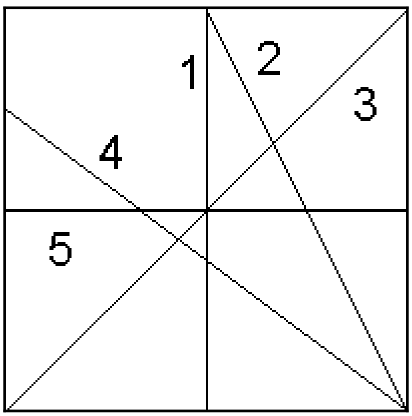

Zero-crossings of DoG

Chapter 7: Extracting Lines, Contours, and Components


Canny Contours

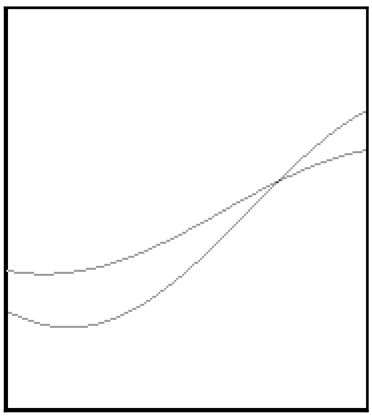

Sobel (low threshold)

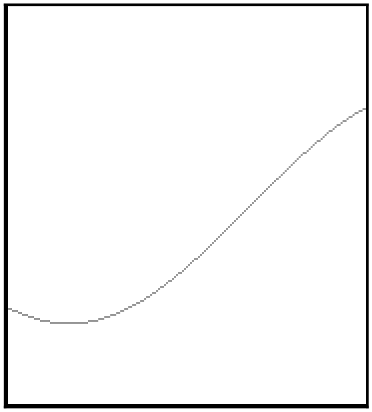

Sobel (high threshold)

