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Saliency Detection: A Spectral Residual Approach

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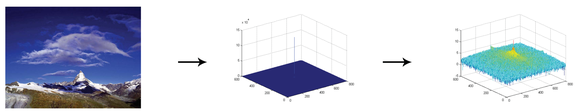
Key words

Saliency detection, Log-spectra, Spectral residual

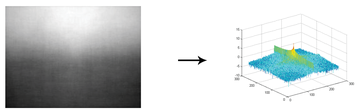
Log-spectra of images

The Log-spectrum of an image:



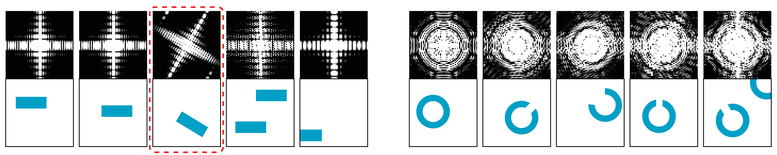

```
logSpec = fftshift(log(abs(fft(inImg))));
```

The average log spectrum of 2288 images:



Log spectra of different images share a similar shape.

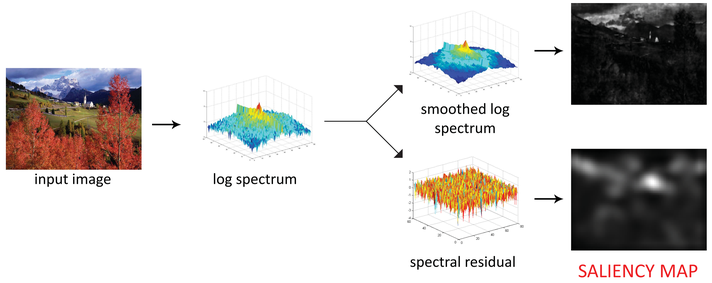
Finding differences in log-spectra



The log-spectra of images is immune to spatial shifts and other “regular” transformations. However, in some “unusual” cases, such as rotation, the log-spectra will active strongly.

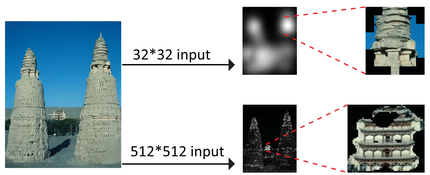
Looking for something different in the log-spectrum...

Spectral residual



Scale selection:

The scale of saliency detection is based on the size of input image. If the input image is large, the spectral residual will be more sensitive to small perturbation.



Implementation

```
%% Read image from file
inImg = imread('img.jpg');
inImg = im2double(rgb2gray(inImg));
inImg = imresize(inImg, [64, 64], 'bilinear');

%% Spectral Residual
myFFT = fft2(inImg);
myLogAmplitude = log(abs(myFFT));
myPhase = angle(myFFT);
mySmooth = imfilter(myLogAmplitude, fspecial('average', 3), 'replicate');
mySpectralResidual = myLogAmplitude - mySmooth;
saliencyMap = abs(ifft2(exp(mySpectralResidual + i*myPhase))).^2;

%% After Effect
saliencyMap = imfilter(saliencyMap, fspecial('disk', 3));
saliencyMap = mat2gray(saliencyMap);
imshow(saliencyMap, []);
```

Result show