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Signal and Image Processing Institute

USC-SIPI Report #432

The USC-SIPI Image Database: Version 6

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Introduction

The USC-SIPI image database is maintained primarily to support research in image processing, image analysis, and machine vision. The database is divided into volumes based on the basic character of the pictures. Images in each volume are of various sizes such as 256×256 pixels, 512×512 pixels, or 1024×1024 pixels. All images are either 8-bits/pixel for black and white images or 24-bits/pixel for color images. The following volumes are currently available:

Textures – 155 monochrome images: 130 512×512, 25 1024×1024.

Aerials – 38 images (37 color, 1 monochrome): 12 512×512, 24 1024×1024.

Miscellaneous – 39 images (14 color, 25 monochrome): 14 256×256, 22 512×512, 3 1024×1024.

Sequences – 69 monochrome images: 3 sequences of 16, 32, and 11 256×256 images, 1 sequence of 10 512×512 images.

Accessing the Database Images

The image database may be acquired over the Internet from the USC Signal and Image Processing Institute at "http://sipi.usc.edu/database". The database web site contains much of the information contained in this document including a list of all image files in the database. A low resolution preview image of the individual files may be displayed by clicking on the name of the file. The full resolution TIFF version of the file can then be download by clicking on the "Download Image" field.

The web site also contains a page with checksum values for all the images that can be downloaded. These can be use to confirm that the image was downloaded intact.

It is the responsibility of the user of the database images to figure out how to get the images onto whatever computer they will be using, and how to access the files from within application programs. USC-SIPI does not have the resources to provide assistance in these areas. If you are in doubt about whether or not you will be able to read the images on your computer, please check with your system managers and/or consultants and show them the above description of the image formats.

Data Format

Image files in the SIPI Image Database are currently stored in TIFF format. Previous versions of the SIPI database stored files in raw binary format with no image information attached to the file. The TIFF format has two advantages over the raw format. Information about the image size (width, length, depth) are stored in the file and can be extracted by TIFF reader software. In addition, it allows color images to be stored as a single file rather than as three files.

Some information about the TIFF format is available from "http://www.awaresystems.be/imaging/tiff.html" and from Adobe Systems. The "libtiff" library of C functions for reading and writing TIFF images is available from "http://www.remotesensing.org/libtiff/". The "netpbm" collection of image format conversion programs (http://netpbm.sourceforge.net/) can convert between TIFF and many different formats.

A sample C program for converting an image from TIFF to raw format on a Unix system is available on the SIPI web site. This program should convert the color (24 bits/pixel) and grayscale (8 bits/pixel) images in the database into the raw binary format files. This program requires the "libtiff" library available at the site mentioned above. Note that while we believe this program works properly on the TIFF images in the database, it has **not** been tested on other TIFF images and may not convert them correctly.

Origin of the Images

Most of the images in the database were scanned over a period of several years, usually by graduate students at USC-SIPI. Some of the older images in the Miscellaneous and Sequences volumes were scanned with a Muirhead flatbed scanner. The Textures and Aerials volumes, and the newer images in the Miscellaneous and Sequences volumes were scanned with a Optronics C-4100HS drum scanner. For the most part, there is very little additional technical information available about the images, such as scanning resolution, etc. If you have questions about the scanning process or need other information about the images, please contact us at telephone number (213) 740-4145 or send email to "`database@sipi.usc.edu`".

The Brodatz texture images are not scans of the pages in the texture book but were instead scanned from black and white photographic prints of textures that were purchased from the author of the book. The prints that were received from the author were not identical in all cases to those shown in the book. These texture images are labeled with the page number of the corresponding texture in the book. While the scanned images are of the same texture material, they are not an image of a portion of the page shown in the book.

Some of the images in the database were scanned from copyrighted material. The image data was generated from this material with the sole intention of using it for research in image processing and related areas. None of these images should be used for commercial purposes unless you have determined that doing so would not violate any copyright. While SIPI does have information on some of the images, the origin of many is unknown. If you have questions about the origins of a particular image or its copyright status, you can contact us. Be advised, that in most cases our answer to your questions will be that we have no useful information.

Users of the database images should be aware that a few of the images have a few blank or otherwise incorrect lines at the top or bottom or sides of the images due to the scanning process. These generally do not extend more that one or two pixels into the image area. In addition, in some of the images the outer portions of the scanned area contains elements from the borders of the film such as 35mm sprocket holes, alignment marks, etc.

Database on CD-R Media

For those who can not or do not wish to access the database images via the Internet, USC-SIPI can supply the database images on CD-R.

CD-R's are written in a format that "should" be readable on any PC, Mac, or Unix system with a CD-ROM drive. Cost is $40 for the complete database.

It is the database purchaser's responsibility to figure out how to read the images into whatever computer they will be using, and how to access the files from within application programs. USC-SIPI does not have the

resources to provide assistance in these areas. If you are in doubt about whether or not you will be able to read the images on your computer, please check with your system managers and show them the description of the image formats.

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- No letters of credit accepted.

Checks should be payable to the Signal and Image Processing Institute. Shipping costs will be added to the price. Contact USC-SIPI for a quote on the shipping costs.

Please send orders to

Laboratory Accountant
University of Southern California
Signal and Image Processing Institute
3740 McClintock Ave., Suite 404
Los Angeles, CA 90089-2564

For more information, please write to the above address, or call 213-740-4145, or send email to "services @ sipi.usc.edu".

Table of Contents

The following pages list the contents of all volumes in the database. Each image in the table of contents is listed along with the following information:

File name: This is the name of the image file, without the trailing extension of ".`tiff`". Many of the images have numerical file names due to an identification scheme used in an earlier version of the database.

Image description: A brief description of the image contents.

Image size: This is the image size in pixels. All images are square unless indicated otherwise.

Color/Mono: Indicates whether the image is a 24-bit color image or an 8-bit monochrome image.

Following the table of contents are reproductions of most of the images in the database.

Volume 1. – TEXTURES

For the Brodatz texture images, the number in parenthesis (i.e. D12) is the page number in the Brodatz texture book that the image came from (P. Brodatz, *Textures: A Photographic Album for Artists and Designers*, Dover Publications, New York, 1966). Images 1.2.01 through 1.2.13 (marked below with a '∗') are histogram equalized versions of 1.1.01 through 1.1.13.