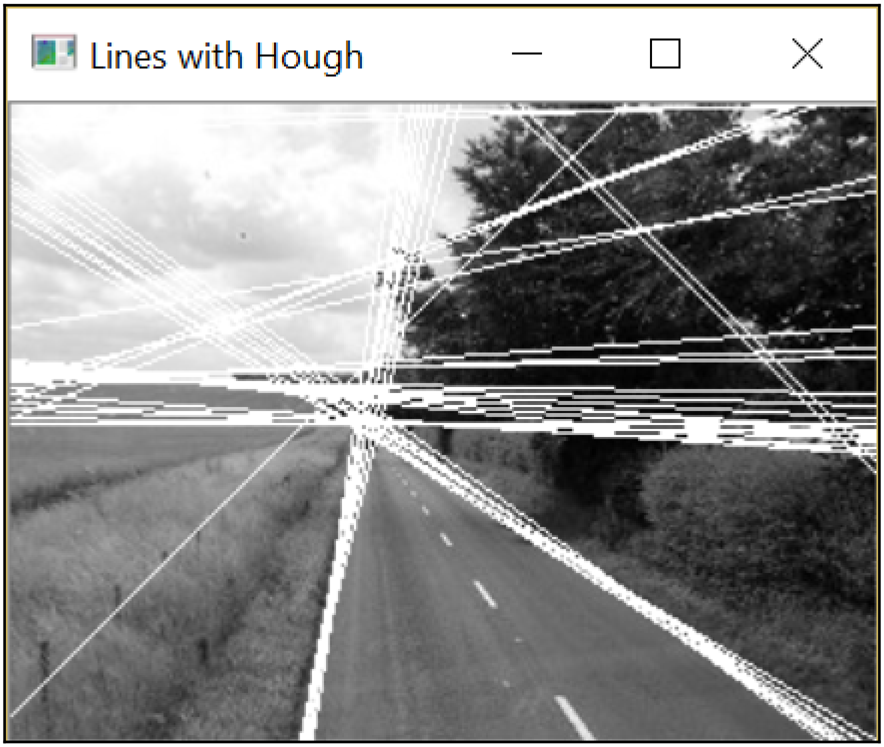

1
2
3
4
5

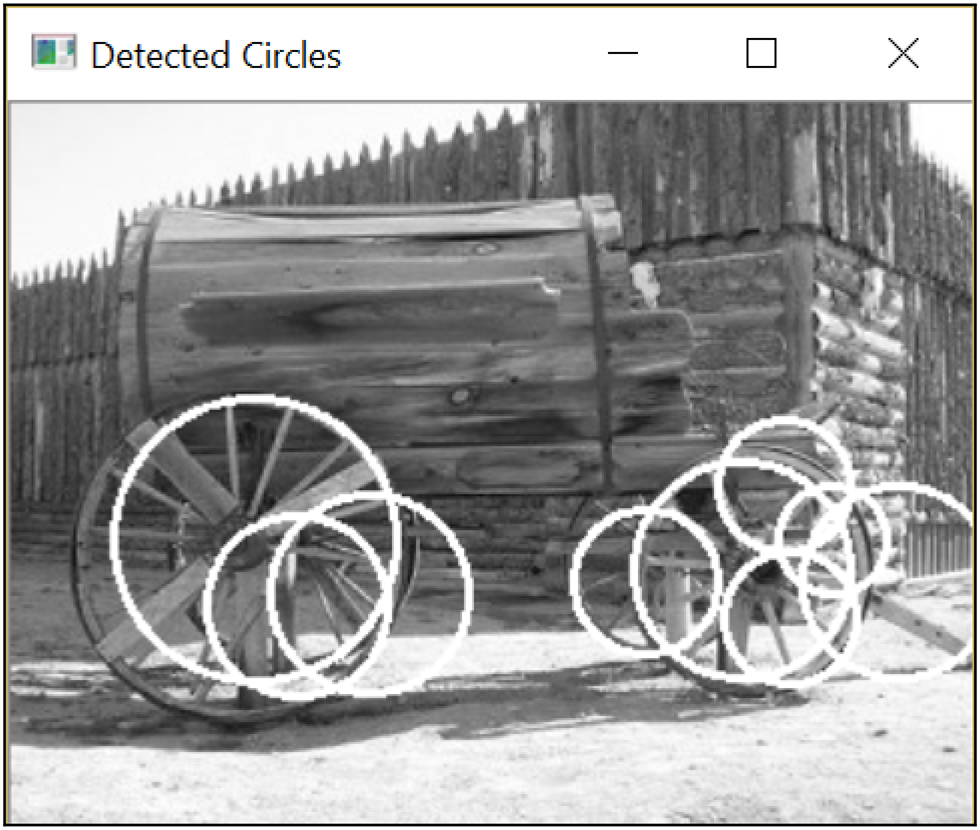

Lines with Hough

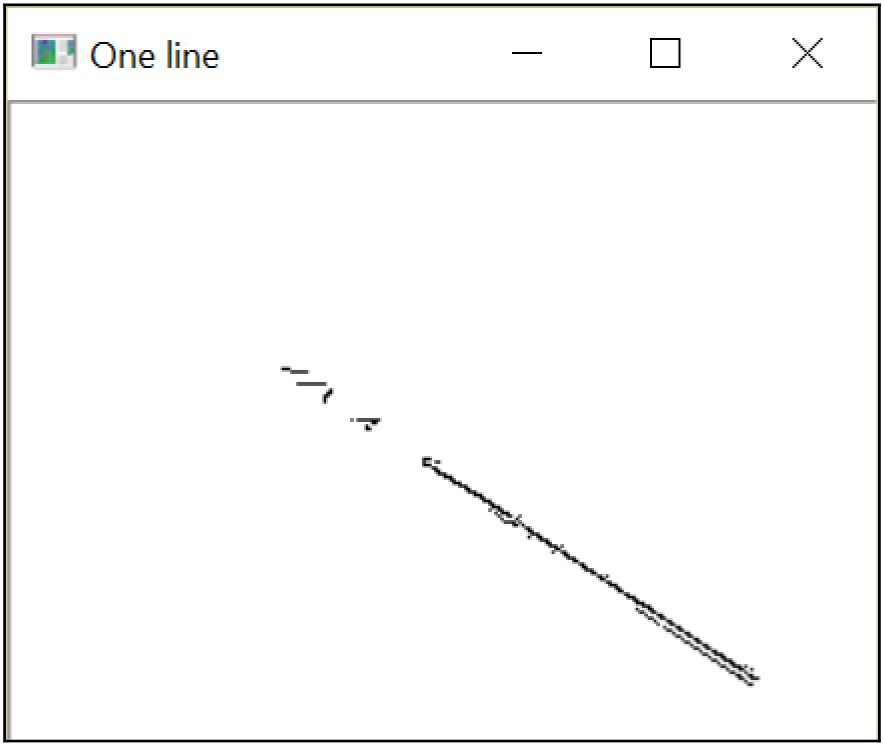

Lines with HoughP



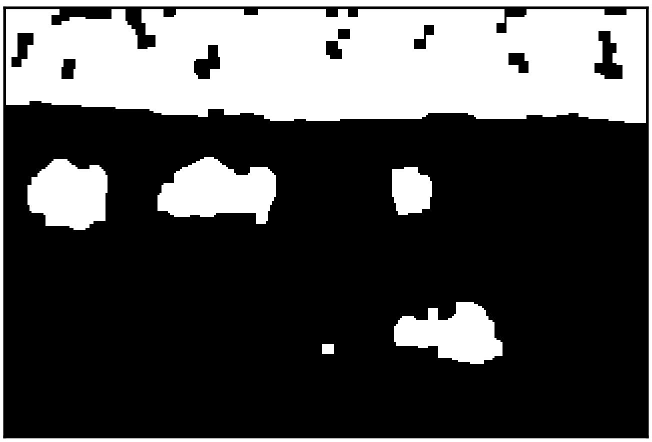


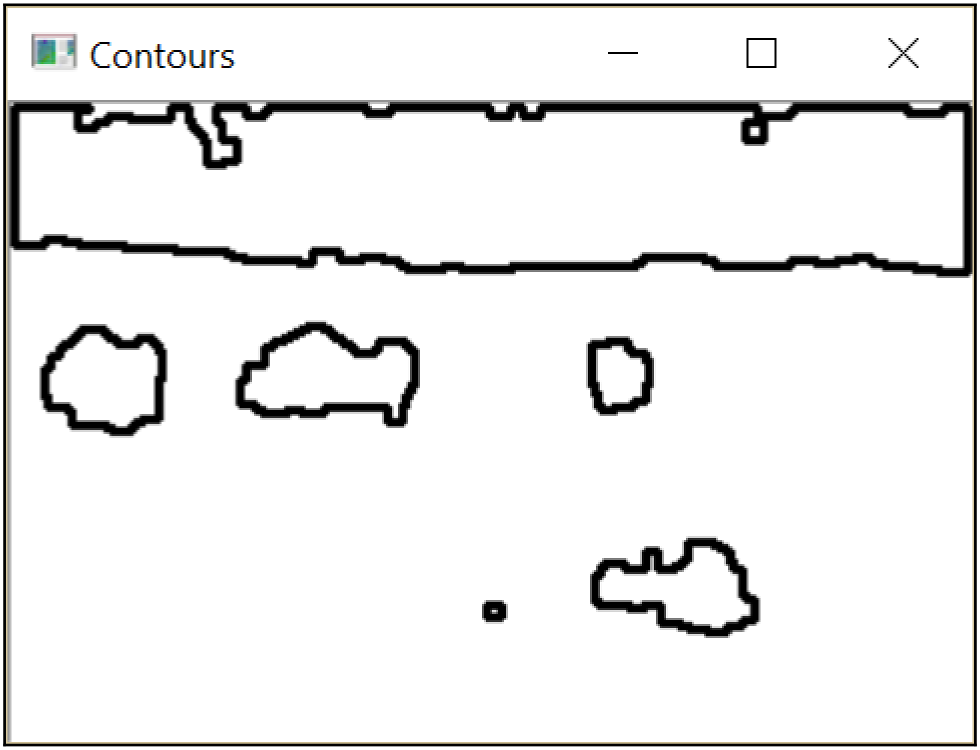

Lines with Hough

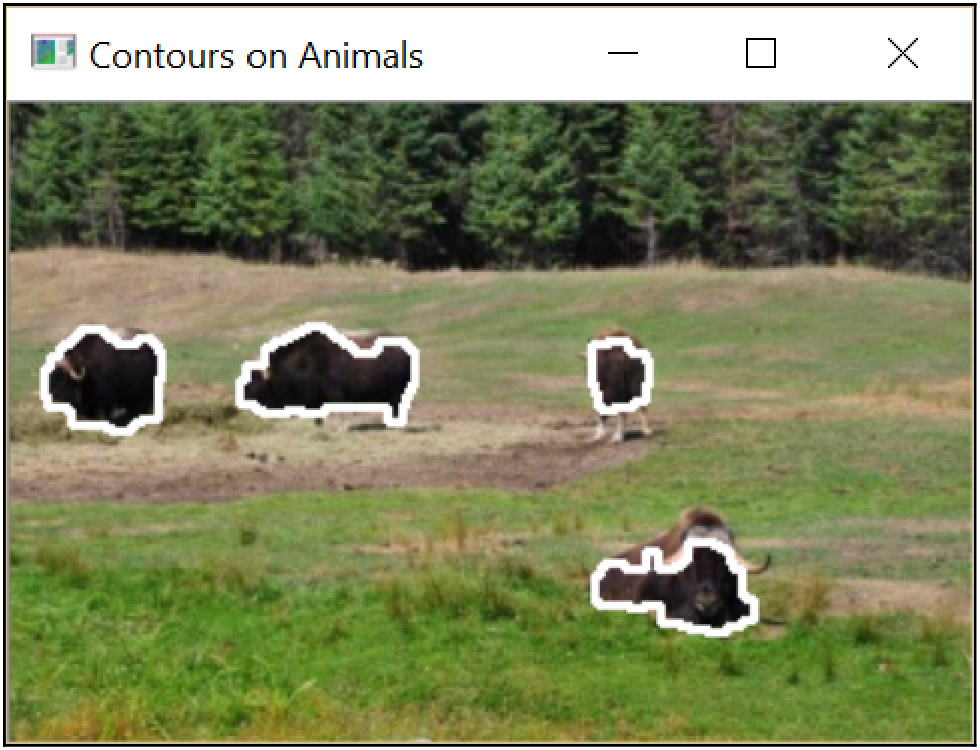

Detected Circles

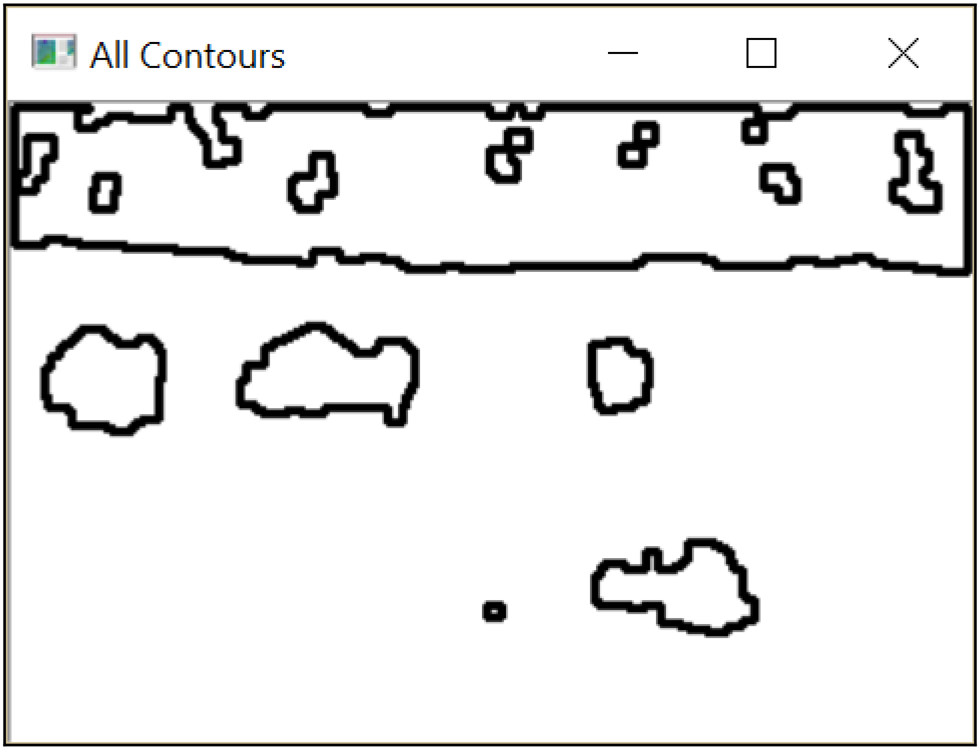

One line

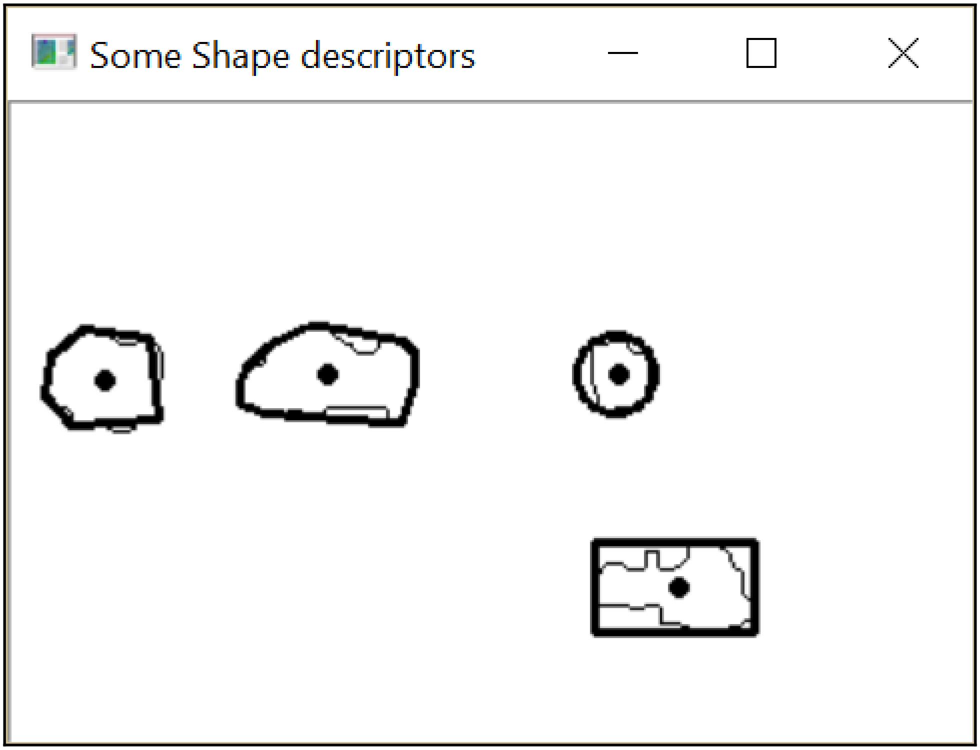

Fitted line

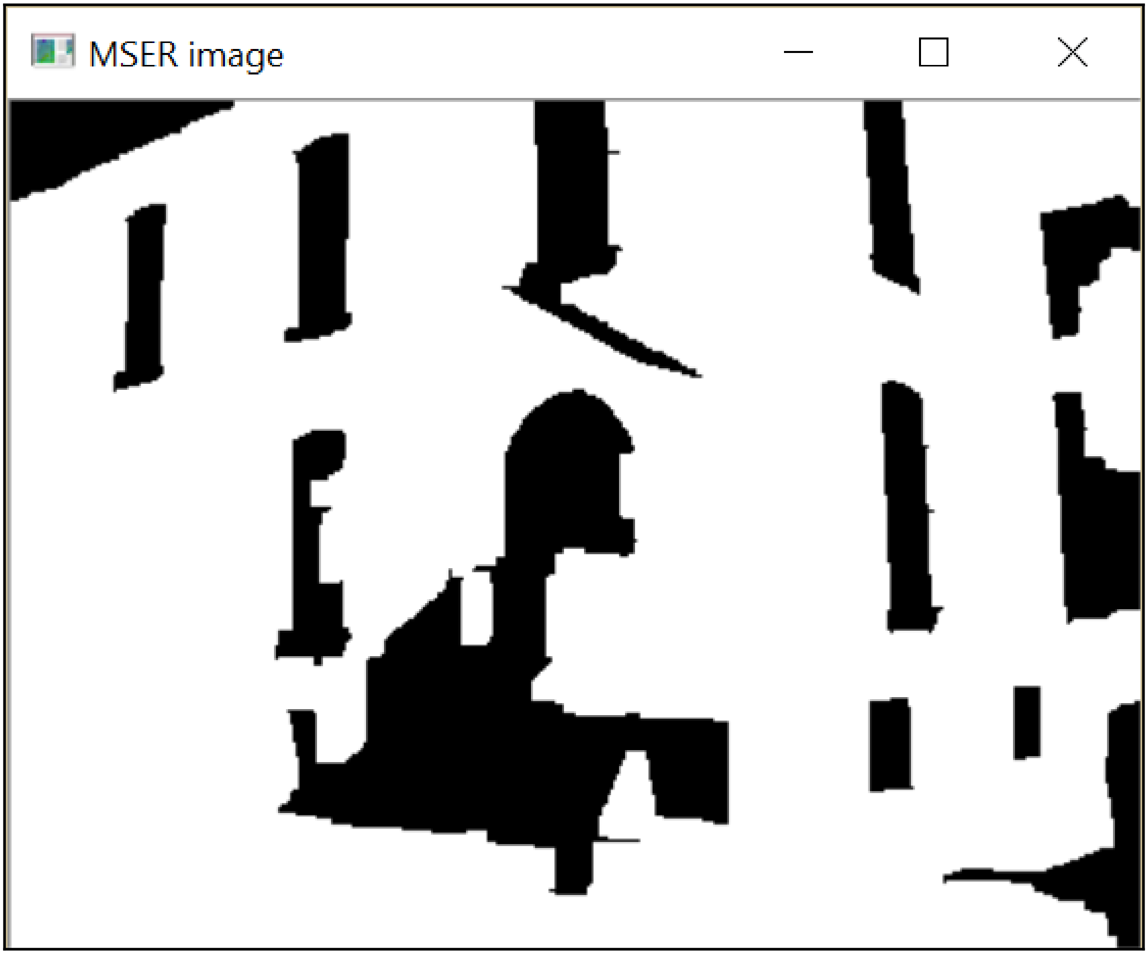


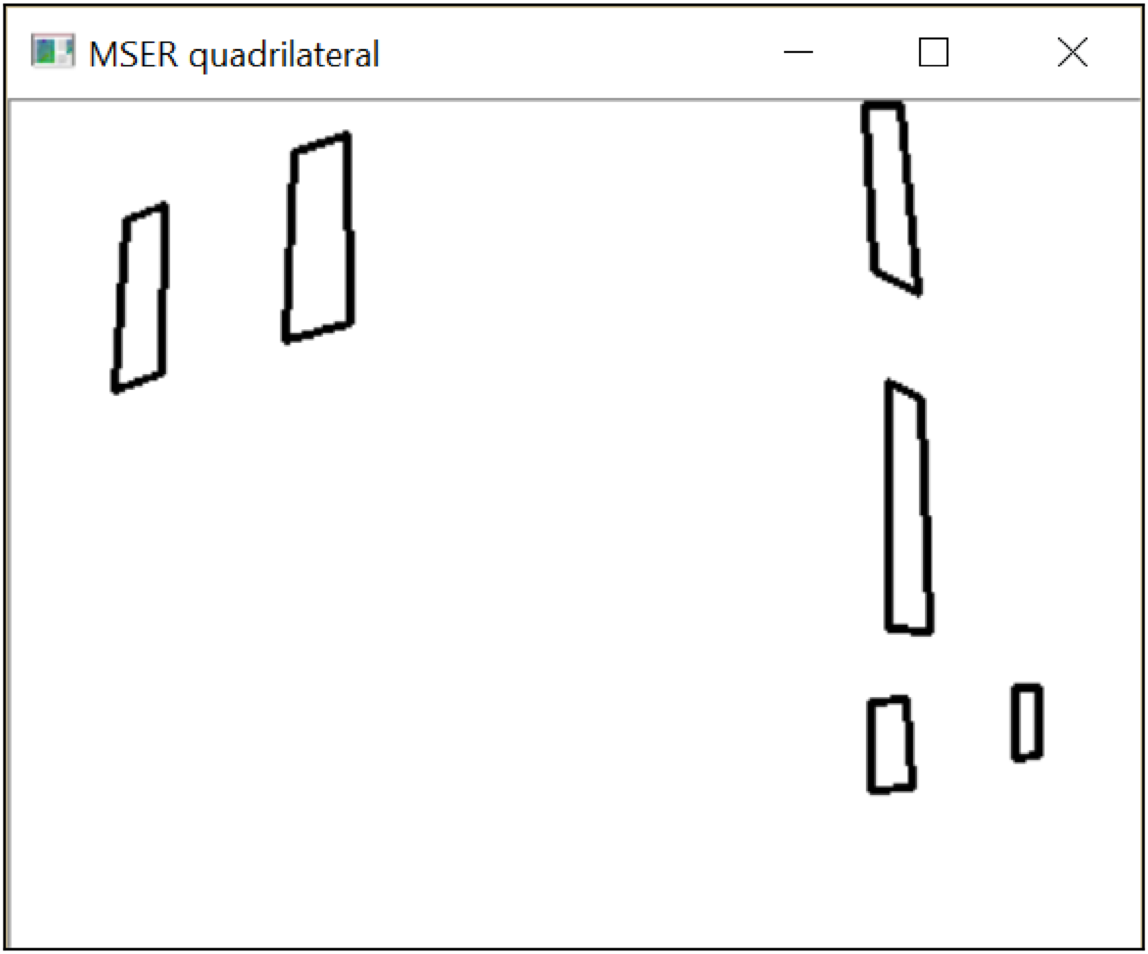

Contours

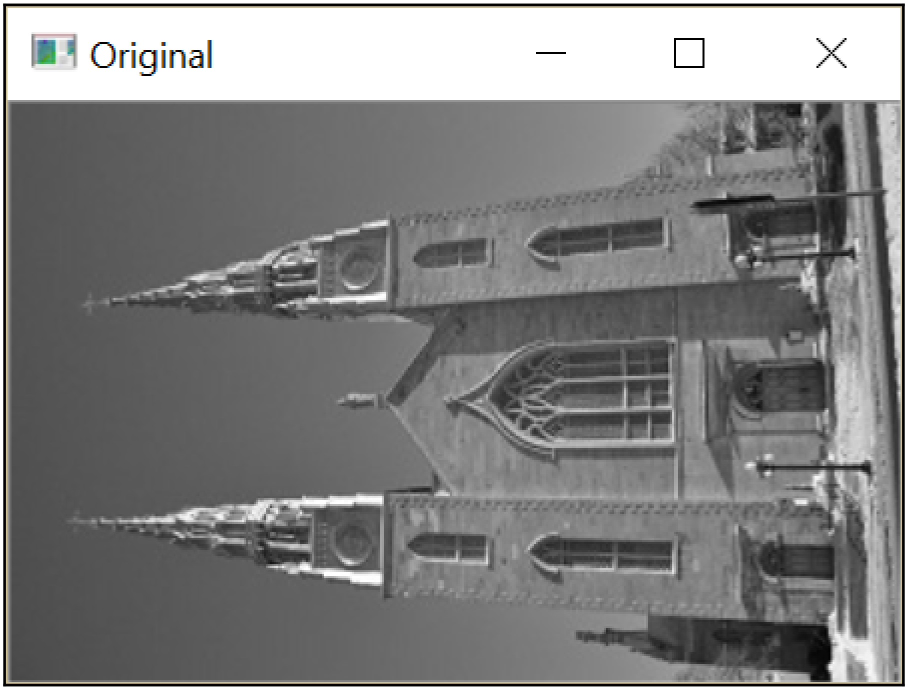

Contours on Animals

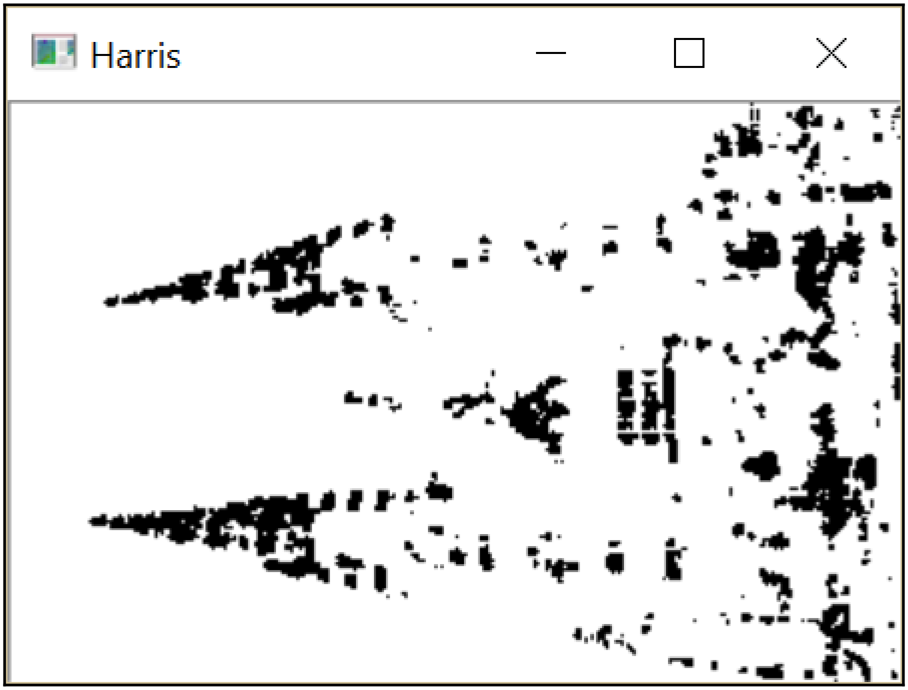

All Contours

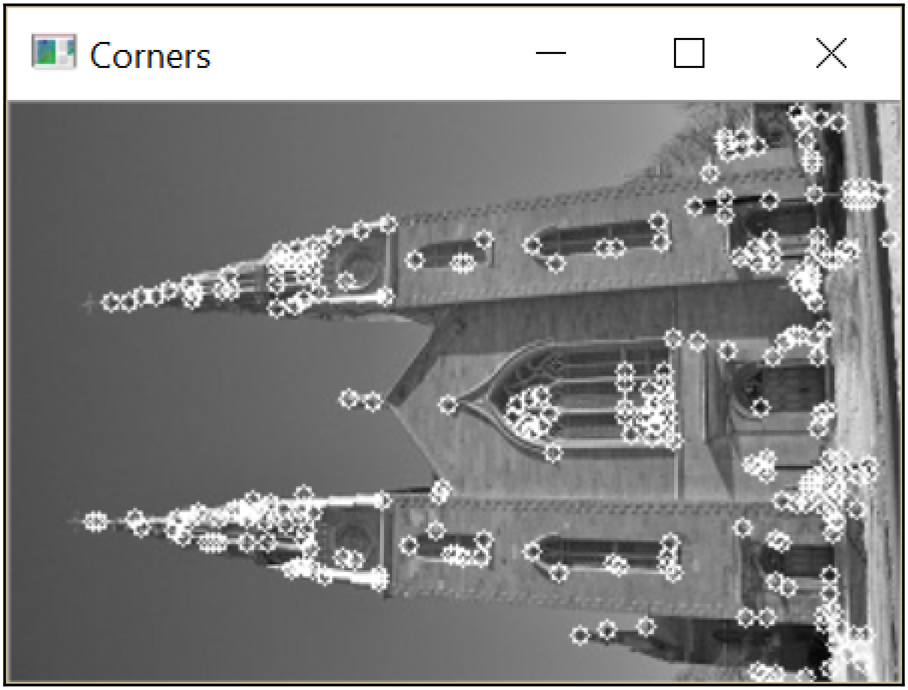

Some Shape descriptors

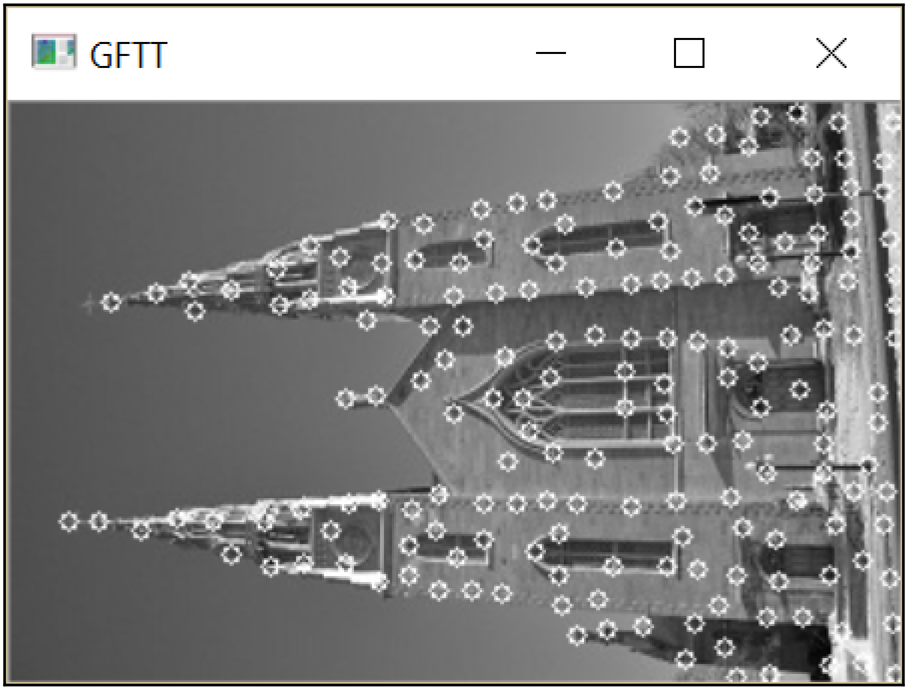

MSER image

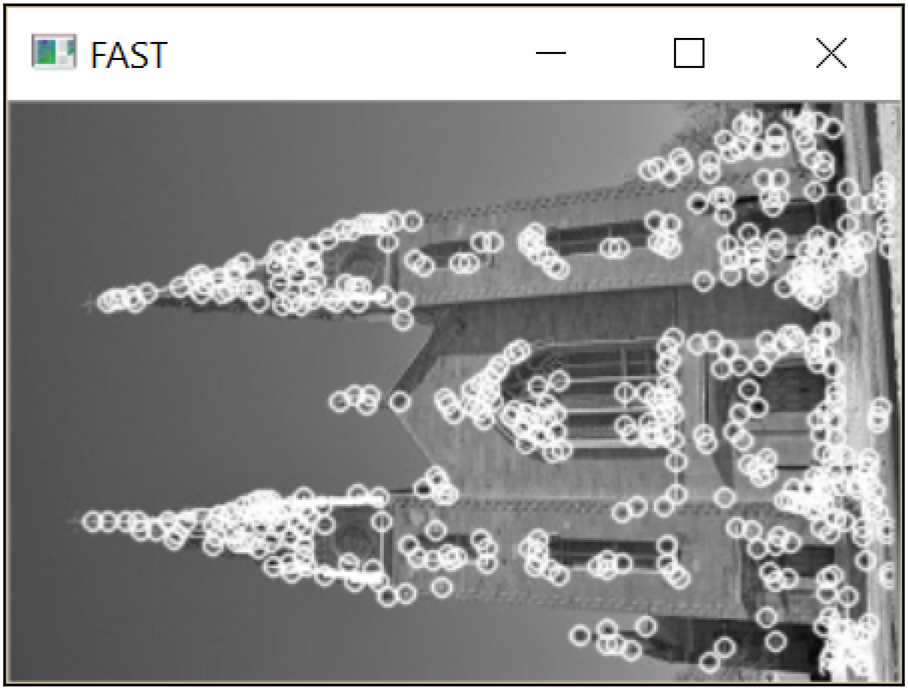

MSER quadrilateral

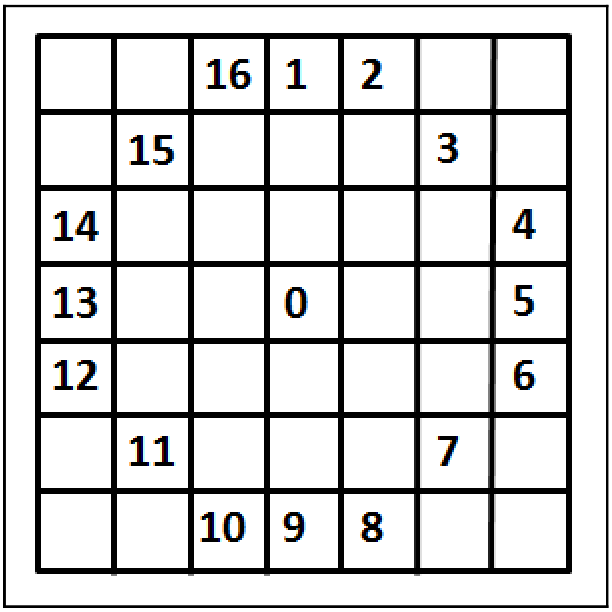

Original

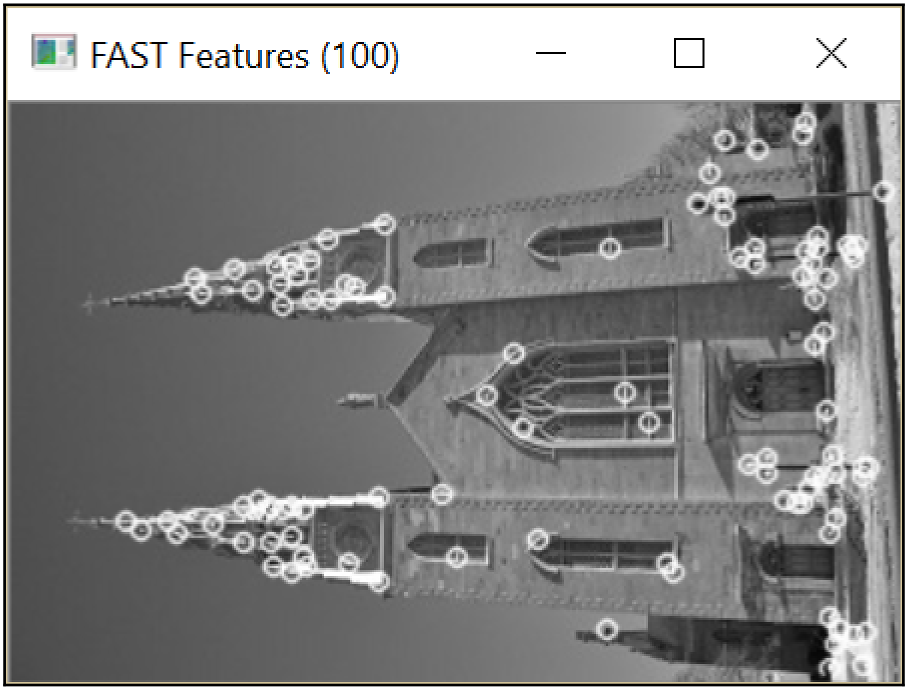

Harris

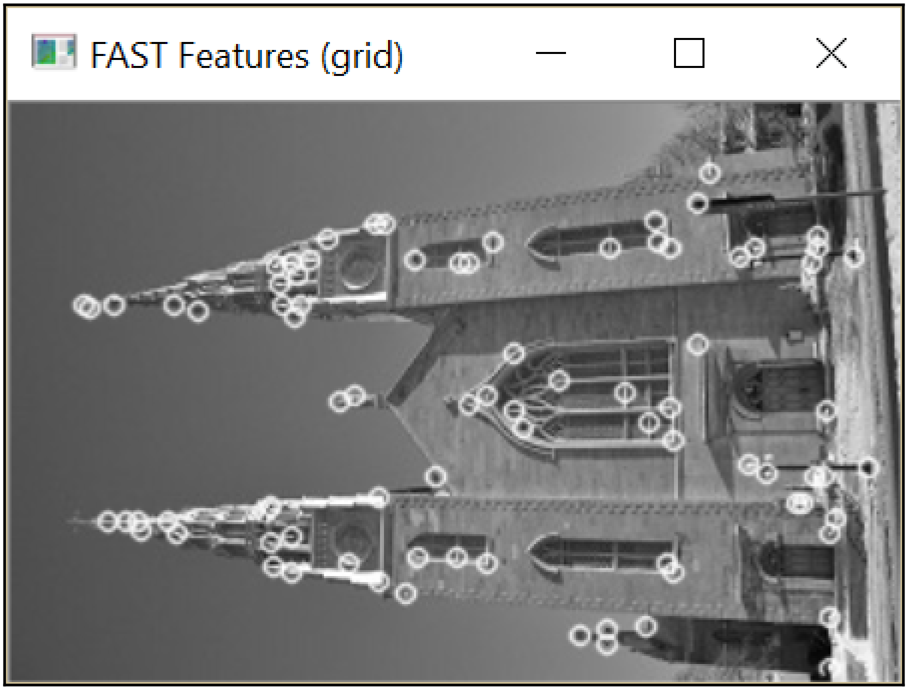

Corners

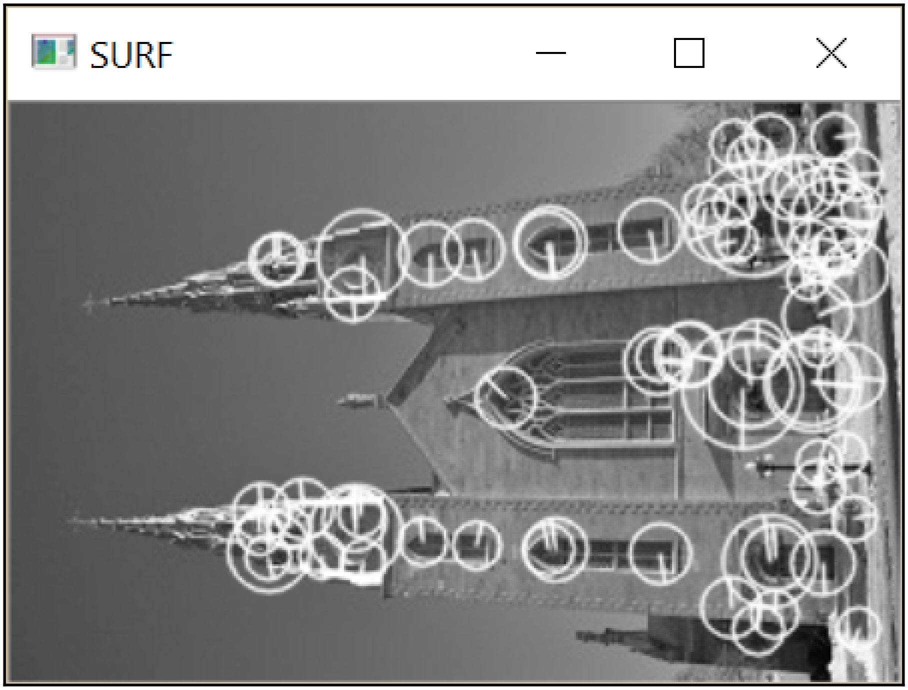

GFTT

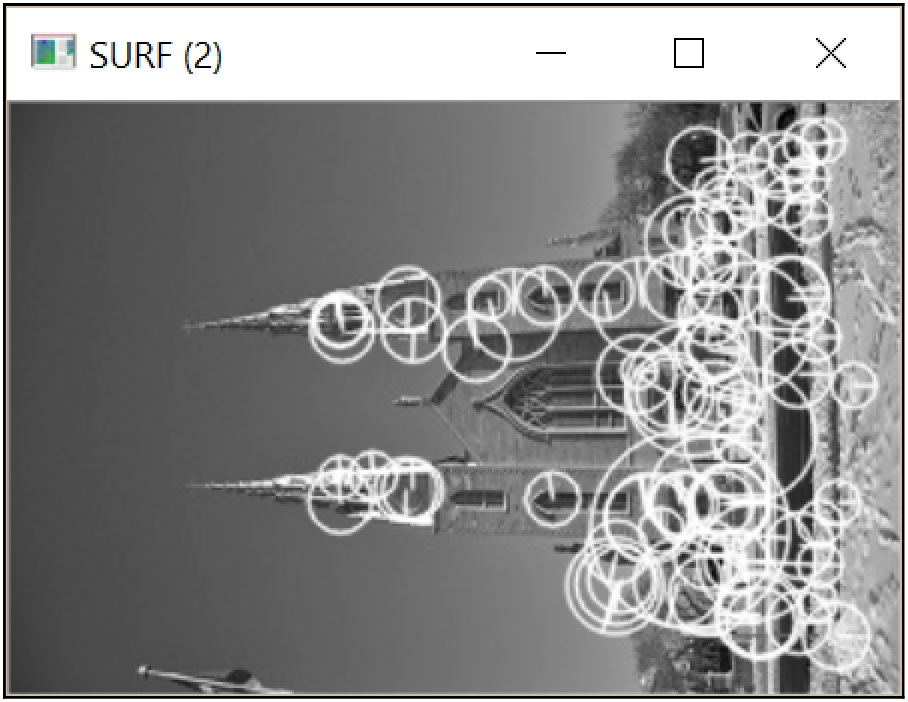

FAST

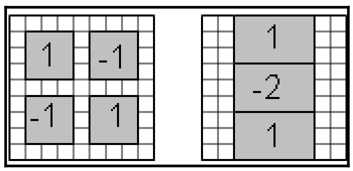

16
1
2
15
3
14
4
13
0
5
12
6
11
7
10
9
8

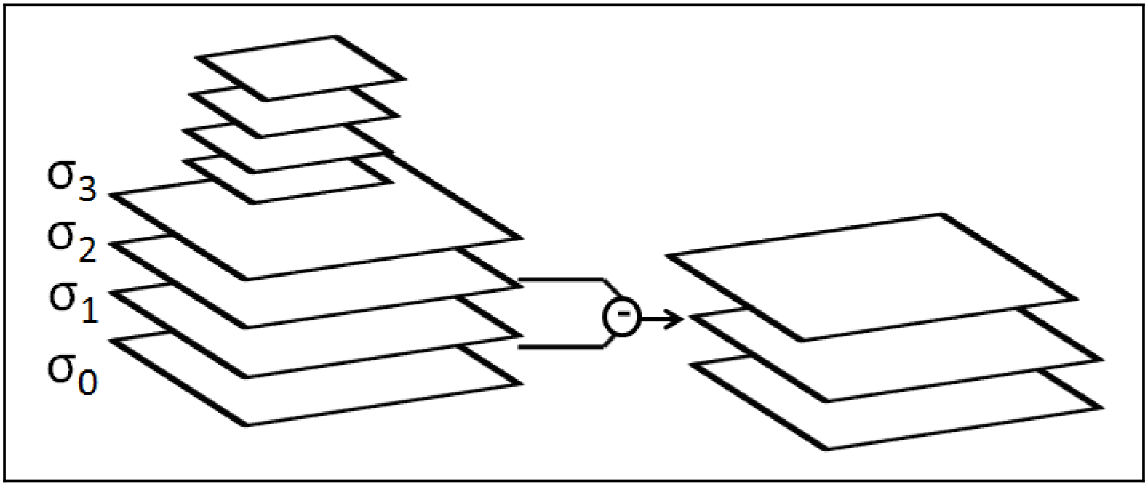

FAST Features (100)

