

2.7 Geometrische Algorithmen

2.7.1 Inside-Test

2.7.2 Konvexe Hülle

2.7.3 Nachbarschaften

2.7.4 Schnittprobleme



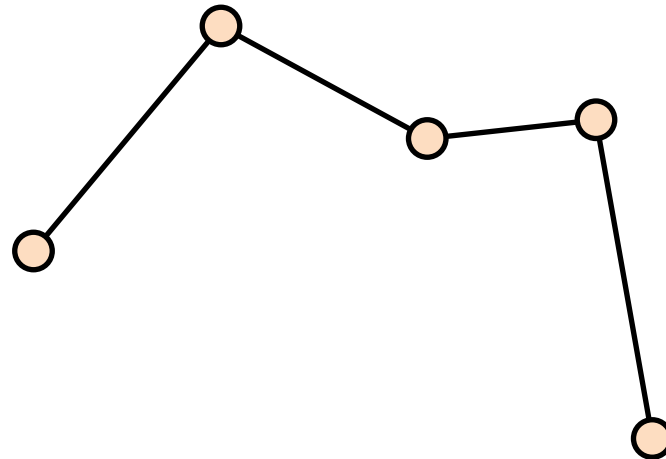
Polygone

- Sequenz von Knoten/Eckpunkten

p_1, \dots, p_n

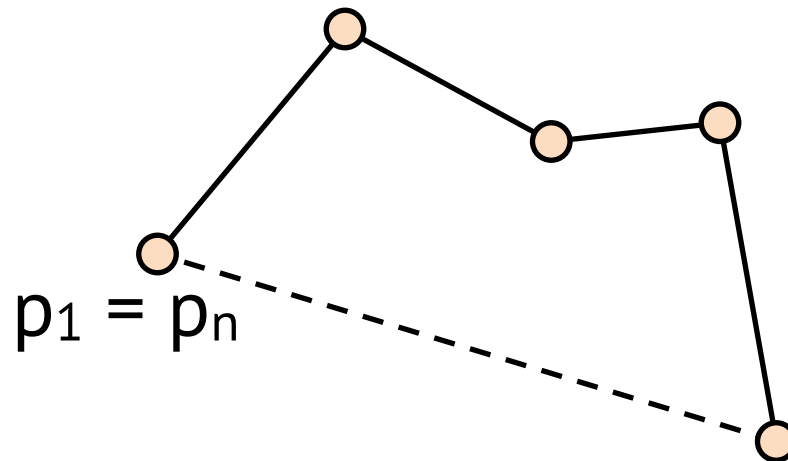
- Sequenz von Kanten

$e_i = (p_i, p_{i+1})$



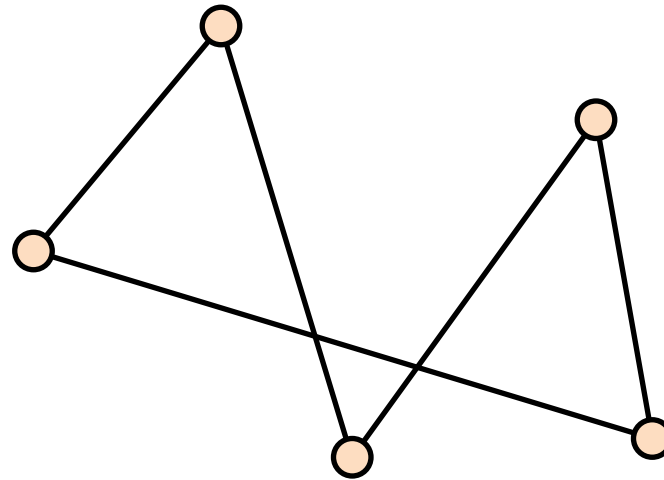
Polygone

- Eigenschaften
