ΗΥ416
ΓΡΑΦΙΚΑ ΥΠΟΛΟΓΙΣΤΩΝ

Αποκοπή

Π. ΤΣΟΜΠΑΝΟΠΟΥΛΟΥ
ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ
ΤΜΗΜΑ ΗΛΕΚΤΡΟΛΟΓΩΝ ΜΗΧΑΝΙΚΩΝ & ΜΗΧΑΝΙΚΩΝ ΥΠΟΛΟΓΙΣΤΩΝ

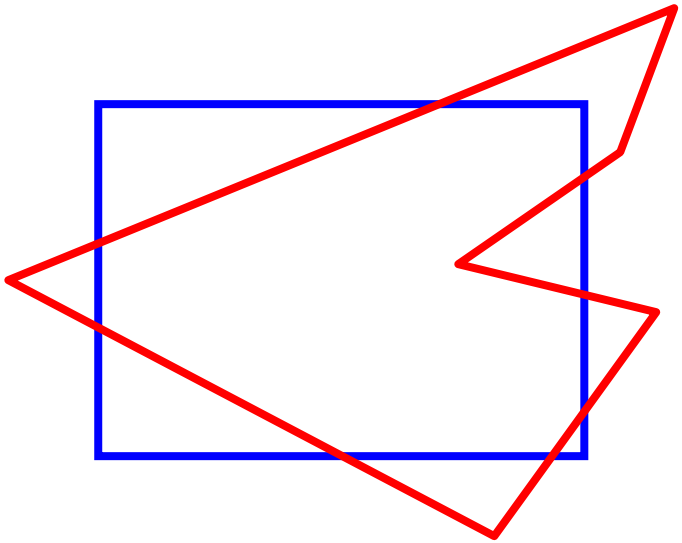
Sutherland-Hodgman Algorithm

Sutherland-Hodgman Clipping

- Basic idea:

  - consider each edge of the view window individually

  - clip the polygon against the view window edge's equation



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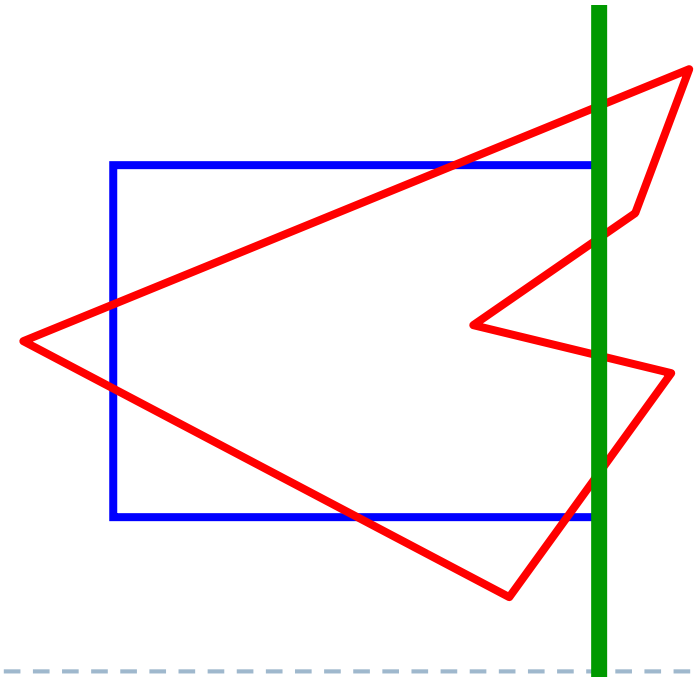

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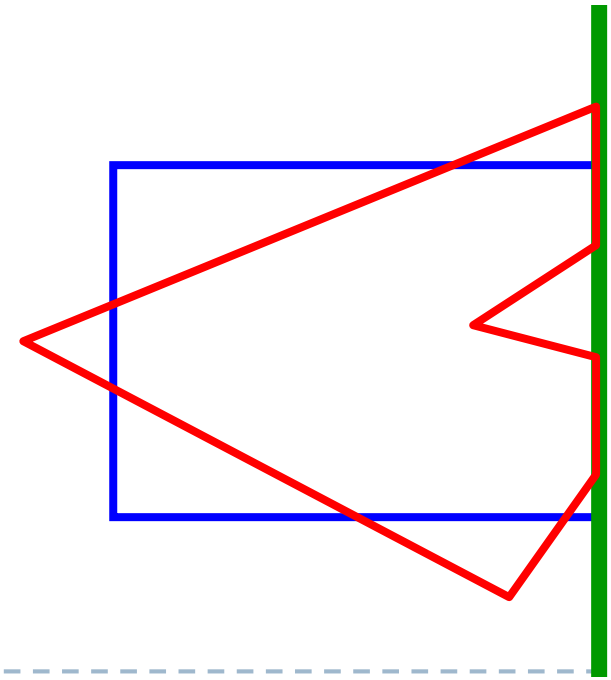

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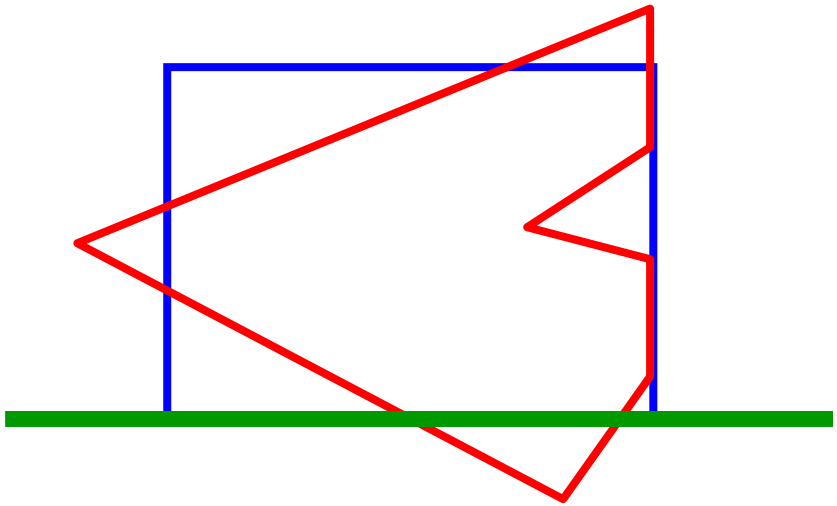

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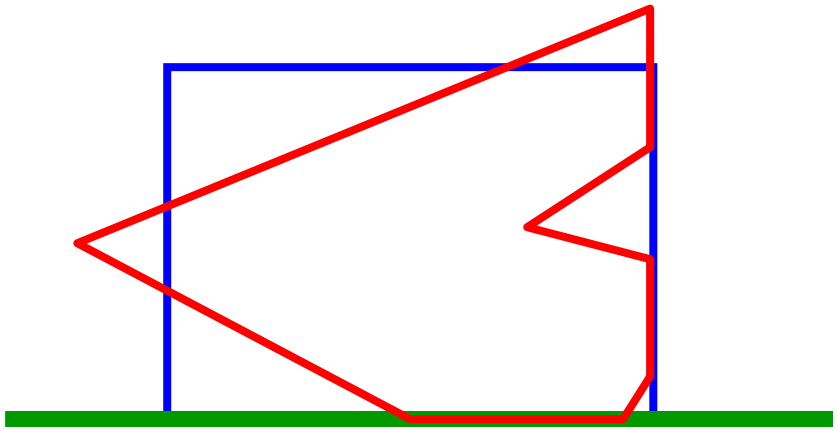

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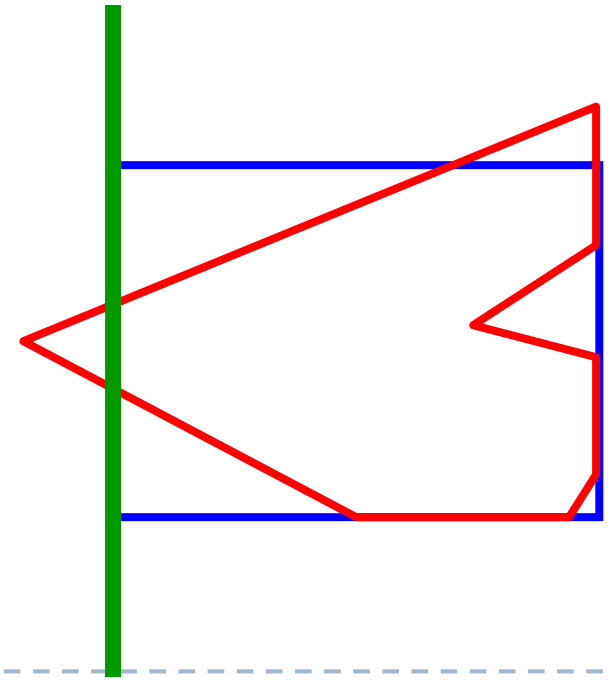

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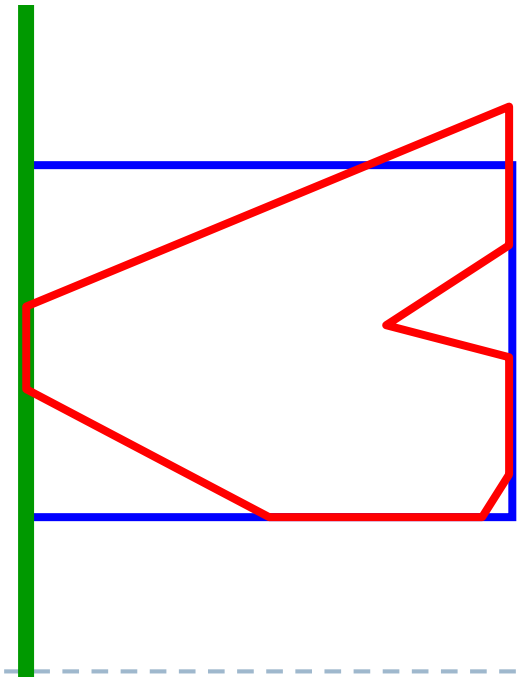

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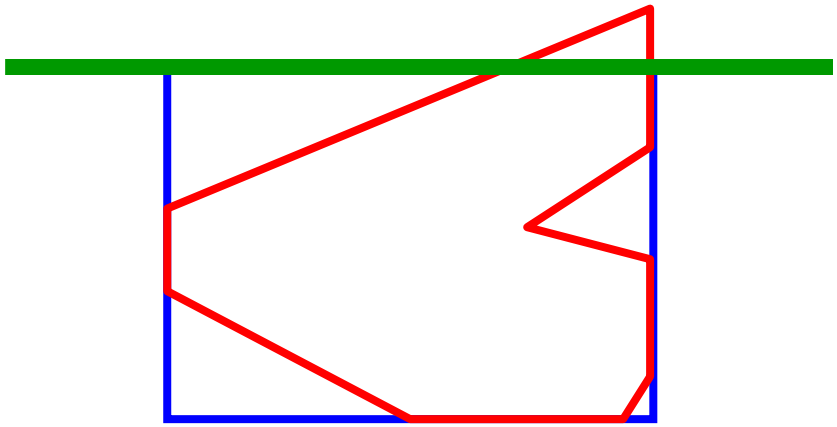

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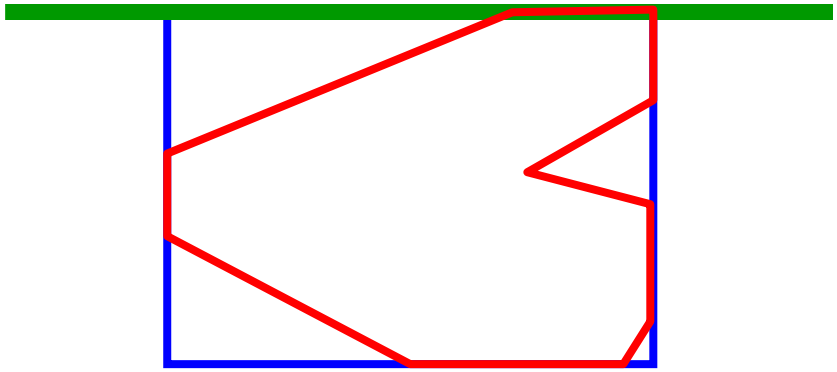

Sutherland-Hodgman Clipping

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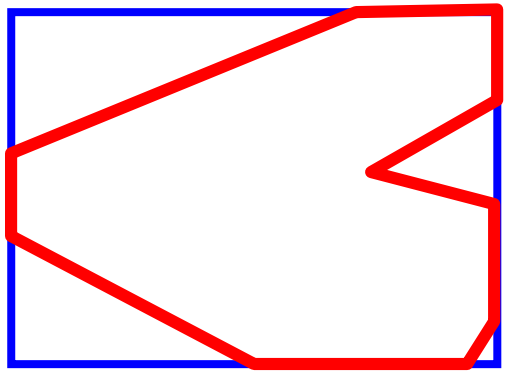
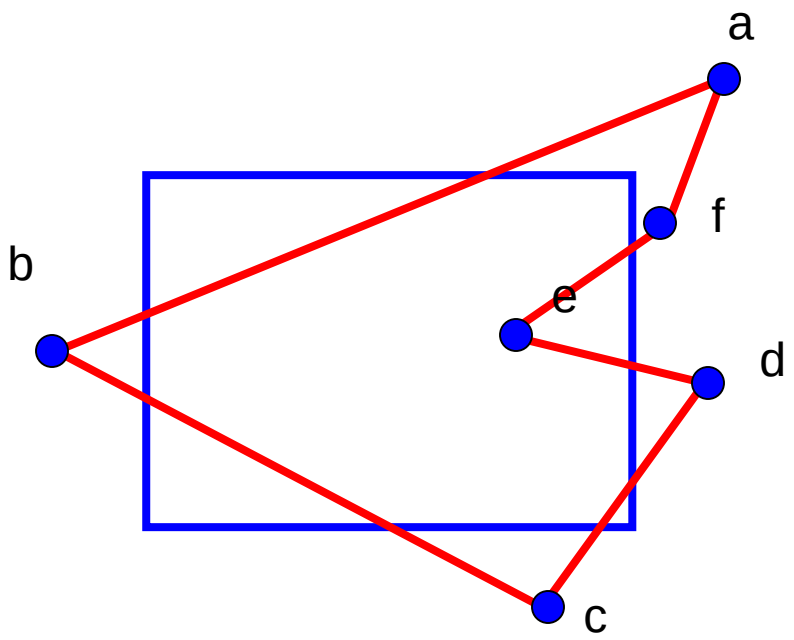
  - consider each edge of the view window individually
  - clip the polygon against the view window edge's equation
  - after doing all edges, the polygon is fully clipped