Name	Description	Size	Color/Mono
1.1.01	Brodatz - Grass (D9)	512	Mono
1.1.02	Brodatz - Bark (D12)	512	Mono
1.1.03	Brodatz - Straw (D15)	512	Mono
1.1.04	Brodatz - Herringbone weave (D15)	512	Mono
1.1.05	Brodatz - Woolen cloth (D19)	512	Mono
1.1.06	Brodatz - Pressed calf leather (D24)	512	Mono
1.1.07	Brodatz - Beach sand (D29)	512	Mono
1.1.08	Brodatz - Water (D38)	512	Mono
1.1.09	Brodatz - Wood grain (D68)	512	Mono
1.1.10	Brodatz - Raffia (D84)	512	Mono
1.1.11	Brodatz - Pigskin (D92)	512	Mono
1.1.12	Brodatz - Brick wall (D94)	512	Mono
1.1.13	Brodatz - Plastic bubbles (D112)	512	Mono
1.2.01	Brodatz - Grass (D9) ∗	512	Mono
1.2.02	Brodatz - Bark (D12) ∗	512	Mono
1.2.03	Brodatz - Straw (D15) ∗	512	Mono
1.2.04	Brodatz - Herringbone weave (D16) ∗	512	Mono
1.2.05	Brodatz - Woolen cloth (D19) ∗	512	Mono
1.2.06	Brodatz - Pressed calf leather (D24) ∗	512	Mono
1.2.07	Brodatz - Beach sand (D29) ∗	512	Mono
1.2.08	Brodatz - Water (D38) ∗	512	Mono
1.2.09	Brodatz - Wood grain (D68) ∗	512	Mono
1.2.10	Brodatz - Raffia (D84) ∗	512	Mono
1.2.11	Brodatz - Pigskin (D92) ∗	512	Mono
1.2.12	Brodatz - Brick wall (D94) ∗	512	Mono
1.2.13	Brodatz - Plastic bubbles (D112) ∗	512	Mono
1.3.01	Brodatz - Grass (D9)	1024	Mono
1.3.02	Brodatz - Bark (D12)	1024	Mono
1.3.03	Brodatz - Straw (D15)	1024	Mono
1.3.04	Brodatz - Woolen cloth (D19)	1024	Mono
1.3.05	Brodatz - Herringbone weave (D16)	1024	Mono
1.3.06	Brodatz - Pressed calf leather (D24)	1024	Mono
1.3.07	Brodatz - Beach sand (D29)	1024	Mono
1.3.08	Brodatz - Water (D38)	1024	Mono
1.3.09	Brodatz - Wood grain (D68)	1024	Mono
1.3.10	Brodatz - Raffia (D84)	1024	Mono
1.3.11	Brodatz - Pigskin (D92)	1024	Mono
1.3.12	Brodatz - Brick wall (D94)	1024	Mono
1.3.13	Brodatz - Plastic bubbles (D112)	1024	Mono

Name	Description	Size	Color/Mono
1.4.01	Brick wall	1024	Mono
1.4.02	Wood shingle roof	1024	Mono
1.4.03	Wood shingle roof	1024	Mono
1.4.04	Brick wall	1024	Mono
1.4.05	Tile roof	1024	Mono
1.4.06	Wood fence	1024	Mono
1.4.07	Metal grates	1024	Mono
1.4.08	Brick wall	1024	Mono
1.4.09	Brick wall	1024	Mono
1.4.10	Grass	1024	Mono
1.4.11	Sand	1024	Mono
1.4.12	Sand	1024	Mono
1.5.01	Brick wall	512	Mono
1.5.02	Hexagonal hole array	512	Mono
1.5.03	Rough wall	512	Mono
1.5.04	Sand	512	Mono
1.5.05	Gravel	512	Mono
1.5.06	Brick wall	512	Mono
1.5.07	Grass	512	Mono

The texture mosaics (texmos1, texmos2, and texmos3) are mosaics of eight Brodatz textures for use in image texture segmentation research. The files texmos2.s512 and texmos3.s512 are images containing eight gray levels which indicate which of the eight textures are present at each point in the corresponding texture mosaic. A document containing a more detailed description of the texture mosaics is available on the SIPI web site.

Name	Description	Size	Color/Mono
texmos1.p512	USC texture mosaic #1	512	Mono
texmos2.p512	USC texture mosaic #2	512	Mono
texmos2.s512	USC texture mosaic #2 (info)	512	Mono
texmos3.p512	USC texture mosaic #3	512	Mono
texmos3b.p512	USC texture mosaic #3 (modified)	512	Mono
texmos3.s512	USC texture mosaic #3 (info)	512	Mono

The following images are a set of Brodatz textures digitized at seven different rotation angles: 0, 30, 60, 90, 120, 150, and 200 degrees. The images were digitized using a 512×512 pixel video digitizer. In general , the quality of the scans is not as good as those of the Brodatz images above. There are a total of 91 images in the rotation set (13 textures at 7 rotations.) The filenames indicate the texture subject and the angle of rotation (e.g. bark.000, bark.030, bark.060, etc.)

Name	Description	Size	Color/Mono
bark	Bark (D12)	512	Mono
brick	Brick (D94)	512	Mono
bubbles	Bubbles (D112)	512	Mono
grass	Grass (D9)	512	Mono
leather	Leather (D24)	512	Mono
pigskin	Pigskin (D92)	512	Mono
raffia	Raffia (D84)	512	Mono
sand	Sand (D29)	512	Mono
straw	Straw (D15)	512	Mono
water	Water (D38)	512	Mono
weave	Weave (D16)	512	Mono
wood	Wood (D68)	512	Mono
wool	Wool (D19)	512	Mono

Volume 2. − AERIALS

Name	Description	Size	Color/Mono
2.1.01	San Diego, CA (Miramar NAS)	512	Color
2.1.02	San Diego, CA	512	Color
2.1.03	San Francisco, CA (Golden Gate)	512	Color
2.1.04	Oakland, CA	512	Color
2.1.05	San Diego, CA (North Island NAS)	512	Color
2.1.06	Woodland Hills, CA	512	Color
2.1.07	Foster City, CA	512	Color
2.1.08	San Diego, CA	512	Color
2.1.09	San Diego, CA (Point Loma)	512	Color
2.1.10	San Diego, CA (Shelter Island)	512	Color
2.1.11	Earth from space	512	Color
2.1.12	San Diego, CA (Downtown)	512	Color
2.2.01	San Diego, CA	1024	Color
2.2.02	San Diego, CA	1024	Color
2.2.03	San Diego, CA	1024	Color
2.2.04	Richmond, CA	1024	Color
2.2.05	San Diego, CA (Miramar NAS)	1024	Color
2.2.06	San Francisco, CA (Bay Bridge)	1024	Color
2.2.07	Oakland, CA	1024	Color
2.2.08	San Diego, CA	1024	Color
2.2.09	San Francisco, CA	1024	Color
2.2.10	Richmond and San Rafael, CA	1024	Color
2.2.11	Stockton, CA	1024	Color
2.2.12	San Francisco and Oakland, CA	1024	Color
2.2.13	Stockton, CA	1024	Color
2.2.14	Shreveport, LA	1024	Color
2.2.15	San Francisco, CA	1024	Color
2.2.16	San Francisco, CA	1024	Color
2.2.17	San Francisco, CA	1024	Color
2.2.18	Stockton, CA	1024	Color
2.2.19	Stockton, CA	1024	Color
2.2.20	Stockton, CA	1024	Color
2.2.21	San Francisco, CA	1024	Color
2.2.22	San Francisco and Oakland, CA	1024	Color
2.2.23	San Diego, CA	1024	Color
2.2.24	Stockton, CA	1024	Color
3.2.25	Pentagon building	1024	Mono
wash-ir	Washington, D.C. (infra-red)	2250	Color

