Subject: Re: Compute area between curves
Posted by jameskuyper on Tue, 14 Oct 2008 11:26:49 GMT
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mystea wrote:
> Hi everyone,
>
> I am also working on a topic where I need to numerically calculate an
> integral
> of a tabulated function. However, what I need is an indefinite
> integral, namely,
> the area under a curve as a function of x-coordinate.

You can't calculate the true indefinite integral using numerical methods; that's something that can only be done by using a symbolic math program like Mathematica.

> The procedure int_tabulated only calculates the definite integral,
> given tabulated
> f and its x-coordinates x. Let's say both f and x are double array of
> length nl.
>
> I tried the following fix:
>
> integral=dblarr(nl)
> for i=1, nl-1 do integral[i]=int_tabulated(x[0:i],f[0:i])

What you're getting by this method is not the indefinite integral, but a tabulation of definite integrals. This can represent the indefinite integral, in much the same sense that your x and f arrays represent the function you want to integrate, but it is not the indefinite integral itself.

> I thought it will work but not quite! Turns out that in general, the
> result
> integral will not be monotone even if f are always positive.

That should not be the case for the true integral of a function that is always positive, assuming that the x values are sorted.

However, numerical integration always produces no better than an approximation. INT_TABULATED uses a " a five-point Newton-Cotes integration formula", which is basically derived from fitting those five points to a polynomial. The best-fit polynomial could go to negative values within the range of integration, even if all of the data it is being fitted to is positive; in that case, the integral could decrease with increasing x, for some values of x. That seems unlikely, however, if your function is tabulated with sufficient detail.

Could you give a simple example that demonstrates the problem you've seen?