Sutherland-Hodgman Clipping

- Input/output for algorithm:
  - input: list of polygon vertices in order
    {abcdef}



Sutherland-Hodgman Clipping

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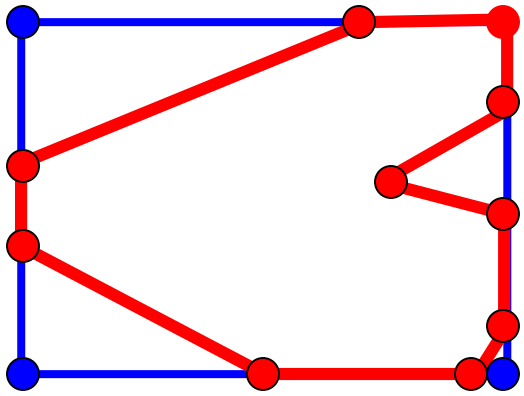

Sutherland-Hodgman Clipping

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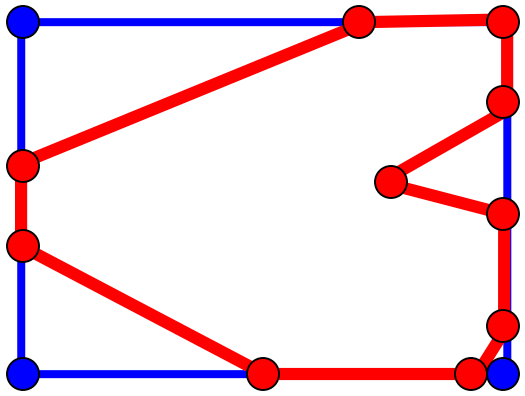
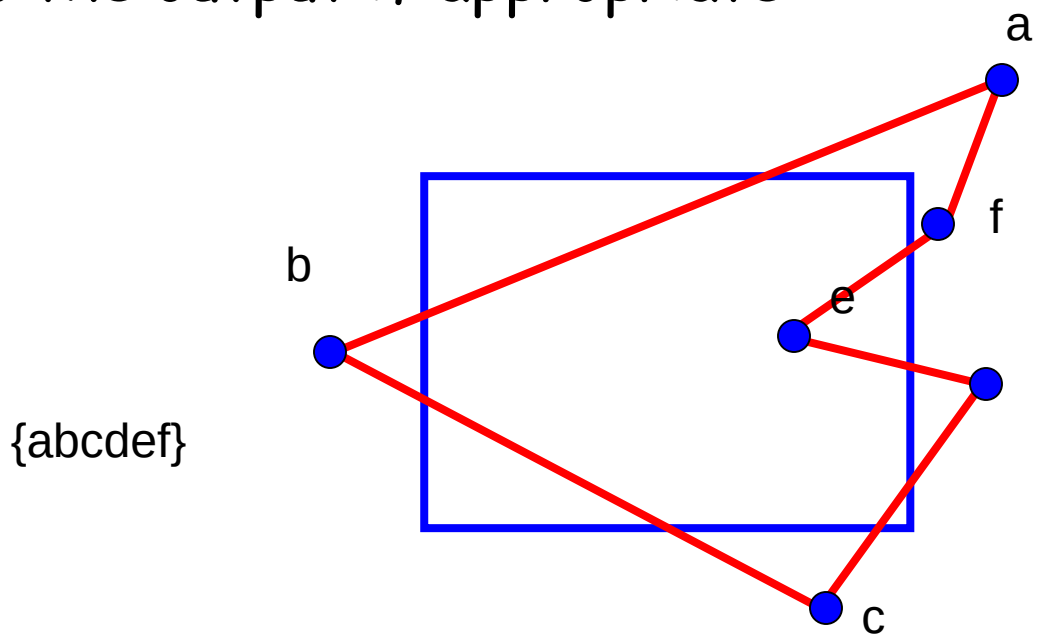
  - exactly what expect from the clipping operation against each edge!



Sutherland-Hodgman Clipping

- Basic routine:
  - Go around polygon one vertex at a time
  - Current vertex has position ***E***
  - Previous vertex had position ***S***, and it has been added to the output if appropriate



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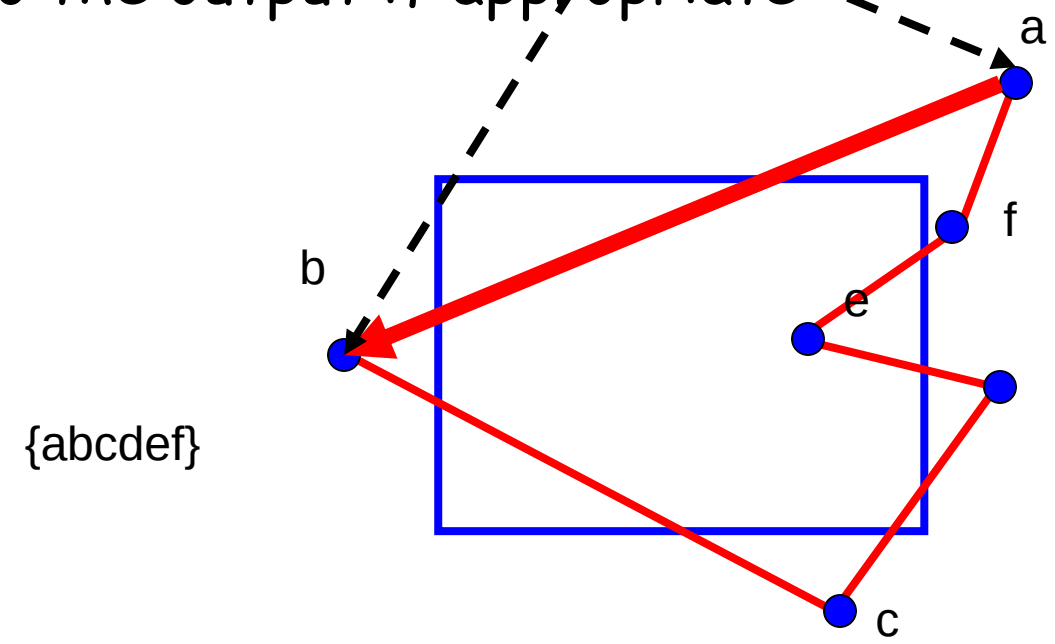
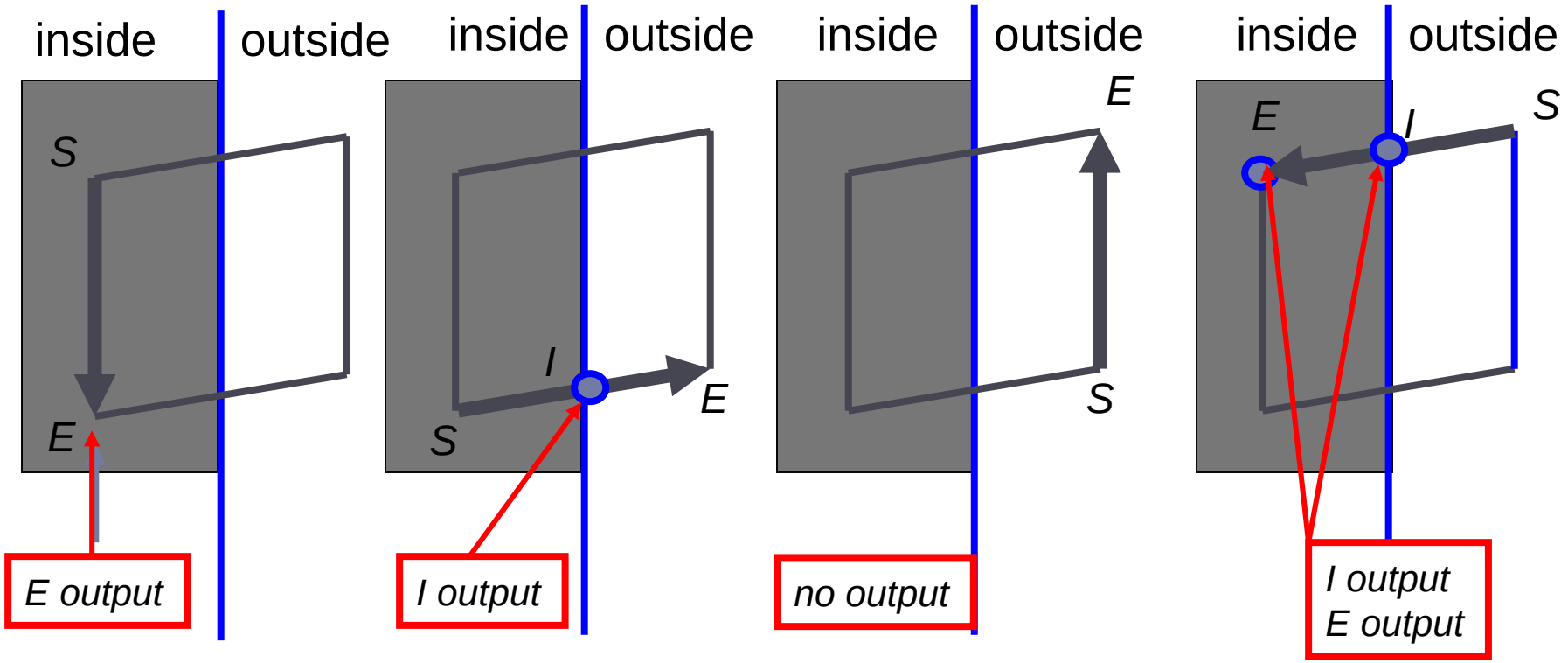


Sutherland-Hodgman Clipping

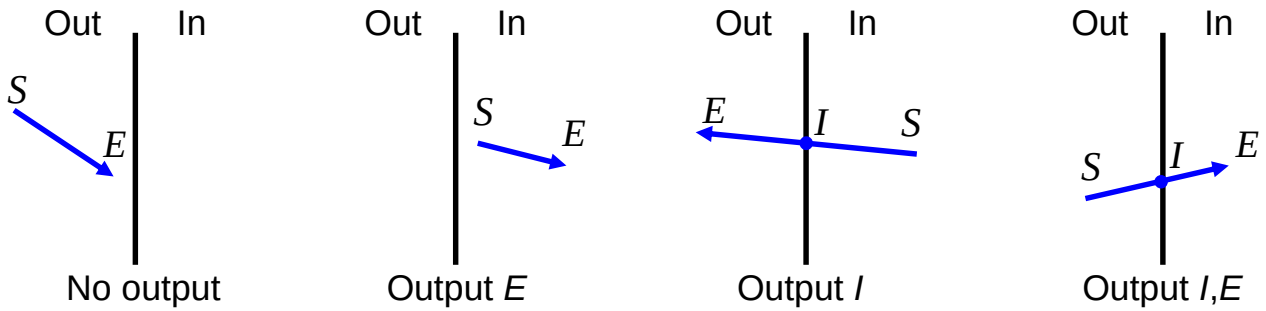
- Edge from ***S*** to ***E*** takes one of four cases:

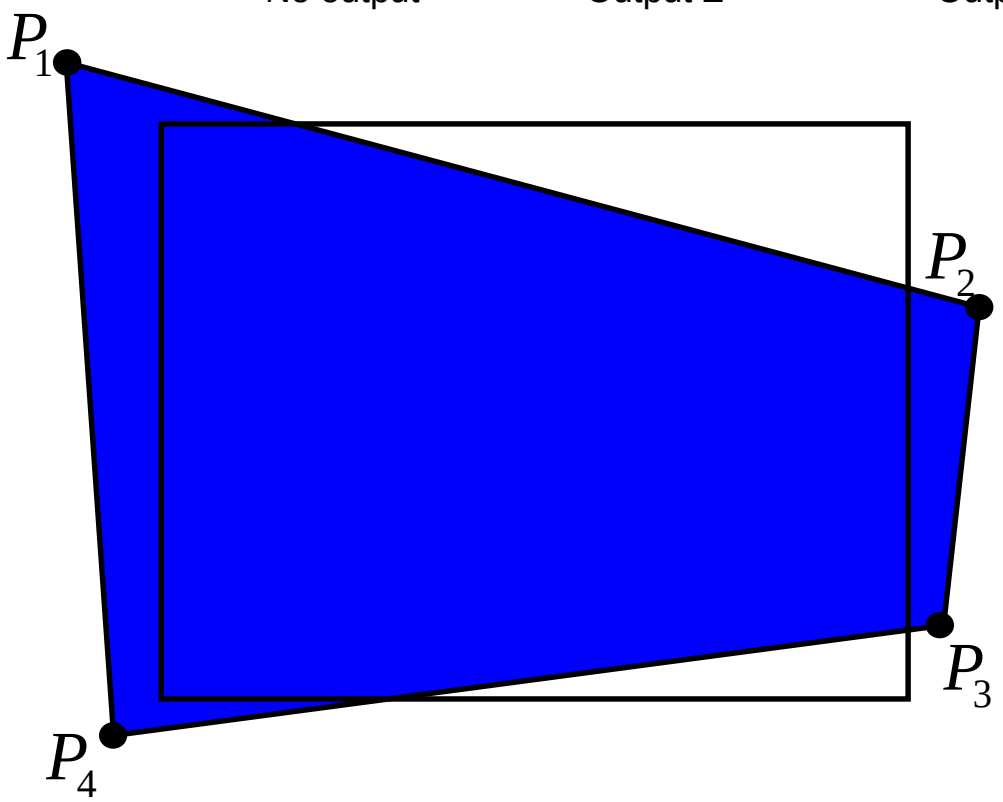


Sutherland-Hodgman Clipping

- Four cases:
  - *S* inside plane and *E* inside plane
    - Add *E* to output
    - Note: *S* has already been added
  - *S* inside plane and *E* outside plane
    - Find intersection point *I*
    - Add *I* to output
  - *S* outside plane and *E* outside plane
    - Add nothing
  - *S* outside plane and *E* inside plane
    - Find intersection point *I*
    - Add *I* to output, followed by *E*