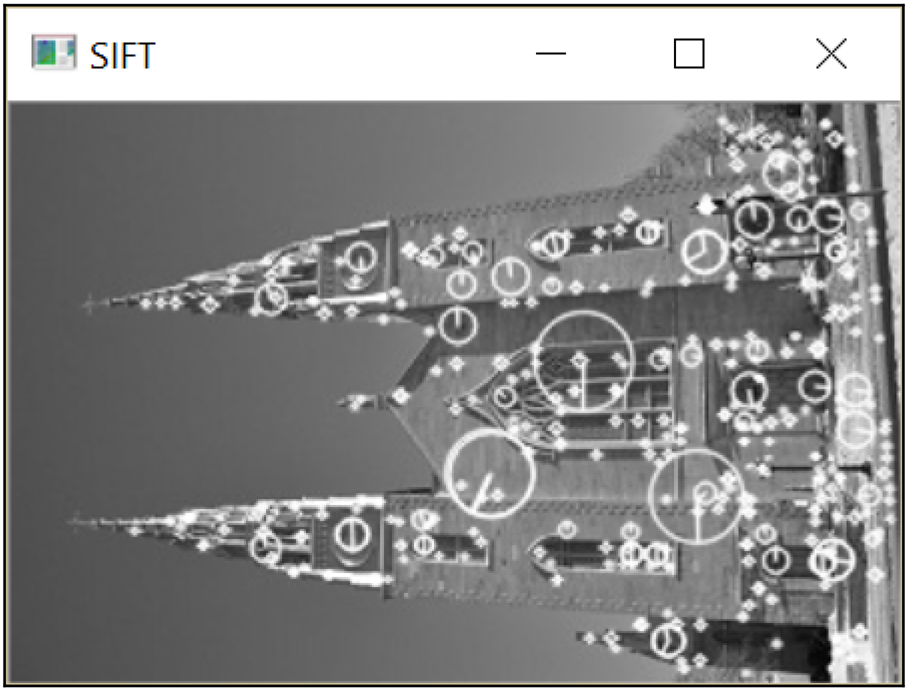

FAST Features (grid)

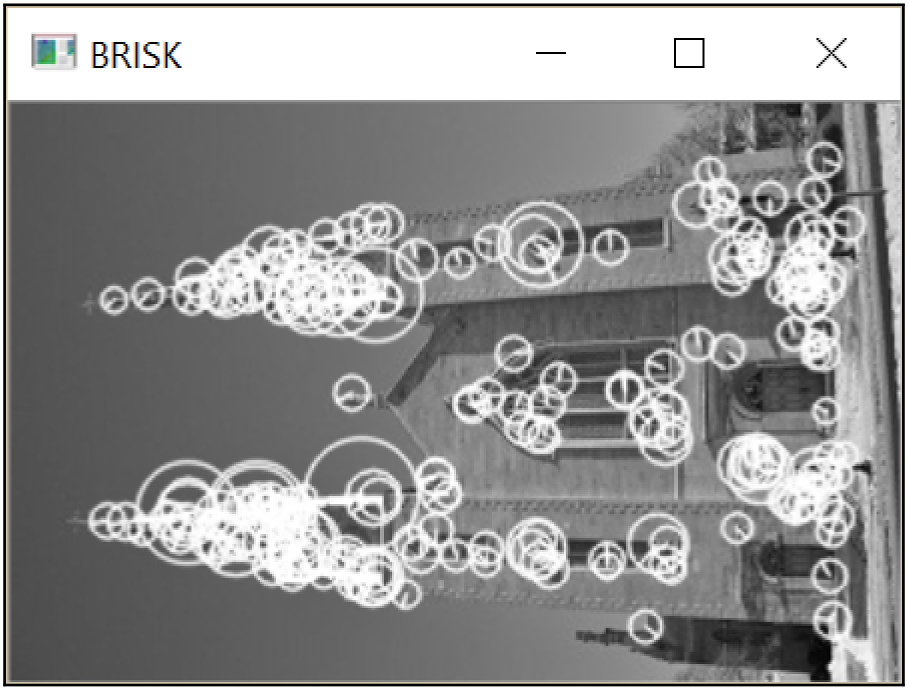

SURF


SURF (2)

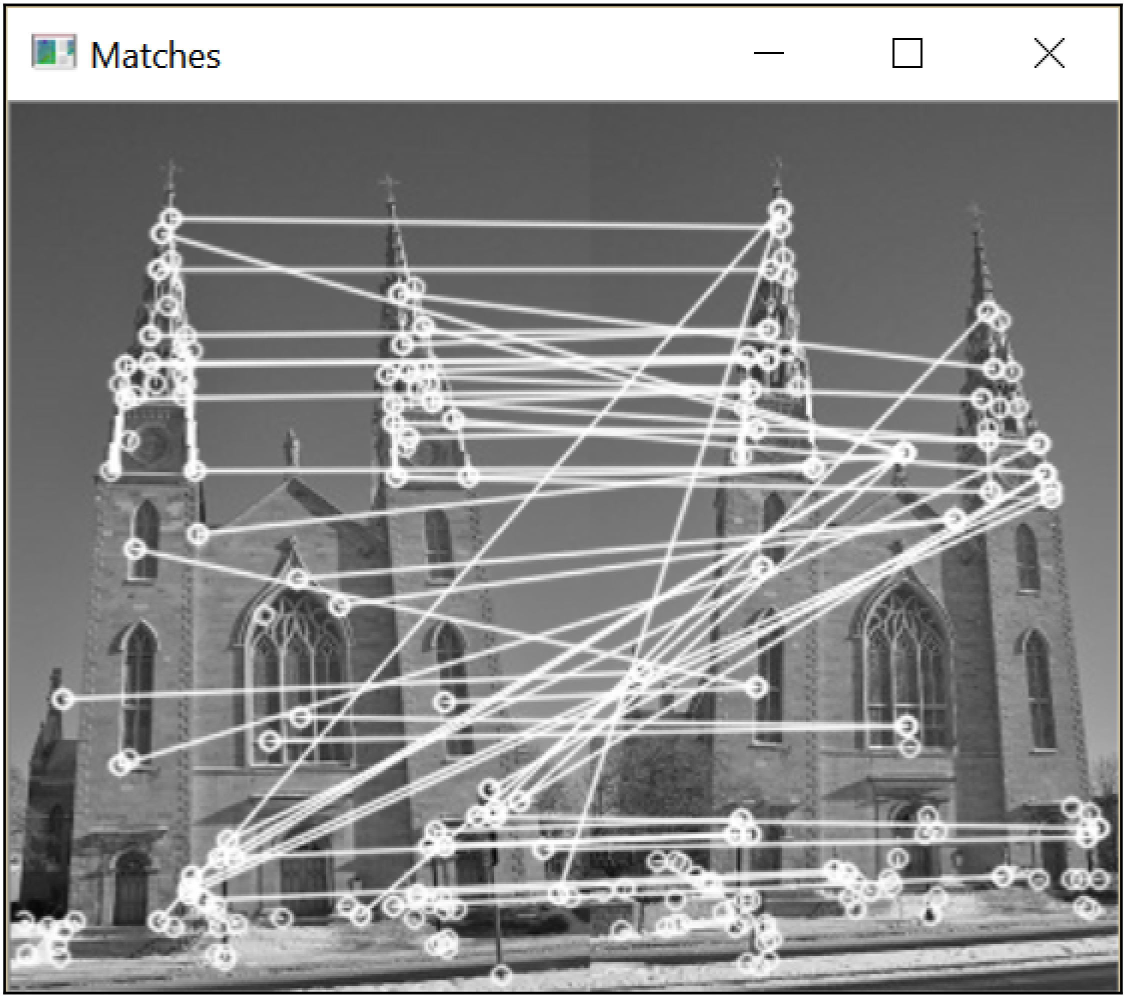

1
-1
-1
1
1
-2
1

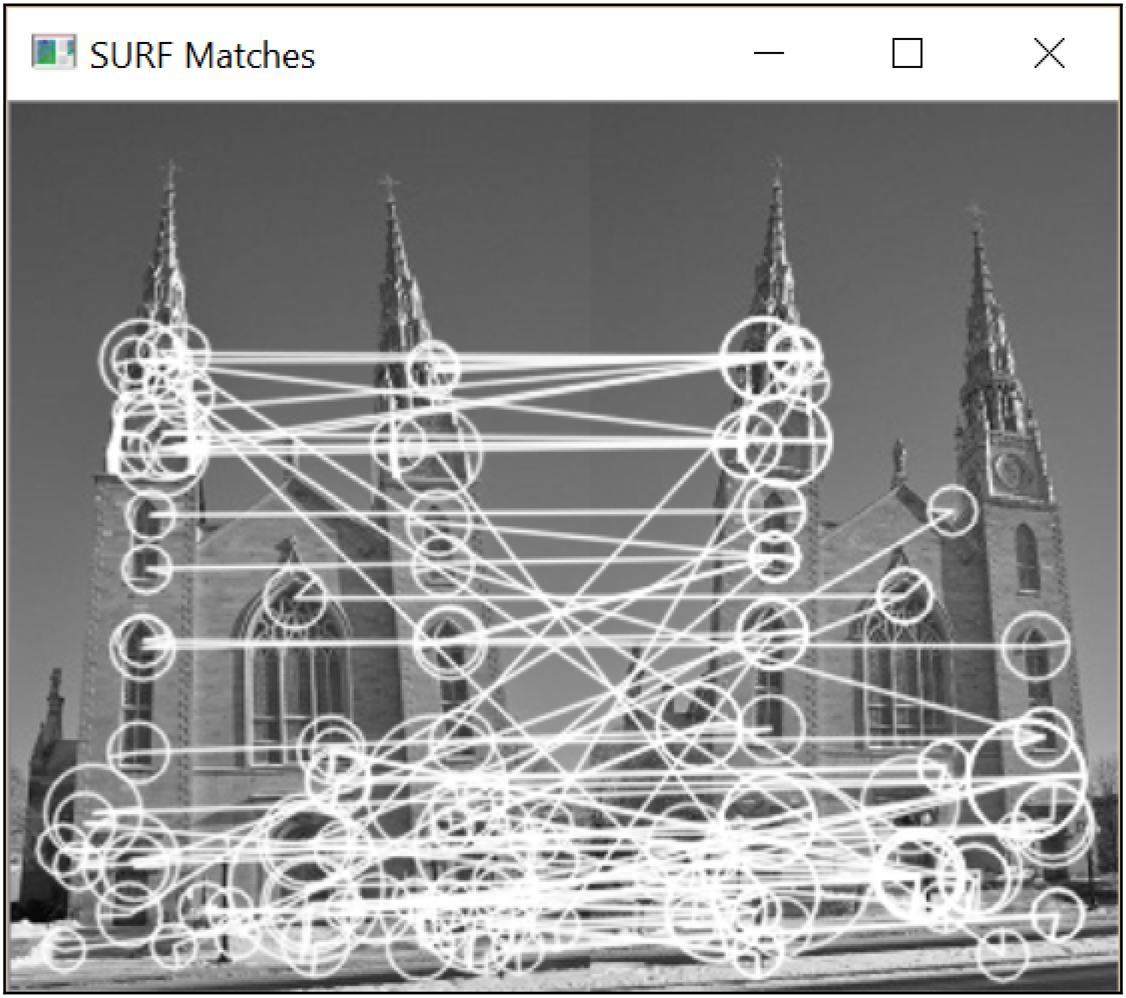

σ3
σ2
σ1
σ0

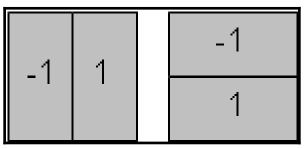

SIFT

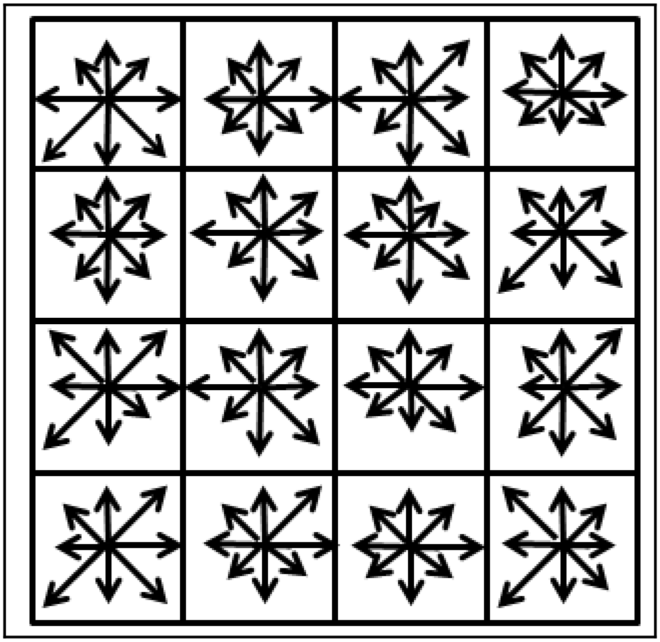

BRISK

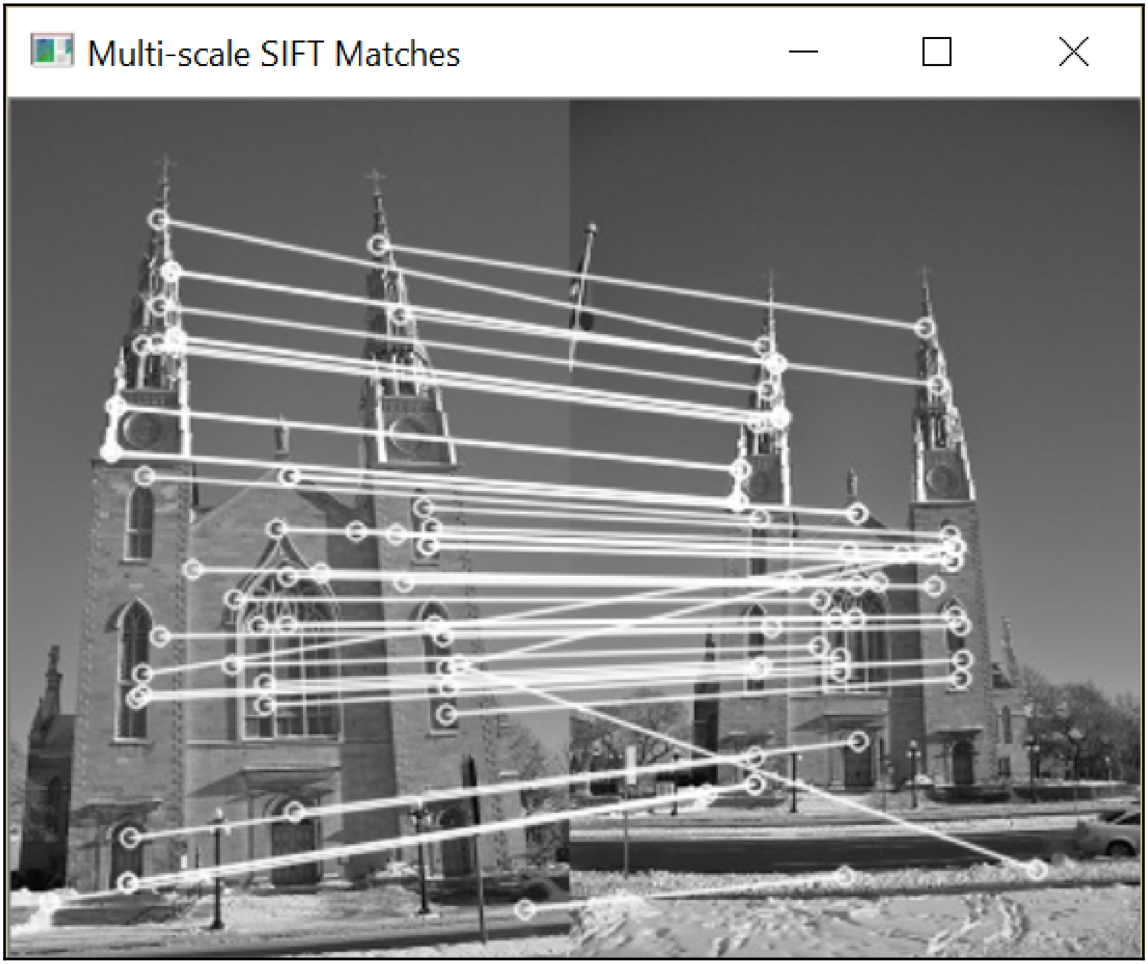
Chapter 9: Describing and Matching Interest Points

