
Subject: Re: Convolution, IDL & Numerical Recipes
Posted by [muzic](#) on Tue, 12 Nov 2002 14:10:32 GMT
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The definition of discrete convolution is
$$c[n] = \text{sum_over_i} (a[i] * b[n-i])$$
where c equals a convolved with b.

Correlation differs in that sign inside the [] of b
$$d[n] = \text{sum_over_i} (a[i] * b[n+i])$$
where d equals correlation of a with b

In both cases, `sum_over_i` can mean sum as i goes from negative infinity to positive infinity. Since computers have finite speed and memory, this does not make implementation practical ... unless, of course, a and b have only a finite number of non-zero values so that multiplication and summing need only be done on non-zeros.

In a IDL, C, MATLAB or whatever implementation, the index of the first element of an array is typically zero or one but not negative. This means how the results are stored in an array representing `c[]` or `d[]` may require an offset since someone might like to calculate `c[-4]`. If we want to put `c[-4]` in the first element of an IDL array, then one would have to apply an offset of four. E.g. let `cc` be a shifted (or offset) version of `c`, so that `cc[0] = c[-4]` and in general `cc[n] = c[n+4]`.

Regarding, "center" and a sharpening filter kernel, ... it is the same principle but the issue is the offset of a or b. Let a be the signal to filter and b be the coefficients of a filter kernel. Then, center should(!) is an offset for the indexing on b. If you follow the details of the math, changing the center should(!) simply shift the result. If IDL implementation does not behave in this way, (or at least in a manner consistent with its documentation) I'd say it is a bug.

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David Fanning <david@dfanning.com> wrote in message
news:<MPG.182c80089cb24eff9899fb@news.frii.com>...

> R.G. Stockwell (sorry@noemail.now) writes:

>

>>> Which would I use if I'm trying to make a pretty image? :-)

>>

>> I suggest running all possible permutations of the keywords, and

>> selecting the one that matches the textbook examples :)

>

> Right. That's what I'm doing now, but those SOBs

> are tricky! I get the same result, but only after

> a tiny histogram stretch that they fail to mention

> to make the final image have the same gray-scale

> range as the original. Fortunately, I've written

> a book too, so the ol' enhance-the-image-so-it-looks-

> better-in-the-book trick is not new to me. :-)

>

> Cheers,

>

> David

>

> P.S. Let's just say that my original plan to write

> a nice, short image processing recipe book for IDL

> users looks like a harder project than I imagined.

> But then, again, I could have started with HISTOGRAM

> instead of CONVOL. :-)