Sutherland-Hodgman Algorithm





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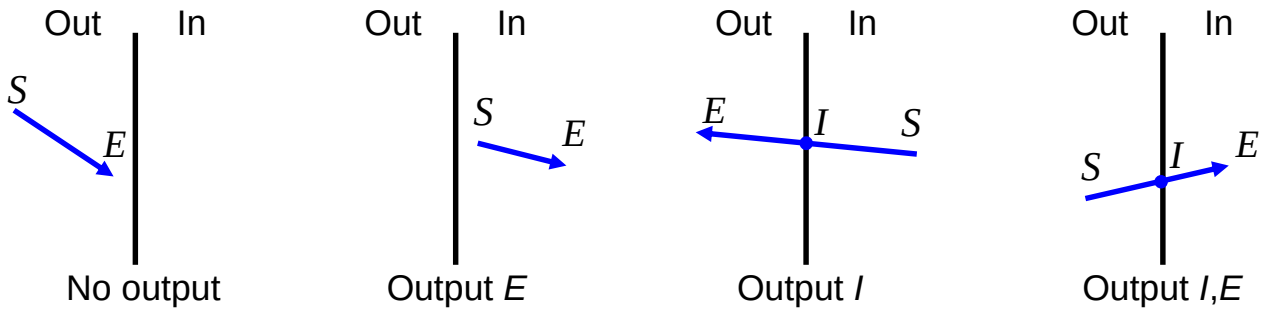

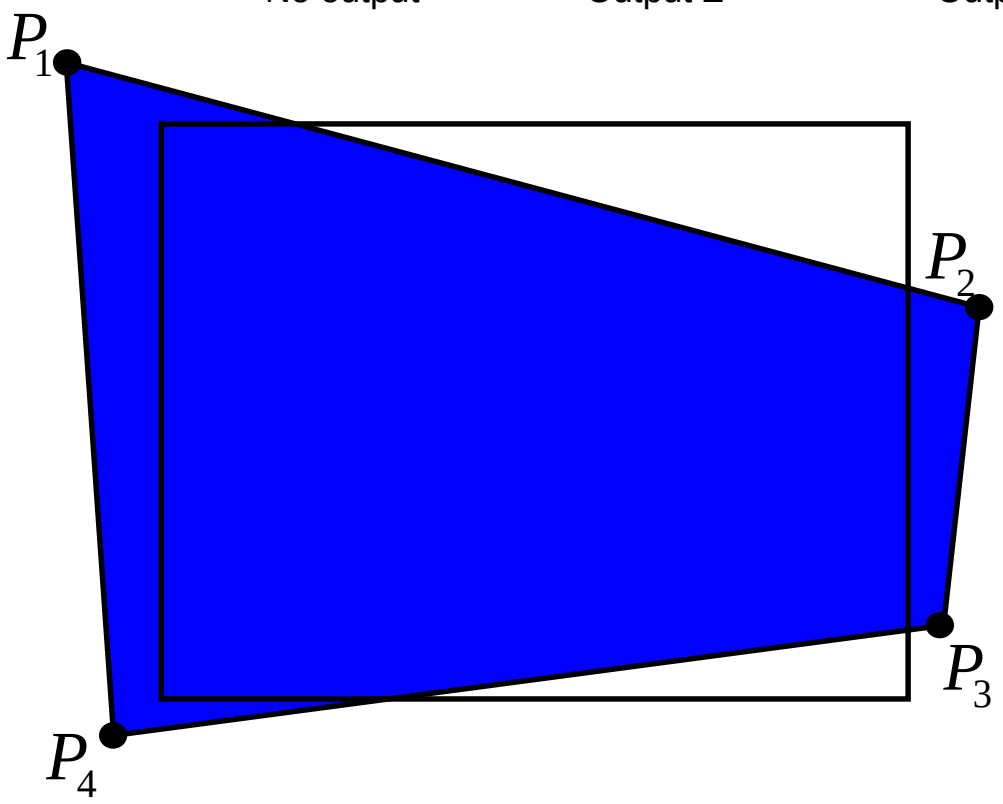

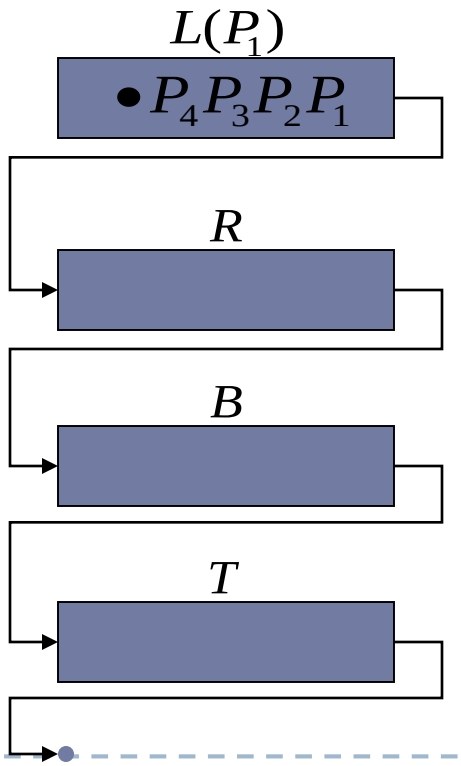

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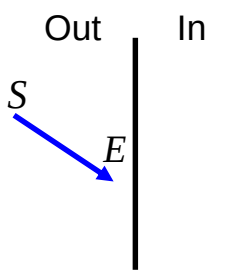

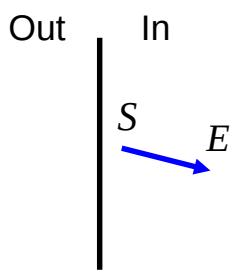

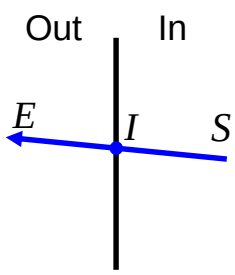

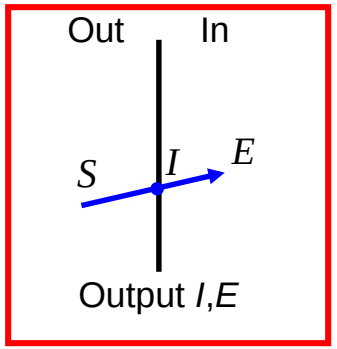

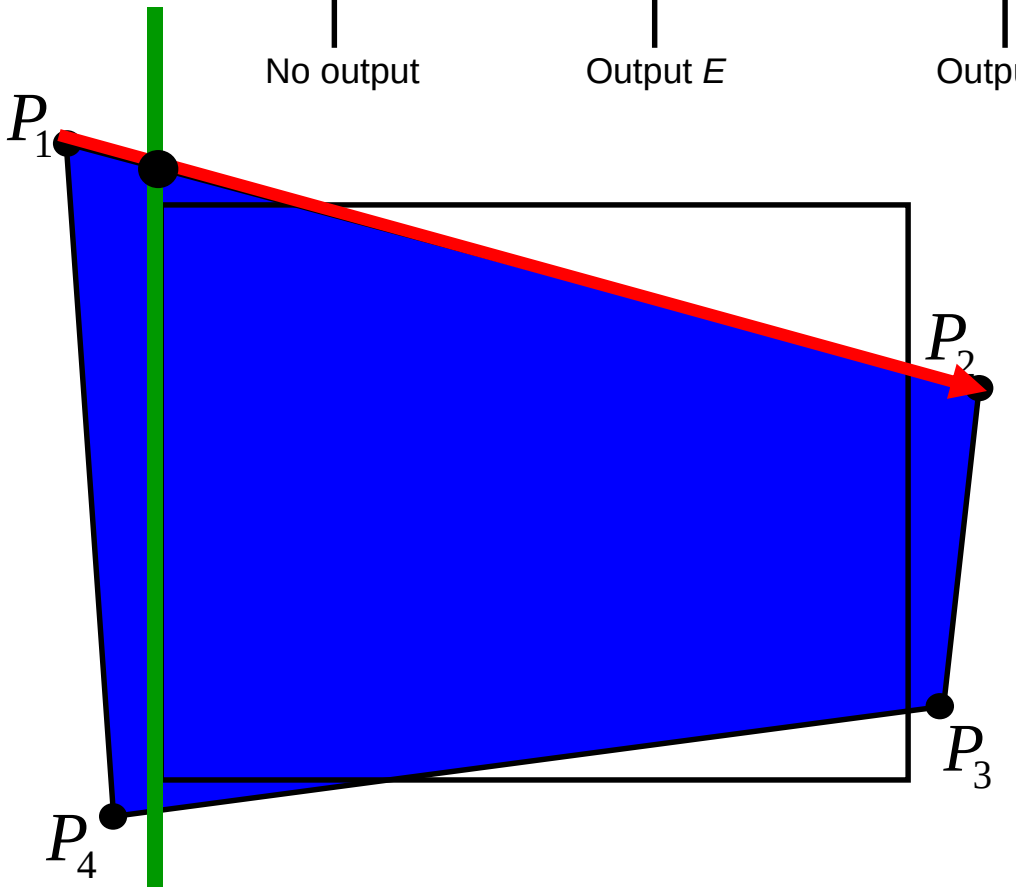

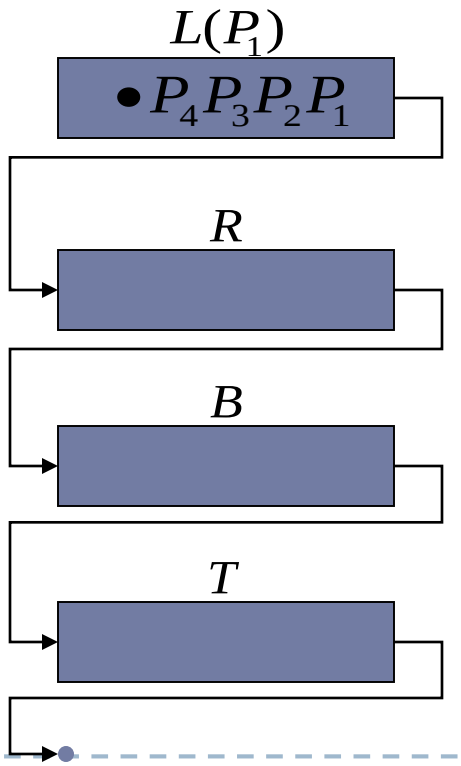

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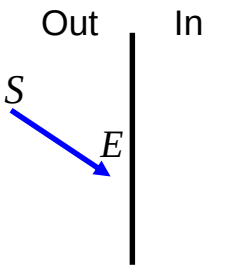