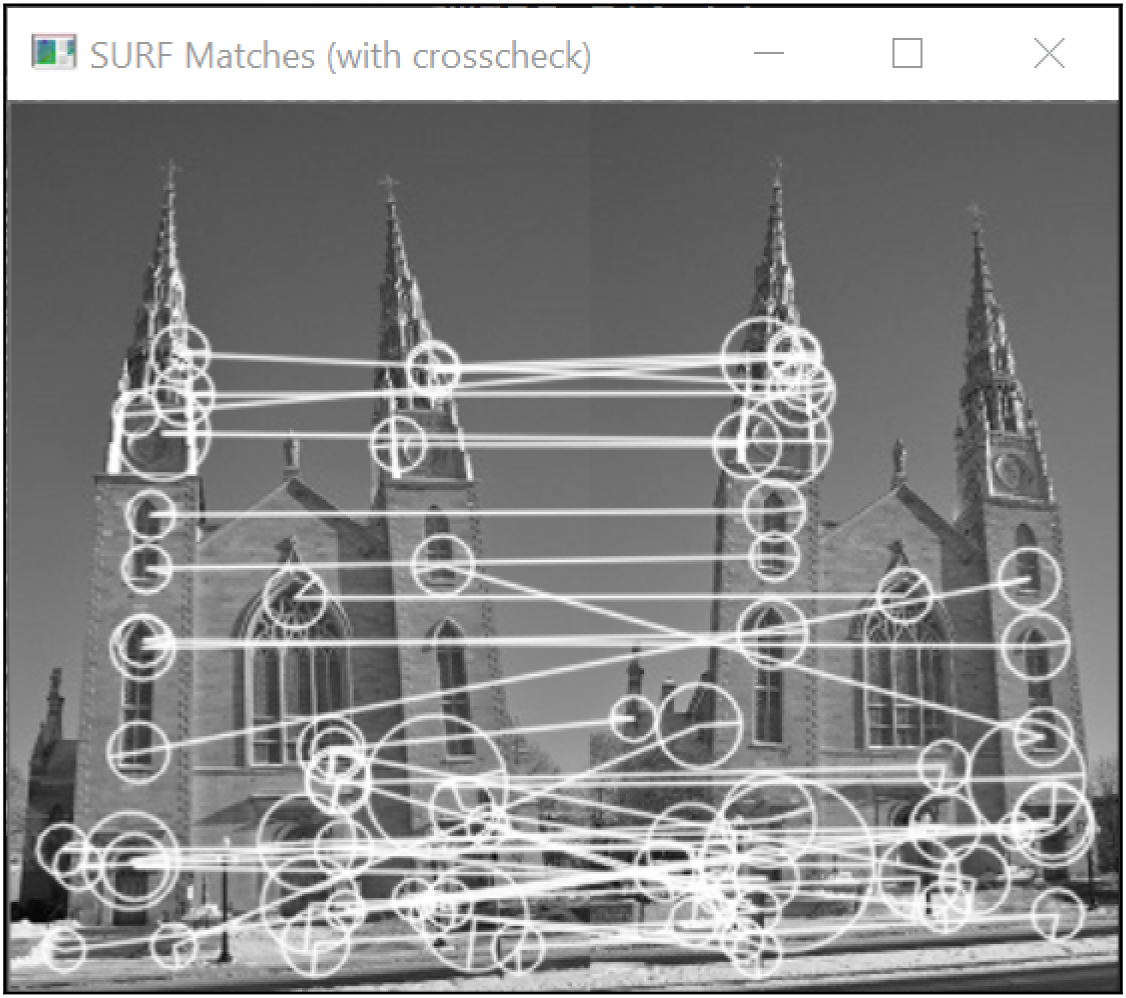


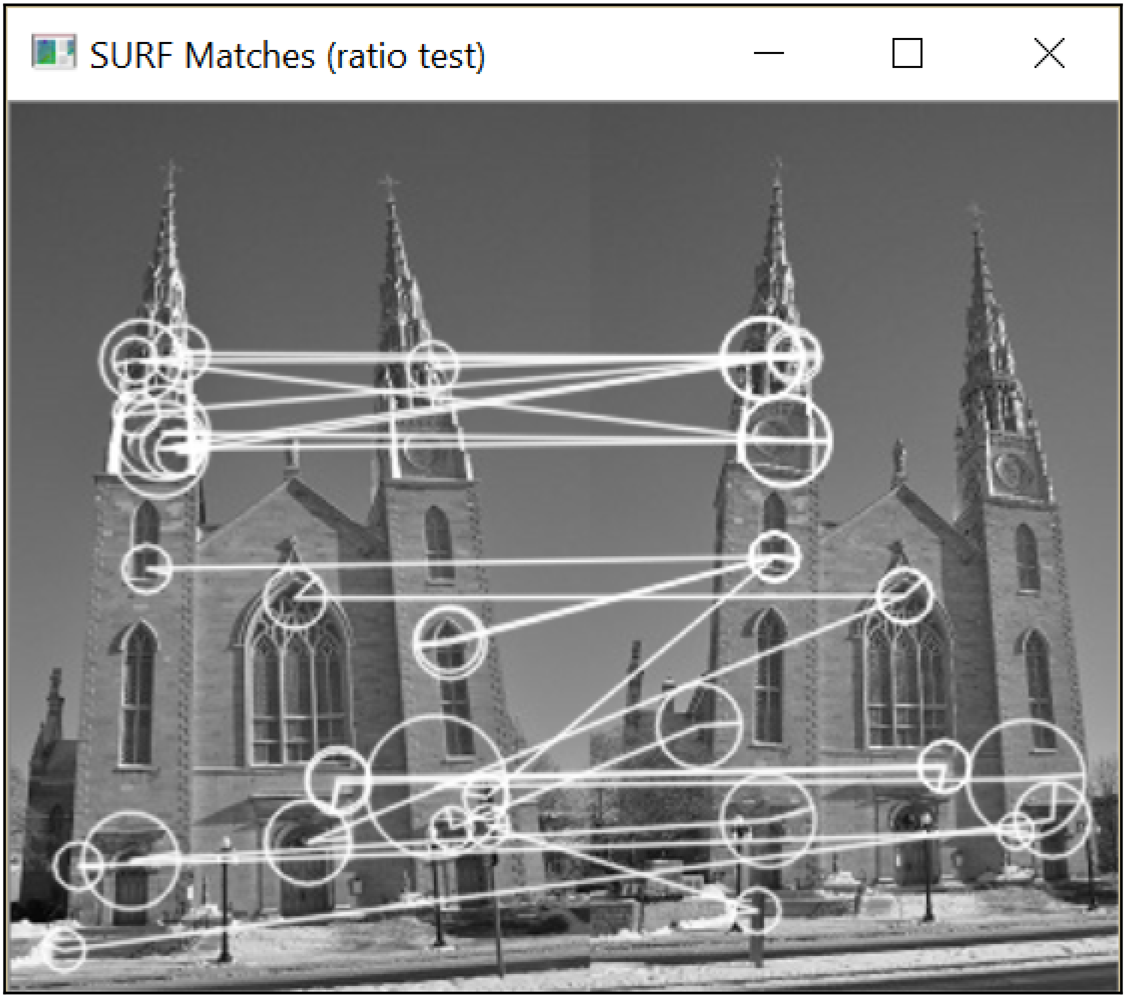

SURF Matches

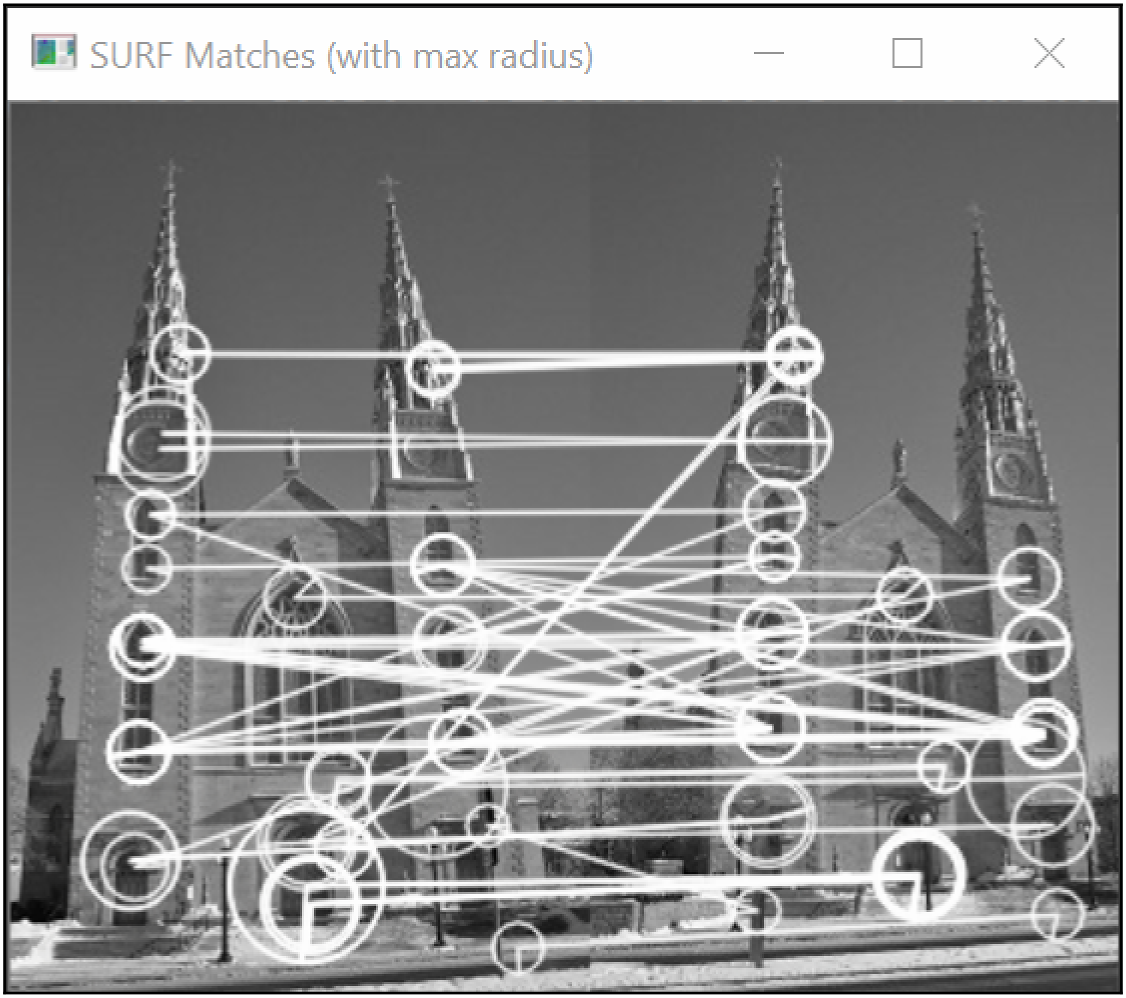

-1
1
-1
1

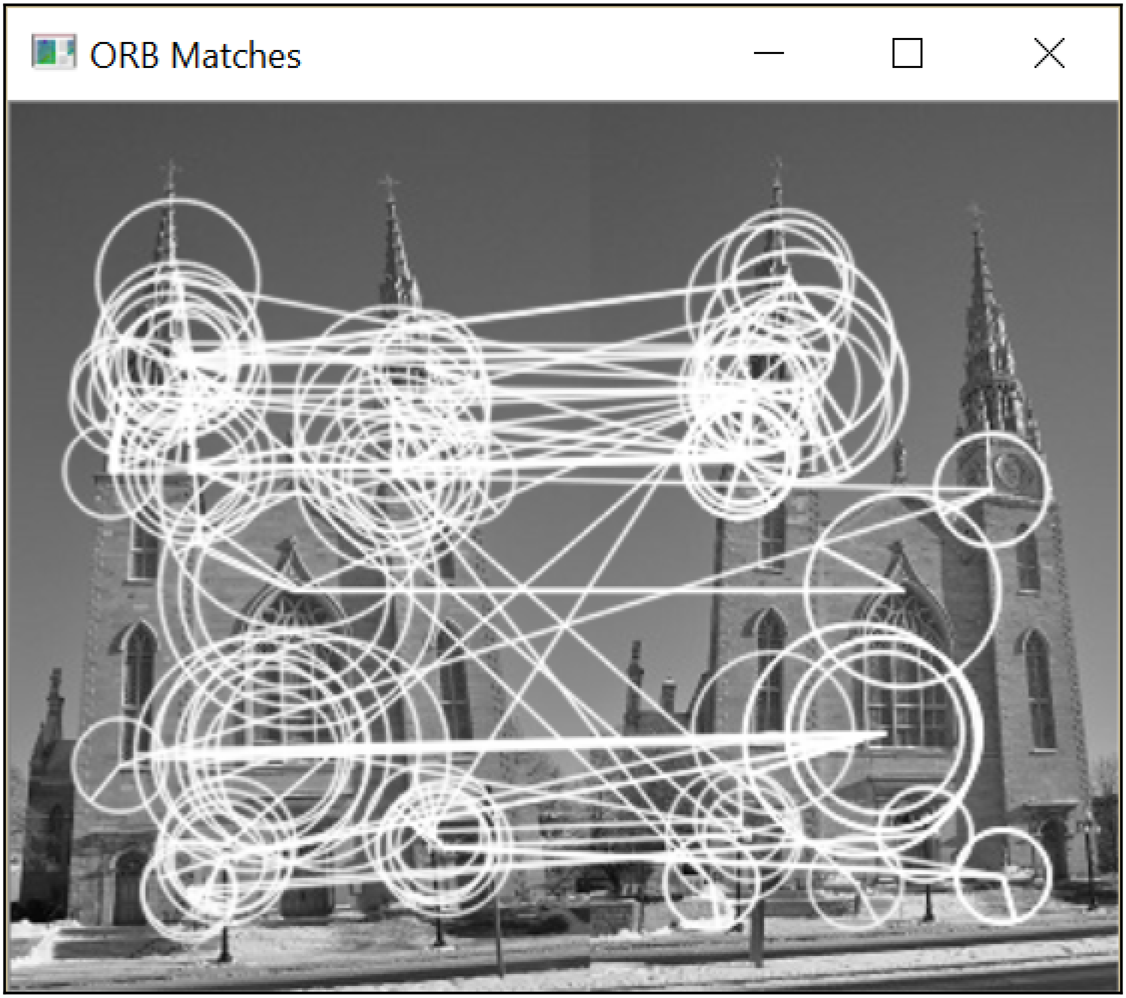


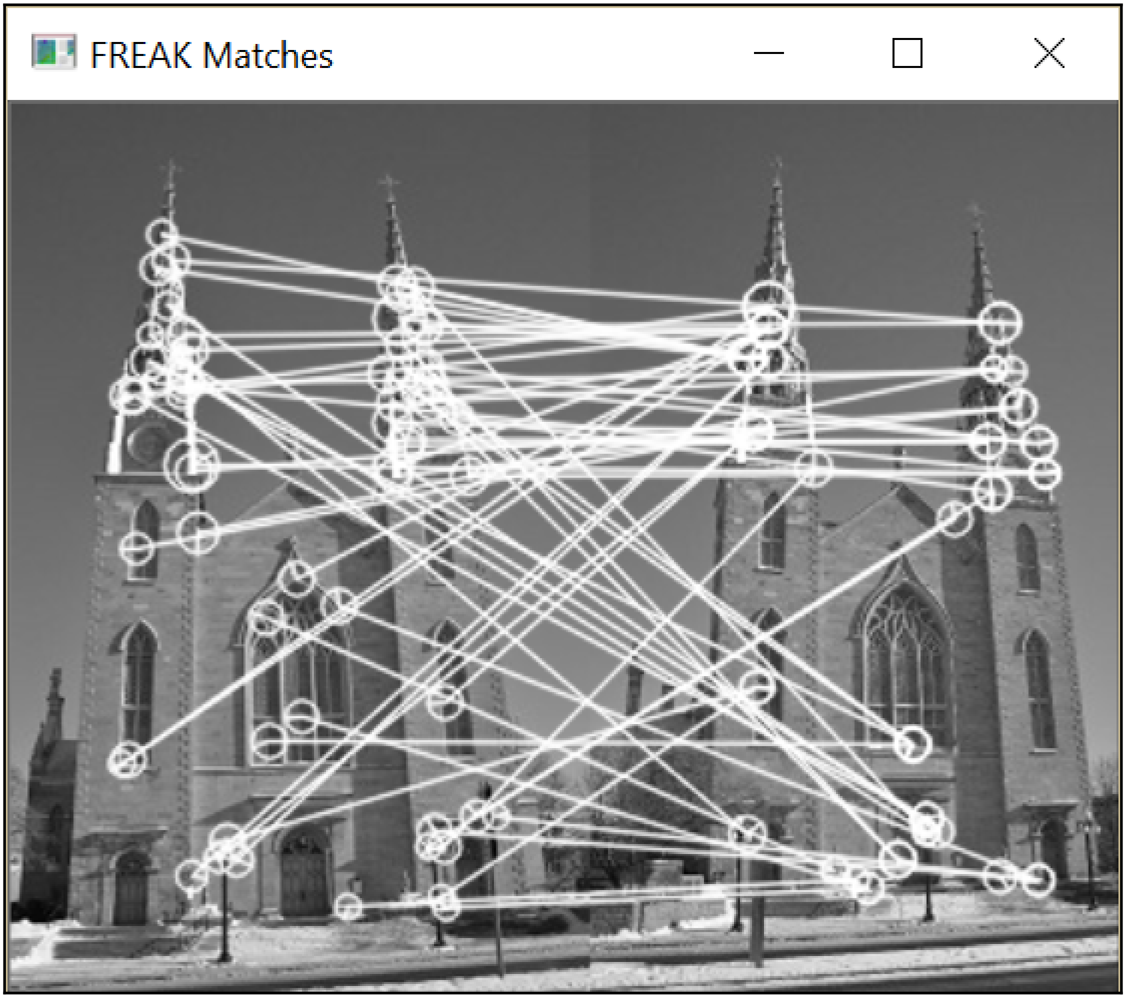

Multi-scale SIFT Matches

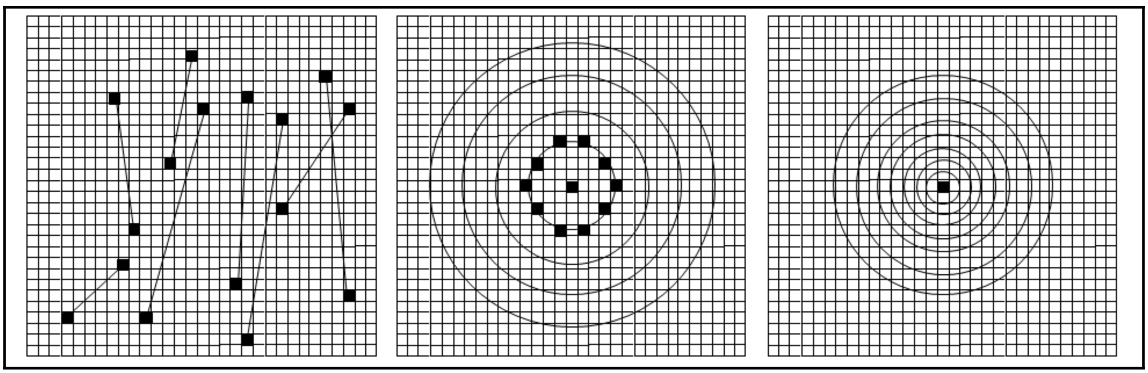

SURF Matches (with crosscheck)

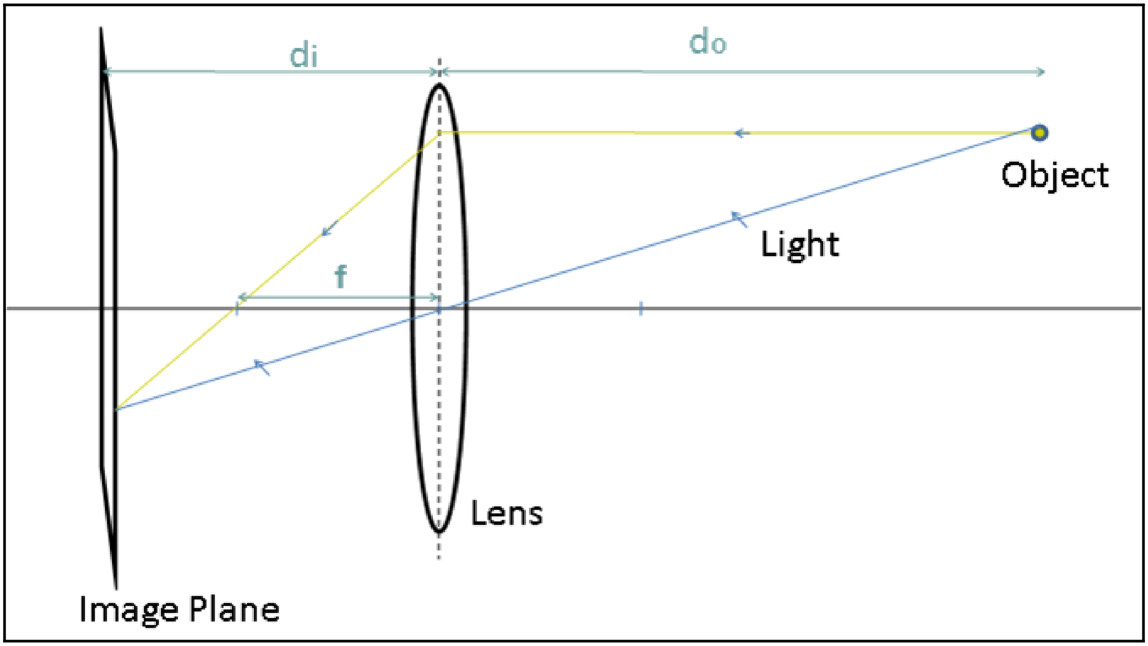

SURF Matches (ratio test)

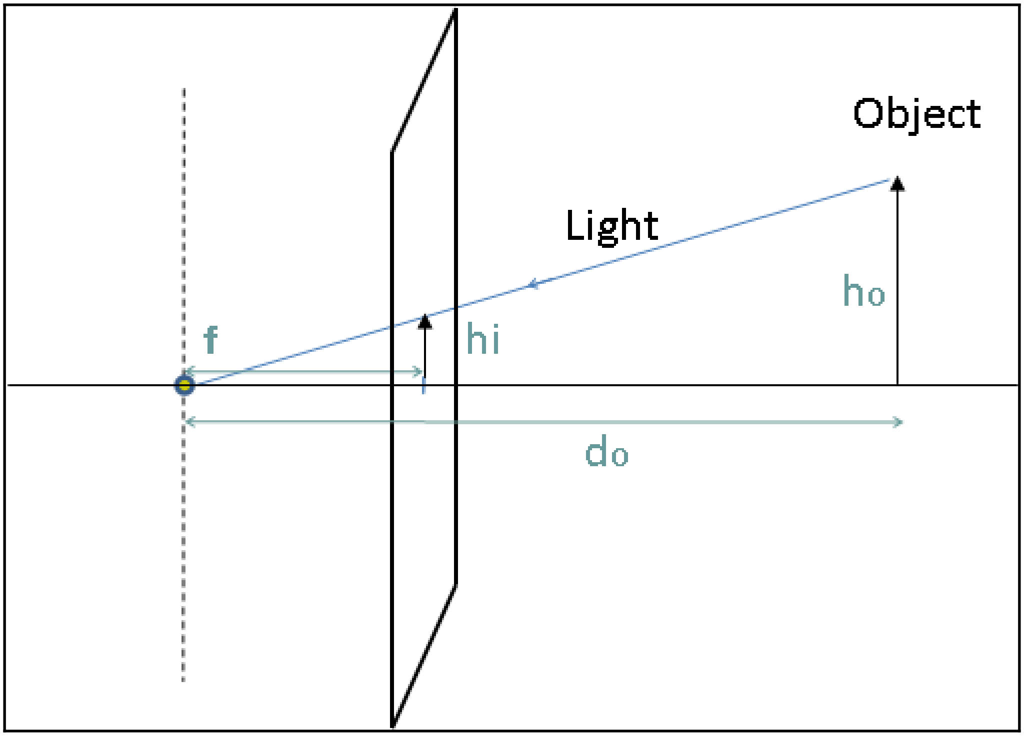

SURF Matches (with max radius)