Volume 3. – MISCELLANEOUS

Name	Description	Size	Color/Mono
4.1.01	Female (NTSC test image)	256	Color
4.1.02	Couple (NTSC test image)	256	Color
4.1.03	Female (from Bell Labs?)	256	Color
4.1.04	Female	256	Color
4.1.05	House	256	Color
4.1.06	Tree	256	Color
4.1.07	Jelly beans	256	Color
4.1.08	Jelly beans	256	Color
4.2.01	Splash	512	Color
4.2.03	Mandrill (a.k.a. Baboon)	512	Color
4.2.05	Airplane (F-16)	512	Color
4.2.06	Sailboat on lake	512	Color
4.2.07	Peppers	512	Color
5.1.09	Moon surface	256	Mono
5.1.10	Aerial	256	Mono
5.1.11	Airplane	256	Mono
5.1.12	Clock	256	Mono
5.1.13	Resolution chart	256	Mono
5.1.14	Chemical plant	256	Mono
5.2.08	Couple (NTSC test image)	512	Mono
5.2.09	Aerial	512	Mono
5.2.10	Stream and bridge (only 64 gray levels)	512	Mono
5.3.01	Male	1024	Mono
5.3.02	Airport	1024	Mono
7.1.01	Truck	512	Mono
7.1.02	Airplane	512	Mono
7.1.03	Tank	512	Mono
7.1.04	Car and APCs	512	Mono
7.1.05	Truck and APCs	512	Mono
7.1.06	Truck and APCs	512	Mono
7.1.07	Tank	512	Mono
7.1.08	APC	512	Mono
7.1.09	Tank	512	Mono
7.1.10	Car and APCs	512	Mono
7.2.01	Airplane (U-2)	1024	Mono
boat.512	Fishing Boat	512	Mono
house	House	512	Color
gray21.512	21 level step wedge	512	Mono
ruler.512	Pixel ruler	512	Mono

Please note that we no longer distribute the following images that were previously available in our database. Although these images have played a significant role in the history of image processing, they no longer represent the best examples for future research.

Name	Description	Size	Color/Mono
4.2.02	Female (Tiffany)	512	Color
4.2.04	Female (Lena, or Lenna)	512	Color
elaine.512	Female (Elaine)	512	Mono
numbers.512	256 level test pattern	512	Mono
testpat.1k	General test pattern	1024	Mono

Volume 4. – SEQUENCES

Each of the sequences consist of multiple images showing motion of the subject matter. The image filenames consist of the name shown below followed by the number in the sequence (e.g. 6.1.01, 6.1.02, etc.)

Sequence 6.2 consists of 32 images but only the first 16 appear to be a true motion sequence. Images 17 through 32 show some motion but not in any clear direction. They are included in the database only because they have been part of it for several years.

Name	Description	Size	Frames	Color/Mono
6.1	Walter Cronkite moving head	256	16	Mono
6.2	Chemical plant flyover (close view)	256	32	Mono
6.3	Chemical plant flyover (far view)	256	11	Mono
motion	Toy vehicles	512	10	Mono

Volume 1: Textures - Brodatz textures, 512×512
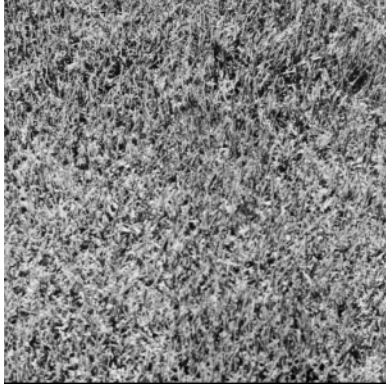
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1.1.02

1.1.03
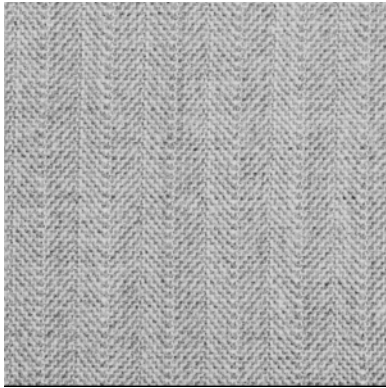
1.1.04
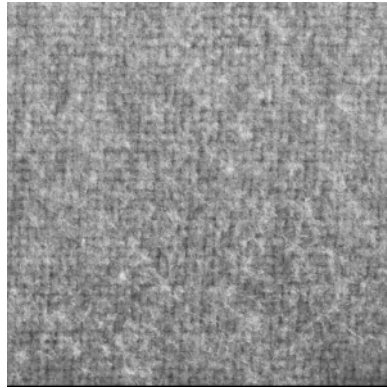
1.1.05
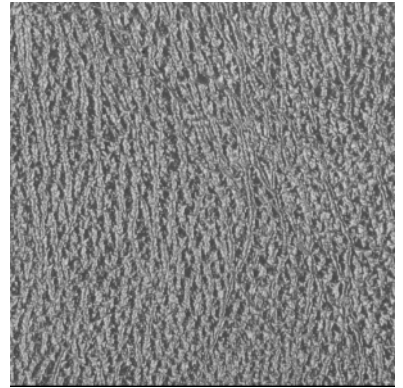
1.1.06
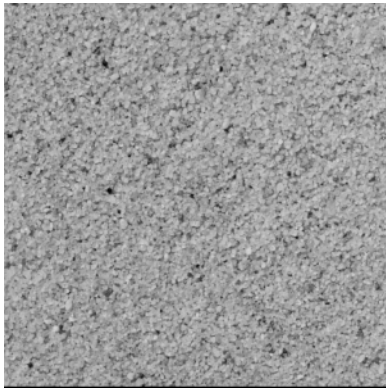
1.1.07
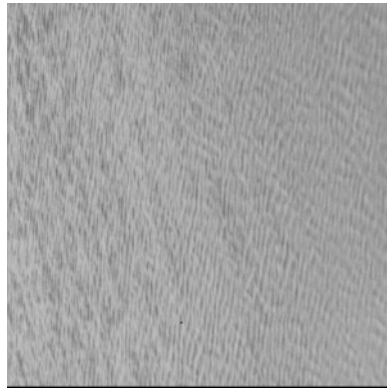
1.1.08
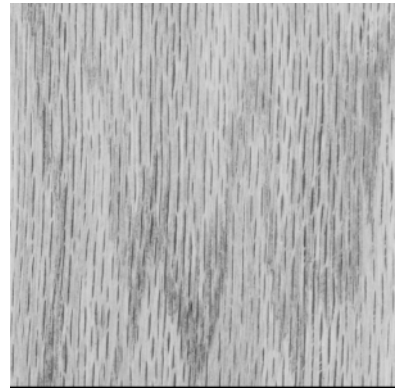
1.1.09
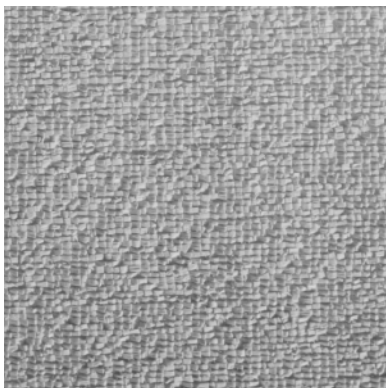
1.1.10
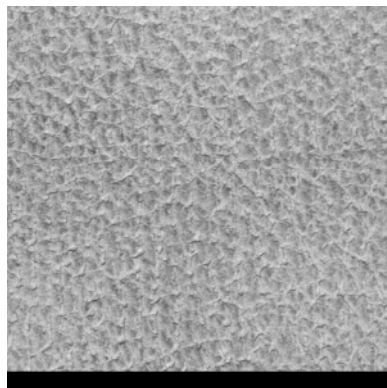
1.1.11
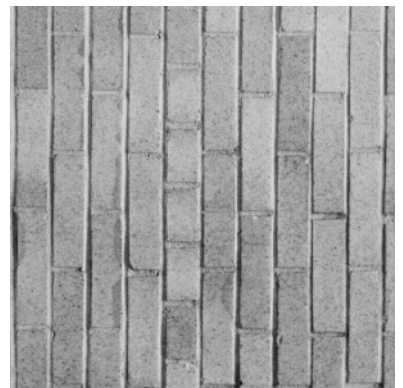
1.1.12
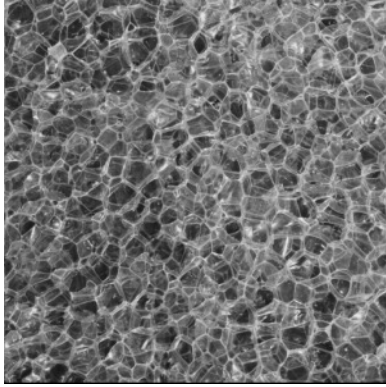
1.1.13