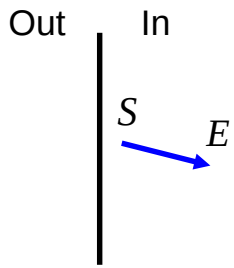

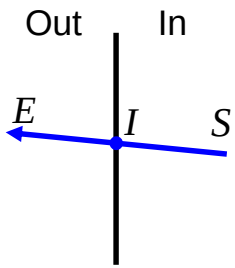

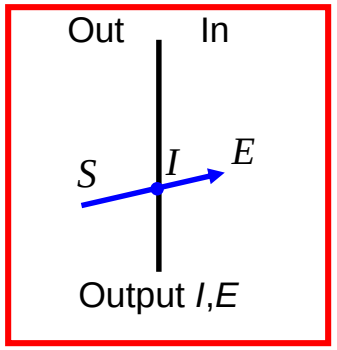

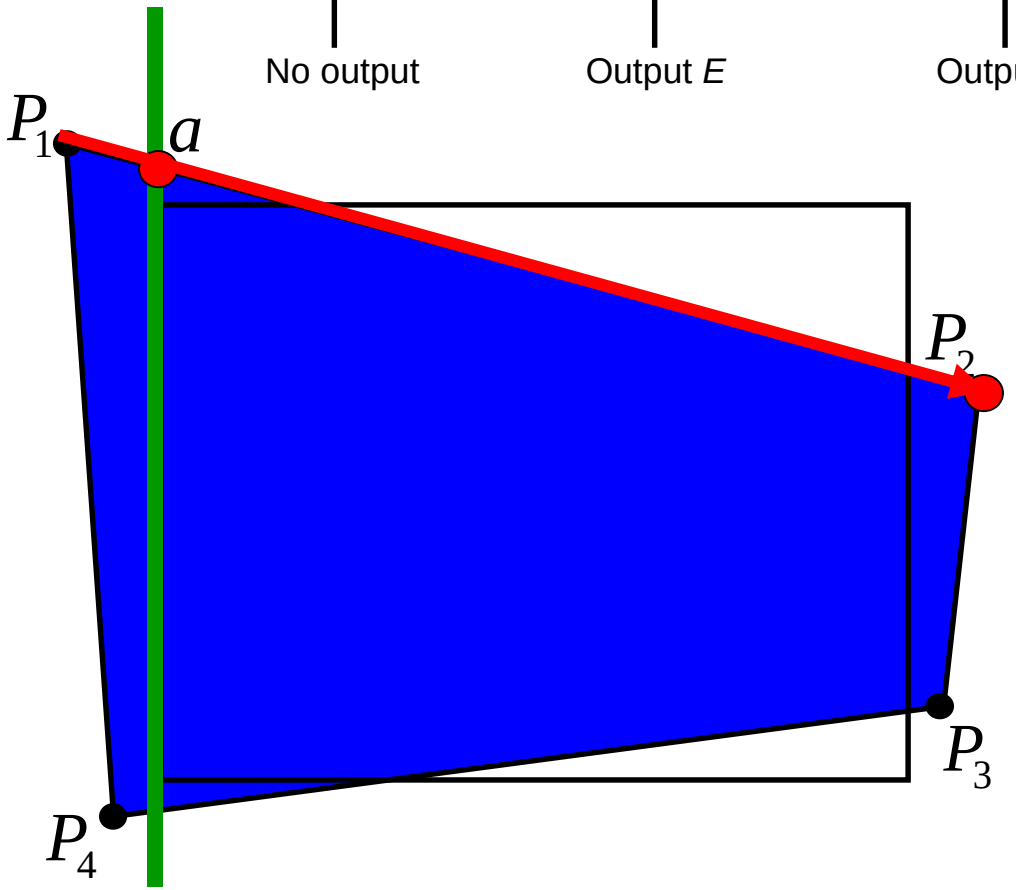

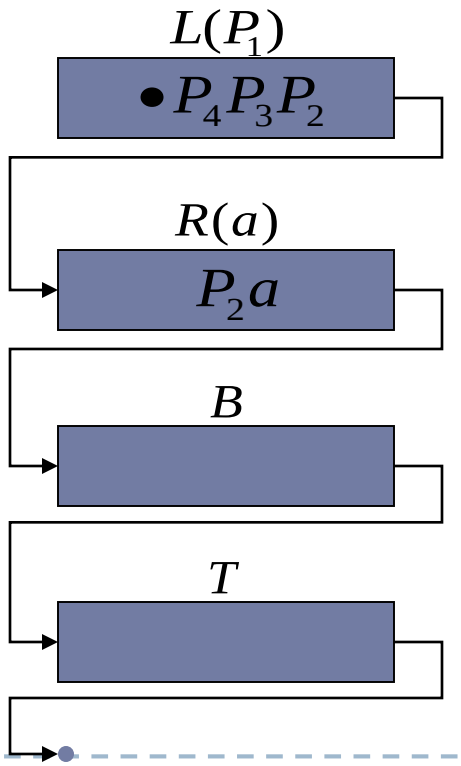

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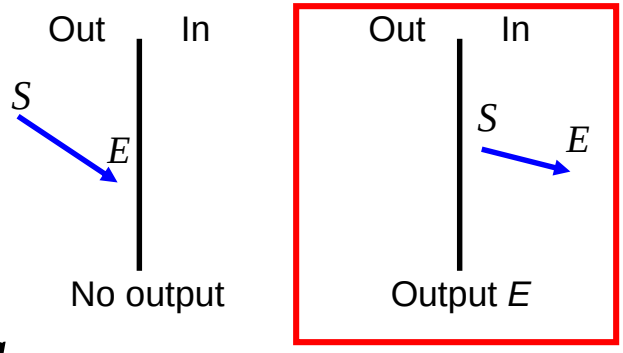

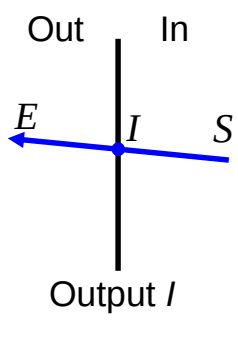

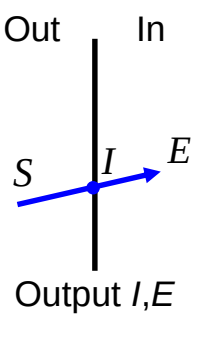

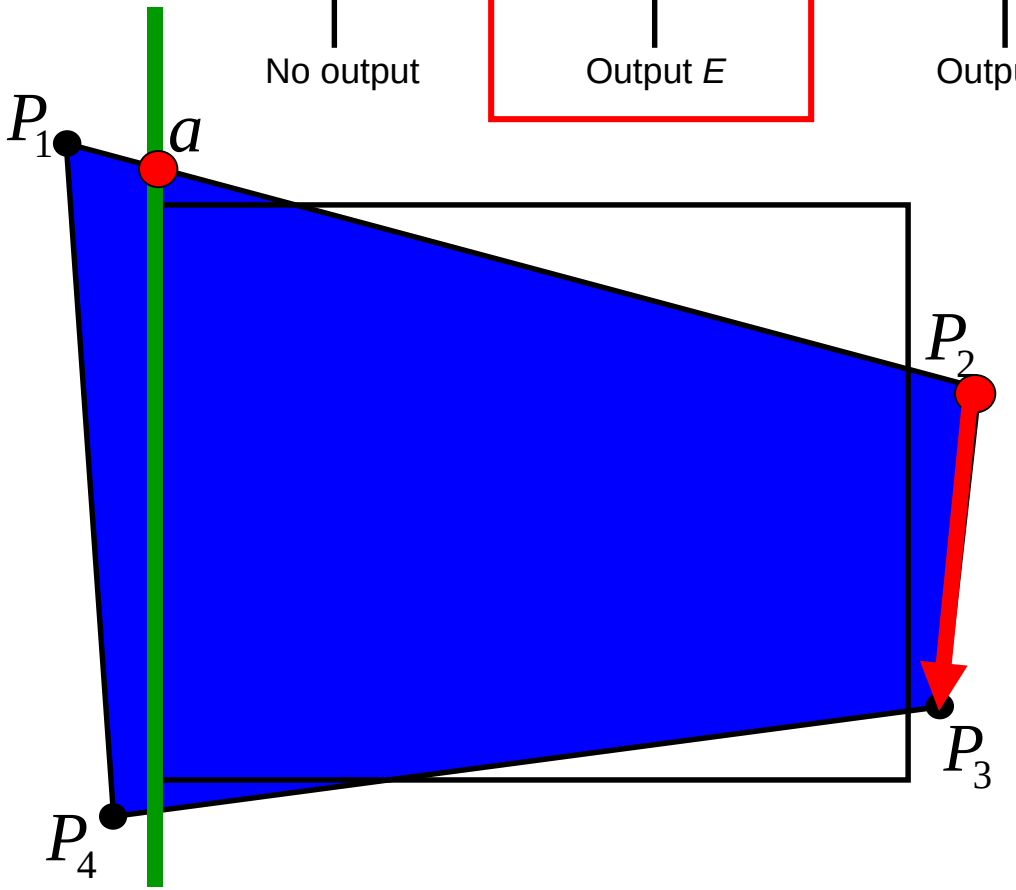

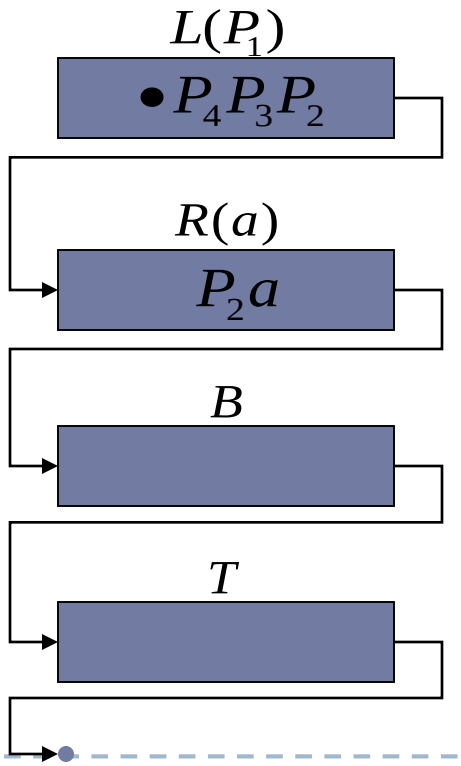

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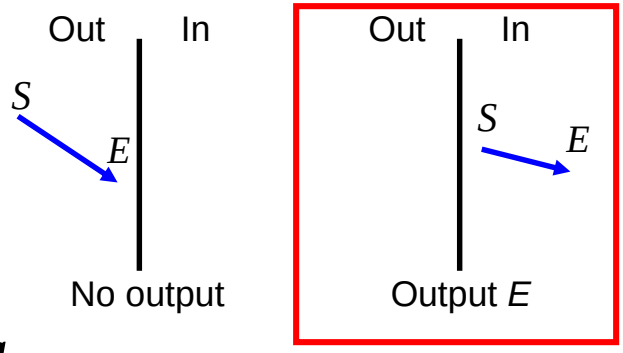

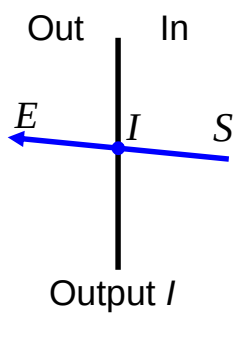

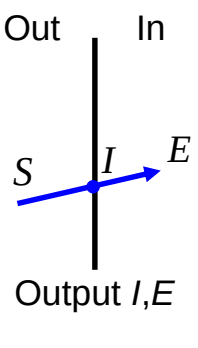

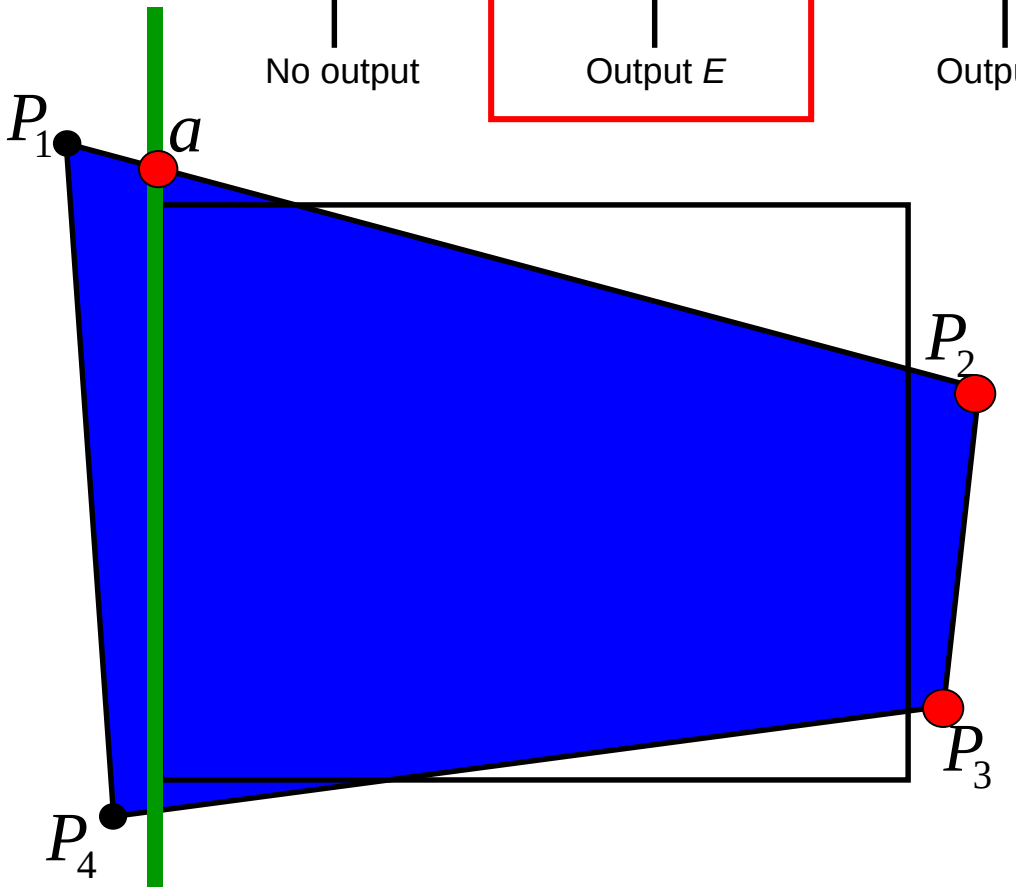

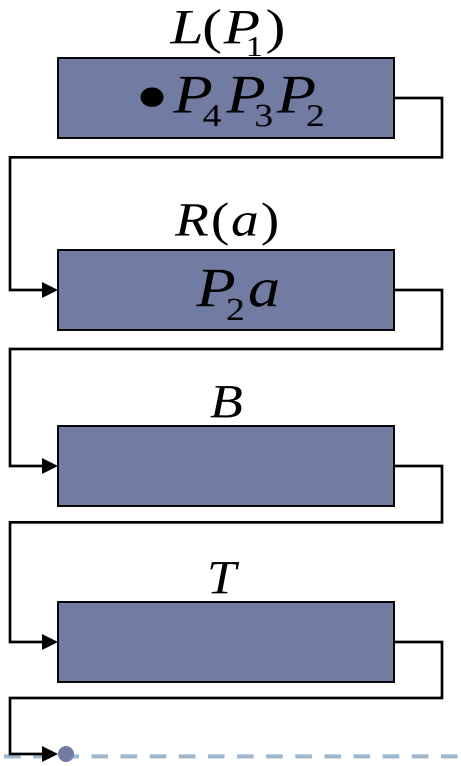

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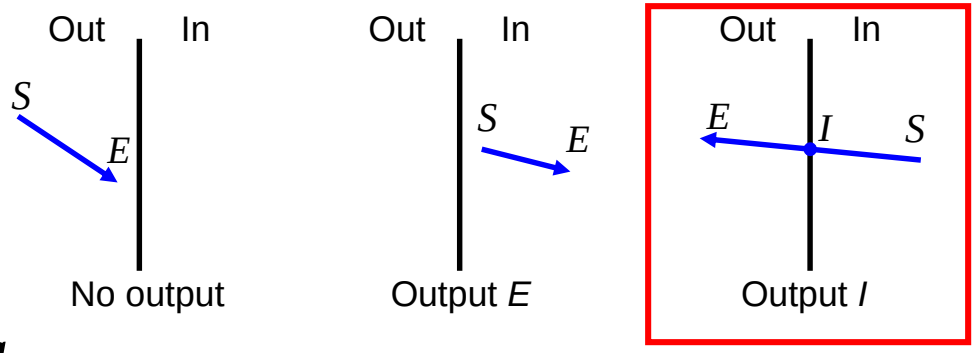