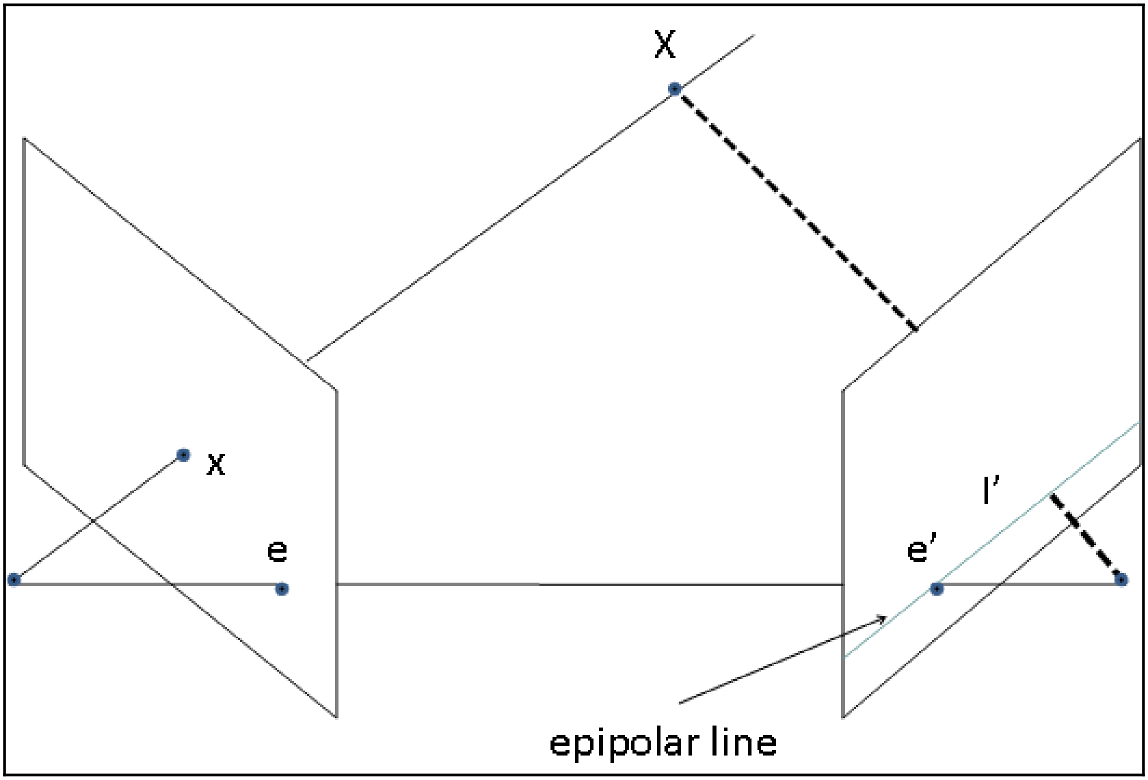

ORB Matches


FREAK Matches

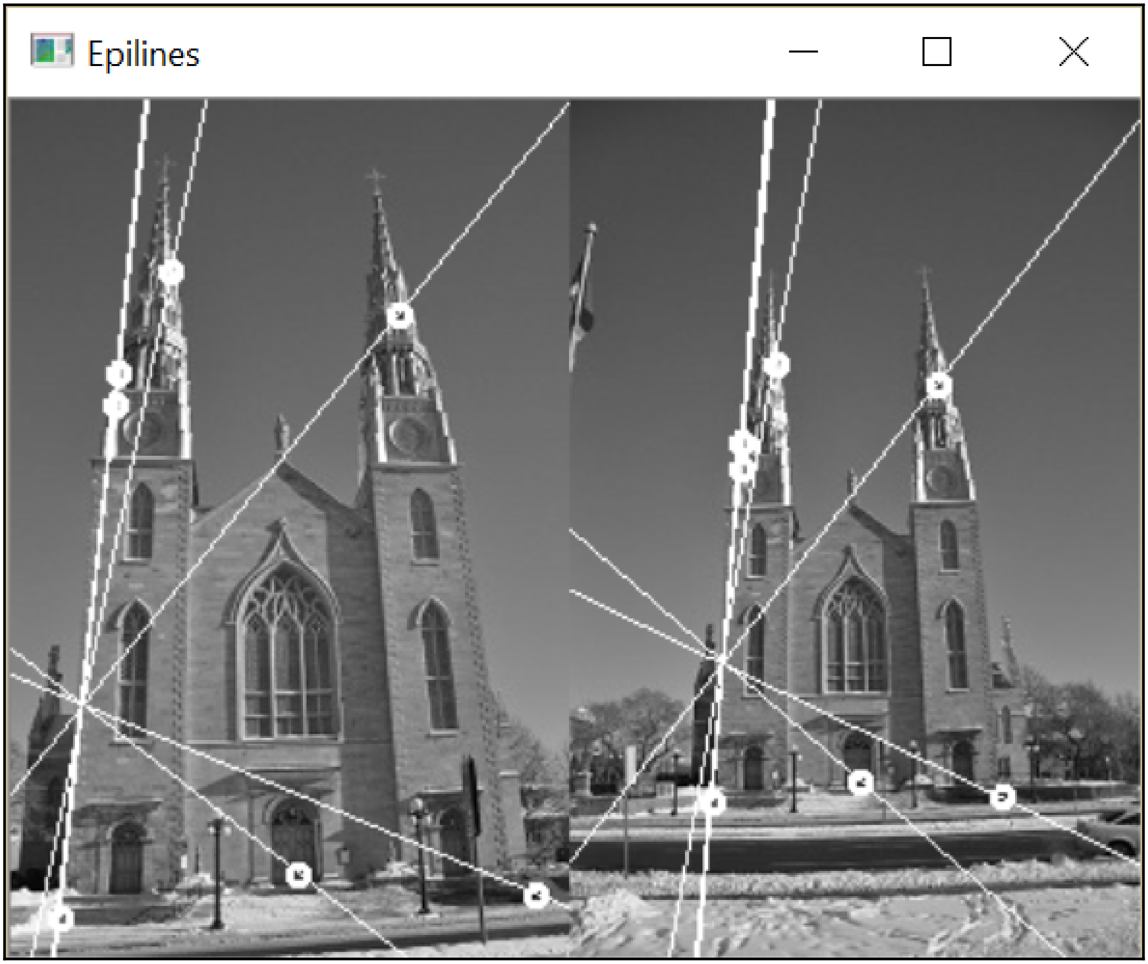


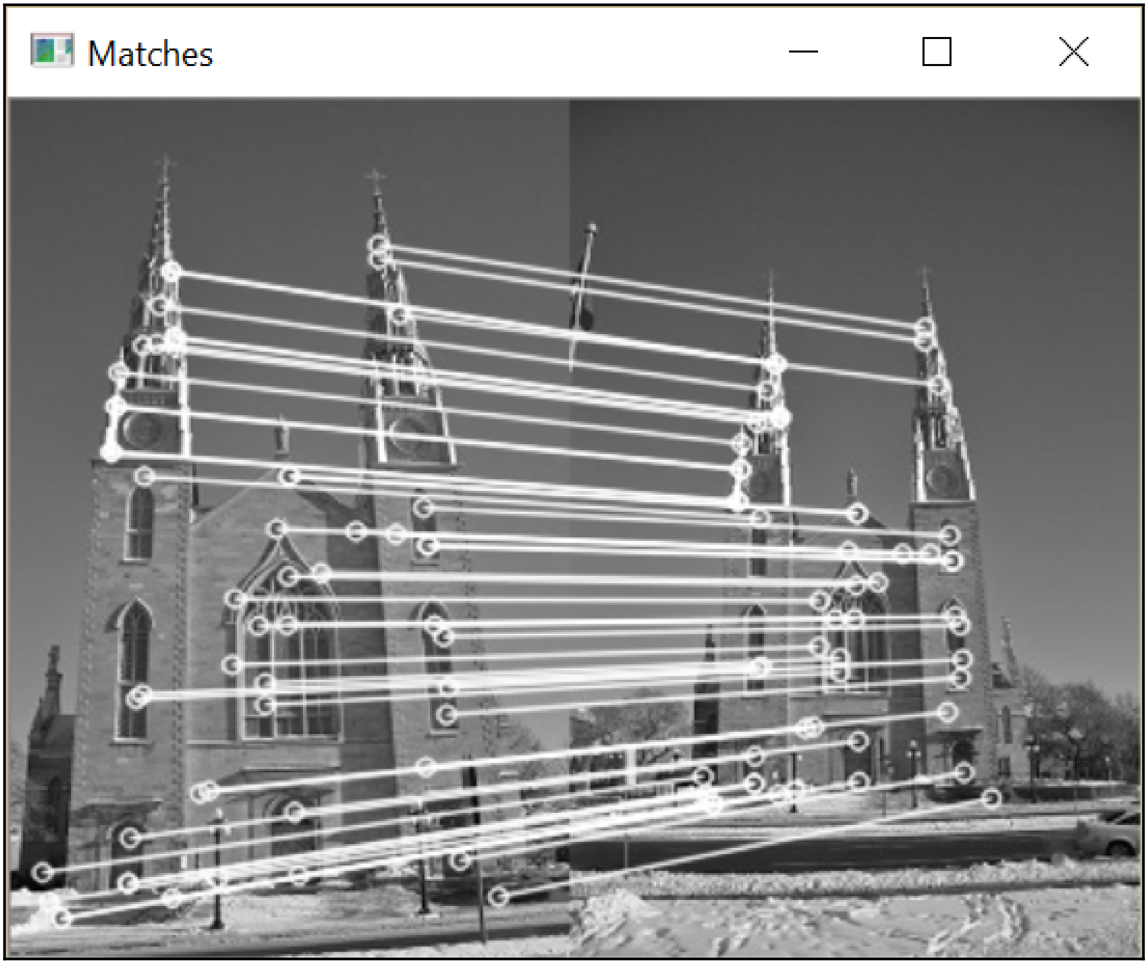

di
do
Object
Light
f
Lens
Image Plane


Object
Light
ho
hi
f
do


X
x
e
e'
l'
epipolar line


Matches


Epilines


Matches


Matches (pure rotation case)

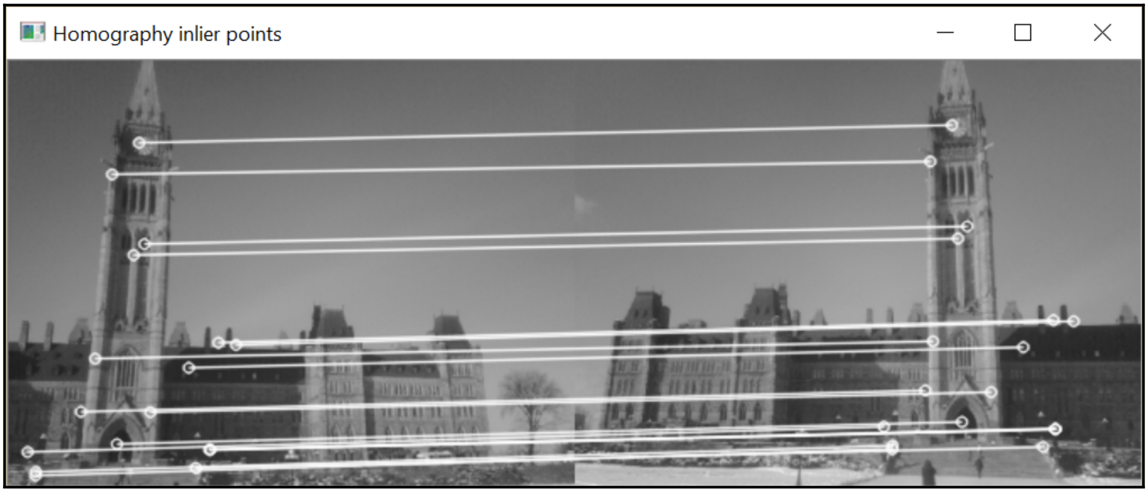
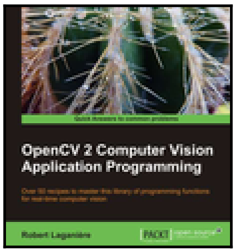
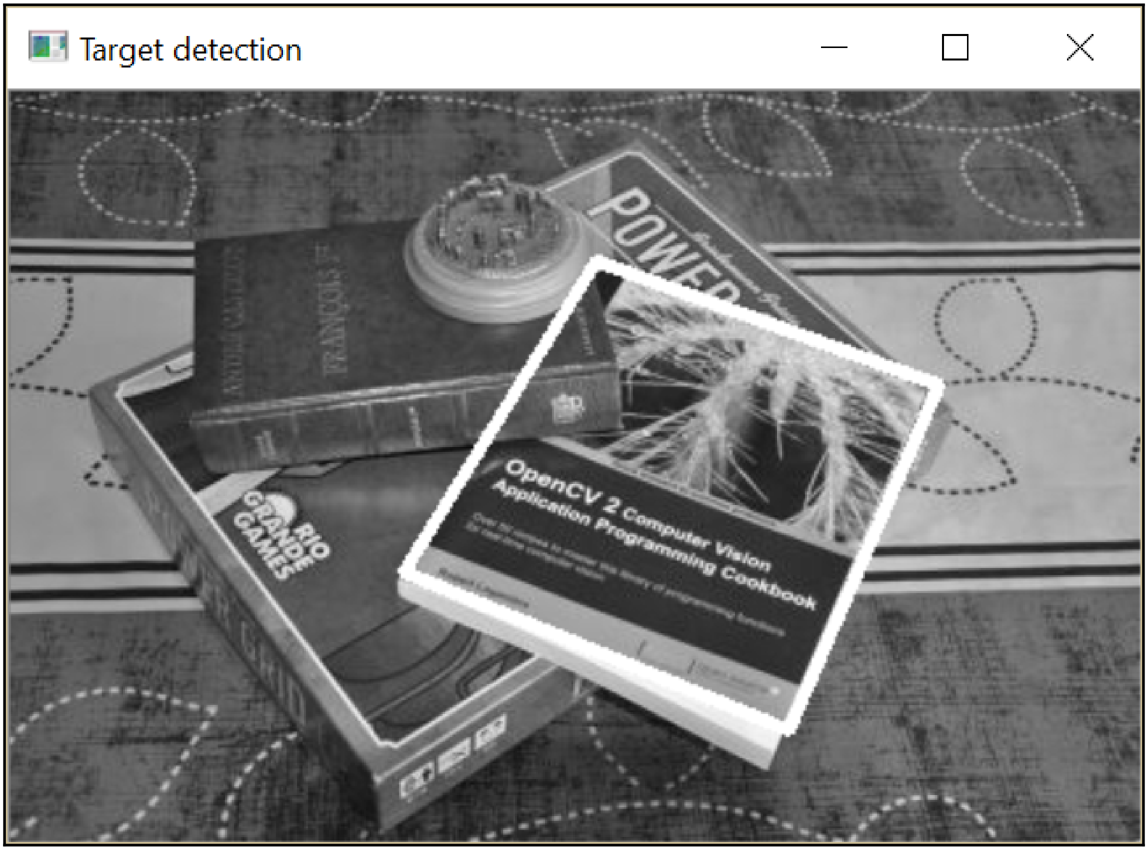

Homography inlier points

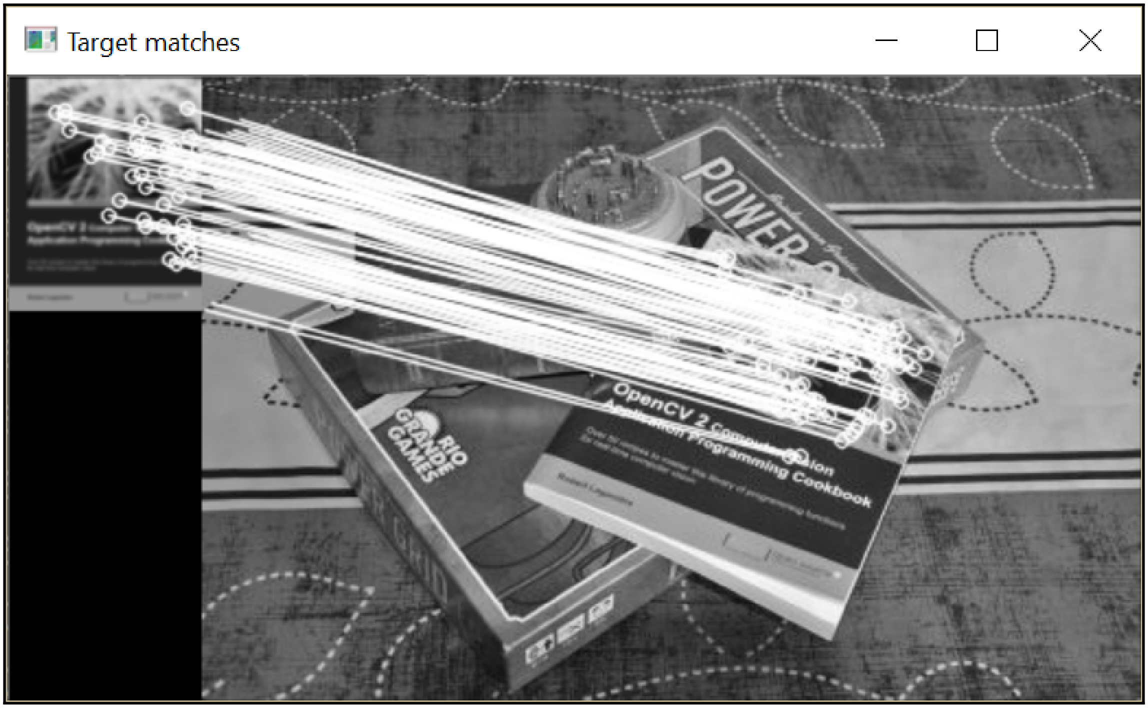

Image mosaic


Panorama

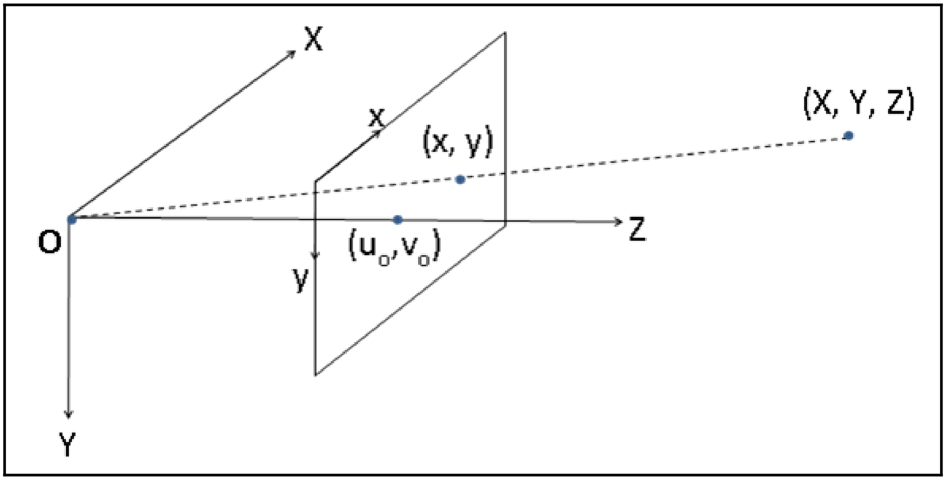

OpenCV 2 Computer Vision
Application Programming Cookbook
RIO GRANDE GAMES

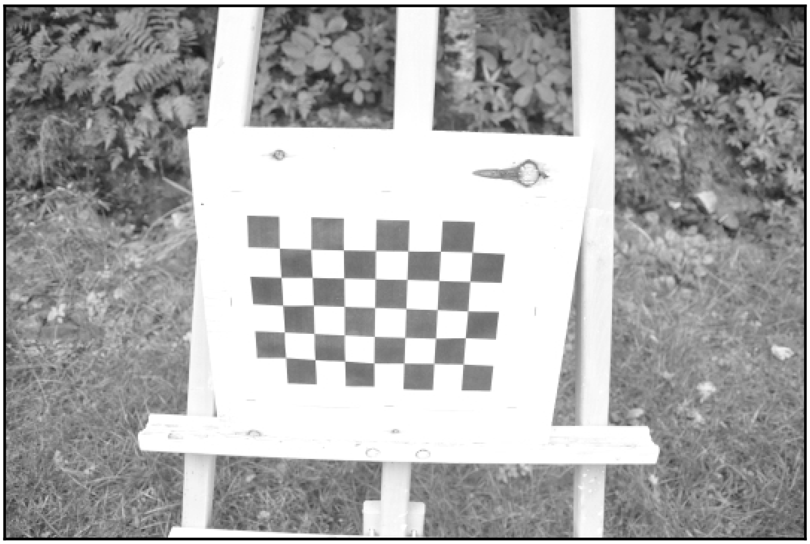

OpenCV 2 Computer Vision
Application Programming


Target detection
POWER
RIO
GRANDE
GAMES
OpenCV 2 Computer Vision
Application Programming Cookbook