 - offen/geschlossen



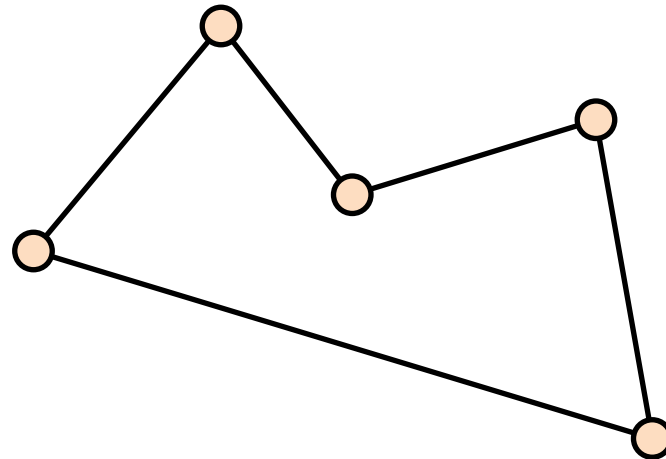
Polygone

- Eigenschaften
 - offen/geschlossen
 - einfach/komplex



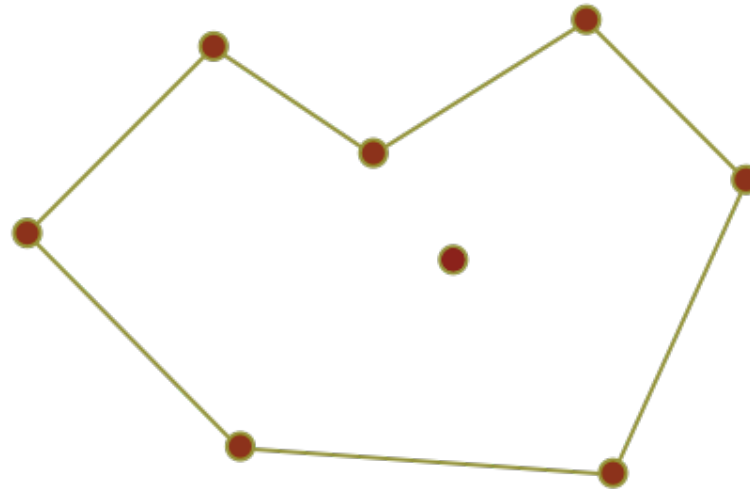
Polygone

- Eigenschaften
 - offen/**geschlossen**
 - **einfach**/komplex



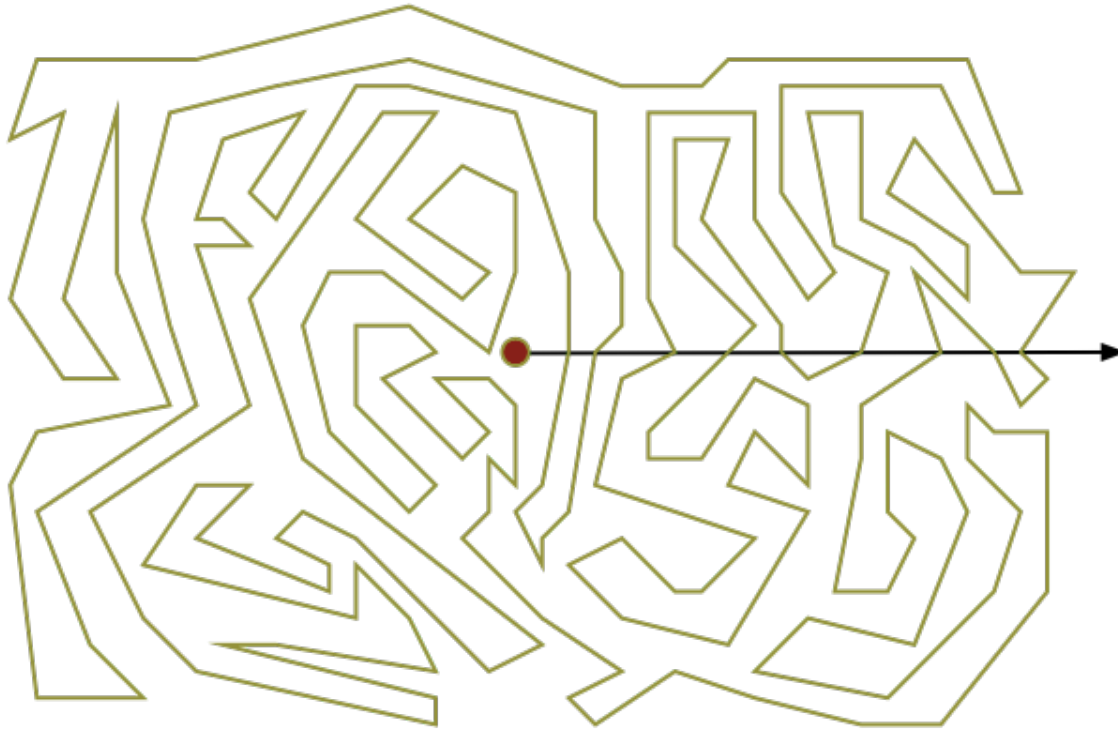
Inside-Test

- Liegt ein gegebener Punkt q innerhalb eines geschlossenen Polygons p_1, \dots, p_n ?