Volume 1: Textures - Brodatz textures, 512×512, histogram equalized
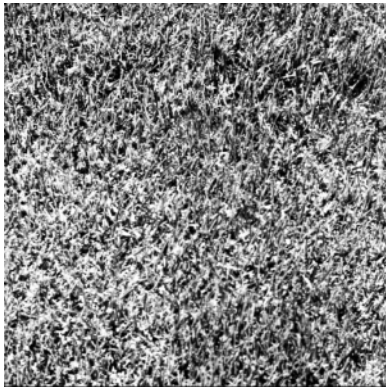
1.2.01

1.2.02

1.2.03
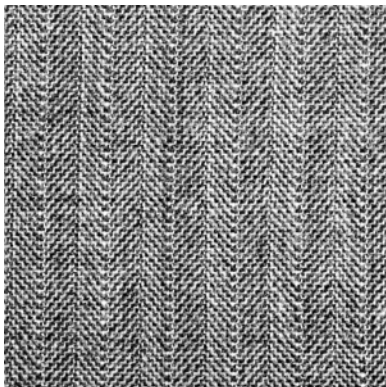
1.2.04
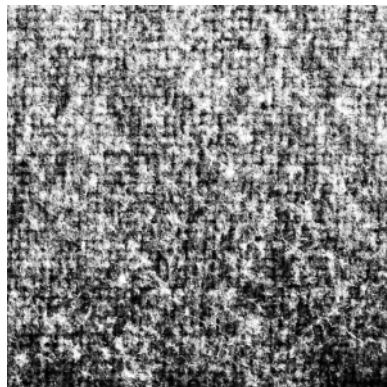
1.2.05
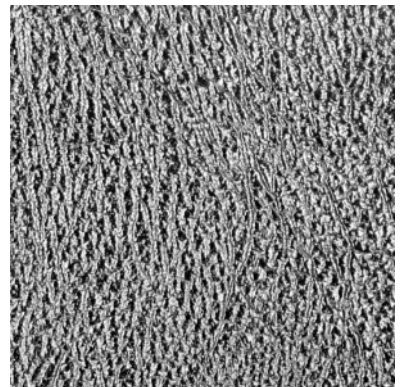
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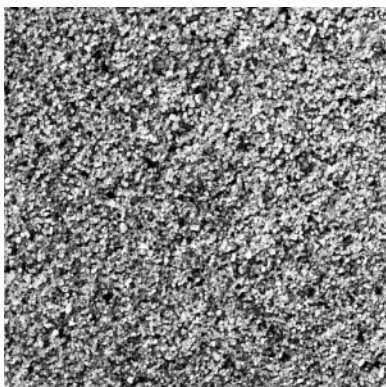
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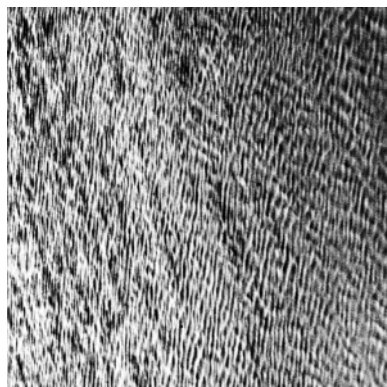
1.2.08
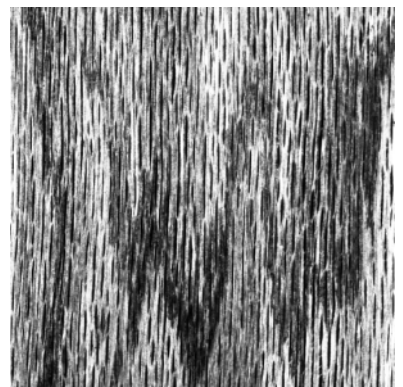
1.2.09
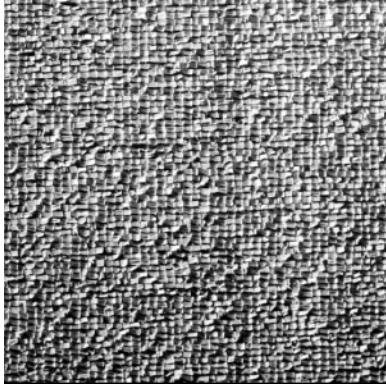
1.2.10
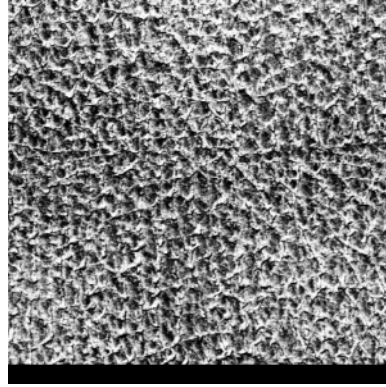
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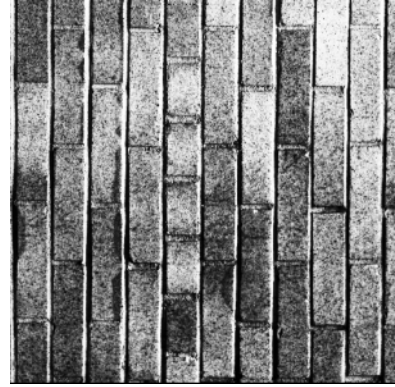
1.2.12
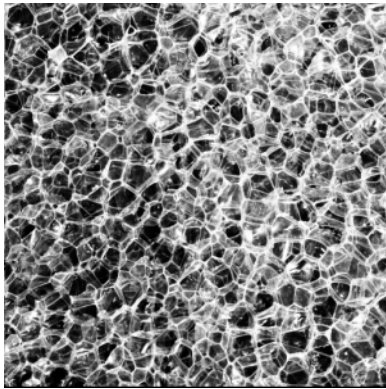
1.2.13