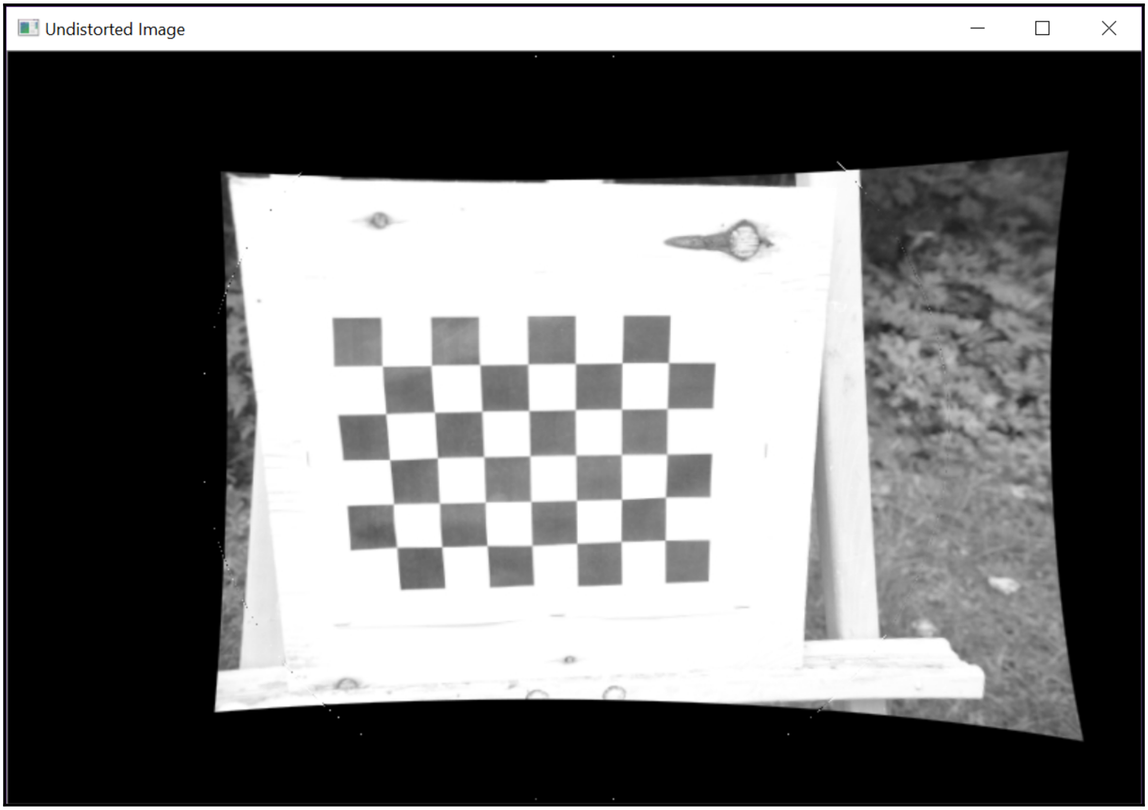

Target matches
POWER
RIO
GRANDE
GAMES
OpenCV 2
Programming Cookbook

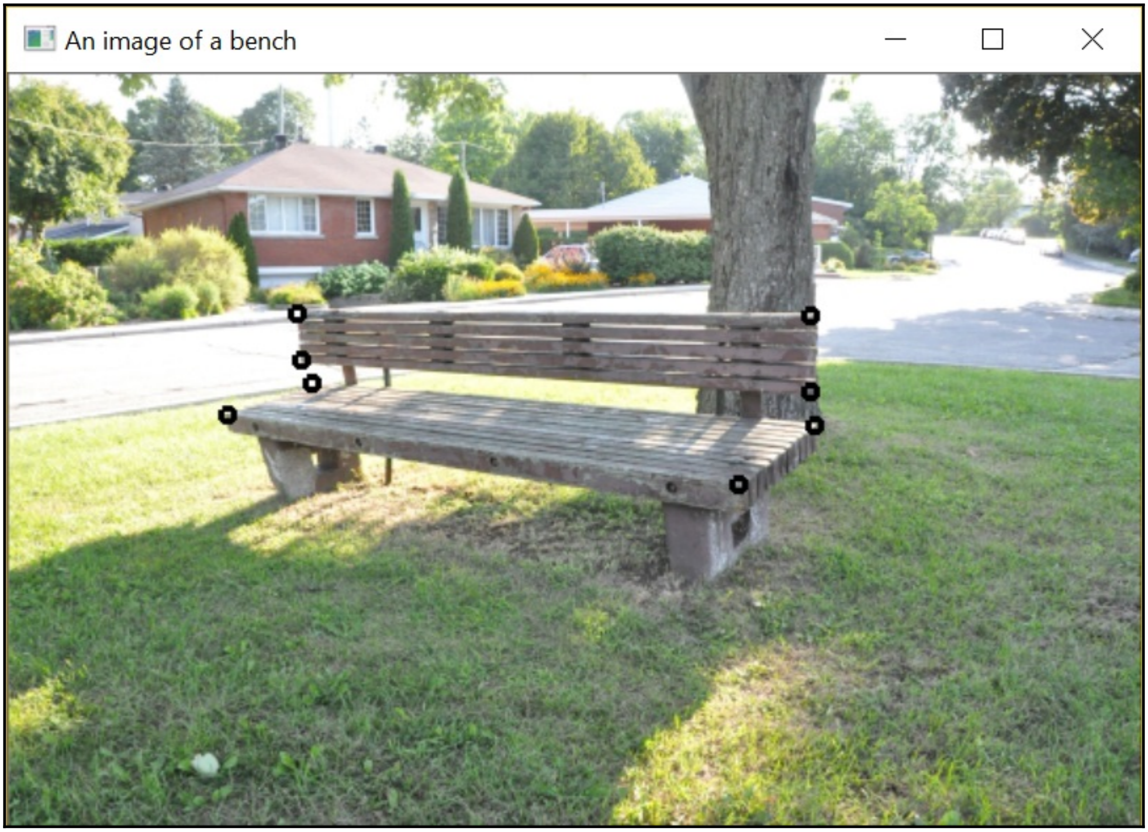
Chapter 11: Reconstructing 3D Scenes

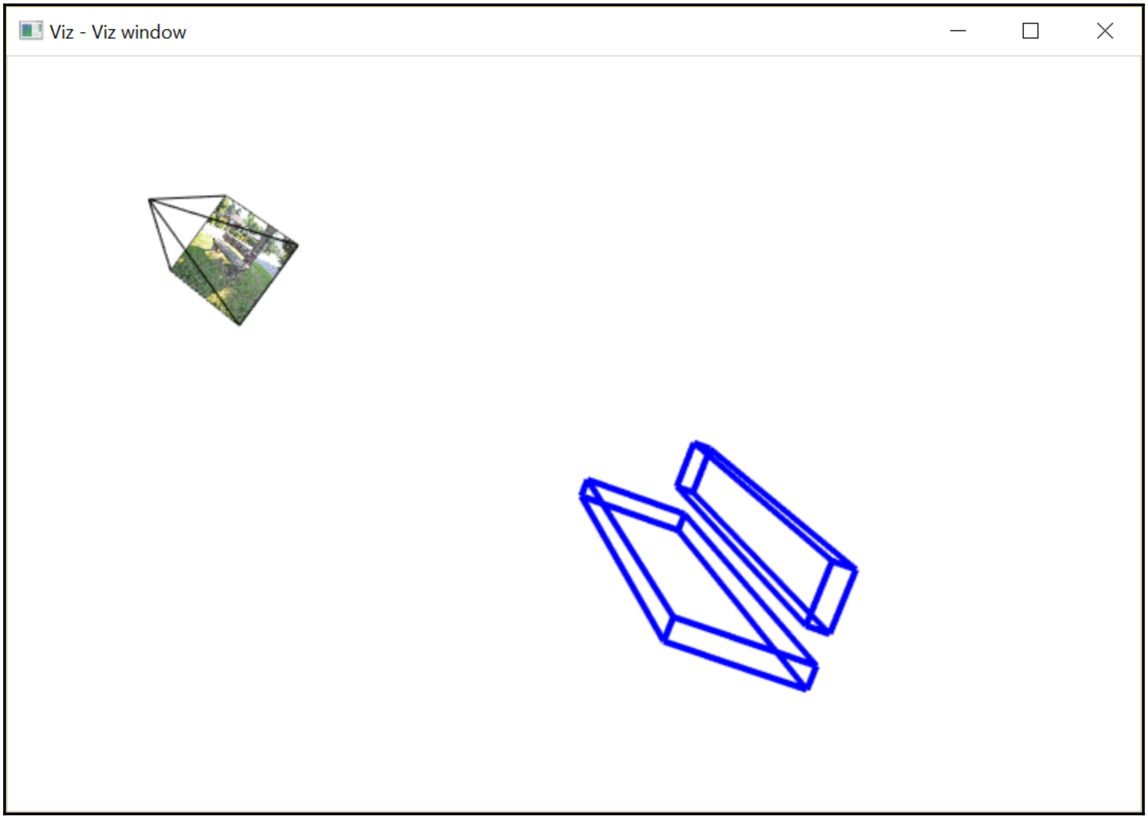




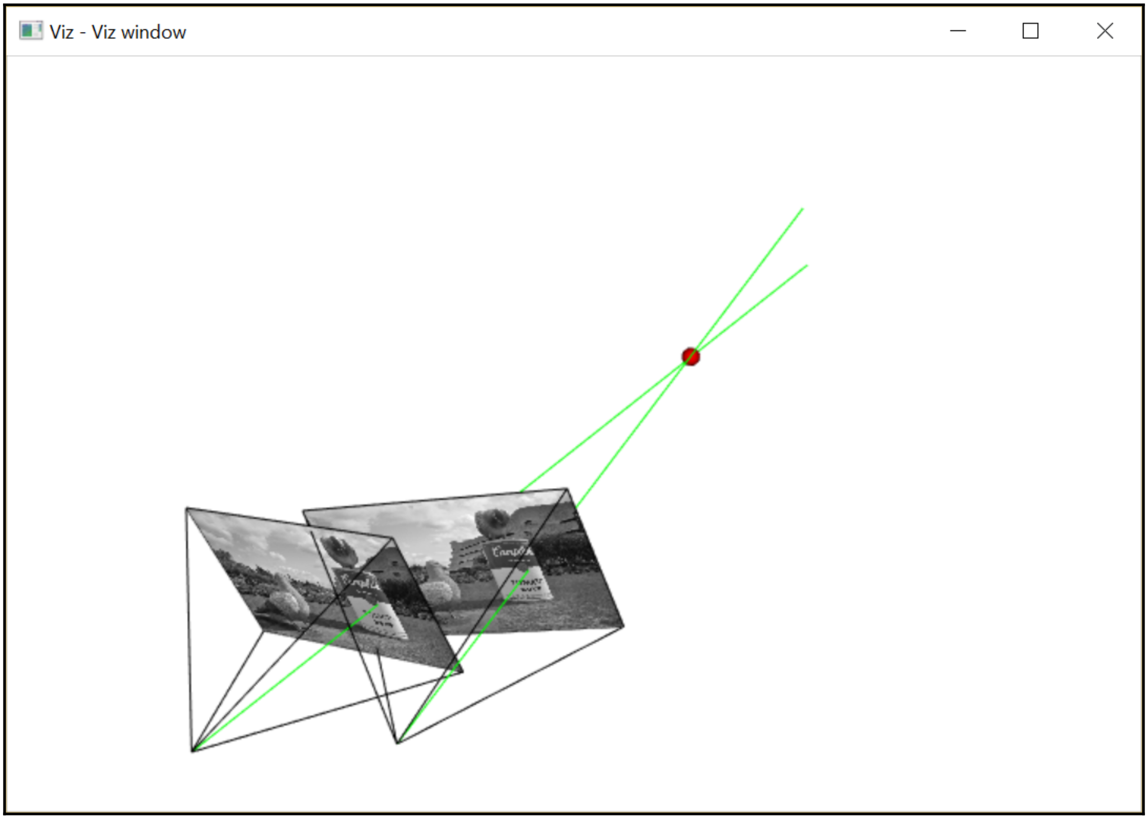

Detected points

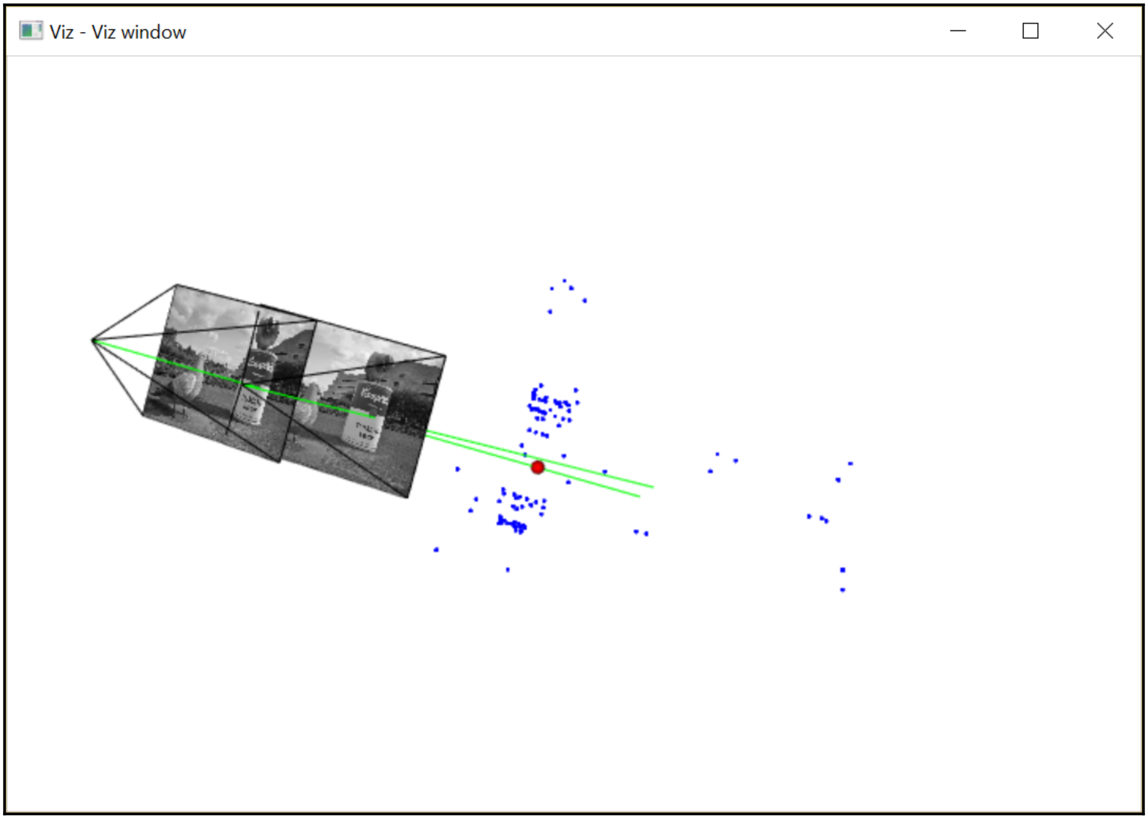

Undistorted Image

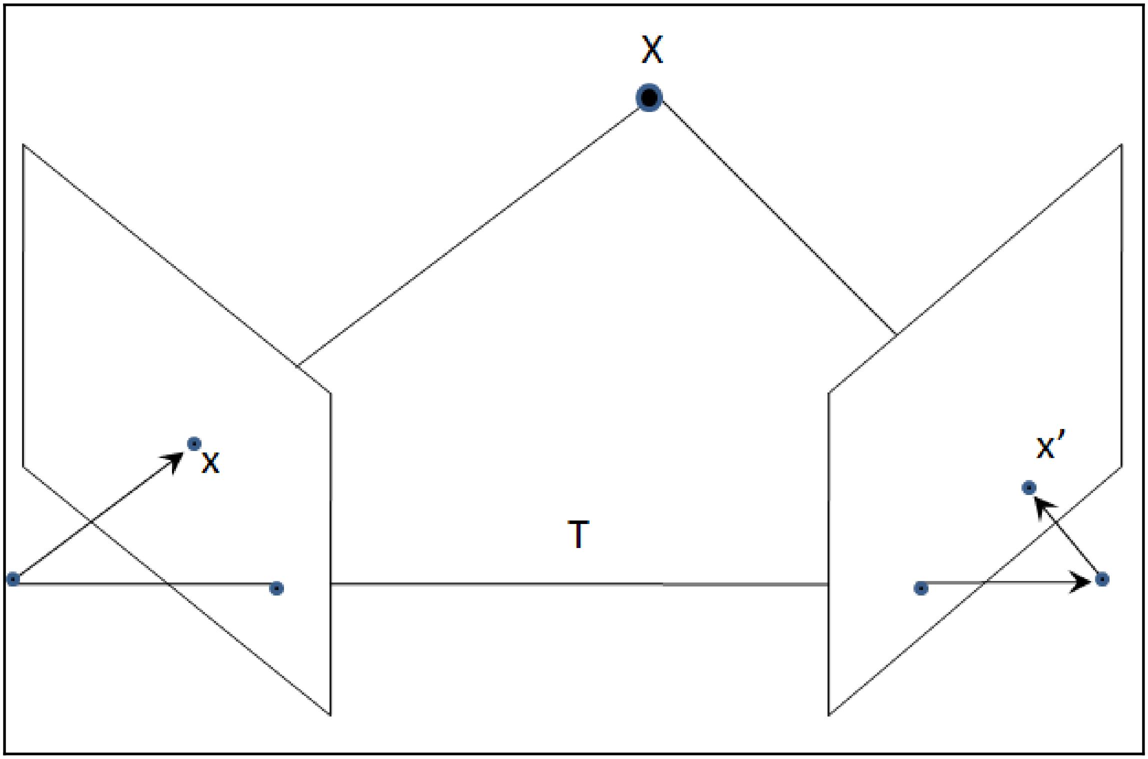

An image of a bench

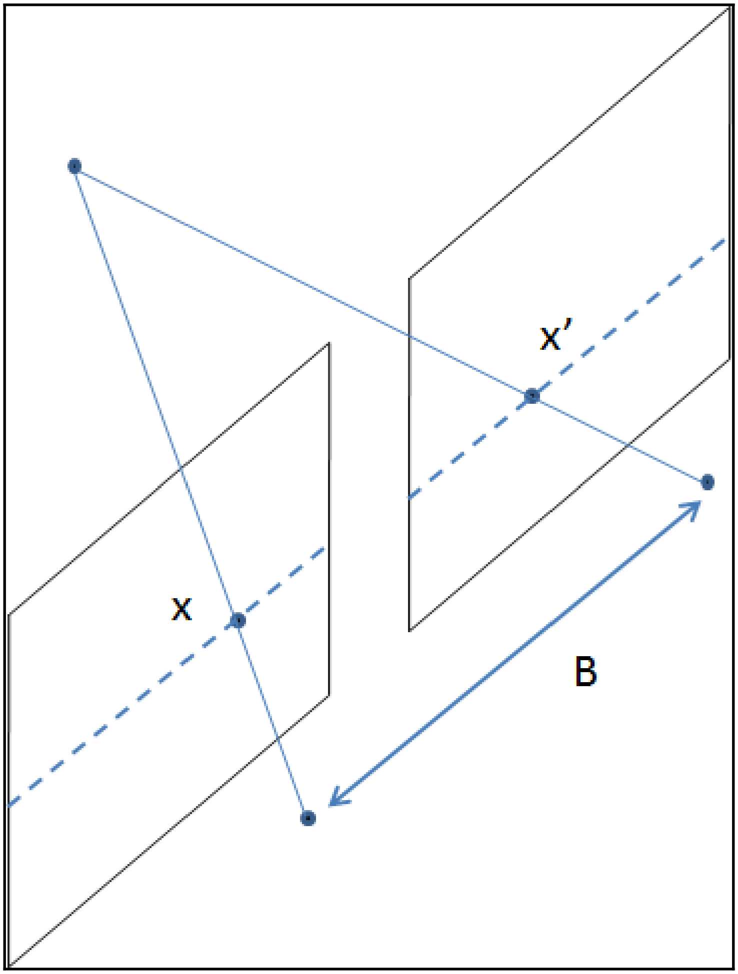

Viz - Viz window


Inliers matches


Viz - Viz window

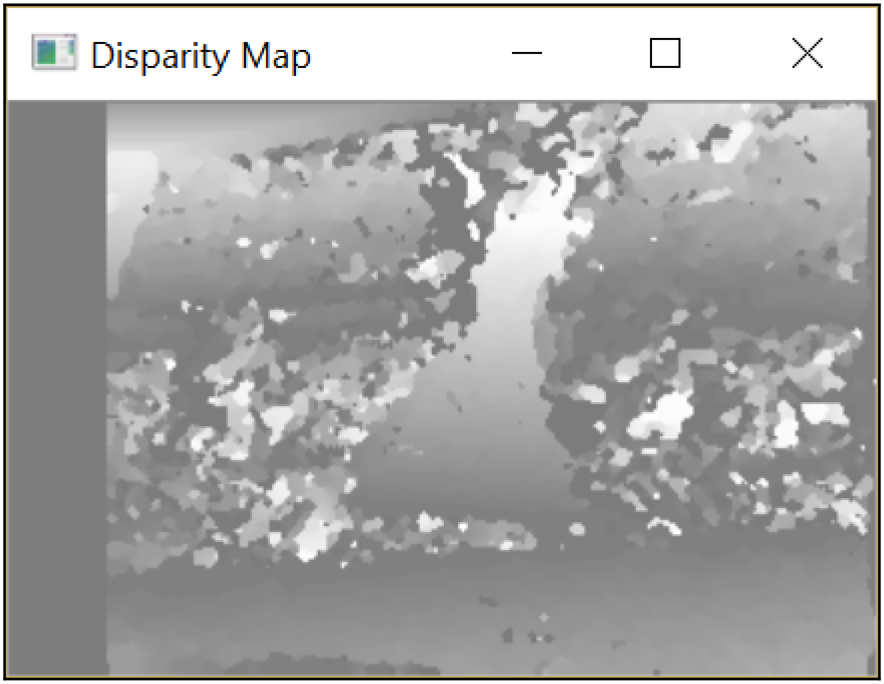

Viz - Viz window


X
x
T
x’