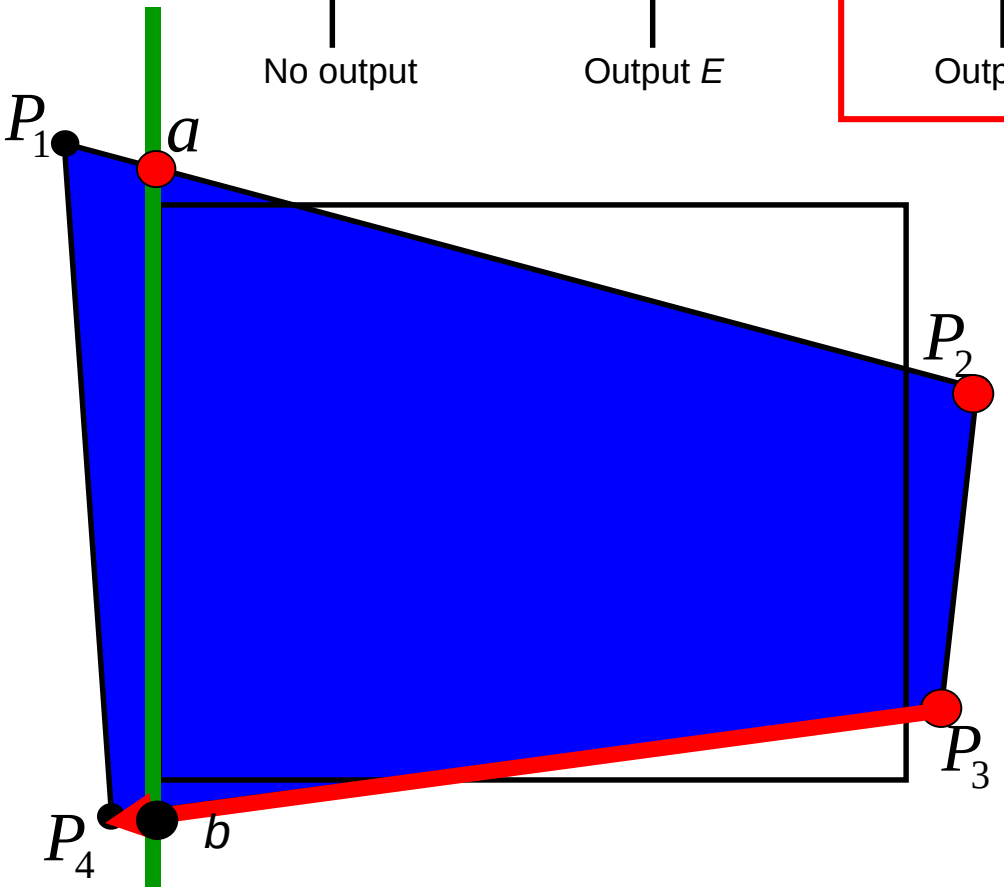

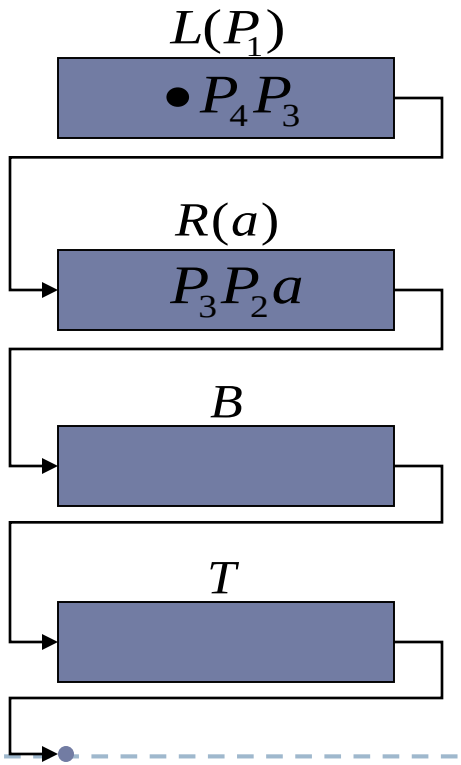

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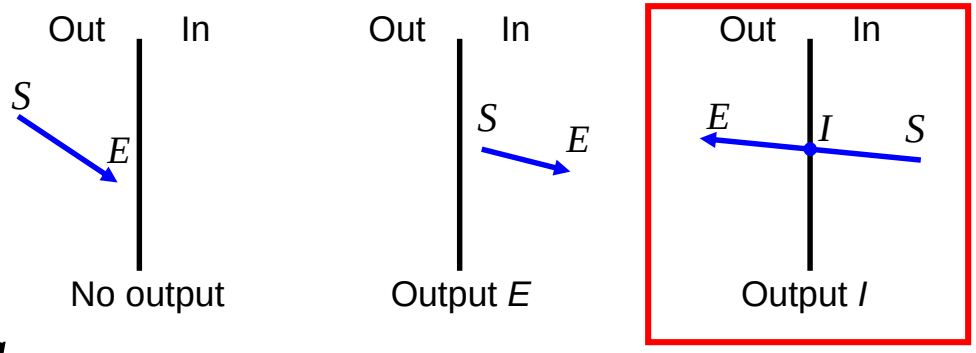
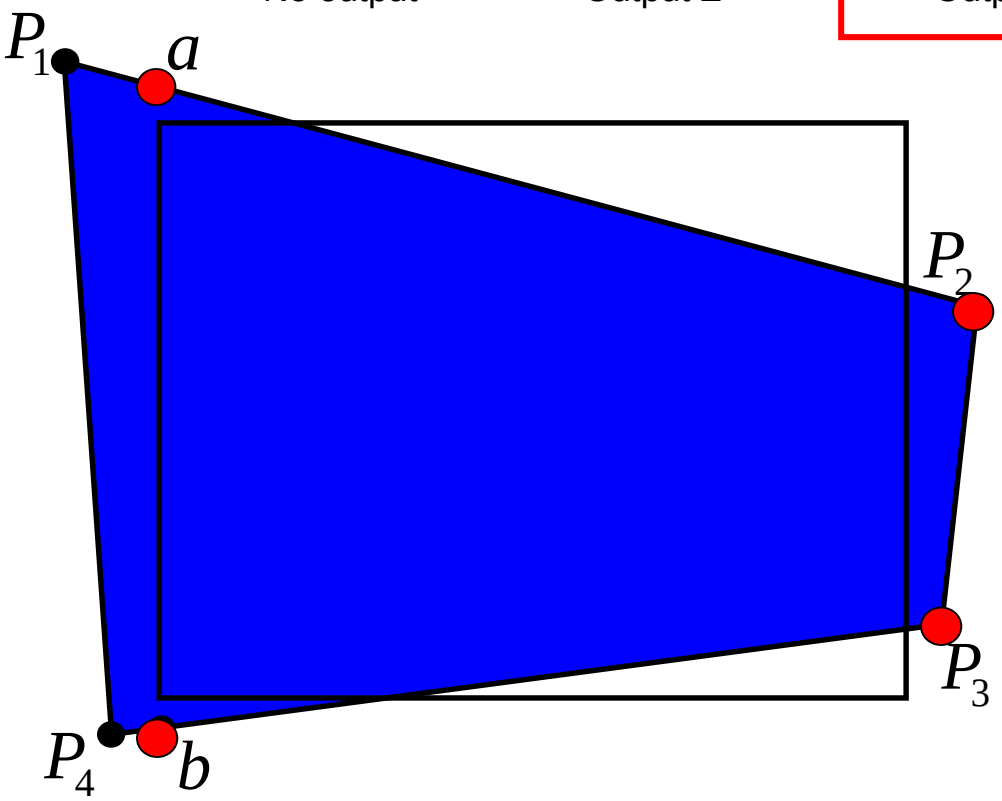
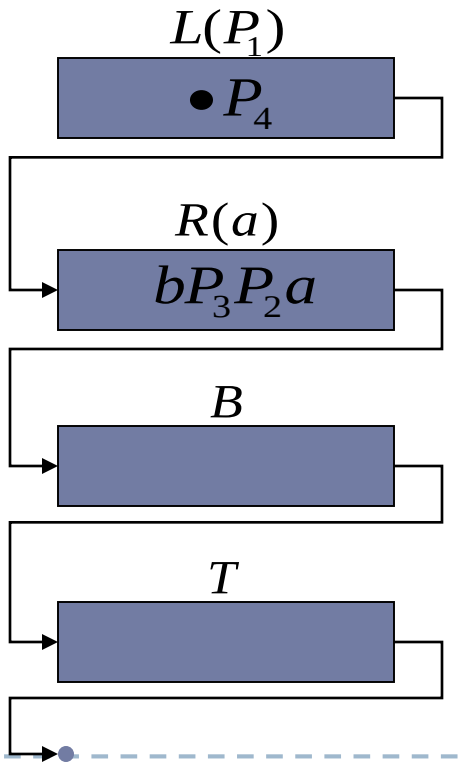
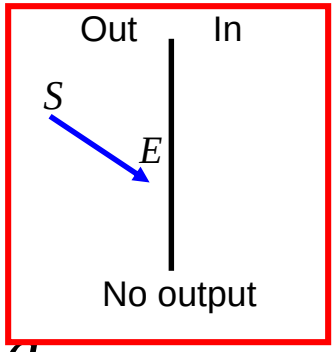
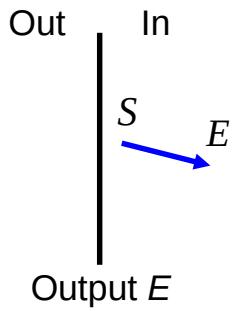


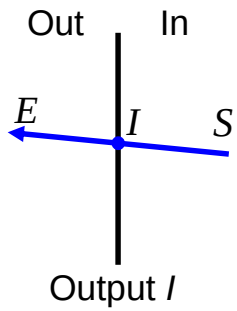


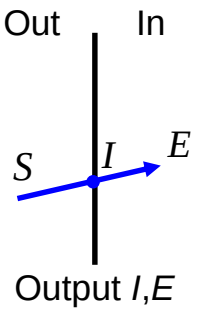


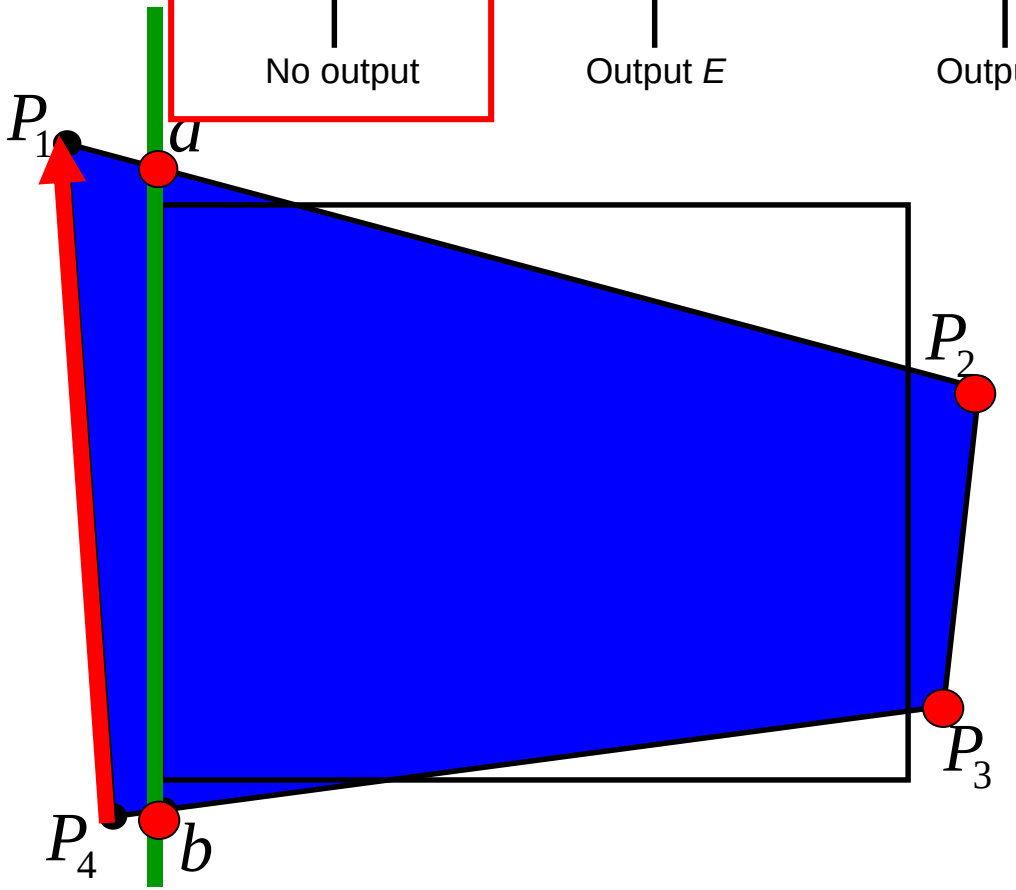
Sutherland-Hodgman Algorithm

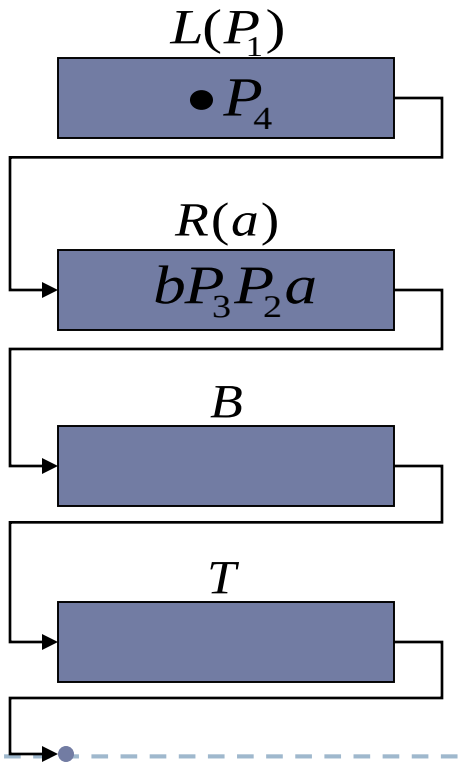












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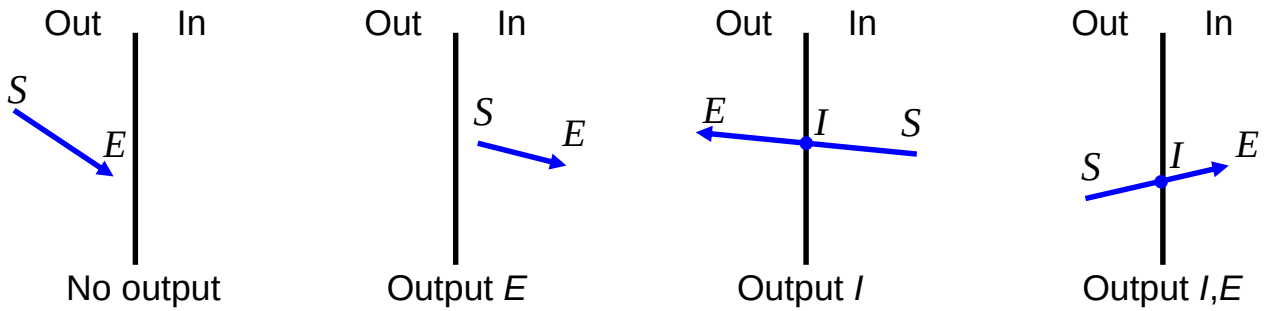

