Exercise in Change Detection via MAF

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The aim of this exercise is to take two images taken over Kenya in 1987 and 1989 respectively, and find the changes between the two. This is to be done by computing the difference between the two images – after they have been normalized – and computing the MAF of this difference.

1. In order to load the two images use the function `freadenvit.m`. The two images are called `thika87` and `thika89`. Load by e.g. writing `Im87=freadenvit('thika87')` . A function for viewing the images is `imshowrgb.m`, which we find easier to use then the standard MatLab functions in this case. An example use is `imshowrgb(Im87, [3 2 1], 3)`.

2. To get the two images in the same approximate scale, and thereby correcting for arbitrary linear light changes, normalize the images such that they have zero mean and unit variance.

3. Calculate the difference between the two normalized images. This is the image that you should calculate the MAF of.

4. Compute the image shifted one pixel right and one pixel down, i.e.
```
Ih=Im(2:end,1:end-1,:);
Iv=Im(1:end-1,2:end,:);
Id=(Ih+Iv)/2;
```

5. Calculate the covariance (use `cov` in MatLab) of the difference image, `Im`, and the change by shifting the image , i.e. `Id-Im`.

6. Compute the MAF components from these two covariances. Use either `eig` or principal components.

7. Consider *Allan Aasbjerg Nielsen (1999). "Orthogonal Transformations", lecture note.* Check that your MAF result fulfills criteria *i* and *ii* on the top of page 4.

8. In what sense are the linear MAF combinations orthogonal?

9. Choose the appropriate MAF component and do change detection via simple thresholding.

10. Improve this change detection estimate, by adding a homogenity constraint. Note that this is as binary labelling problem and use the results from your previous MRF exercise.