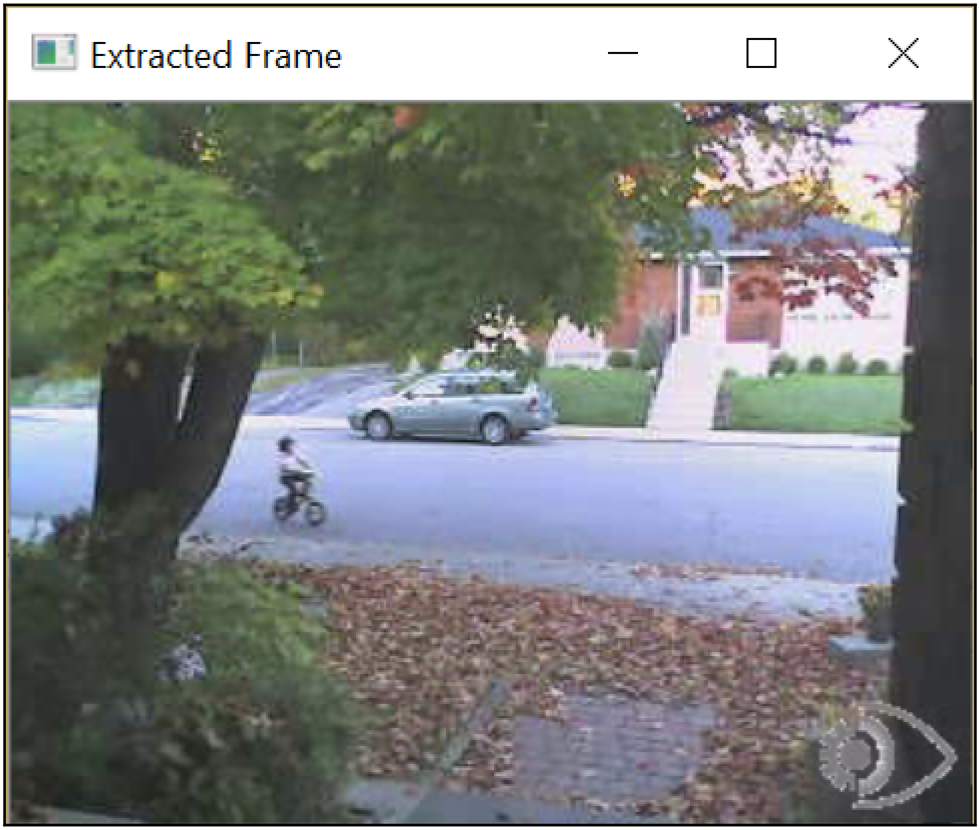

X'
X
B

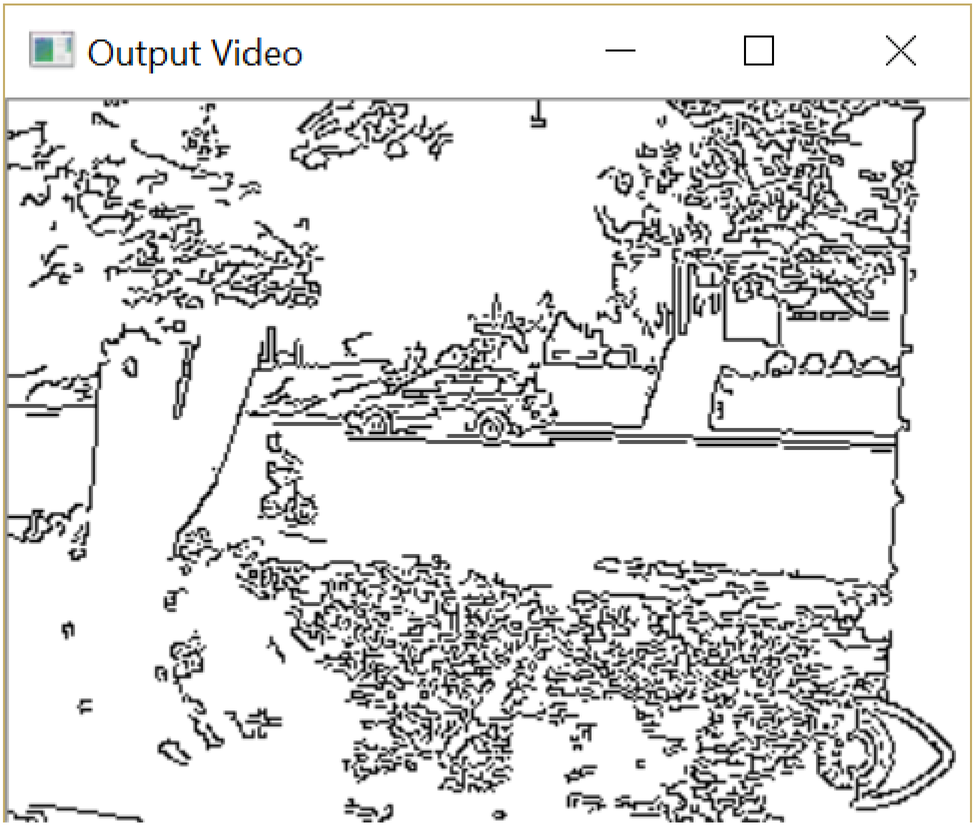

A Stereo pair

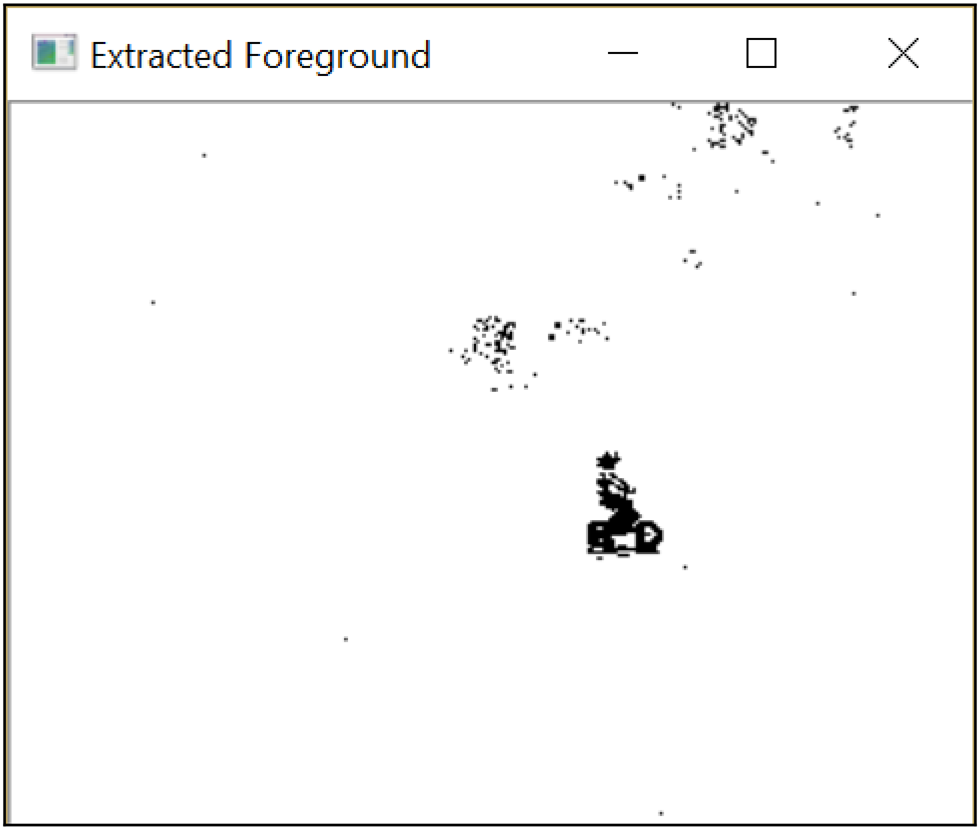

Rectified Stereo pair

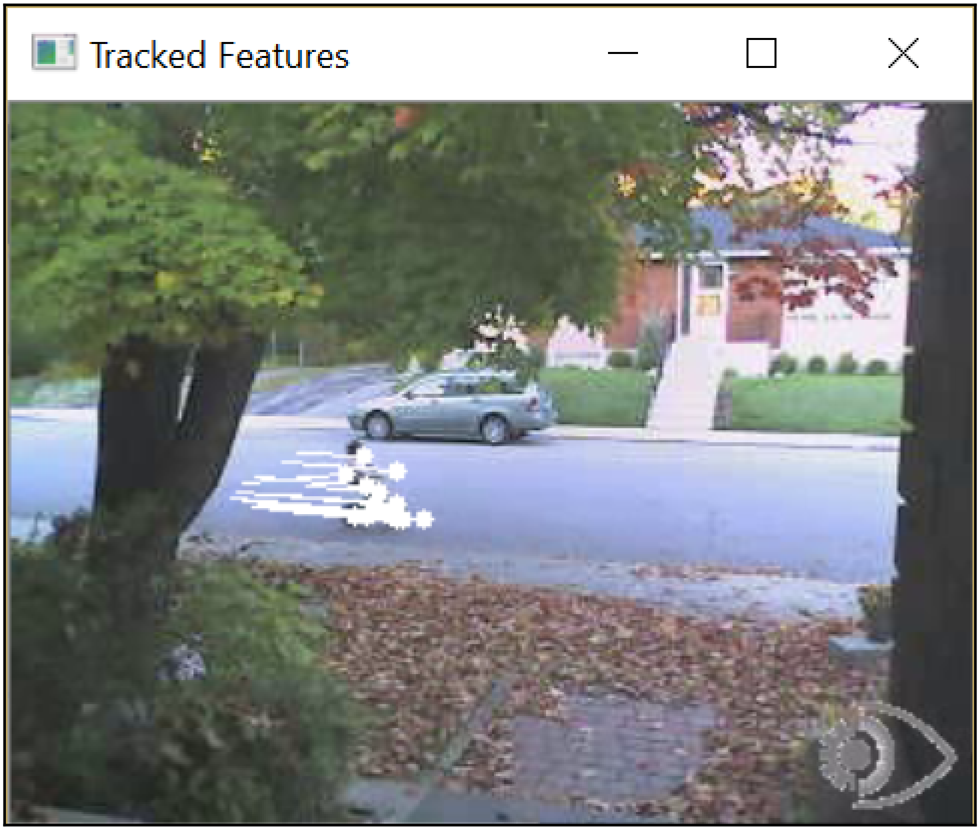

Disparity Map

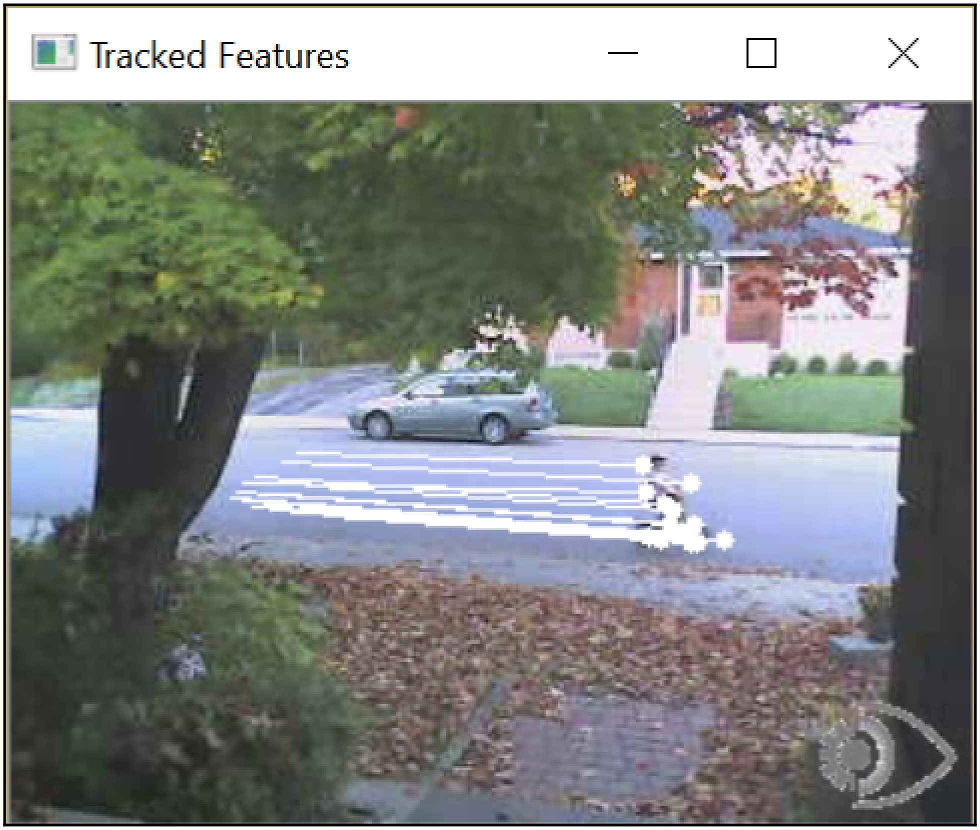
Chapter 12: Processing Video Sequences



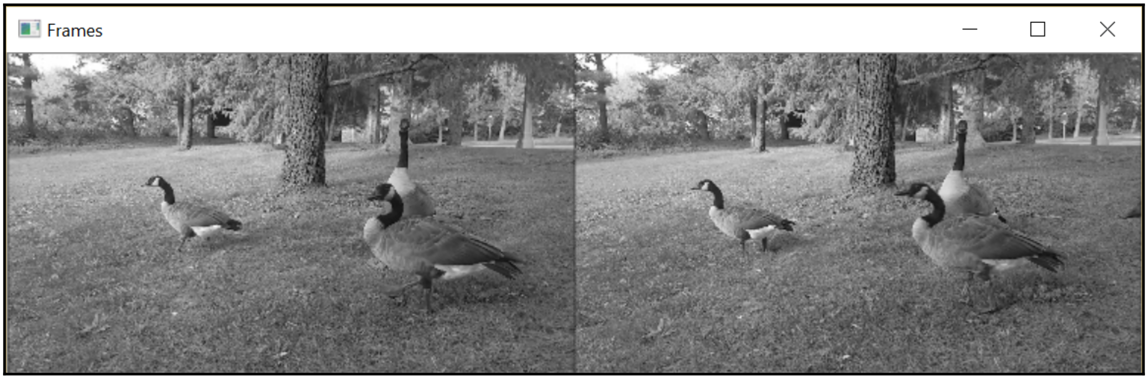

Output Video

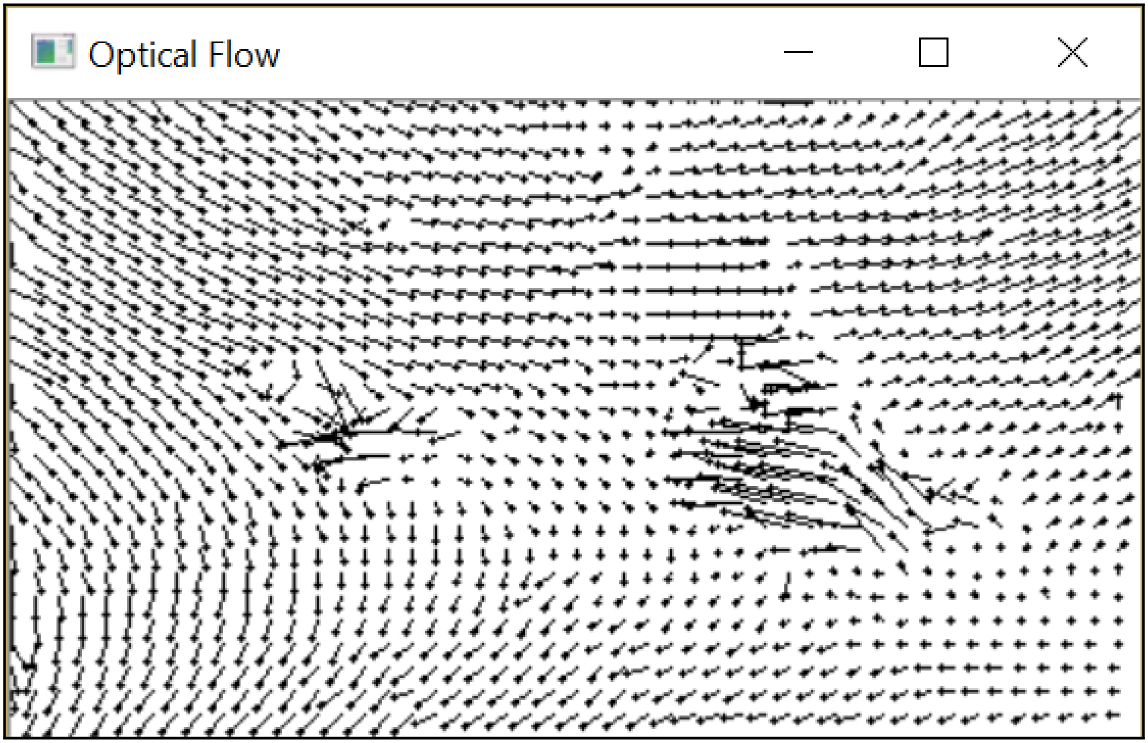

Extracted Foreground

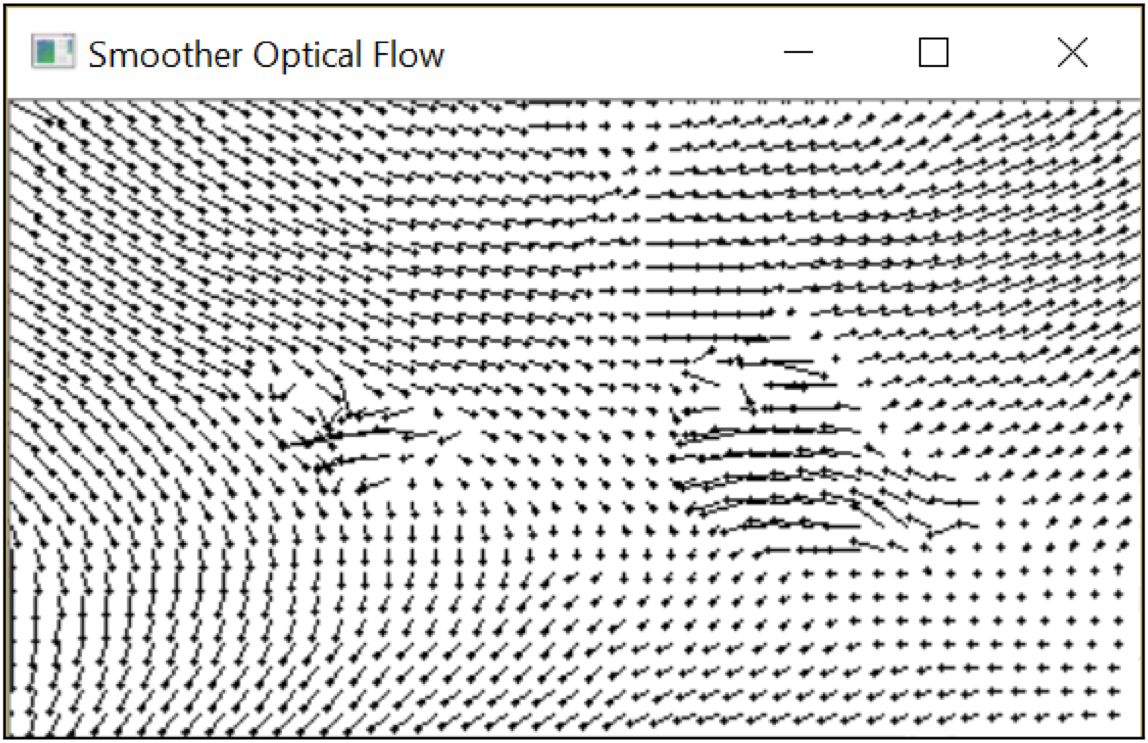

Tracked Features

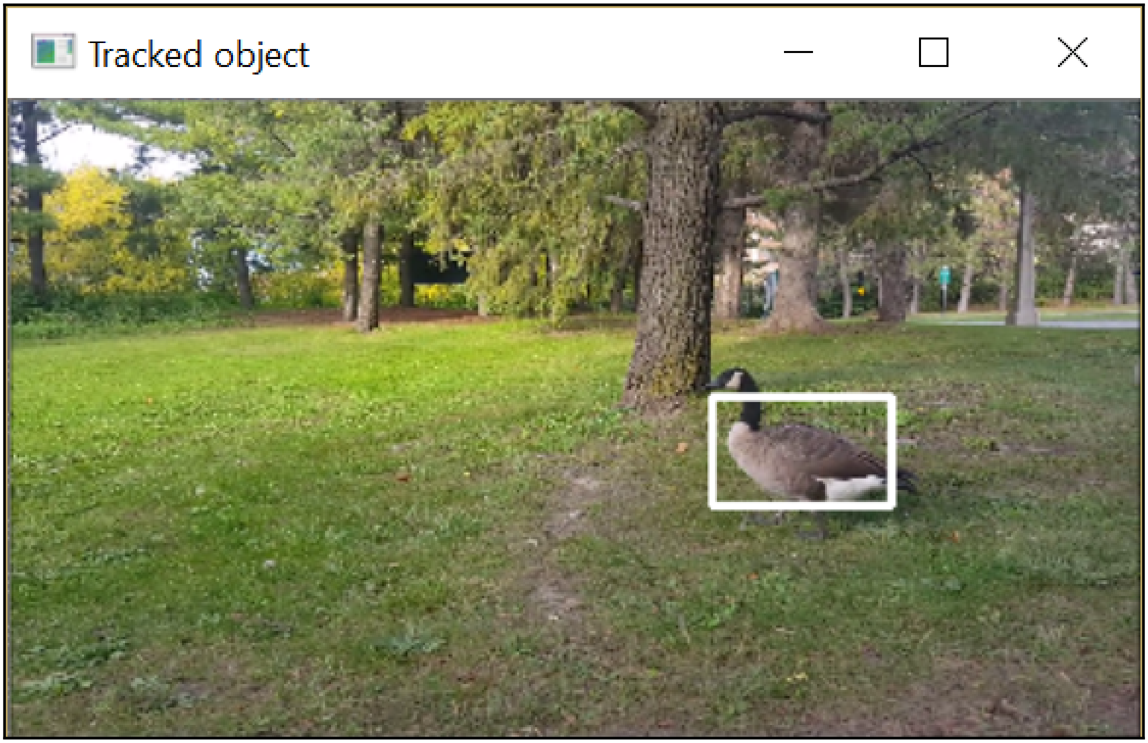

Tracked Features

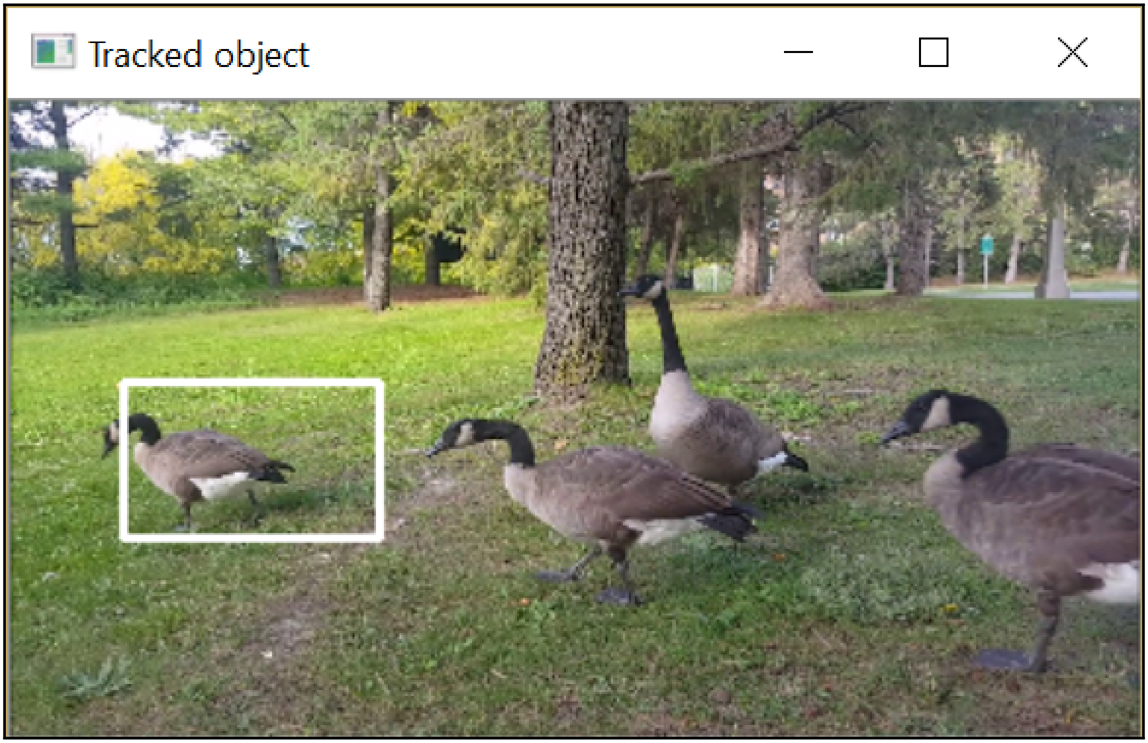

IMPERIAL
BARBER SHOP


Frames

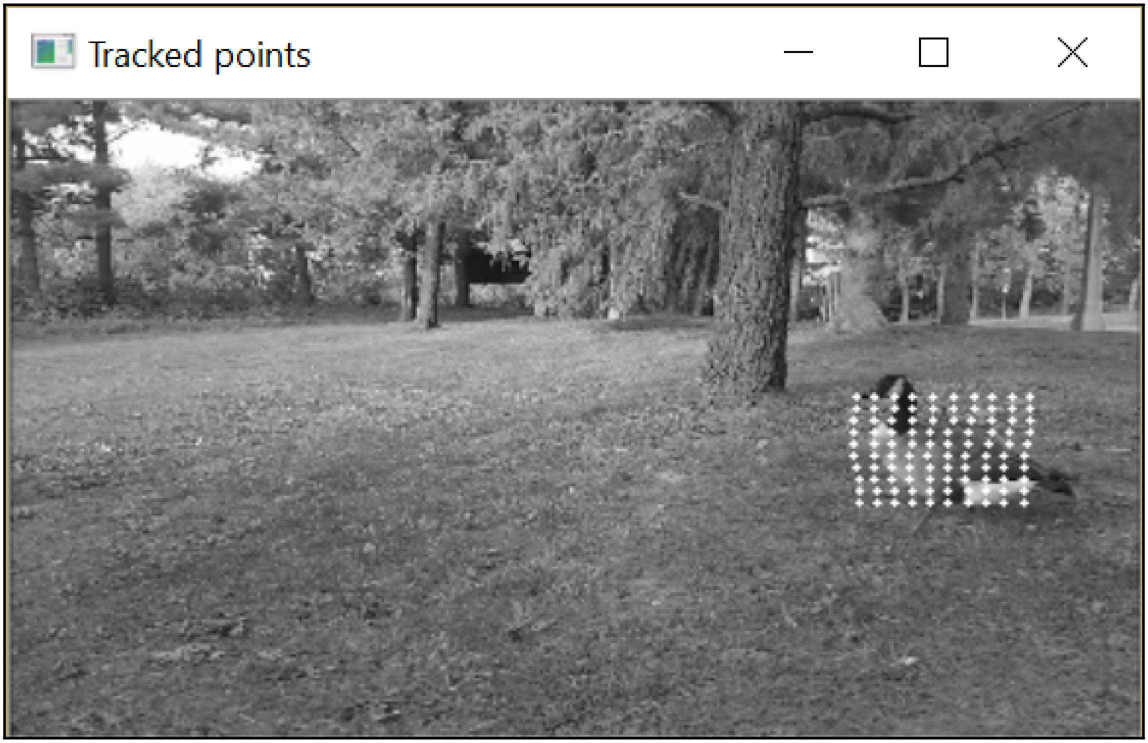

Optical Flow

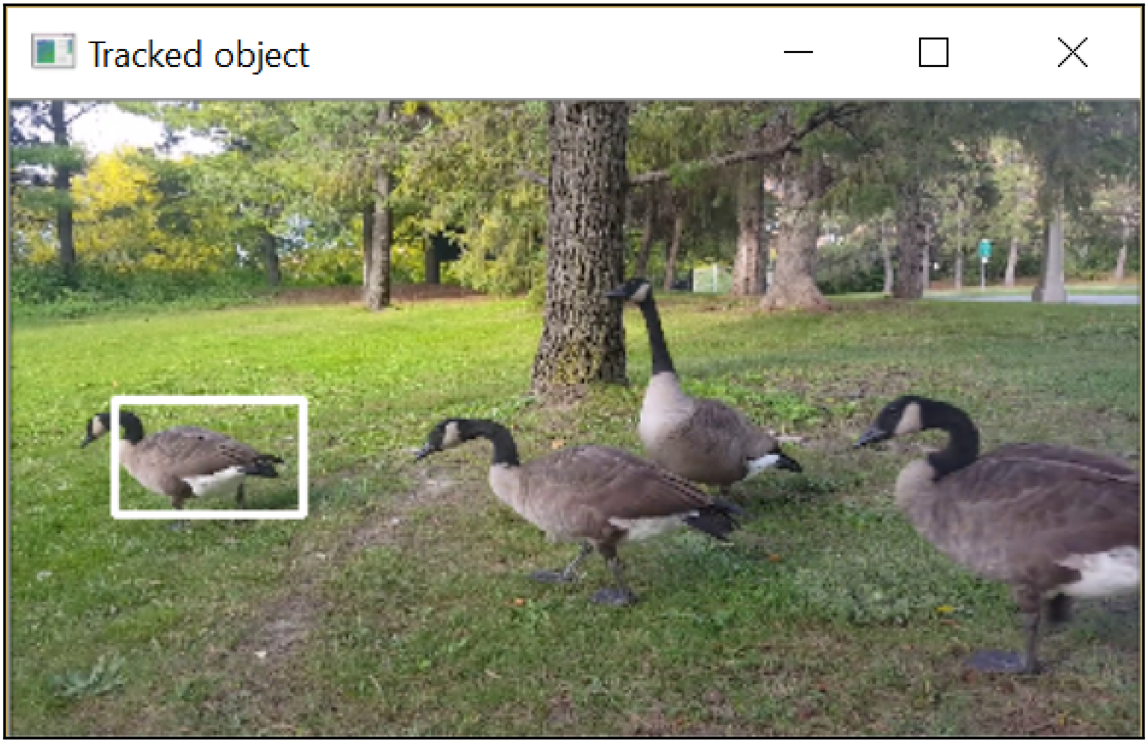

Smoother Optical Flow

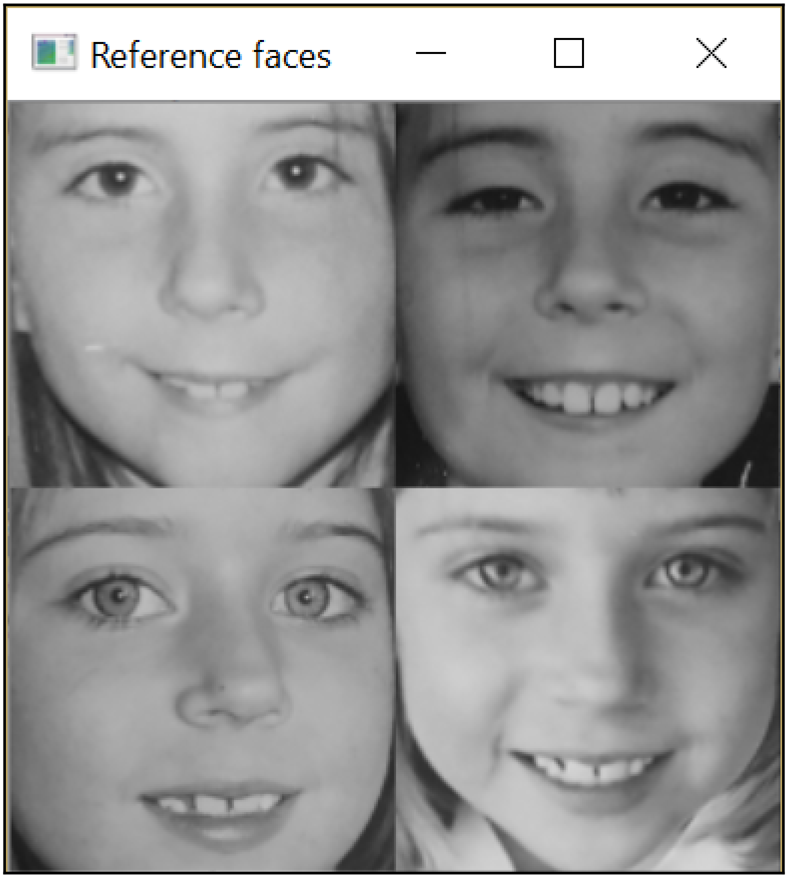

