

How to calculate the area of a polygon

The signed area can be computed in linear time by a simple sum. The key formula is this: If the coordinates of vertex v_i are x_i and y_i , twice the signed area of a polygon is given by:

$$2 A(P) = \sum_{i=0}^{n-1} (x_i y_{i+1} - y_i x_{i+1})$$

Here n is the number of vertices of the polygon. A rearrangement of terms in this equation can save multiplications and operate on coordinate differences, and so may be both faster and more accurate:

$$2 A(P) = \sum_{i=0}^{n-1} ((x_i + x_{i+1}) (y_{i+1} - y_i))$$

To find the area of a planar polygon not in the x-y plane, use:

$$2 A(P) = \text{abs}(N \cdot (\sum_{i=0}^{n-1} (v_i \times v_{i+1})))$$

where N is a unit vector normal to the plane. The \cdot represents the dot product operator, the \times represents the cross product operator, and $\text{abs}()$ is the absolute value function.

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