
Subject: Intersection of polyline curve and polygon in 3D

Posted by [syonoun](#) on Mon, 01 Mar 2010 13:59:41 GMT

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I have, say, N arrays of points that make up N polylines in 3D space. The points that make up the polylines are reasonably close together (maybe 0.5 voxel resolution). I also have M sets of points that define M (possibly overlapping) regions in 3D space. I would like to compute, for each polyline, which of the M regions it passes through. N can be up to 1 million, and M can be any number, but the max so far is about 615.

What is the best way to do this with IDL? Below I've outlined a couple of attempts that I think are somewhat simplistic, and so I'm trying to figure out a better way. I would appreciate any help and/or criticisms of my attempts:

1) Use IDLgrROIGroup's containsPoints method on each IDLgrPolyline. This method seems to work, but it seems slower than (2).

2) Create a (xdim,ydim,zdim,M) byte array, and for each m=1...M, [*,*,*,m] is a 3D binary mask with 1s where the region is active and 0 otherwise. Then,

```
region_masks = bytarr(xdim,ydim,zdim,M)
```

```
for n = 0, N-1 do begin ;; for each polyline
  sz_polyline = n_elements(polyline[n])/3 ;; number of points
  describing polyline
  temp = lonarr(sz_polyline)
  for m = 0, M-1 do begin ;; for each region mask
    temp[*] = m
    test = region_masks[(polyline[n])[0,*], (polyline[n])[1,*],
(polyline[n])[2,*], temp]
    hits = where(test ne 0, n_hits)
    if (n_hits ne 0) then begin
      ;; polyline intersects
    endif else begin
      ;; polyline doesn't intersect
    endelse
  endfor
endfor
```

This method seems faster than method 1 but requires much more space. Both methods can fail in the case where a line segment of the polyline passes through the region, but the points making up the line segment do not lie in the region. The resolution of the points makes this rare, but still it is annoying to know that it can happen.

Thanks for any assistance!
