

01 - Algoritmos

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15 de agosto de 2023

Problema a ser resolvido

Problema

Dado um polígono e um ponto P , determinar se P está dentro ou fora do polígono.

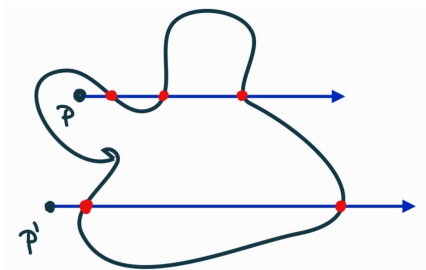
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Teorema da curva de Jordan

Seja C uma curva simples e fechada no R^2 . O complementar de C possui duas componentes conexas, uma limitada e outra ilimitada.



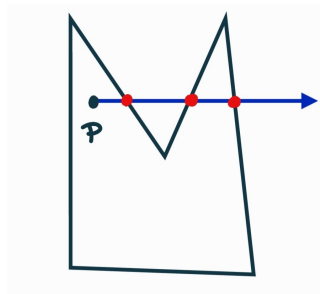
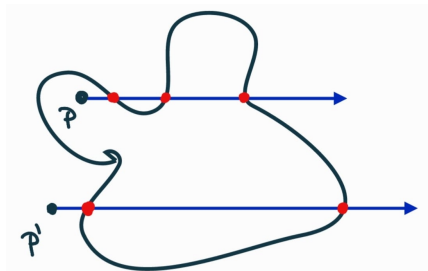
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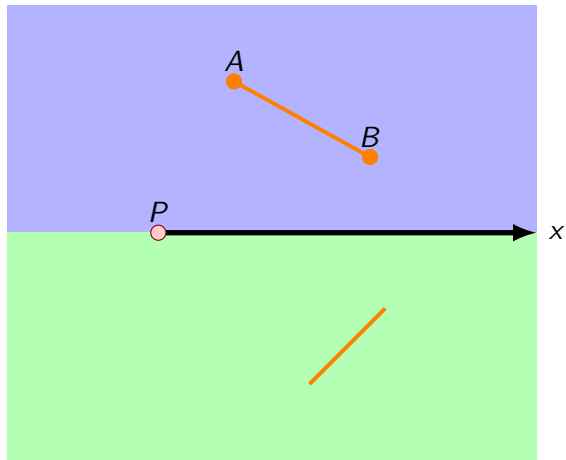
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Teorema da curva de Jordan

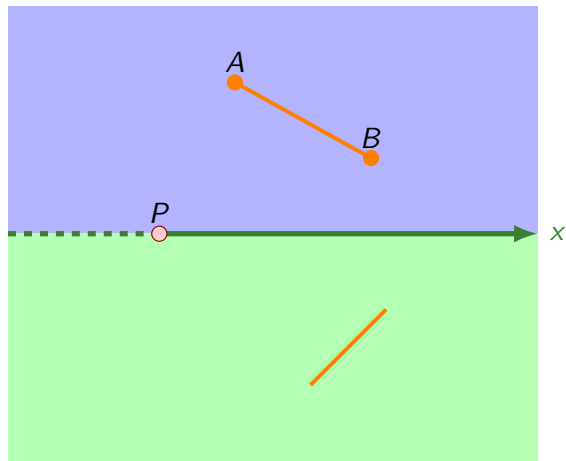
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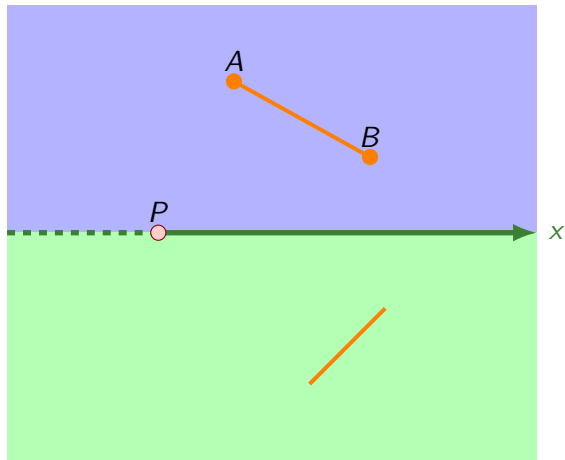
Algoritmo de Interseção



