



Centre for Image Analysis

Swedish University of Agricultural Sciences
Uppsala University

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Kylberg Texture Dataset v. 1.0

Gustaf Kylberg

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Centre for Image Analysis,
Swedish University of Agricultural Sciences &
Uppsala University

`gustaf.kylberg@cb.uu.se` alt. `gustaf.kylberg@gmail.com`

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1 Summary

This document describes the Kylberg texture dataset and how it was compiled. The dataset come in two versions; *without* rotated texture patches, see Table 1 for properties, and *with* rotated texture patches, see Table 2 for properties.

Table 1: Properties for the texture dataset *without* rotated texture patches.

number of texture classes	28
number of unique samples/class	160
total number of samples	4,480
texture patch size	576×576 pixels
Image format	8bit gray scale PNG
total size of dataset	1.76 GB

Table 2: Properties for the texture dataset *with* rotated texture patches.

number of texture classes	28
number of rotations	12
rotation increment	30 degrees
number of samples/class	1,920
total number of samples	53,760
texture patch size	576×576 pixels
image format	8bit gray scale PNG
total size of dataset	10.3 GB

2 Material

A number of textured surfaces, including fabrics and surfaces of stone, were imaged in the local surroundings. Textured surfaces were also arranged using articles such as rice grains, sesame seeds and lentils. The texture class names indicate the source material and Table 3 gives a short description of each class.

Table 3: Names of texture classes and a short description of the material.

Class Name	Description
blanket1	Woven blanket.
blanket2	Woven blanket.
canvas1	Woven linen canvas.
ceiling1	Painted concrete ceiling.
ceiling2	Metal plate ceiling with small holes.
cushion1	Woven fabric on a cushion.
floor1	Plastic plate floor on top of concrete.
floor2	Linoleum floor with stone imitation.
grass1	Grass from a lawn.
lentils1	Red lentils on a flat surface.
linseds1	Linseeds on a flat surface.
oatmeal1	Oatmeal on a flat surface.
pearlsugar1	Pearl sugar on a flat surface.
rice1	White rice on a flat surface.
rice2	Arborio rice on a flat surface.
rug1	Rya rug (long pile rug).
sand1	Sand surface.
scarf1	Woven scarf.
scarf2	Woven scarf.
screen1	Woven fabric on a screen.
seat1	Woven fabric on chair.
seat2	Woven fabric on chair.
sesameseeds1	Sesame seeds on a flat surface.
stone1	Flat part of a granite base of a sculpture.
stone2	Flat part of stone base of a building.
stone3	Flat part of stone wall.
stoneslab1	Stone slab from a building's entrance.
wall1	Painted lime plaster of an outdoor wall.

3 Image Acquisition

Each texture class was imaged under only one light setting from one direction on the same distance. The images were acquired with a Canon EOS 550d DSLR camera with a Sigma 17-70 mm zoom lens. Focus and exposure were manually set. The $5,184 \times 3,456$ pixel size images were acquired as lossless compressed raw files (CR2). The raw files were corrected for lens distortion, chromatic aberration and vignetting formed by the Sigma lens. The corrections was performed according to the settings in the “Adobe (SIGMA 17-70mm F2.8-4 DC Macro OS HSM, Canon)” lens profile in Adobe Photoshop CS5¹. The images were then converted to gray scale and saved as lossless PNG files. Lens correction and raw conversion was done in Adobe Photoshop CS5.

4 Texture Patch Generation

Four images were acquired of each material. To generate the texture patches, each image was divided into 40 square patches of size 576×576 pixels. This leaves space around the edges of the original image to allow for rotations of the squares later on for the rotated data set. This results in 160 unrotated unique samples per class. Figure 1 shows example patches from each class.