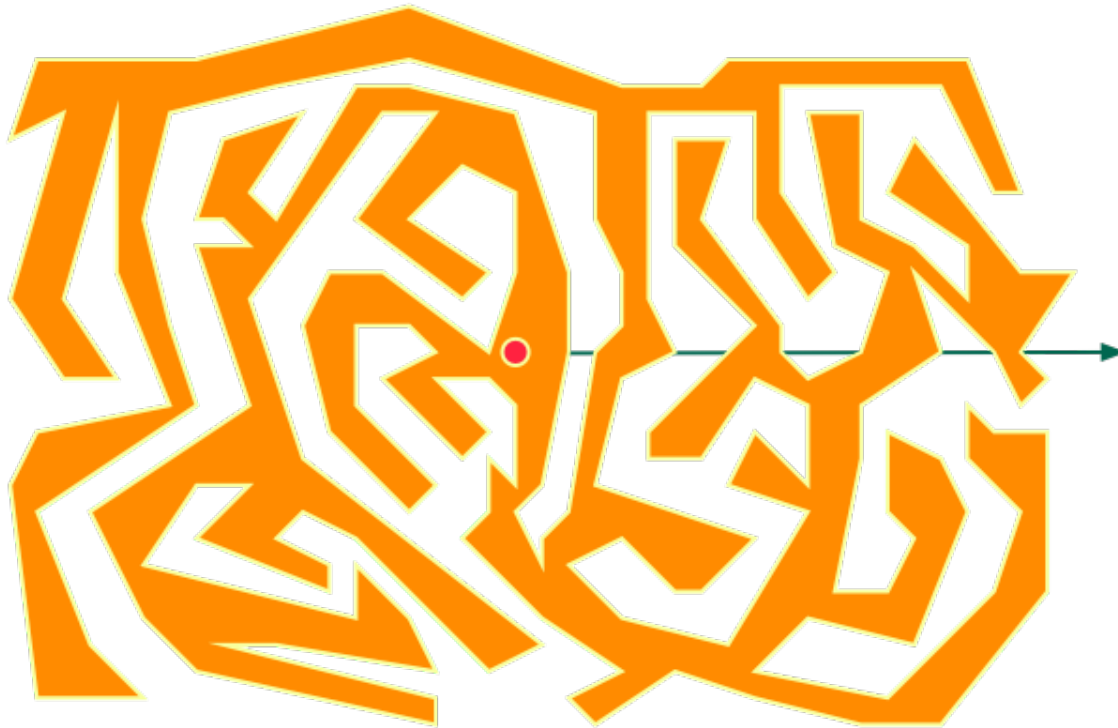
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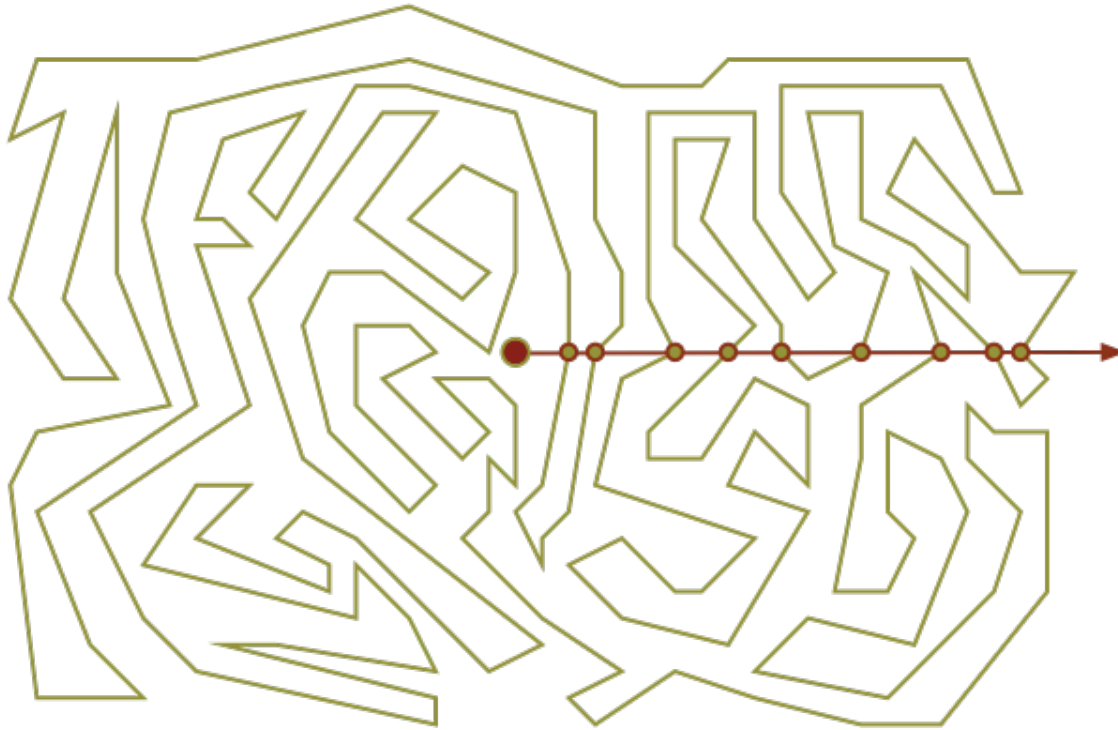
Inside-Test

