

Edge Detection Software

This document describes software written in MATLAB for analyzing intensity changes in 2D images, stored in the /home/cs332/download/edges subdirectory on the CS file server (also contained in a zip file linked from the course schedule page). These notes provide the name of each M-File, format for calling each function, and brief comments describing the function.

getRange.m

```
[minv maxv] = getRange(image, border);
```

getRange returns the minimum and maximum values contained in a central region of an input image that excludes a border around the outer edge of the image.

gauss2D.m

```
g = gauss2D(sigma);
```

gauss2D returns a 2D square matrix of samples of the 2D Gaussian function. The size of the matrix is $(8*\sigma+1)$ and the x and y values for the Gaussian range from $-4*\sigma$ to $+4*\sigma$.

laplacian.m

```
lap = laplacian(w);
```

laplacian returns a 2D square matrix of samples of a Laplacian-of-Gaussian function with a diameter of w for the central positive region. The size of the matrix is $(4*w+1)$ and the x and y values for the Laplacian-of-Gaussian function range from $-2*w$ to $+2*w$.

conv2D.m

```
conv = conv2D(image, operator);
```

conv2D convolves the input image with the input convolution operator and returns a 2D matrix of the same size as the image, containing the convolution result. No convolution values are computed for a border around the outer edge of the image that is half the operator size (the value 0 is stored here).

zeros2D.m

```
zc = zeros2D(conv);
```

zeros2D returns a 2D matrix of the slopes of the zero-crossings of the input matrix of convolution results. A value of 0 is placed at locations that do not correspond to zero-crossings.

zcMap.m

```
zc = zcMap(zeros2D, threshold);
```

zcMap returns a 2D 1-bit (logical) matrix with the value 1 at the location of each zero-crossing in the input zeros2D matrix, and 0 elsewhere. The input threshold is a fraction between 0.0 and 1.0. Only zero-crossings whose slope is larger than this fraction of the maximum slope are preserved. If the threshold is 0.0, all zero-crossings are preserved.

overlayZC.m

```
newImage = overlayZC(image, zcMap);
```

overlayZC returns a 2D 8-bit matrix of the same size as the input image that contains white zero-crossing contours (from the input zcMap) superimposed on a low-contrast version of the image.

displayImage.m

```
displayImage(image, border);
```

displayImage is a short-cut function for invoking `imtool` on an image with the range of values that are contained within a central region that excludes a border around the outer edge of the image.