
Subject: Re: mnf and masks

Posted by [Peter Mason](#) on Fri, 01 Jul 2005 00:25:49 GMT

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msauer@calpoly.edu wrote:

> I've recently applied forward mnf in ENVI to an image in which I've
> employed a mask to knock out the region surrounding the one I'm
> interested in. The MNF output shows that the masked area has values of
> zero while the region I'm interested in has + or - values. Good.
> However, when I apply the inversion using the stats from this
> transform, the image that results shows that the previously masked
> areas have values, the same throughout, and z-profiles that appear to
> approximate the mean spectra of the whole region I'm interested in.
> Thought that these previously masked areas should still be 0 with a
> flat line for a spectrum, indicating no data. I've done a map
> difference image thru band math which seems to indicate a difference
> of ~0.002 (rounding error?). Why does area in the inversion
> corresponding to the mask employed in the mnf have a spectrum and
> data values?

The inverse MNF transform is done with a calculation like this (shown here for one spectrum):

```
inv_mnf_spec = (mnf_spec ## inv_mnf_trans_matrix) + scene_mean_spec
```

"Scene_mean_spec" is the mean spectrum, calculated over the masked-on pixels in the (earlier) forward MNF stats step.

MNF is driven by differences from a mean spectrum, so this mean is subtracted from all the spectra when going into MNF space and added back when going out. It's stored in the MNF stats file.

The mask option in ENVI's forward-MNF module is a bit confusing, as this module's work is done in four stages: estimation of noise stats, calculation of signal stats, calculation of transformation matrices from the signal & noise stats, actually transforming the image. It might look like the mask is just for tidying up the result in the last stage but it is also used to focus the signal stats in the second stage. (IMHO this is its *main* use and it should get a mention in the docs.) I don't think that the noise stats are done through the mask (they never used to be in the past) - they (now) have a separate spatial subsetting option of their own.

ENVI's inverse-MNF module has no knowledge of whether or not a mask was used in the forward transform. (It isn't safe to assume that an all-zero MNF spectrum means "this one was masked off so the inverse-MNF spectrum should be all-zero as well".)

The lack of a mask option in this module is probably an oversight. It's much more straightforward than the forward module and has no "higher reason" for a mask option. I imagine that no-one has asked RSI to put one in yet.

HTH

Cheers
Peter Mason