Volume 1: Textures - Brodatz textures, 1024×1024
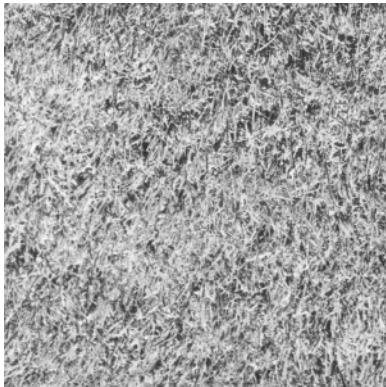
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1.3.02

1.3.03
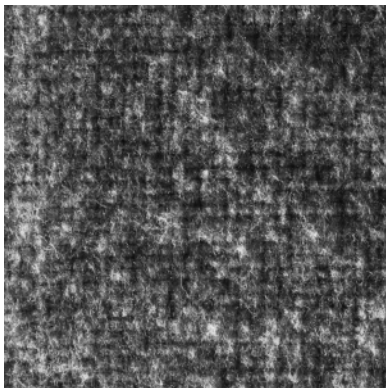
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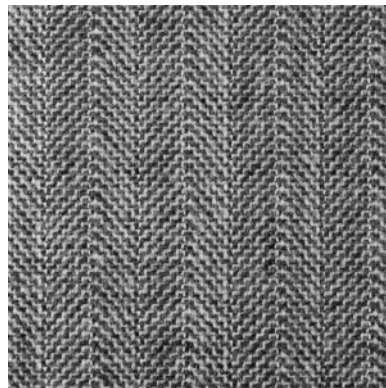
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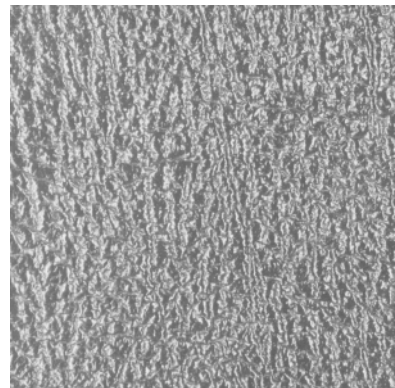
1.3.06

1.3.07
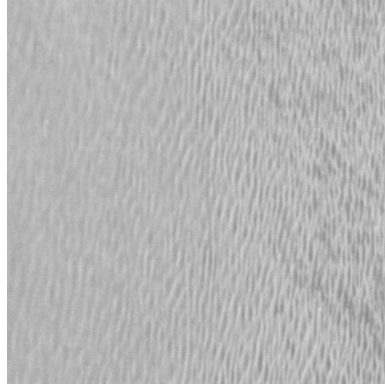
1.3.08
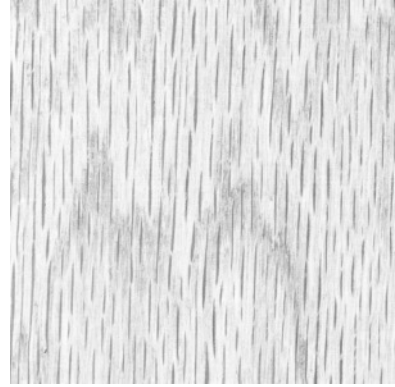
1.3.09
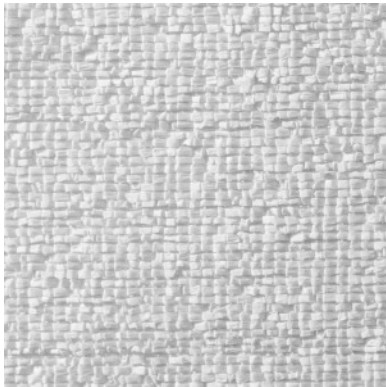
1.3.10
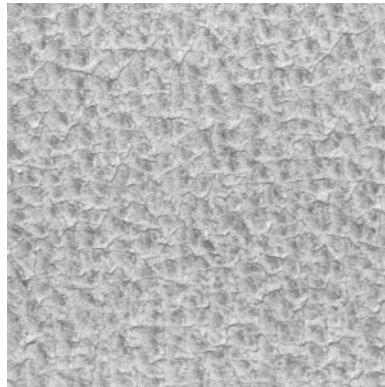
1.3.11
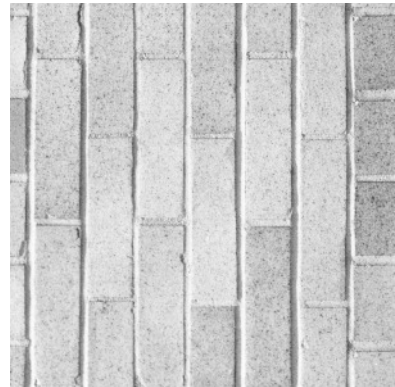
1.3.12
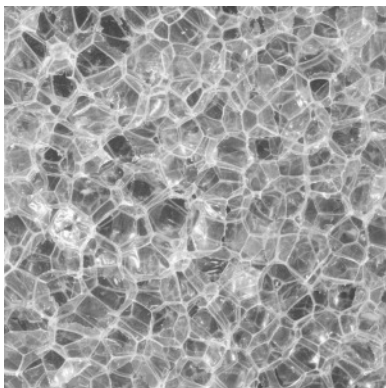
1.3.13

Volume 1: Textures - Miscellaneous textures, 1024×1024
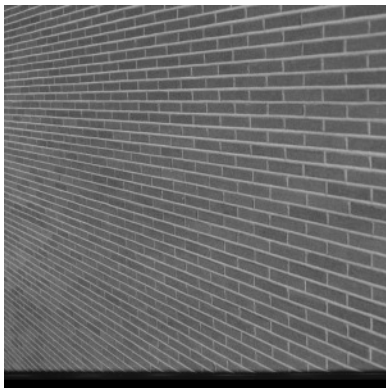
1.4.01
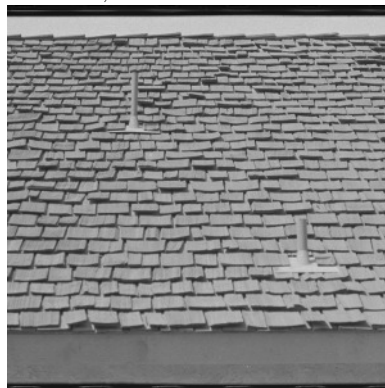
1.4.02