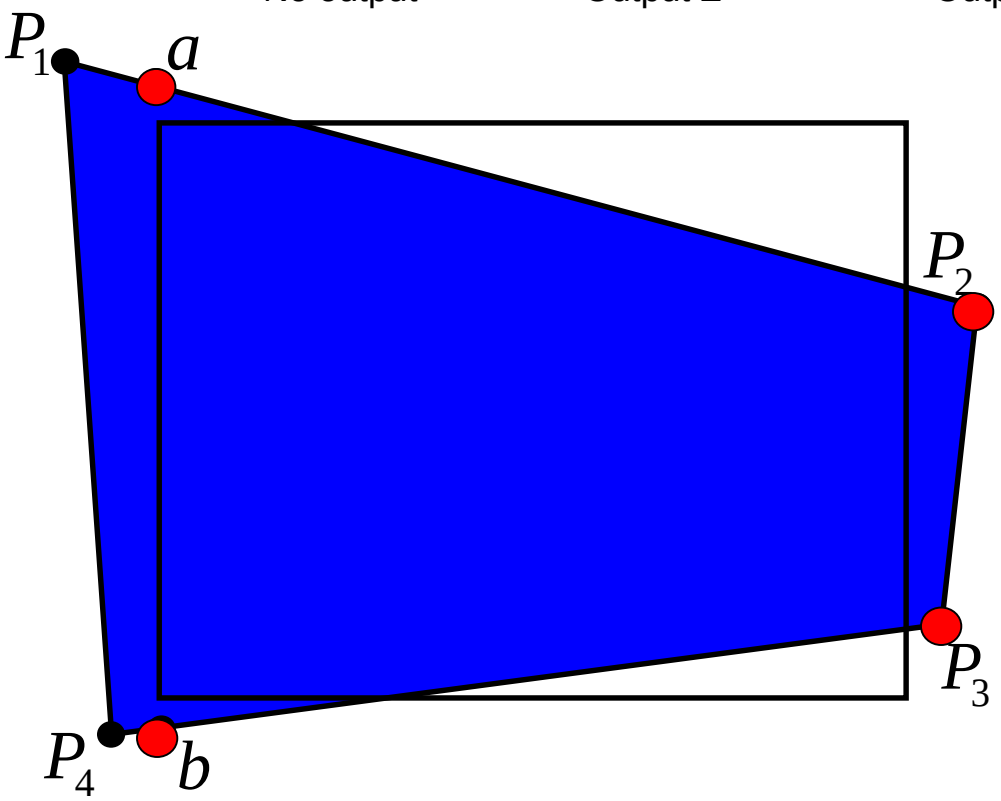

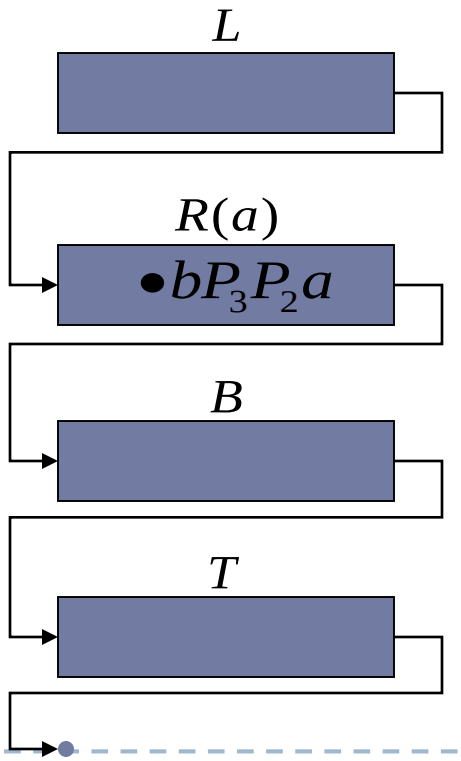

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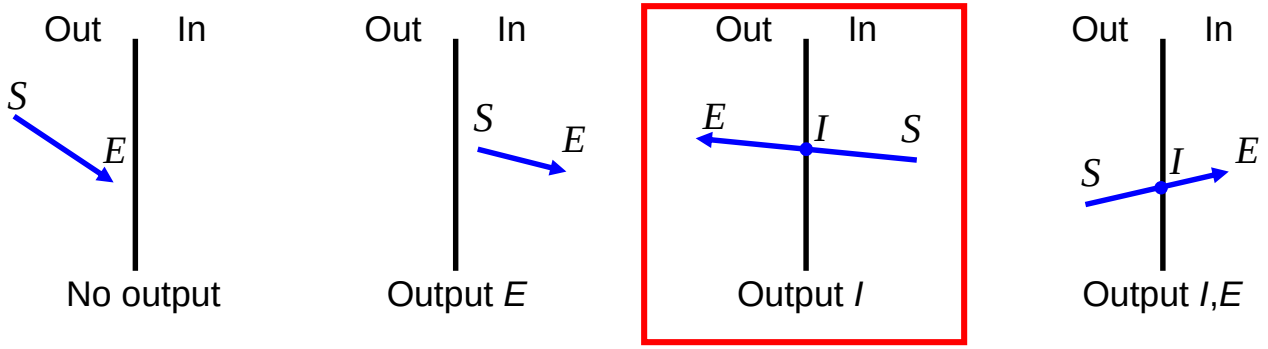

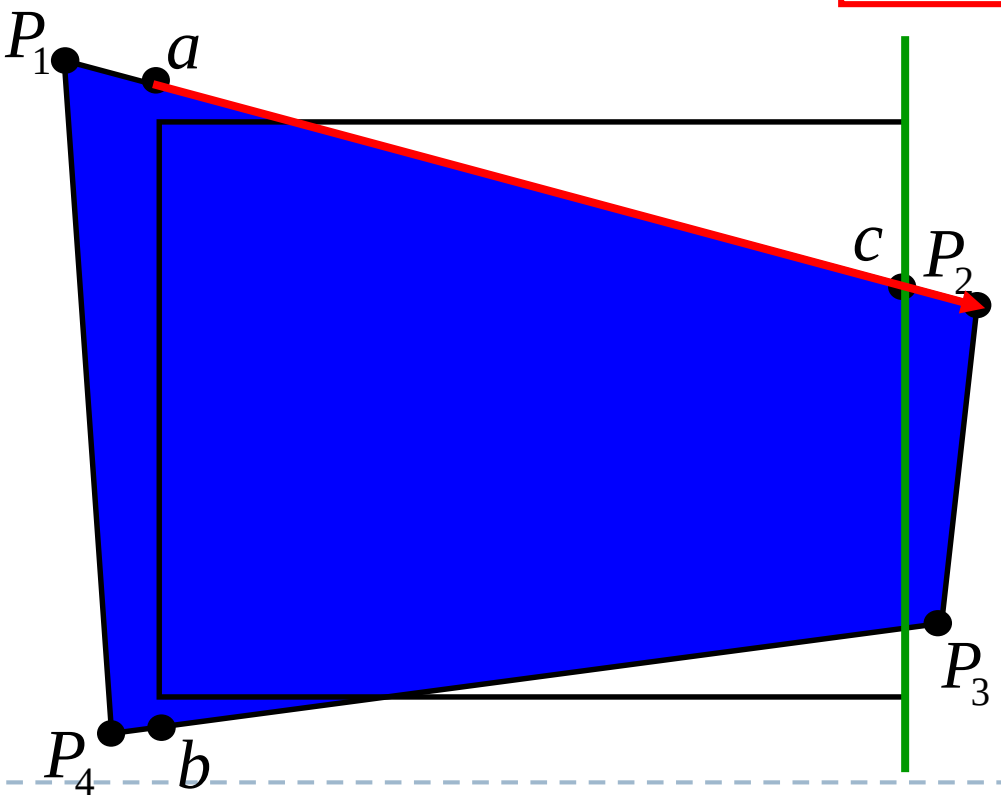

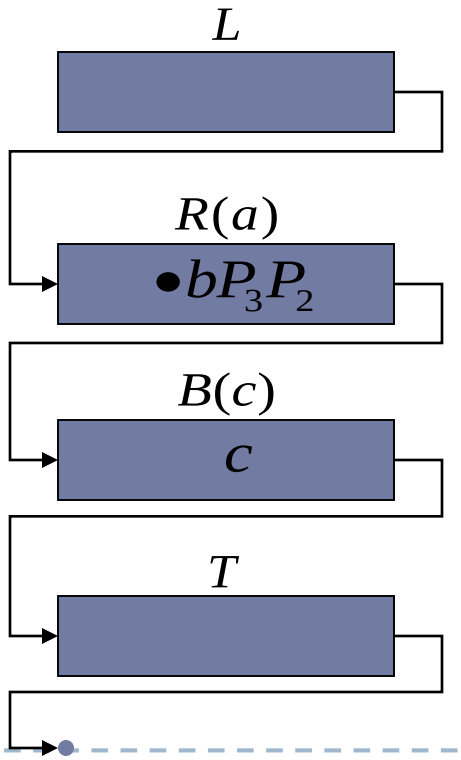

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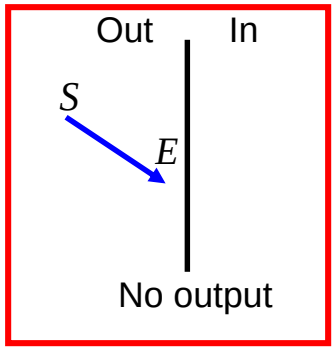

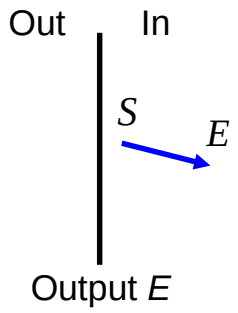

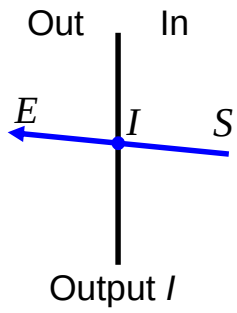

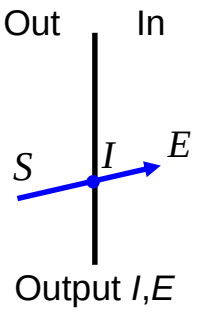

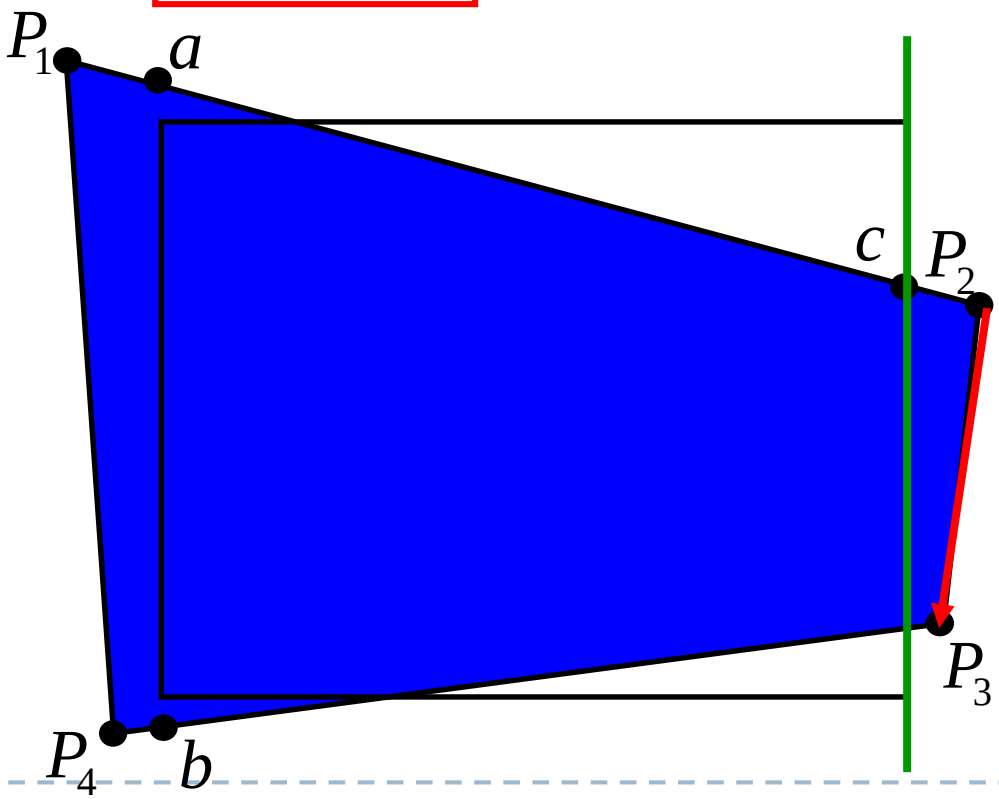

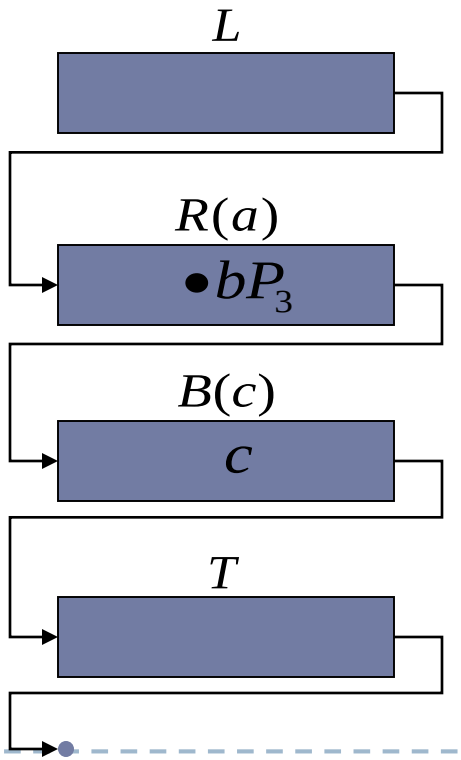

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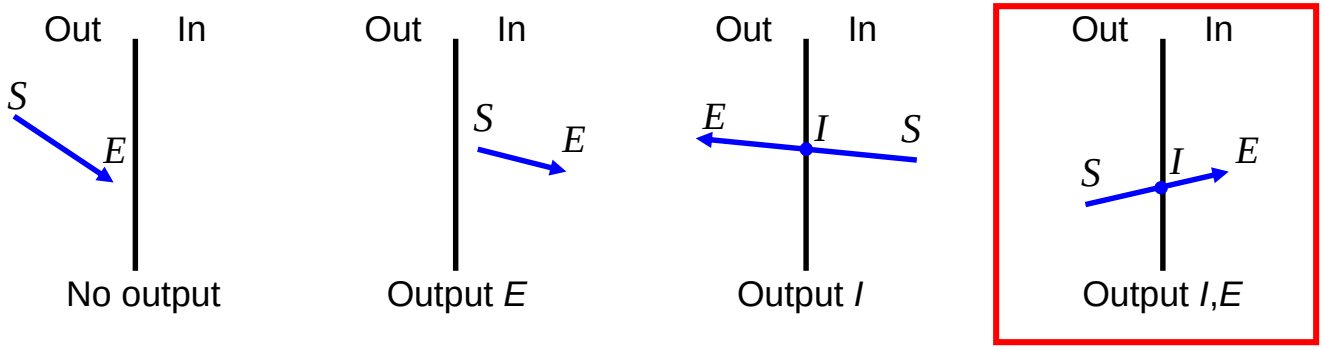