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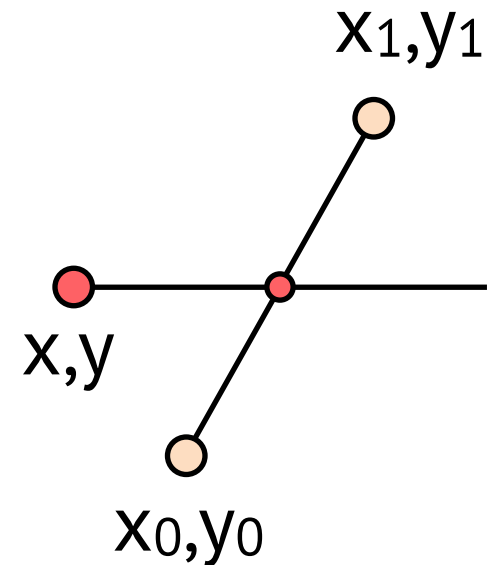
Inside-Test

- Liegt ein gegebener Punkt q innerhalb eines geschlossenen Polygons p_1, \dots, p_n ?



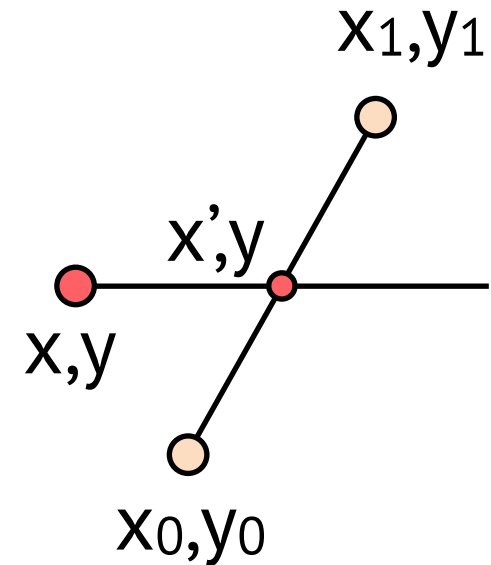
Inside-Test

- Inside($x, y, x[1..n], y[1..n]$)
 $k \leftarrow 0$
 for $i \leftarrow 1$ to n do
 if $y[i] < y[i+1]$ then
 $x_0 \leftarrow x[i]; y_0 \leftarrow y[i]$
 $x_1 \leftarrow x[i+1]; y_1 \leftarrow y[i+1]$
 else
 $x_1 \leftarrow x[i]; y_1 \leftarrow y[i]$
 $x_0 \leftarrow x[i+1]; y_0 \leftarrow y[i+1]$
 if $y_0 \leq y$ and $y < y_1$ then
 if $(x-x_0) \times (y_1-y_0) < (y-y_0) \times (x_1-x_0)$ then
 $k \leftarrow k + 1$
 return odd(k)