Algoritmo de Interseção

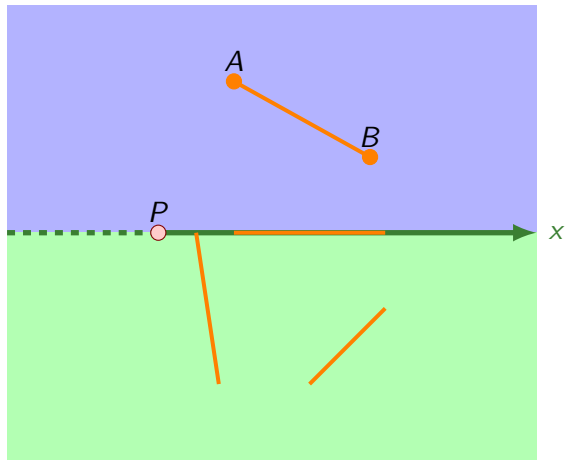


Algoritmo de Interseção



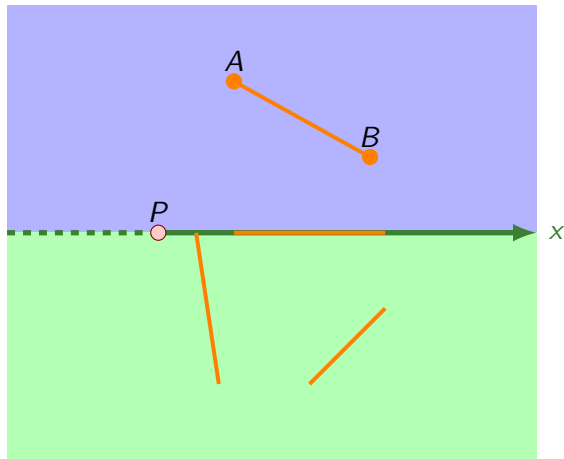
if $(y_a > y_p \text{ and } y_b > y_p)$ or
 $(y_a \leq y_p \text{ and } y_b \leq y_p)$ **then**
 return *false*
end if