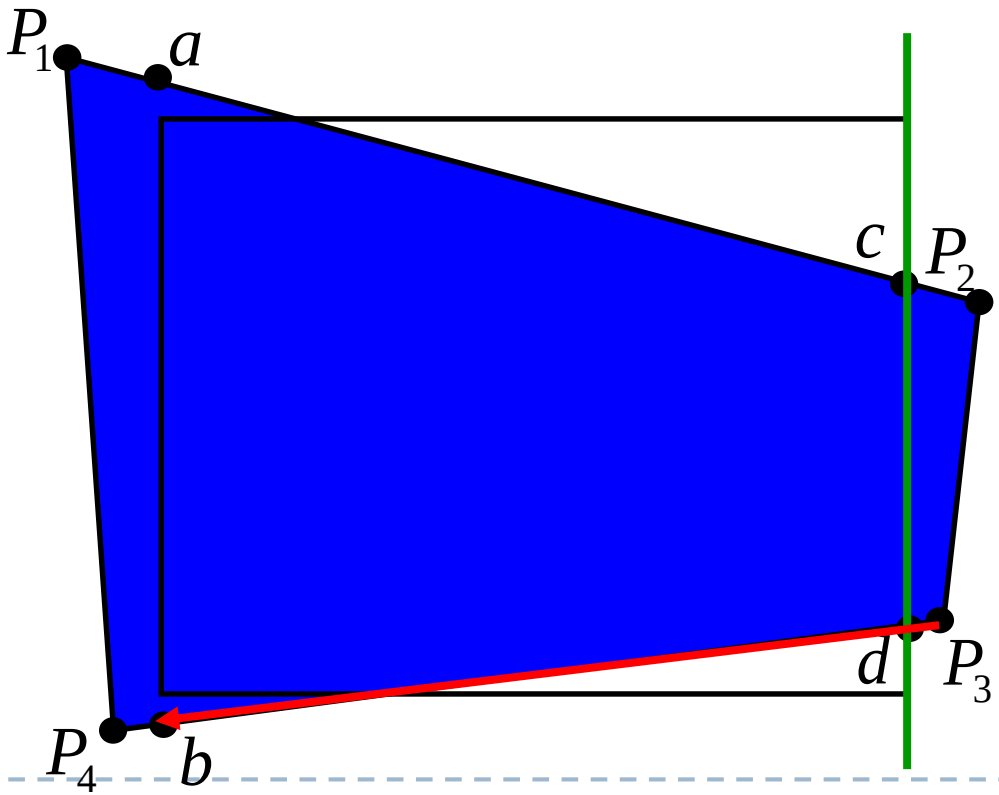

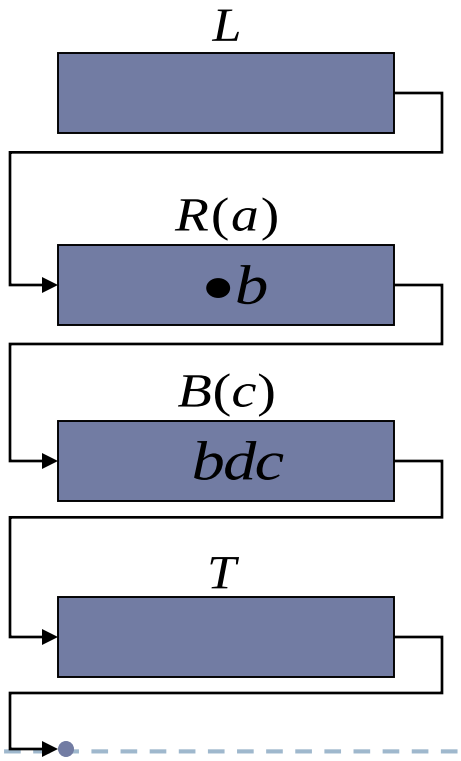

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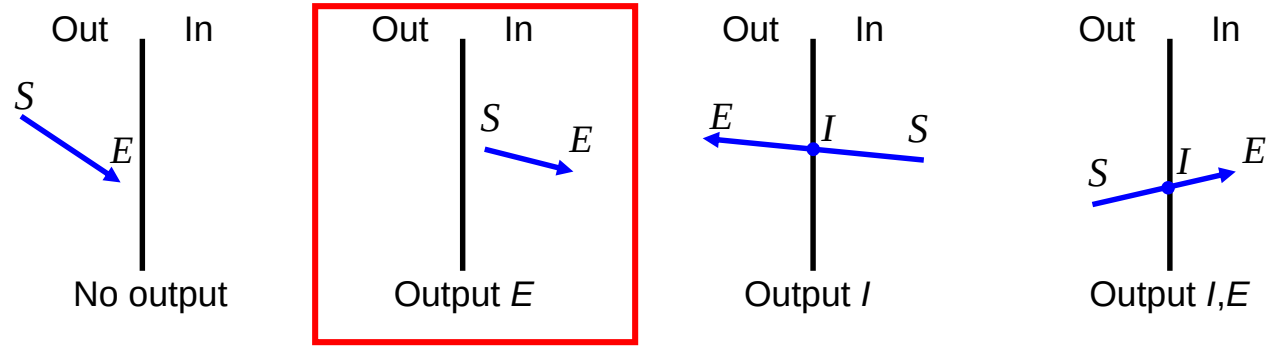

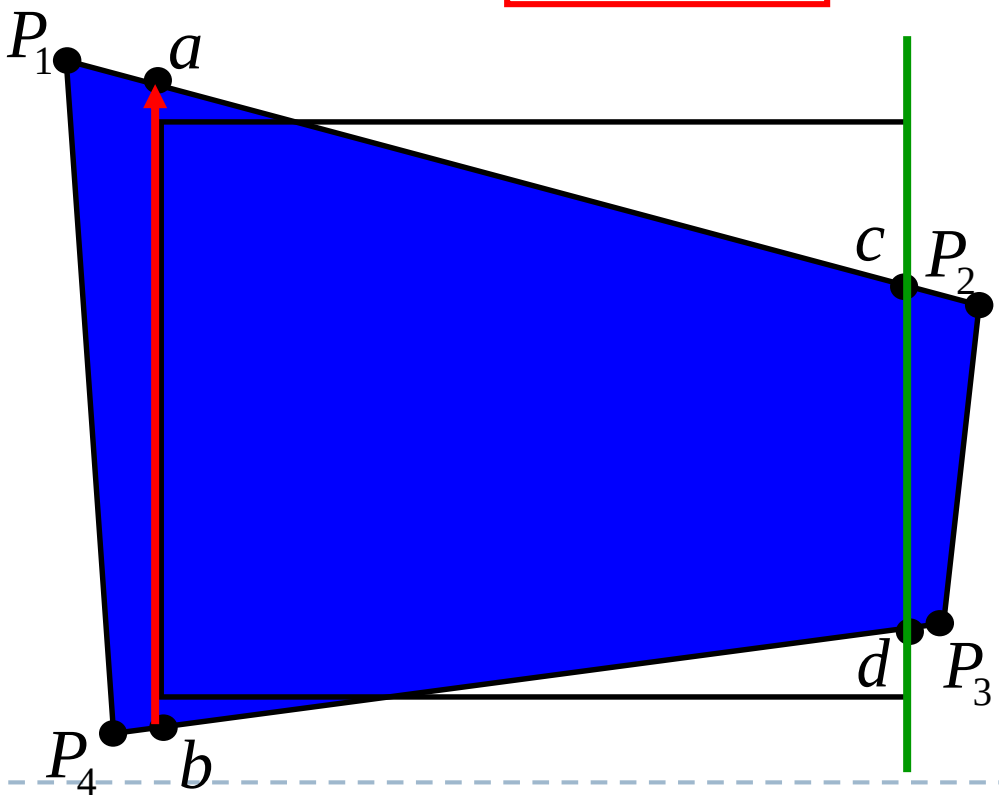

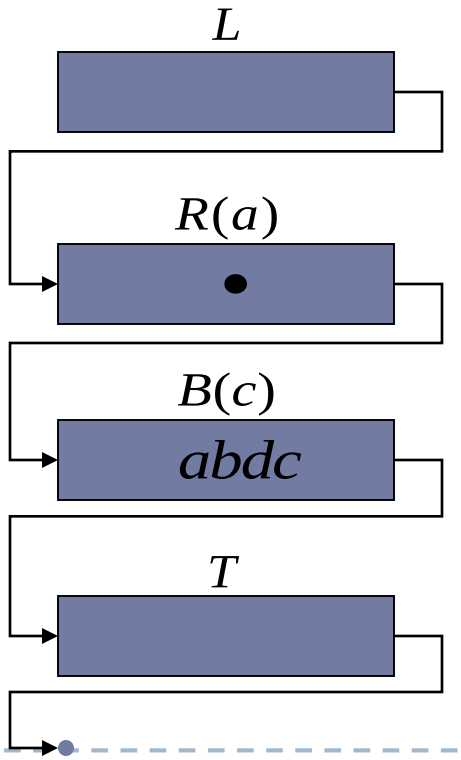

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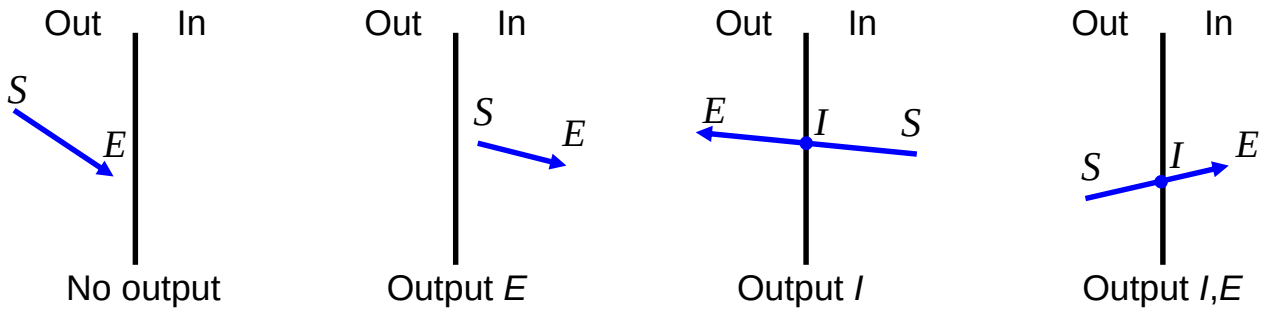