Tracked object

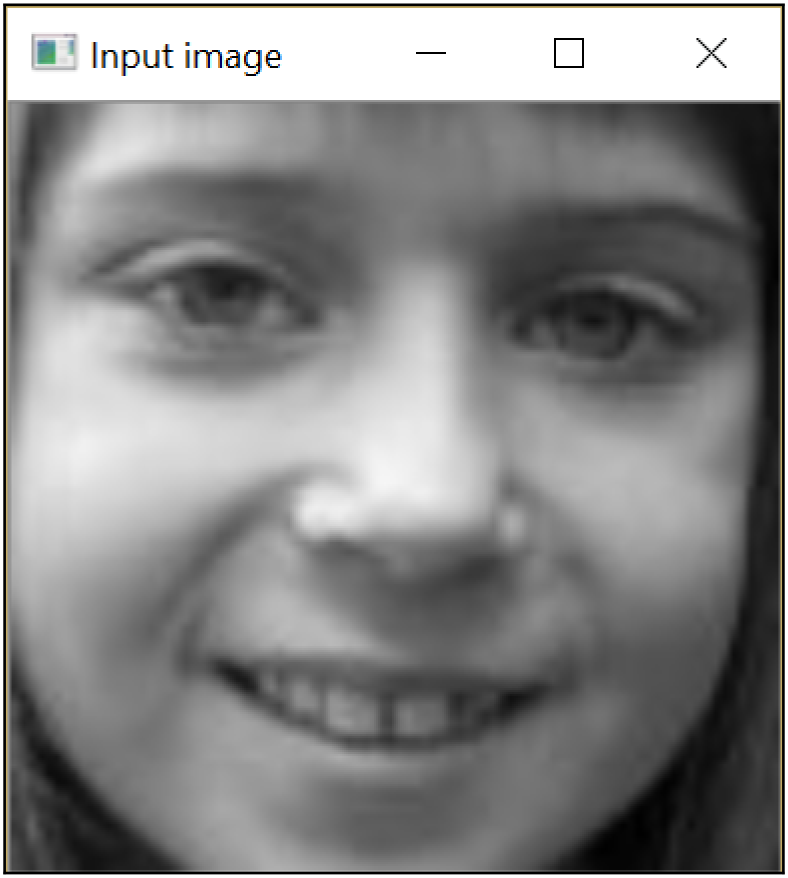

Tracked object


Initial points


Tracked points

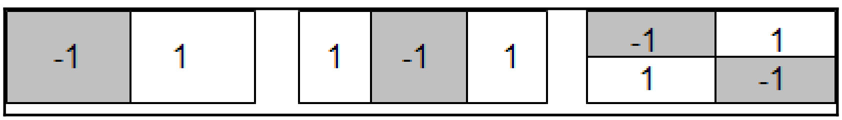

Tracked object

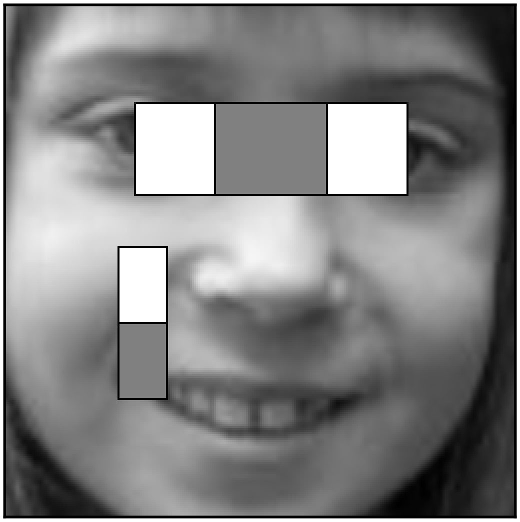

Reference faces


Input image


Original image


LBP image

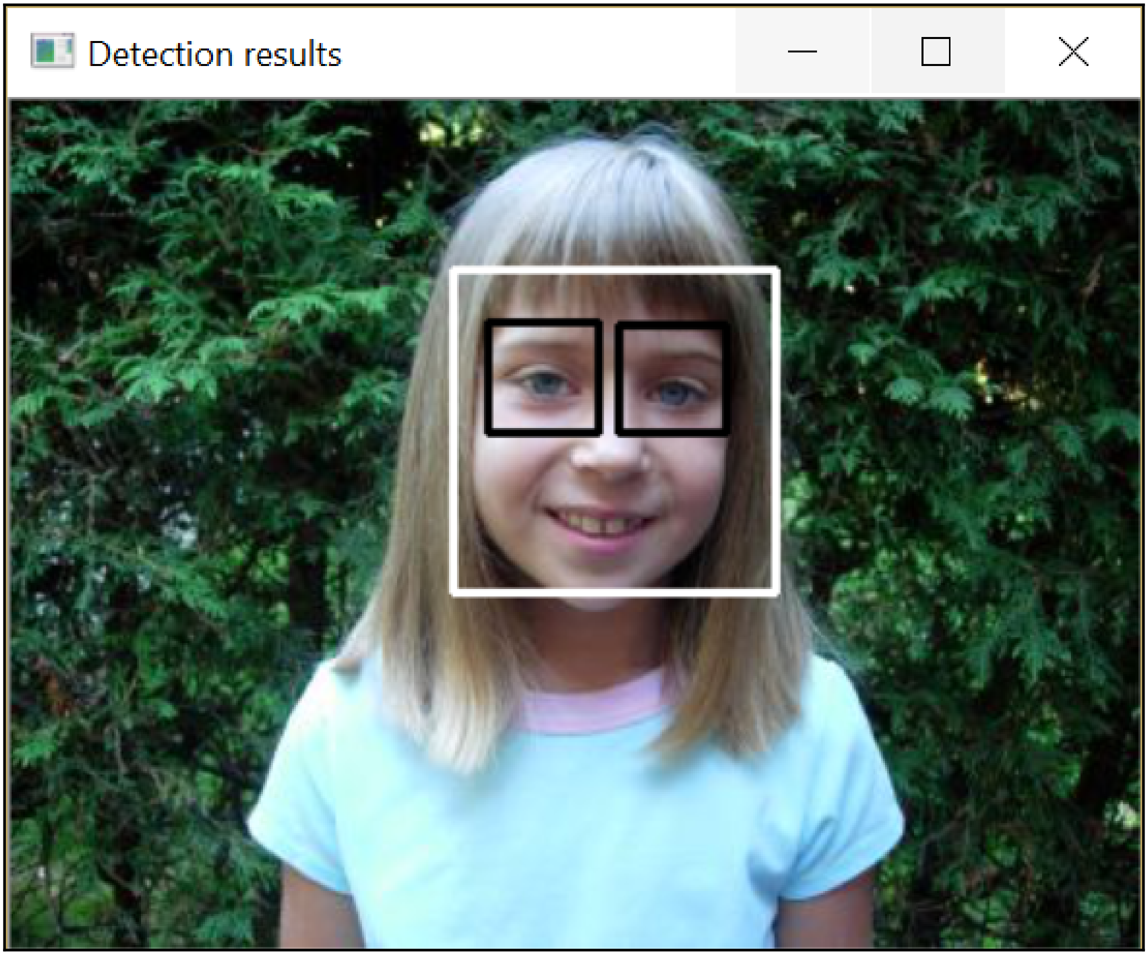

-1
1
1
-1
1
-1
1
1
-1



Positive samples
STOP
STOP
STOP
STOP
STOP
STOP
STOP
STOP

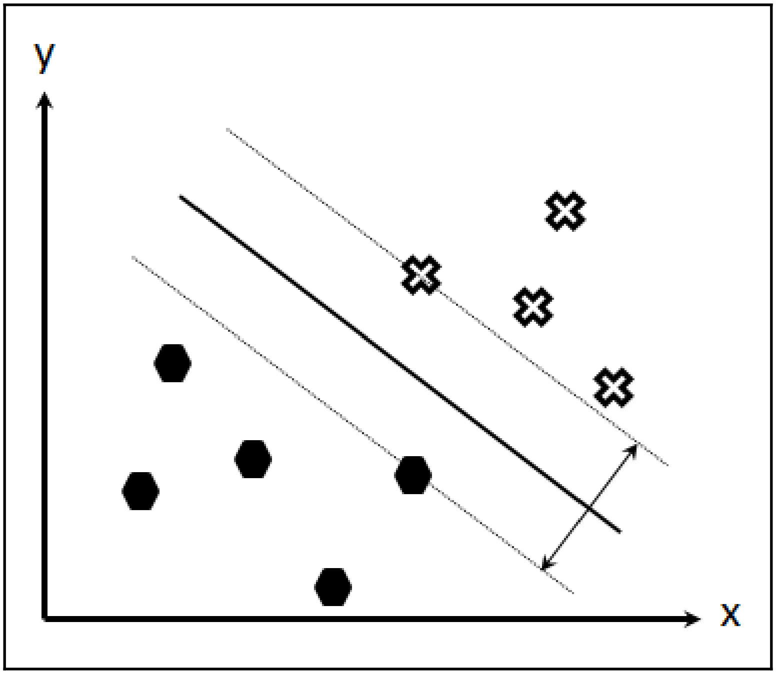

One negative sample
SALONROUGE
SALONROUGE
SUN
739-7200

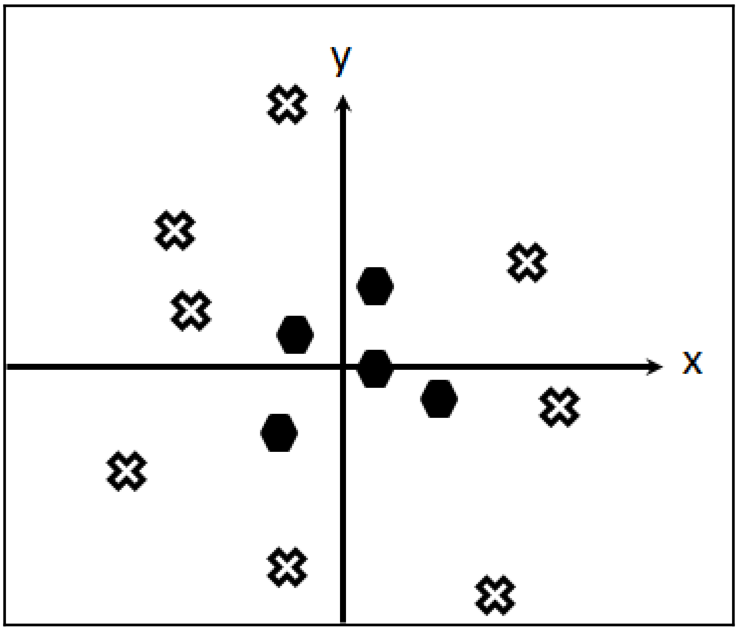

Stop sign detection
STOP

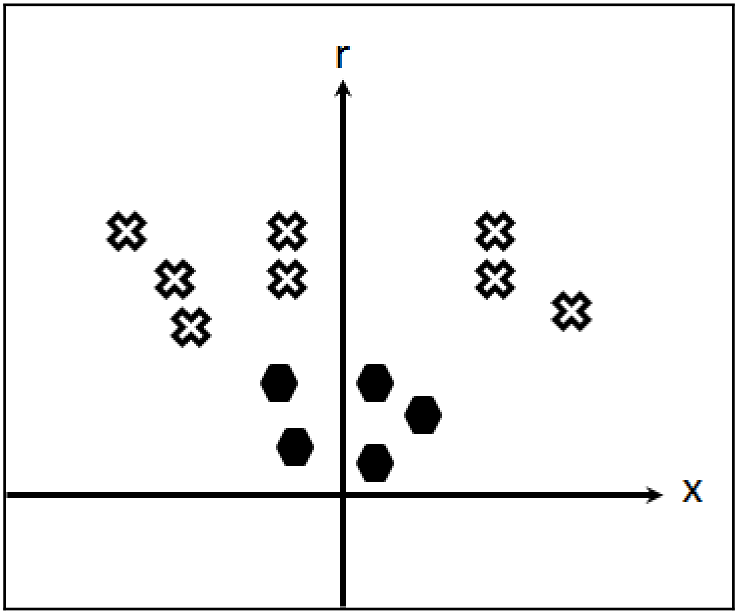

Detection results

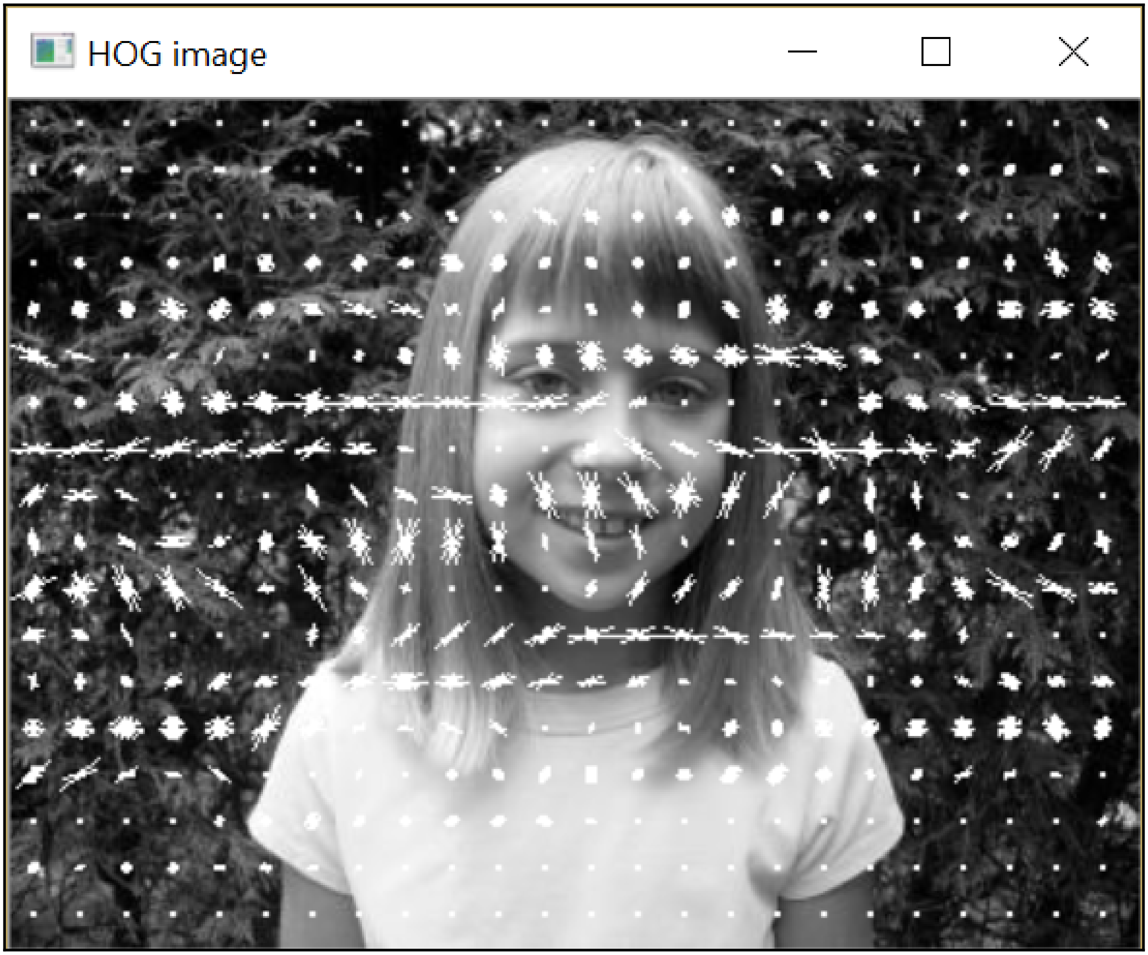

Positive samples
STOP


Negative samp...
SALON


y
x


y
x


r
x


HOG image


People detection


People detection