Algoritmo de Interseção



```
if ( $y_a > y_p$  and  $y_b > y_p$ ) or  
( $y_a \leq y_p$  and  $y_b \leq y_p$ ) then  
    return false  
end if
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Algoritmo de Interseção

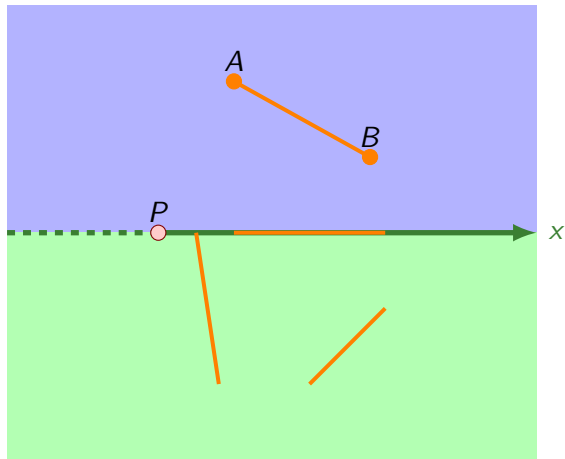


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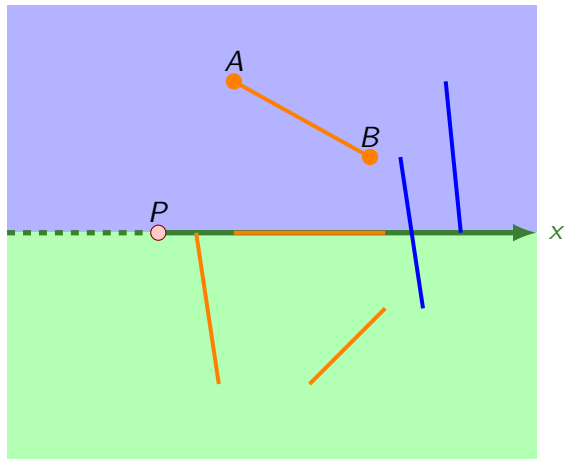
$$x_i \leftarrow x_a + \frac{y_p - y_a}{y_b - y_a} (x_b - x_a)$$

Algoritmo de Interseção



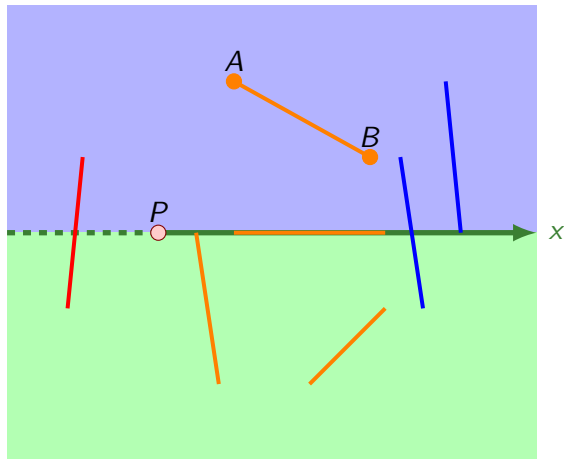
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Algoritmo de Interseção



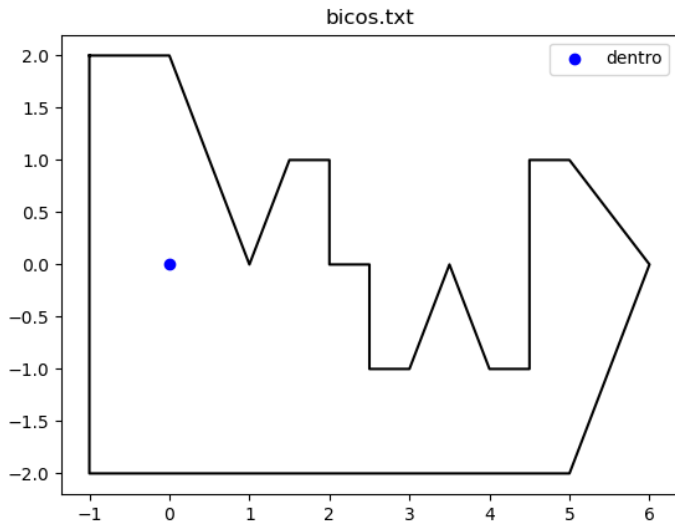
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Algoritmo de Interseção

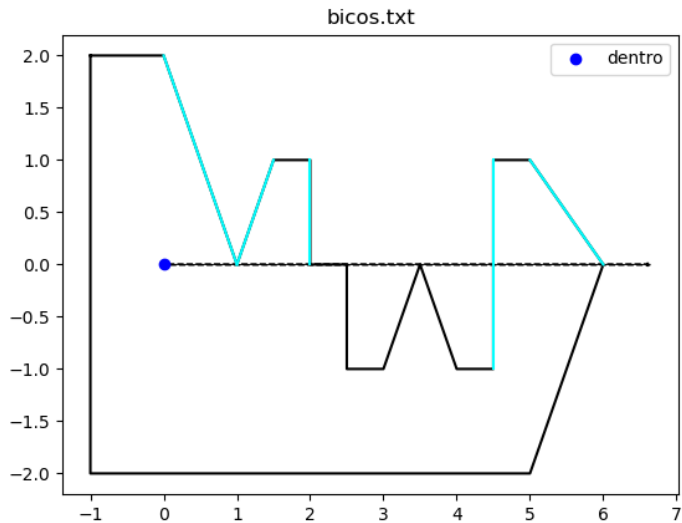


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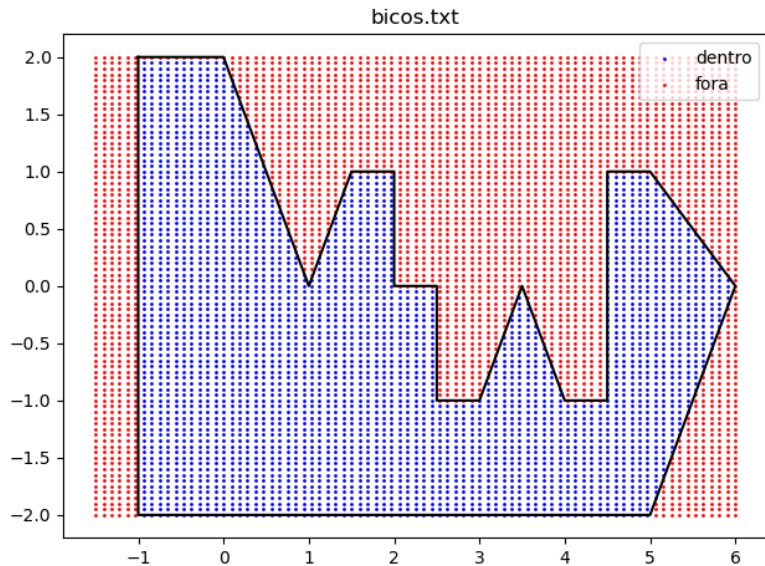
Exemplo



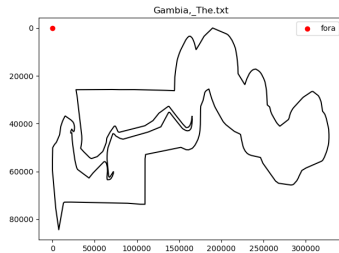