1.4.03
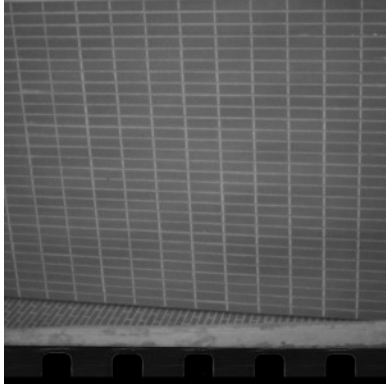
1.4.04
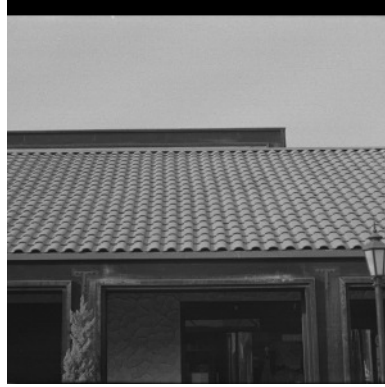
1.4.05

1.4.06
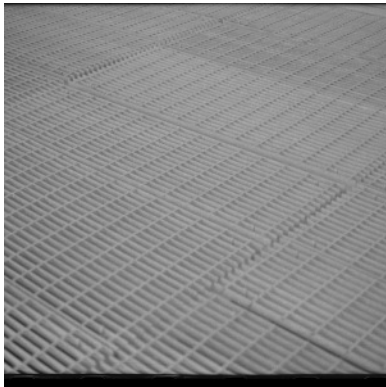
1.4.07
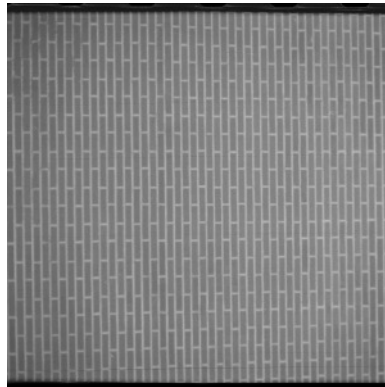
1.4.08
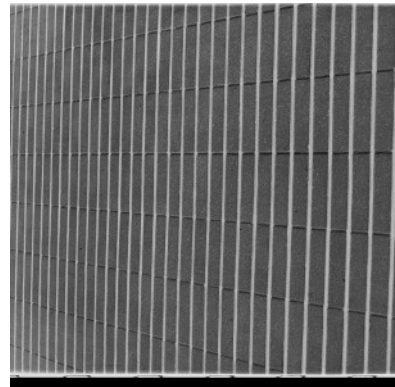
1.4.09
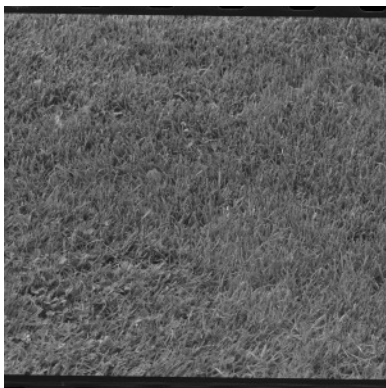
1.4.10
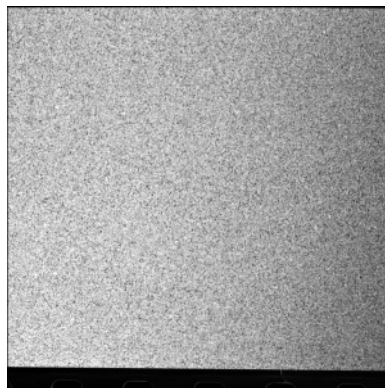
1.4.11
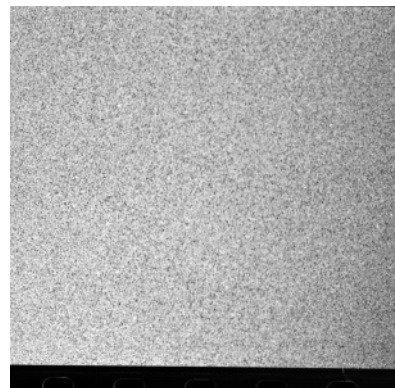
1.4.12

Volume 1: Textures - Miscellaneous textures, 512×512
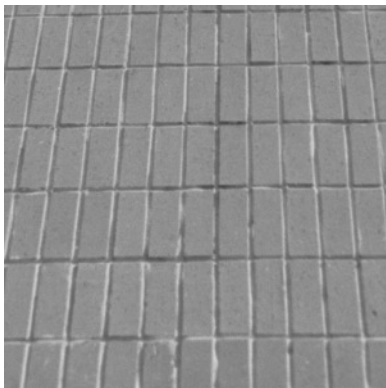
1.5.01
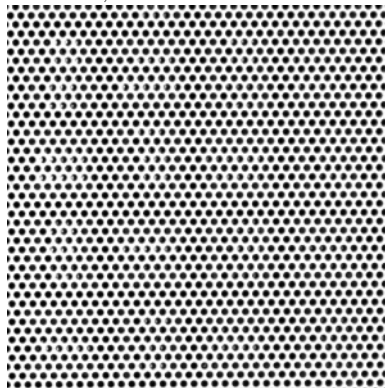
1.5.02
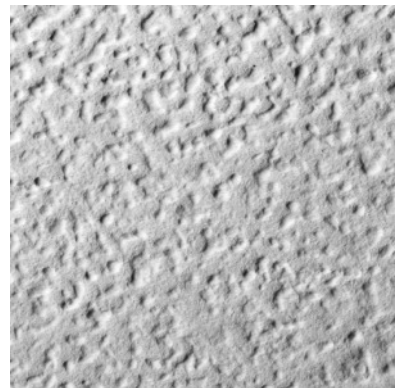
1.5.03
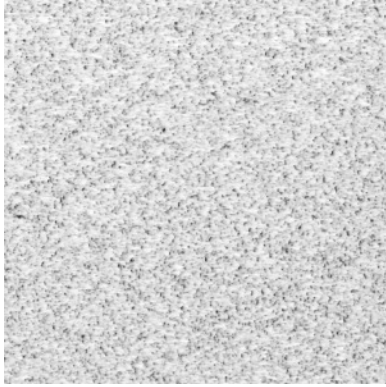
1.5.04
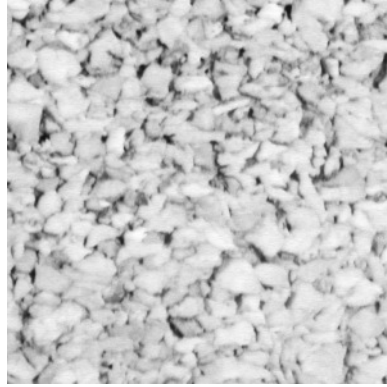
1.5.05

