
Subject: Point/Polygon Routine
Posted by [cavanaugh](#) on Tue, 02 Jan 1996 08:00:00 GMT
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Does anyone have a routine that determines if a given 2-D point is inside a given 2-D polygon?

Thanks in advance.

Charles Cavanaugh

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Charles Cavanaugh | "Words are very unnecessary, they can only do harm"
cavanaugh@ncar.ucar.edu | - Depeche Mode
NCAR Boulder, CO, USA | "Facts all come with points of view"
My opinions | - Talking Heads

Subject: Re: Point/Polygon Routine
Posted by [jlaw](#) on Wed, 03 Jan 1996 08:00:00 GMT
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In article 760@ncar.ucar.edu, cavanaugh@uars1.acd.ucar.edu (Charles Cavanaugh) writes:

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> given 2-D polygon?

I did have, but I left it behind when I changed jobs.

Are you any good at finite elements??(This is where I looked this up)

Consider a triangle of points I,J,K with coordinates
(Xi,Yi) , (Xj,Yj) , (Xk,Yk).

the Area of the triangle is then

$$0.5 * \det \begin{pmatrix} 1 & X_i & Y_i \\ 1 & X_j & Y_j \\ 1 & X_k & Y_k \end{pmatrix}$$

Now take the point P at (Xp, Yp).

(Strictly, if P is inside the triangle) we can define "Area coordinates"
as follows:

$$L_i = \text{area}(pjk) / \text{area}(ijk)$$

$$L_j = \text{area}(pki) / \text{area}(ijk)$$

$L_k = \text{area}(p_{ij}) / \text{area}(i_{jk})$

If P is indeed inside the triangle, all the area coordinates are positive.
But if P is outside the triangle, one or more is negative.

For a polygon, split it into a set of triangles. If the point is inside one of the triangles, it must be inside the polygon.

I think this all depends on the points being placed in the correct sense around the triangle (ie clockwise or anticlockwise.) You had better experiment a little, but that is the basic principle.

It is not actually many lines of code.

all the best

f.

Subject: Re: Point/Polygon Routine
Posted by [tildes](#) on Tue, 09 Jan 1996 08:00:00 GMT
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In article 760@ncar.ucar.edu, cavanaugh@uars1.acd.ucar.edu (Charles Cavanaugh) writes:

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I dont have any IDL code for doing this but I can outline a method that is pretty straightforward.

Consider a line from the point in question to plus (or minus) infinity.
Count the intersections between this line and each of the edges of the polygon.
If the total count is zero or even then the point is outside the polygon.
If the total count is odd then the point is inside the polygon.

The only traps to watch out for are:

- where the point is on one of the edges or vertices.
- if the line to infinity goes through one of the vertices (you should only count one end of each edge as being a part of that edge).

Good luck.

Paul Tildesley

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