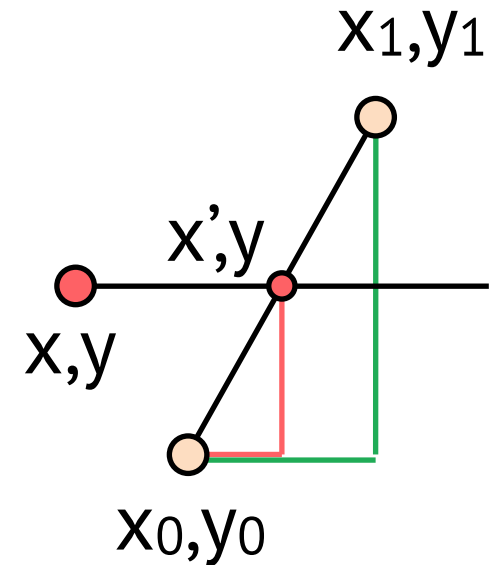
Schnittberechnung

- $(y-y_0) / (y_1-y_0) = (x'-x_0) / (x_1-x_0)$
- $(y-y_0) \times (x_1-x_0) = (x'-x_0) \times (y_1-y_0)$
- $x < x'$
- $x-x_0 < x'-x_0$
- $(x-x_0) \times (y_1-y_0) < (x'-x_0) \times (y_1-y_0)$
- $(x-x_0) \times (y_1-y_0) < (y-y_0) \times (x_1-x_0)$



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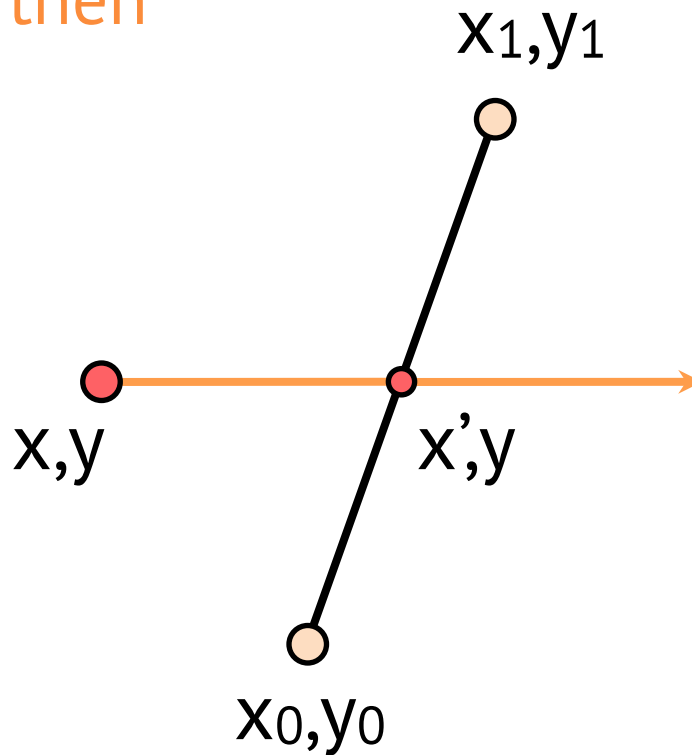
Spezialfälle

- Inside(...)

...

if $y_0 \leq y$ and $y < y_1$ then

...



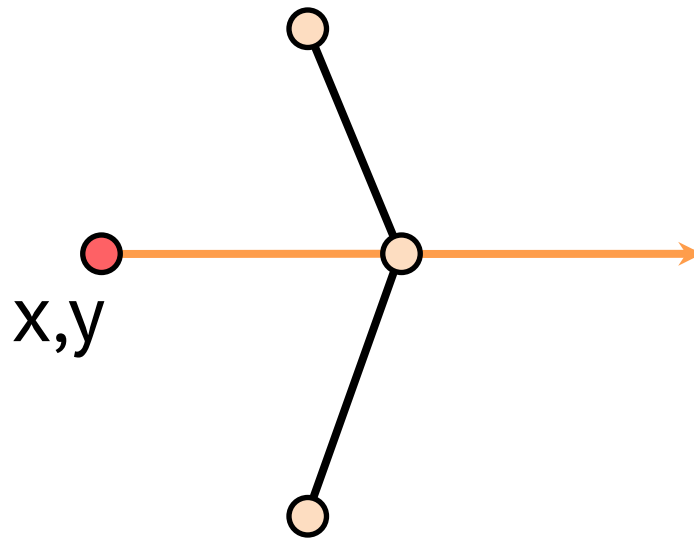
Spezialfälle

- Inside(...)

