Звіт

З предмету комп’ютерної графіки

Лабораторна роботи №1

Тема: Приналежність точки до простого многокутника

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In [computational geometry](https://en.wikipedia.org/wiki/Computational_geometry" \o "), the **point-in-polygon** (**PIP**) problem asks whether a given point in the plane lies inside, outside, or on the boundary of a [polygon](https://en.wikipedia.org/wiki/Polygon" \o "Polygon). It is a special case of [point location](https://en.wikipedia.org/wiki/Point_location" \o "Point location) problems and finds applications in areas that deal with processing geometrical data, such as [computer graphics](https://en.wikipedia.org/wiki/Computer_graphics" \o "Computer graphics), [computer vision](https://en.wikipedia.org/wiki/Computer_vision" \o "Computer vision), [geographical information systems](https://en.wikipedia.org/wiki/Geographic_information_system" \o "Geographic information system) (GIS), [motion planning](https://en.wikipedia.org/wiki/Motion_planning" \o "Motion planning), and [CAD](https://en.wikipedia.org/wiki/Computer-aided_design).

1. Из тестируемой точки выпускаем луч либо в заранее заданном, либо в произвольном направлении.
2. Считаем количество пересечений с многоугольником.
3. Если количество пересечений четное, мы находимся снаружи. Если количество пересечений нечетное, мы – внутри.

One simple way of finding whether the point is inside or outside a [simple polygon](https://en.wikipedia.org/wiki/Simple_polygon" \o "Simple polygon) is to test how many times a [ray](https://en.wikipedia.org/wiki/Ray_(mathematics)" \o "Ray (mathematics)), starting from the point and going in any fixed direction, intersects the edges of the polygon. If the point is on the outside of the polygon the ray will intersect its edge an [even number](https://en.wikipedia.org/wiki/Even_number" \o "Even number) of times. If the point is on the inside of the polygon then it will intersect the edge an [odd number](https://en.wikipedia.org/wiki/Odd_number" \o "Odd number) of times. This method won't work if the point is *on* the edge of the polygon.

This algorithm is sometimes also known as the **crossing number algorithm** or the **[even–odd rule](https://en.wikipedia.org/wiki/Even%E2%80%93odd_rule" \o "Even–odd rule) algorithm**, and was known as early as 1962.[[3]](https://en.wikipedia.org/wiki/Point_in_polygon#cite_note-3) The algorithm is based on a simple observation that if a point moves along a ray from infinity to the probe point and if it crosses the boundary of a polygon, possibly several times, then it alternately goes from the outside to inside, then from the inside to the outside, etc. As a result, after every two "border crossings" the moving point goes outside. This observation may be mathematically proved using the [Jordan curve theorem](https://en.wikipedia.org/wiki/Jordan_curve_theorem" \o "Jordan curve theorem).