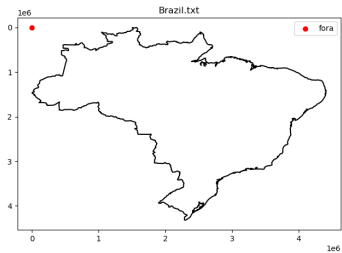
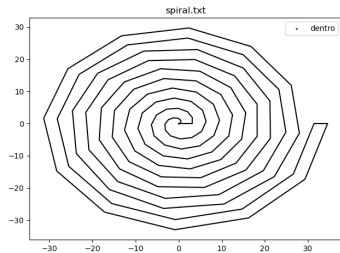
Exemplo



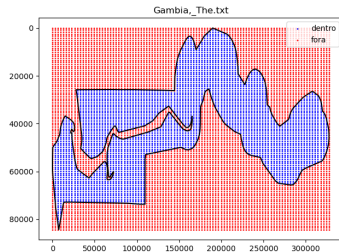
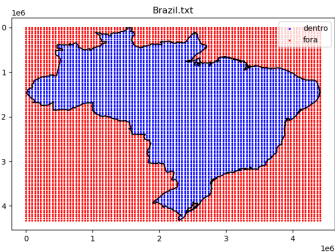
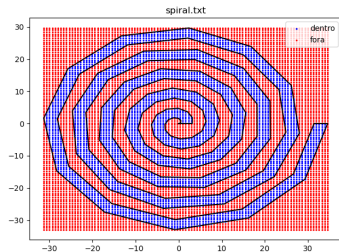
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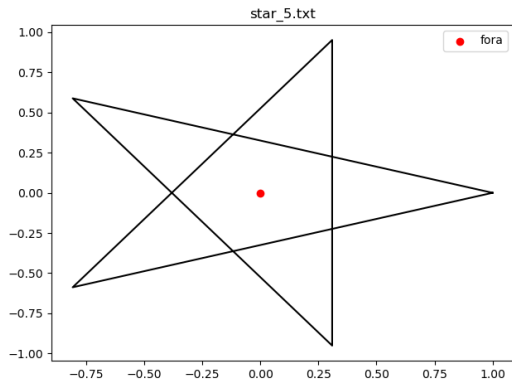
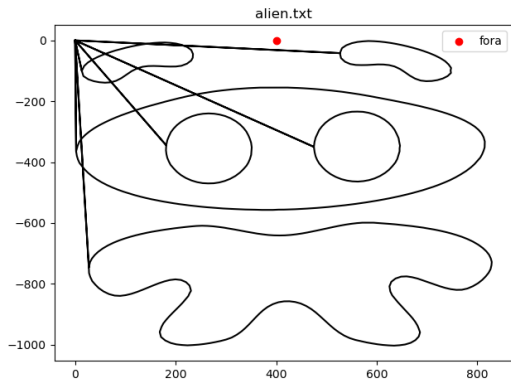
Polígonos Simples



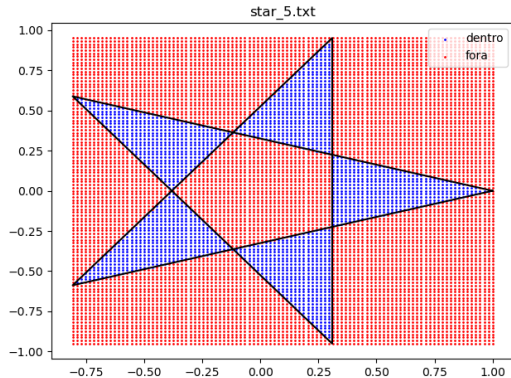
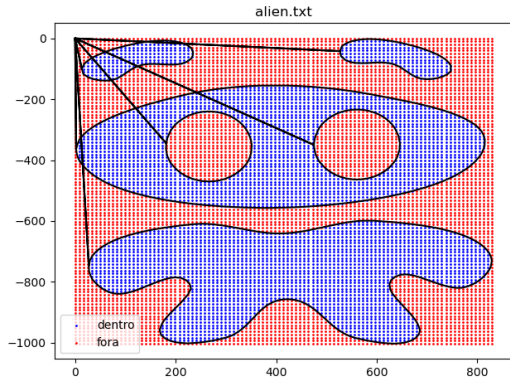
Polígonos Simples



Polígonos Não-Simples

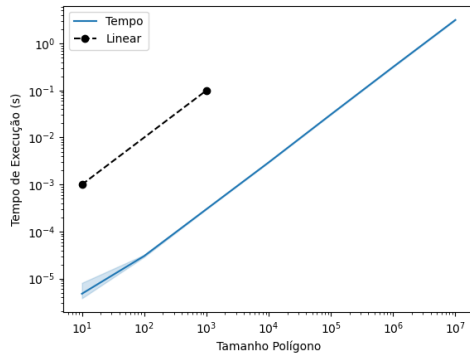


Polígonos Não-Simples



Performance

- ▶ Execução com polígonos regulares
- ▶ Tamanhos de 10 a 10^7 lados
- ▶ 5 execuções com cada tamanho



Conclusões

- ▶ O algoritmo funciona para polígonos simples
- ▶ O algoritmo tratou bem o caso das "quinas"
- ▶ O algoritmo tem resultado que é "razoável" no caso não-simples
- ▶ O tempo de execução pode ser limitado por uma equação linear