¹Adobe Photoshop developed by Adobe, <http://www.adobe.com/>

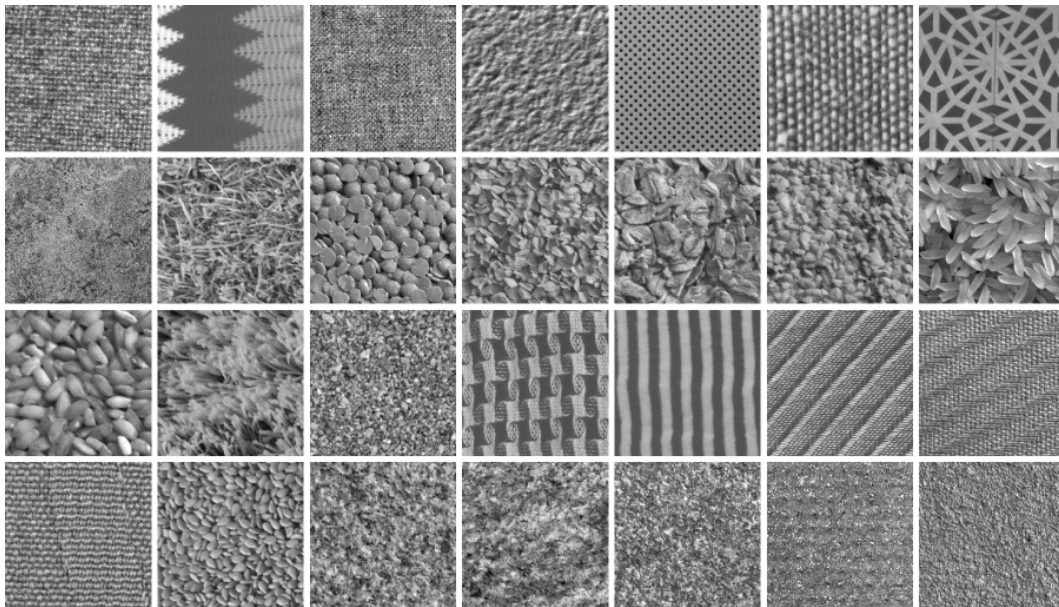


Figure 1: Example patches from each texture class.

4.1 Rotating Patches

At the same center positions as the texture patches were extracted from in Section 4 twice as large patches were cut out and rotated with θ degrees, where $\theta \in [0, 30, 60, \dots, 330]$. Bicubic interpolation was used when rotating the patches. The rotated patches were then cropped to 576×576 pixels now being of the same size and location as the non-rotated patches in Section 4. Figure 2 shows all rotations of one texture patch from the “cushion1” class.

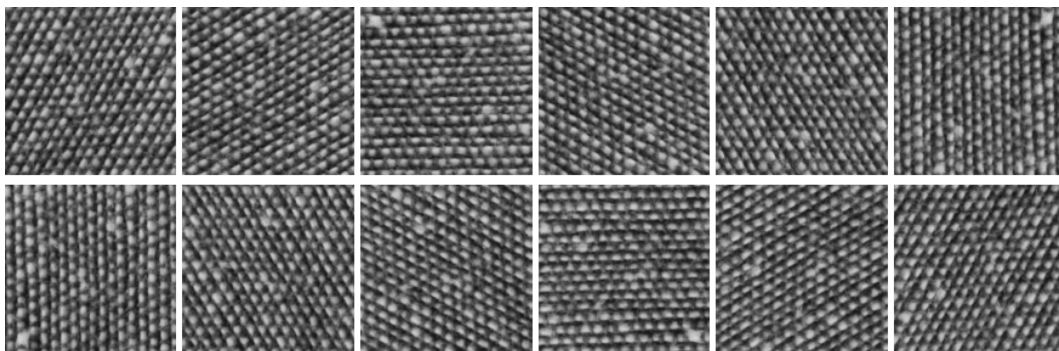


Figure 2: Example of one texture patch from the class “cushion1” and its twelve rotated versions (30 degrees increments). The patches are ordered left-to-right (top row) and right-to-left (bottom row).

4.2 Patch Normalization

To reduce the bias of different exposure settings for different textures all texture patches were normalized to have the same mean gray value, μ , and standard deviation, σ . The patches are saved as 8-bit data and therefore we set $\mu = 127$ and $\sigma = 40$. A higher value of σ risked to introduced saturated pixels. Texture patches may show small deviations from these values due to the conversion from floating point values to unsigned 8-bit integers.

The texture patch generation including patch rotation and normalization was done in MATLAB R2011a².

4.3 File Naming

Each class has it's own directory named with the class name. Texture patches are named as:

`cushion1-b-p023-r030.png`

where `cushion1` is the class name, `b` is the sample name (possible characters are `a`, `b`, `c` and `d`), `p023` is the patch number 23, `r030` patch is rotated 30 degrees.

5 Availability

The dataset is available as 7-zip³ archives online via the author's personal web page at the Centre for Image Analysis:

`http://www.cb.uu.se/~gustaf/texture/`

Alternatively, contact the author directly. The untouched raw originals as well as the preprocessed png originals from which the patches were extracted are all available at this location.

5.1 Updates

While the dataset presented in this document (v 1.0) will be kept in it's original form the dataset may be updated with additional texture classes, following the same procedure of patch generation.

6 How to Reference the Dataset

If you use the texture dataset in your research or in any other way, please refer to it as:

G. Kylberg. *The Kylberg Texture Dataset v. 1.0*, Centre for Image Analysis, Swedish University of Agricultural Sciences and Uppsala University, External report (Blue series) No. 35.
Available online at: `http://www.cb.uu.se/~gustaf/texture/`

²MATLAB developed by MathWorks, `http://www.mathworks.com/`

³7-Zip is an open source file archiver software, `http://www.7-zip.org/`