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Methods to Define a Single Point in the Polygon

Arun Kumar Sharma
M.Tech (Computer Science & Engineering)
Galgotias University, Greater Noida.

Sandeep Kaur Gill
Asst. Professor (CSE Deptt.)
Galgotias University, Greater Noida.

Abstract -In this paper we present the simple methods to define a single point problem. As we know polygon may be represented as a number of line segments connected end to end to form a polygon. Alternatively, it may be represented as the points where the sides of the polygon are connected. The line segments which make up the polygon boundary are called sides or edges. Polygons are the most popular drawing primitives in computer graphics and can represent any structure approximately. The main research focuses on a point which is determined by new methods, either the test point is outside or inside the given polygon. In the practical development, we sort the different building polygon by its shape and characteristics, and simplify it with different methods. Determine, if a point is in polygon or not is used by a lot of applications in computer graphics, geo-informatics, image processing, game applications, and other computer supporting technologies.

Keywords - Method, development, Test point, primitives, processes, application.

INTRODUCTION

At a primary process, the point-in-polygon problem is a simple, pure geometric problem: given a closed figure P called polygon and an arbitrary test point T the question is whether test point lies outside the polygon or inside the polygon. In previous researches there are some algorithms to define a point. There exist different algorithms to solve this problem, such as count infinite algorithm and p-n method algorithm that is used in this paper.

A lot of special cases have to be considered. When a point lies on the line of a polygon then point will be either outside the polygon or inside the polygon. We present an algorithm count-infinite to resolve this problem and no other special cases to be considered. Determining the inclusion of a point *P* in a 2D planar polygon is a geometric problem that results in interesting algorithms. Two commonly used methods are:

1: Count Infinite technique

2: P-N Number method.

COUNT INFINITE TECHNIQUE

The count-infinite technique, extends a count-infinite line from the test point outward, and counts the number of intersections of the edge of the polygon boundary with the line. An odd number of intersections indicate the point is inside the polygon, while an even number (including zero) indicate the point is outside the polygon.

This technique counts the number of times a ray starting from the point *P* crosses the polygon boundary edges. The point is outside when this "crossing number" is even; otherwise, when it is odd, the point is inside.

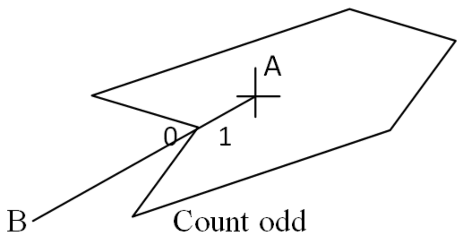

Figure. (1)

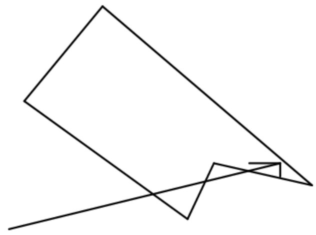

Figure. (2)

This is easy to understand intuitively. Each time the ray crosses a polygon edge, its in-out parity changes. So, if the point is inside, the sequence of crossings "-" must be: in - out - ... - in -out, and there are an odd number < 1, 3, 5, 7 …to Infinite> of them. Similarly, if the point is outside, there is an even number <0, 2, 4, 6 …..to Infinite> of crossings in the sequence: out - in -... - in - out.

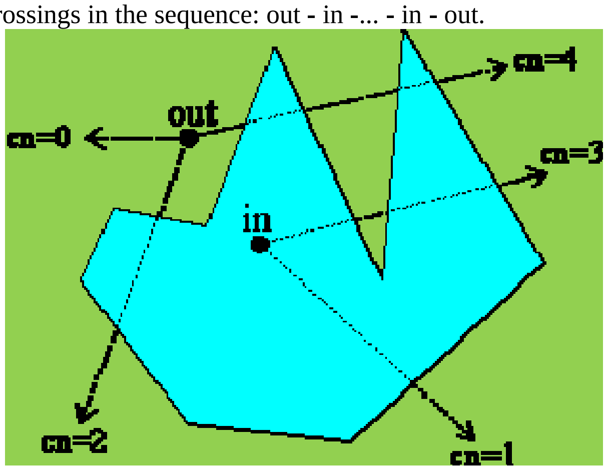

Figure.(3): Showing the point position.

Further, one must decide whether a point on the polygon's boundary is inside or outside. A standard convention is to be process that a point on a left or bottom edge is inside, and a point on a right or top edge is outside. This way, if two distinct polygons share a common boundary segment, then a point on that segment will be in one polygon or the other, but not both at the same time.

P-N NUMBER METHOD

P-N Number defines as a negative-positive number to represent a test point that the given point is either inside or outside.

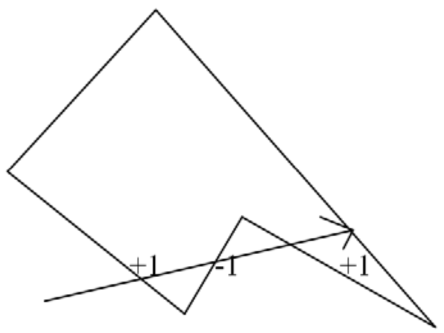

Figure.(4): Representation of P-N method.

By P-N method we will check that the given test point is outside or inside the given polygon. This is another method to test the point position.

When a ray starts from the point P and cross edges of the polygon than we will check the test point position. When the ray starts to move and cross the first edge of the polygon, at that time this will be represent by +1 and after the crossing second edge than representing by -1. That's mean for +1 point is inside the polygon and for -1 the test point is outside the polygon as shown in above figure(3).

This is easy method to understand. Each time the ray crosses a polygon edge, its in-out parity of point changes. So, the point sequence of crossings "**-**" must be: in **-** out **-** ... **-** in **-**out, and there is a sequence < +1, -1, +1, -1 …n> of them.

If the point is on the polygon boundary than standard process for that will be fallowed. We will check the exact position for the point on the boundary either point is left side or right side of the polygon boundary. If point is on left side then outside the polygon, and a point on a right of edge is inside the polygon.

REFERENCE

[1] Zhong Xie, Zi Ye and Liang Wu, *Research on Building Polygon Map Generalization Algorithm*, Eight ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and parallel / distributed computing. China, 2006.

[2] L. P. Kobbelt, T. Bareuther, and H.-P. Seidel. Multiresolution shape deforma-tions for meshes with dynamic vertex connectivity. *Computer Graphics Forum*,19(3):249–259, Aug.2000.

[3] Point in Polygon, One More Time..."*Ray Tracing News* vol. 3 no. 4, October 1, 1990.

[4] Carl Erikson, Polygonal Simplification, TR96-016, Department of Computer Science, CB#3175, Sitter son Hall, UNC-Chapel Hill, NC 27599-3175.

[5] Steven Harrington, *Computer Graphics (A Programming Approach)*, 2ed. Edition McGraw-HILL IN TERNATIONAL EDITIONS, 1987.

[6] Leon Greenberg, *Fundamental polygons in college Park*, Maryland, U.S.A. For Function Groups.

[7] T.H. Ai, R.Z. Guo, X. D. Chen, "Simplification and Aggregation of Polygon Object Supported By Delaunay Triangulation Structure", *Journal of Image and Graphics*, 2001, Vol.6 (7), pp, 703-709.

[8] Marc Alexa, Johannes Behr, Daniel Cohen, Shachar Fleishman, David Levin and Claudio T. Silva *Point Set Surfaces.* AT&T Labs.