1.5.06
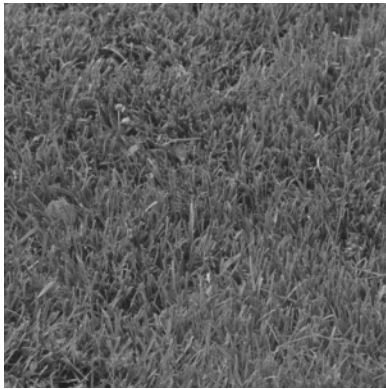
1.5.07

Volume 1: Textures - Texture mosaics, 512×512
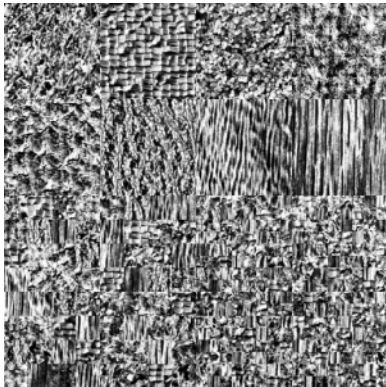
texmos1.p512
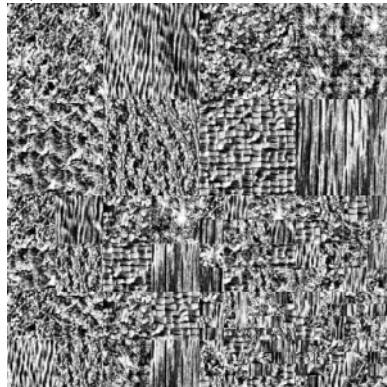
texmos2.p512
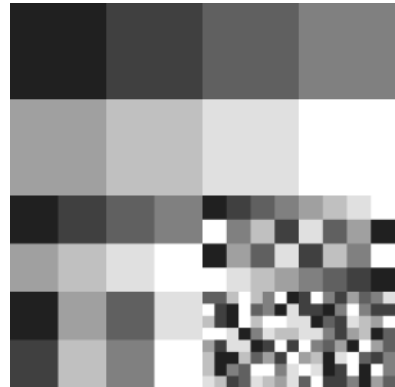
texmos2.s512
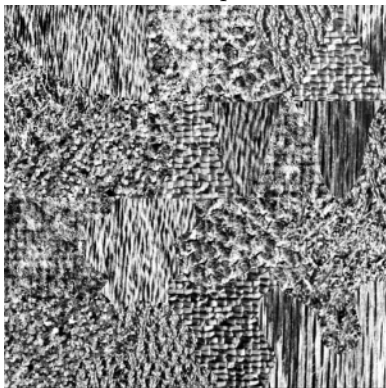
texmos3.p512
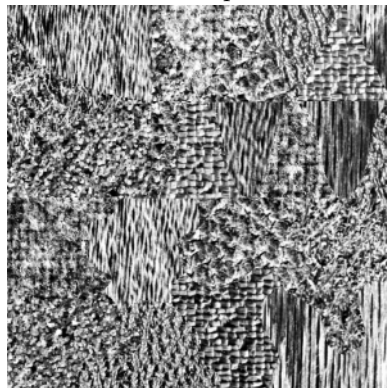
texmos3b.p512