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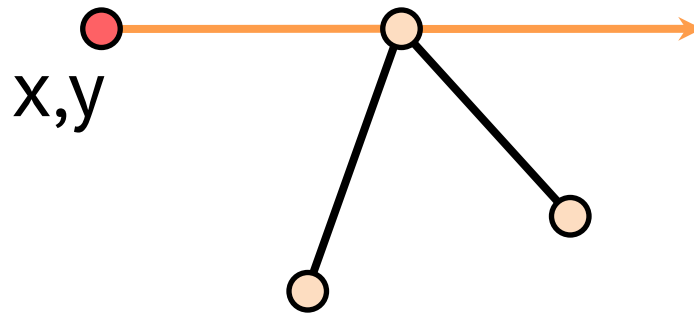
Spezialfälle

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...

if $y_0 \leq y$ and $y < y_1$ then

...



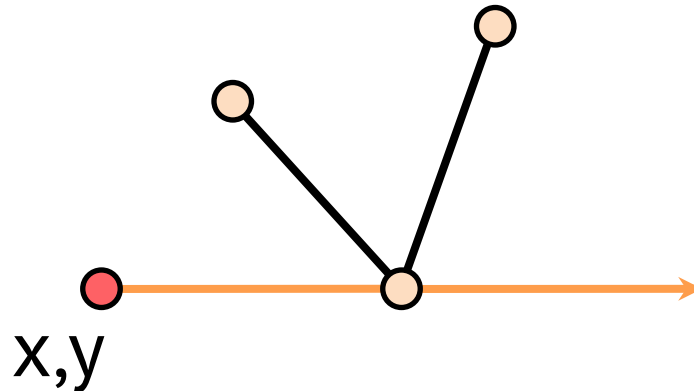
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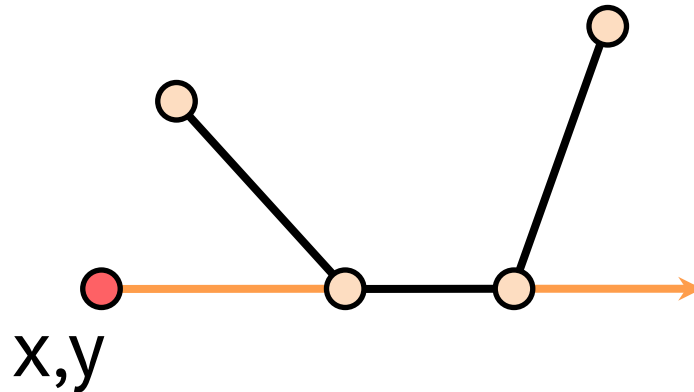
Spezialfälle

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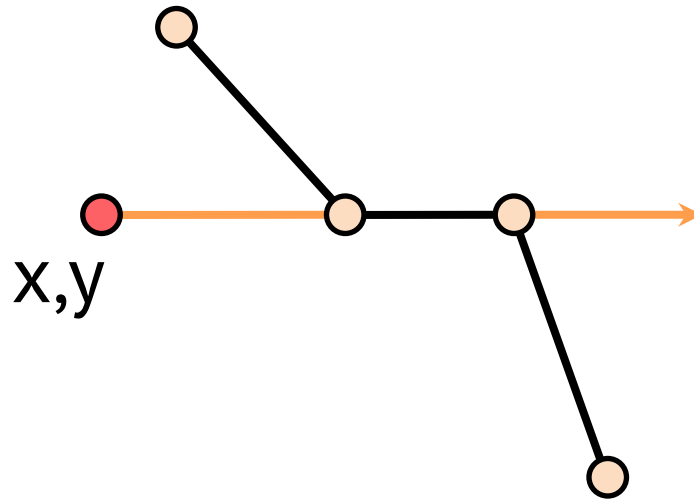
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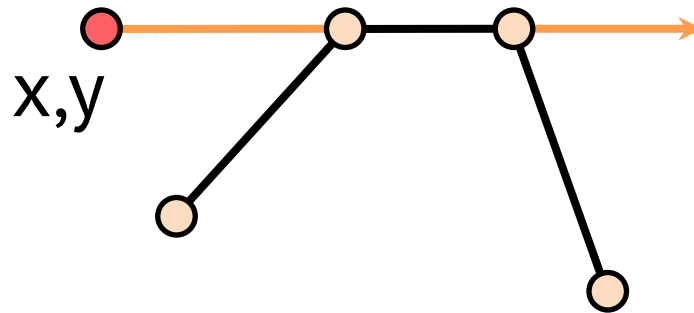
Spezialfälle

- Inside(...)

...

if $y_0 \leq y$ and $y < y_1$ then

...



- Der Aufwand des Inside-Tests ist $O(n)$.

