Subject: Re: Gradient of two dimensional field
Posted by Andy Loughe on Mon, 03 Mar 1997 08:00:00 GMT
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Wilpert_Martin wrote:
>
> Hi everybody,
>
> we want to determine the electrical field from a given potential,
> i.e. we have to calculate the gradient of a two dimensional array.
>
> Has anybody a idl-pvwave procedure to do this task?
>
> Thank you in advance
> Martin Wilpert

The gradient of a 2-D field is a vector field, this function computes the
i,j vector components of the gradient, and returns the *magnitude* of
that vector field. It performs one-sided differences at the lateral
boundaries, which is an assumption that your field does not have a
cyclical boundary condition. Let me know if it works for you!

```
;  Compute the magnitude of the vector gradient.
;
;   Andrew F. Loughe   (afl@cdc.noaa.gov)
;

function grad, data, x, y

sz = size(data)  &  im = sz(1)  &  jm = sz(2)

if ( N_params() eq 0 ) then message, ' grad_data = grad(data, x, y)'
if ( sz(0) ne 2 ) then message, 'Input data must be 2-D'
if ( N_elements(x) eq 0) then x = indgen(im) + 1
if ( N_elements(y) eq 0) then y = jm - indgen(jm)

;  Begin here

x2 = x # replicate(1, jm)
y2 = replicate(1,jm) # y

;  i-component
if (x(1) gt x(0)) then dx = shift(x2, -1, 0) - shift(x2, 1, 0)
if (x(1) lt x(0)) then dx = shift(x2, 1, 0) - shift(x2, -1, 0)
grad_x = ( shift(data, -1, 0) - shift(data, 1, 0) ) / dx
```

```
;  j-component
if (y(1) lt y(0)) then dy = shift(y2, 0, 1) - shift(y2, 0, -1)
if (y(1) gt y(0)) then dy = shift(y2, 0, -1) - shift(y2, 0, 1)
grad_y = ( shift(data, 0, 1) - shift(data, 0, -1) ) / dy


;  But for non-cyclic boundary values we still have a problem...
;  Take care of the outter rows and columns
grad_y(*,jm-1) = ( data(*,jm-1) - data(*,jm-2) ) / $
                 ( y2(*,jm-1) - y2(*,jm-2) )
grad_y(*,0)    = ( data(*,1) - data(*,0) ) / ( y2(*,1) - y2(*,0) )


grad_x(im-1,*) = ( data(im-1,*) - data(im-2,*) ) / $
                 ( x2(im-1,*) - x2(im-2,*) )
grad_x(0,*)    = ( data(1,*) - data(0,*) ) / ( x2(1,*) - x2(0,*) )


grad = sqrt(grad_x^2 + grad_y^2)


return, grad

end
```

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"I do not feel obliged to believe that the same God who has endowed us
with
sense, reason, and intellect has intended us to forego their use."
-Galileo