Subject: Re: triangulating over undefined space in irregular grids
Posted by ben.bighair on Wed, 26 Mar 2008 20:10:04 GMT
View Forum Message <> Reply to Message

On Mar 26, 3:57 pm, bjel...@worldwindsinc.com wrote:
> On Mar 26, 11:48 am, Kenneth Bowman <k-bow...@tamu.edu> wrote:
>
>
>
>> In article < 419932f8-47d6-4822-aa67-6f6e235ef...@n77g2000hse.googlegroup s.com >,
>
>> bjel...@worldwindsinc.com wrote:
>>> The setup: I am trying to contour plot a number of variables for a
>>> storm surge grid that has up to 10 km resolution in the open Atlantic,
>>> yet has 8 meter resolution in New Orleans area waterways. The grid
>>> obviously includes most anything at or below sea level for the
>>> Northwest Atlantic domain, but also includes many (200k or so) land-
>>> based grid points (or it would be useless as a storm surge model). I
>>> mention the land-based nodes to express that a coastline mask will not
>>> fix the problem.
>
>>> The problem: When plotting the results using the triangles returned,
>>> the result includes vast areas that are outside of the model domain.
>>> For example, the plot shows data in trangles running from central
>>> Louisiana to New England, yet the grid does not include any land with
>>> an elevation greater than 20 meters. So the grid does include some
>>> land for a range of distances from the coast, from ~5 to ~100 km
>>> inland based on elevation.
>
>> I think your main problem is that TRIANGULATE computes the convex hull of
>> the set of points. That is, there are no "bays" or concave regions in the
>> resulting set of triangles. This produces the long narrow triangles that
>> you see across the SE U.S.
>
>>> Also of importance is that the grid is numbered and ordered in a
>>> counter-clockwise fashion, not in any order of south to north and the
>>> like. This is native to the model which uses a finite element method
>>> for calculations allowing us to successfully resolve conservation of
>>> momentum, velocity, etc at very high resolutions in areas of interest
>>> while maintaining the ability to carry out computation at lower
>>> resolutions over larger areas where mass conservation is
>>> required...such as the Gulf of Mexico. Could I reorder for purposes of
>>> plotting? Sure, but do I need to and where would it get me?
>
>>> I have been through Dr. Bowman's book, Liam Gumley's book, David
>>> Fanning's site, the astro site, the online help, and the German
>>> library of IDL routines with no light shed on the solution.
>

>>> I have fiddled with the tolerance variable passed to triangulate which
>>> has not changed anything until I make it too large at which time...
>>> % TRIANGULATE: Points are co-linear, no solution.
>
>> You might also have some round-off problems, as your grid spacing spans
>> 4 orders of magnitude 10 to 10^4 m. Are your inputs double precision?
>
>> Your best bet may be to learn how to use object graphics polygon objects,
>> but I'm afraid I can't help you there.
>
>> Ken Bowman- Hide quoted text -
>
>> - Show quoted text -- Hide quoted text -
>
>> - Show quoted text -
>
> Yes, I think that is correct. TRIANGULATE is producing the "convex
> hull of the set of points"...in your words ;)
>
> The inputs are all double precision and the data in the files are
> carried out to enough places to avoid round off errors.
> Example definition for node 1:" 1 -90.2350725000 30.4780242000
> -7.9830000000"
> [node long lat bathymetry]
> Of course this is far beyond the precision of any measuring system,
> but that does not matter at the moment.
>
> The nodes at the corners of the triangles shown in the grid plot
> (above) are defined in the grid file. I am going to try using that to
> look for any side of a triangle that is not repeated, which means it
> is on a boundary, and classify the nodes on either end of the line
> (side of triangle) as a memebr of an array descibing FAULT_POLYGONS
> for use in GRIDDATA.
>
> I'll share how that goes.

Hi,

Wow! What a great problem!

I think it is worth pursuing the FAULT_POLYGONS feature of GRIDDATA.
I suggest that you run your points through GRID_INPUT first - these
can be calculated once and then saved for reuse just like the
triangulation can be saved.

Out of enterprising ignorance I have occasionally introduced sample
locations over undefined regions like land. To these locations I
assign whatever the "missing" value is (like NaN). The nice thing

about that is that the triangulation doesn't have to draw line segments that cross undefined regions (like Florida). But I never did that for a problem this scale.

It will be very interesting to know how you resolve this - so I am glad you will share.

Cheers,
Ben