texmos3.s512

Volume 2: Aerials - 512×512

2.1.01

2.1.02

2.1.03
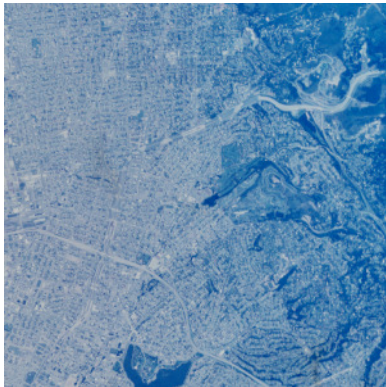
2.1.04

2.1.05
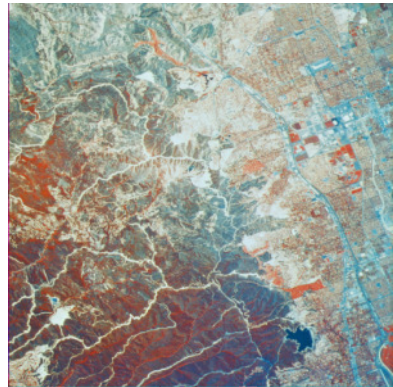
2.1.06

2.1.07

2.1.08

2.1.09

2.1.10
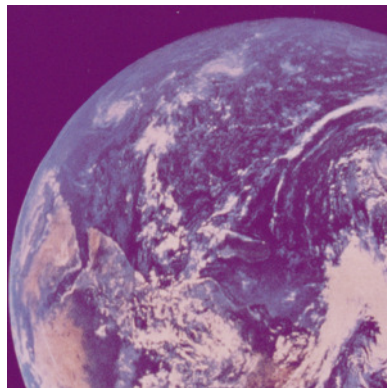
2.1.11

2.1.12

2.2.01
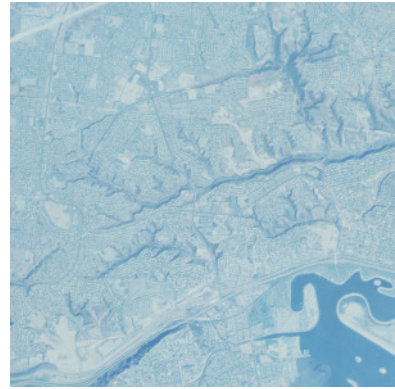
2.2.02

2.2.03

2.2.04

2.2.05

2.2.06

2.2.07

2.2.08

2.2.09

2.2.10

2.2.11
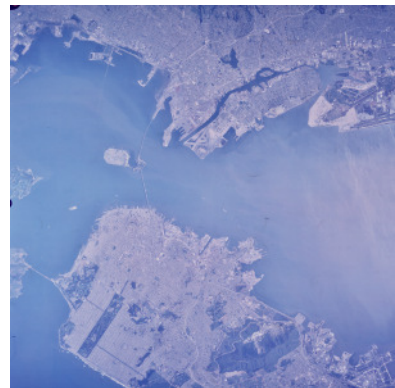
2.2.12

2.2.13

2.2.14
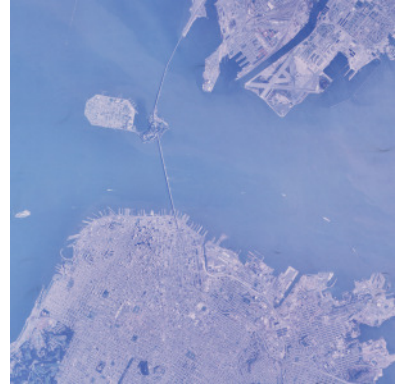
2.2.15

2.2.16
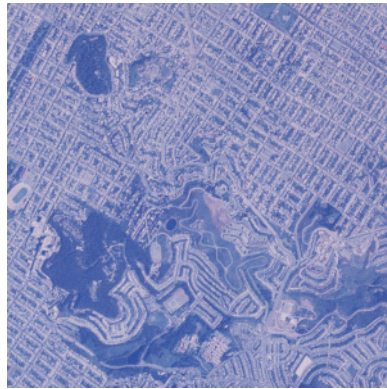
2.2.17

2.2.18

2.2.19

2.2.20
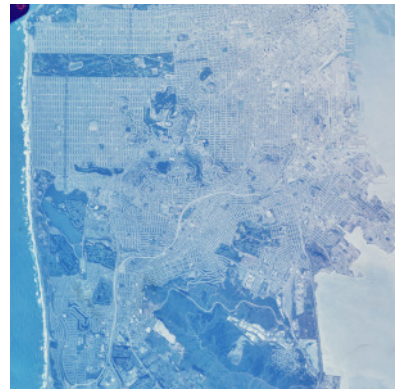
2.2.21

2.2.22
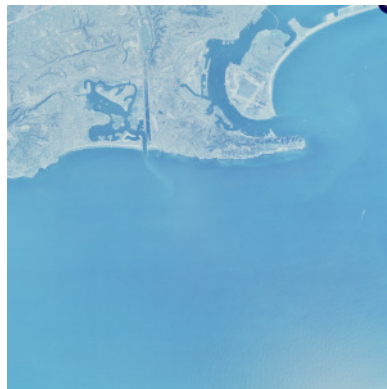
2.2.23

2.2.24

3.2.25
Volume 2: Aerials - Other sizes
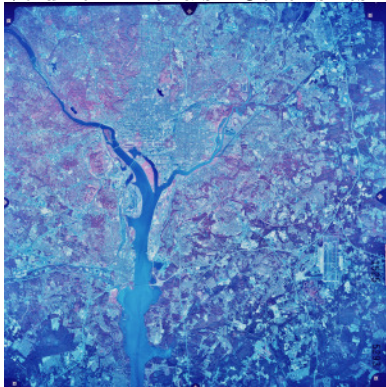
wash-ir

4.1.01
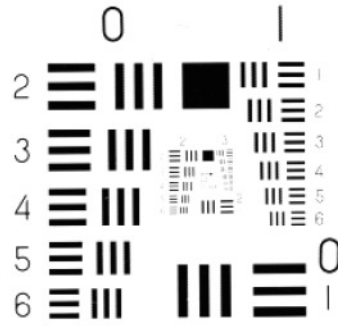

4.1.02

4.1.03

4.1.04

4.1.05

4.1.06

4.1.07

4.1.08

5.1.09

5.1.10
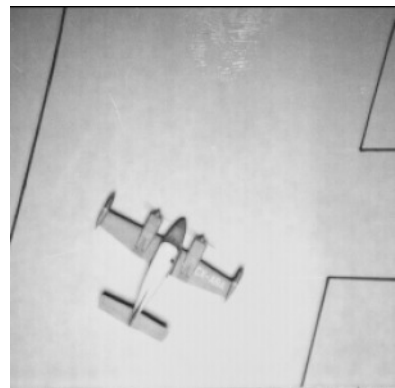
5.1.11

5.1.12

5.1.13

5.1.14

Volume 3: Miscellaneous - 512×512

4.2.01
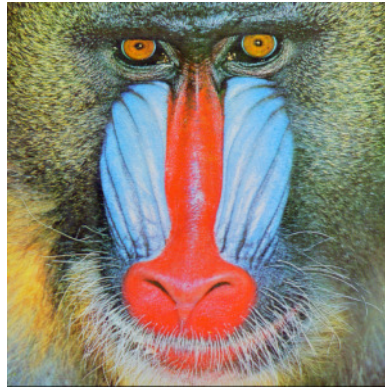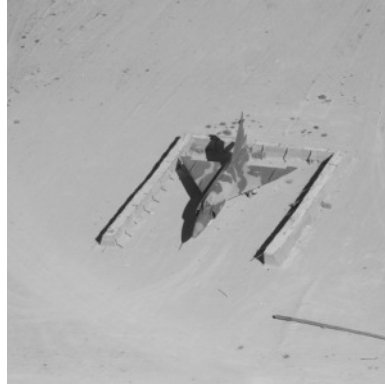

4.2.03

4.2.05

4.2.06

4.2.07

house

5.2.08

5.2.09

5.2.10

7.1.01

7.1.02

7.1.03

7.1.04
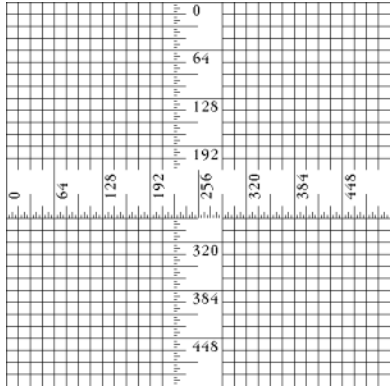

7.1.05

7.1.06

7.1.07

7.1.08

7.1.09
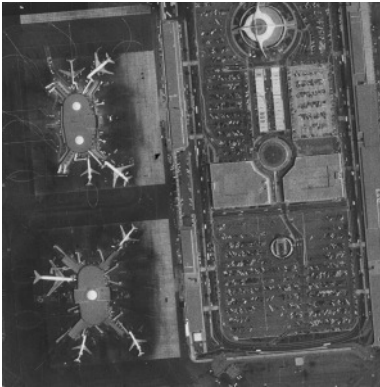

7.1.10

boat.512

gray21.512
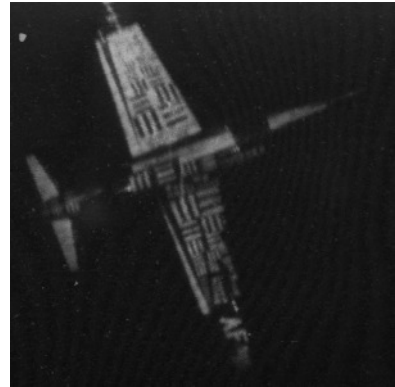
ruler.512

Volume 3: Miscellaneous - 1024×1024

5.3.01

5.3.02

7.2.01

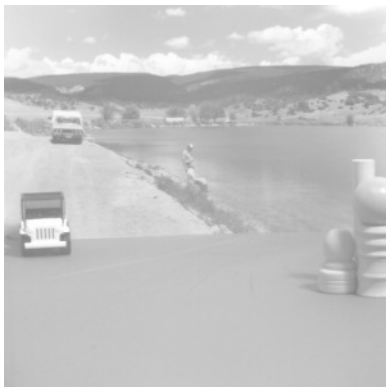Volume 4: Sequences

6.1.01

6.1.08

6.1.16

6.2.01

6.2.08

6.2.16

6.3.01

6.3.06

6.3.11

motion01.512

motion05.512

motion10.512