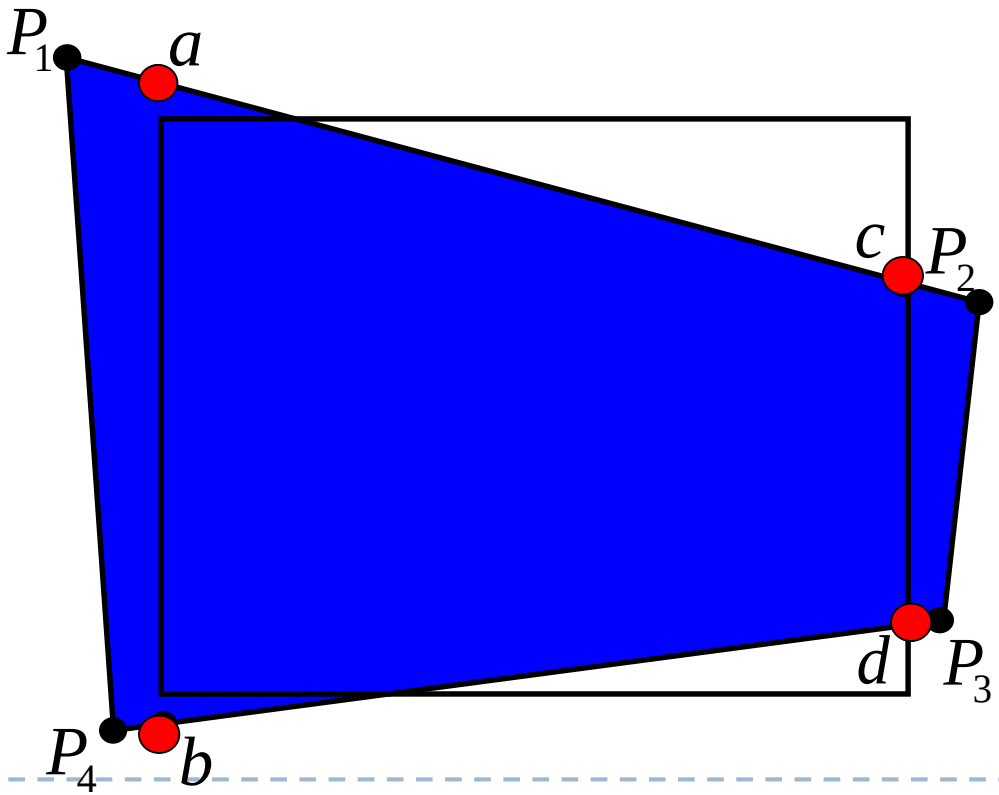

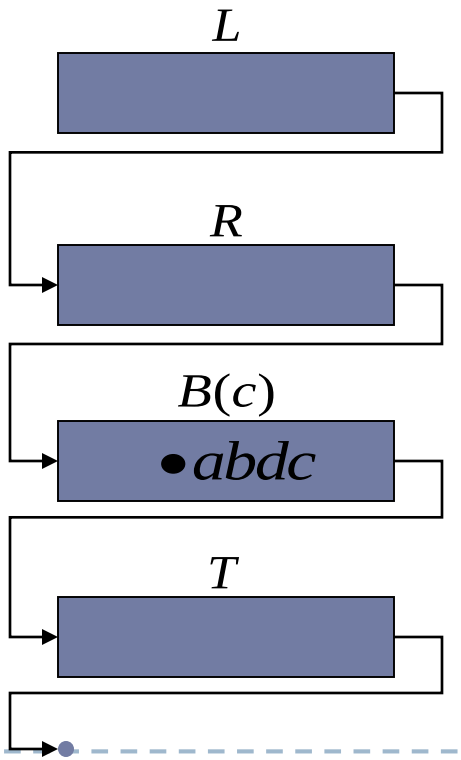

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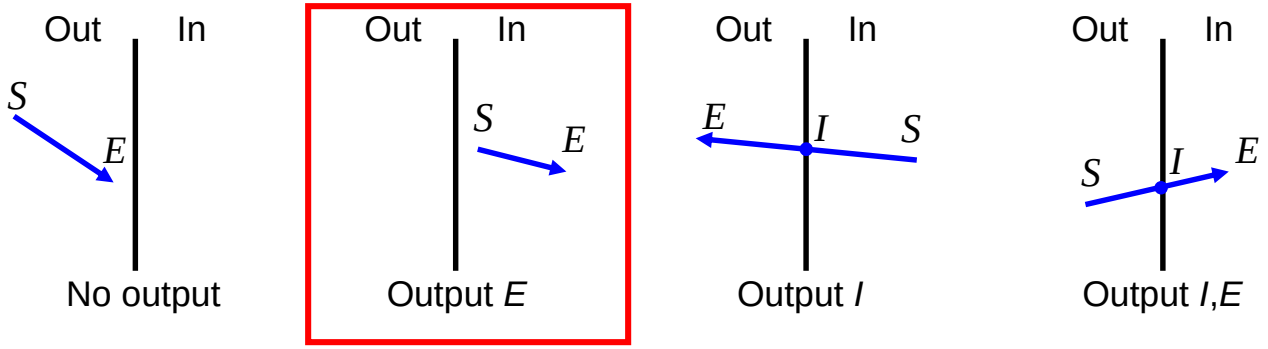

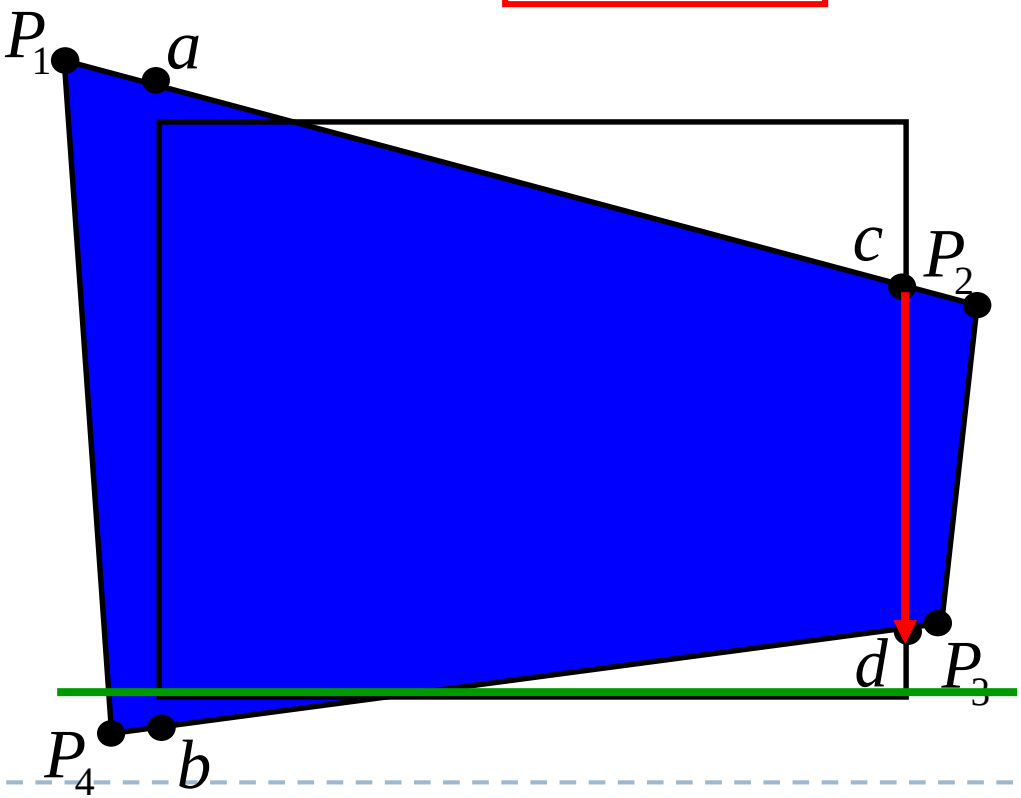

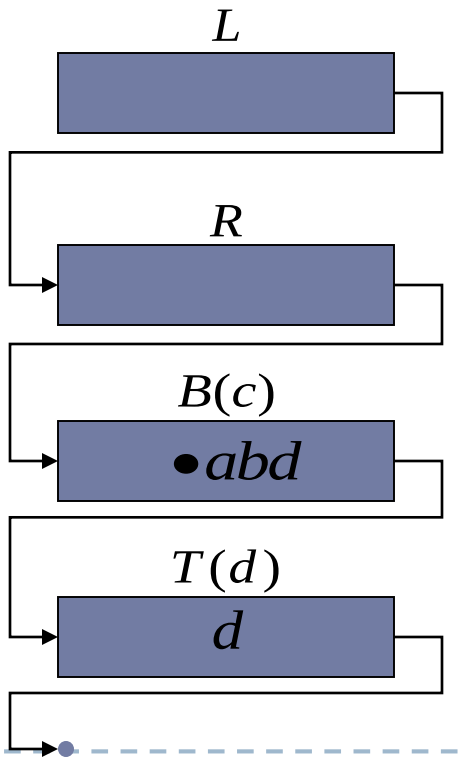

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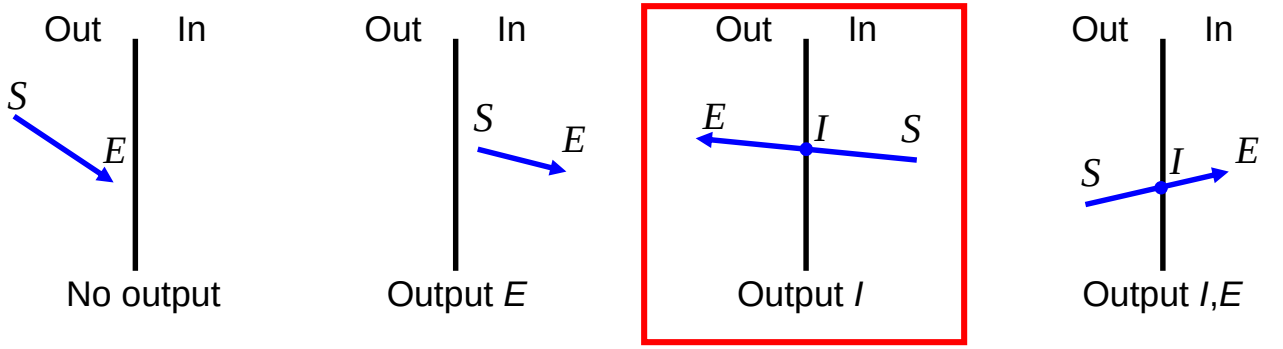

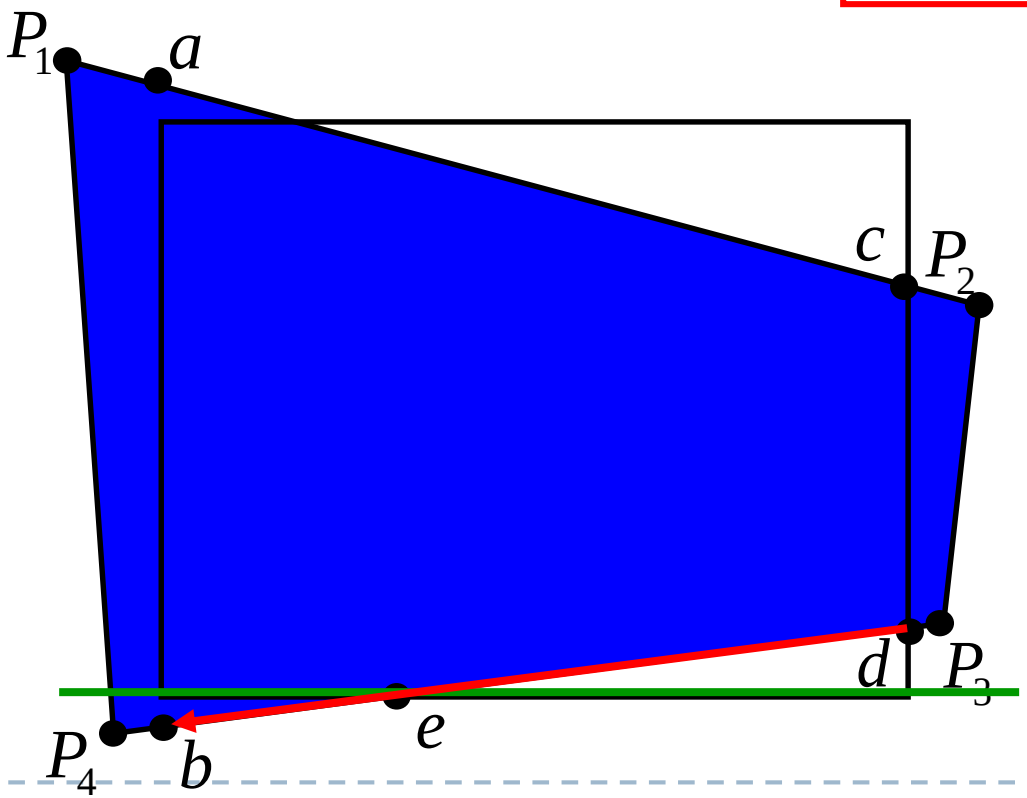

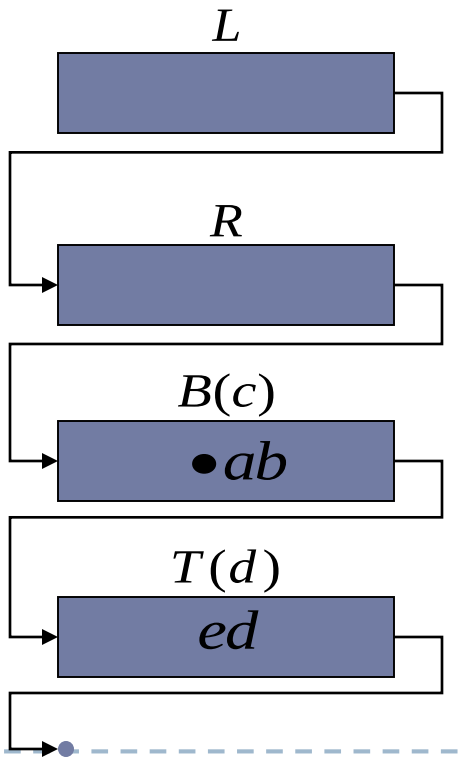

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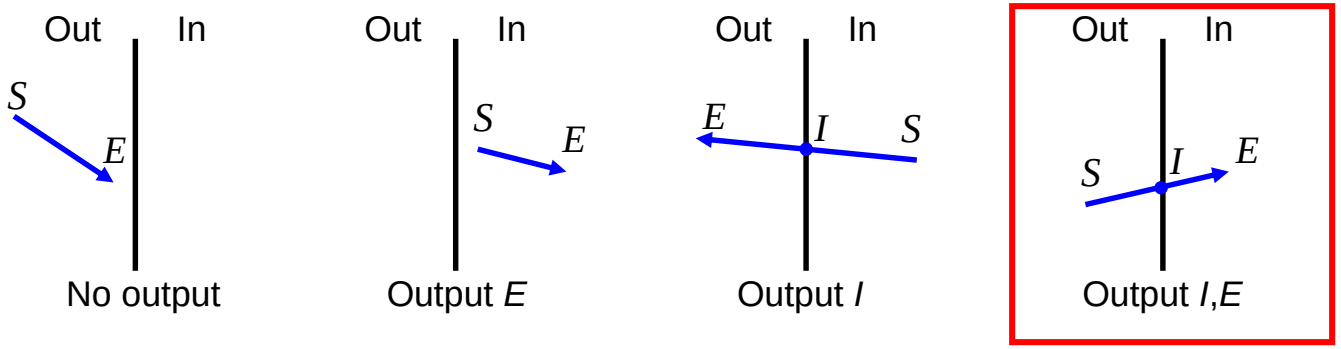

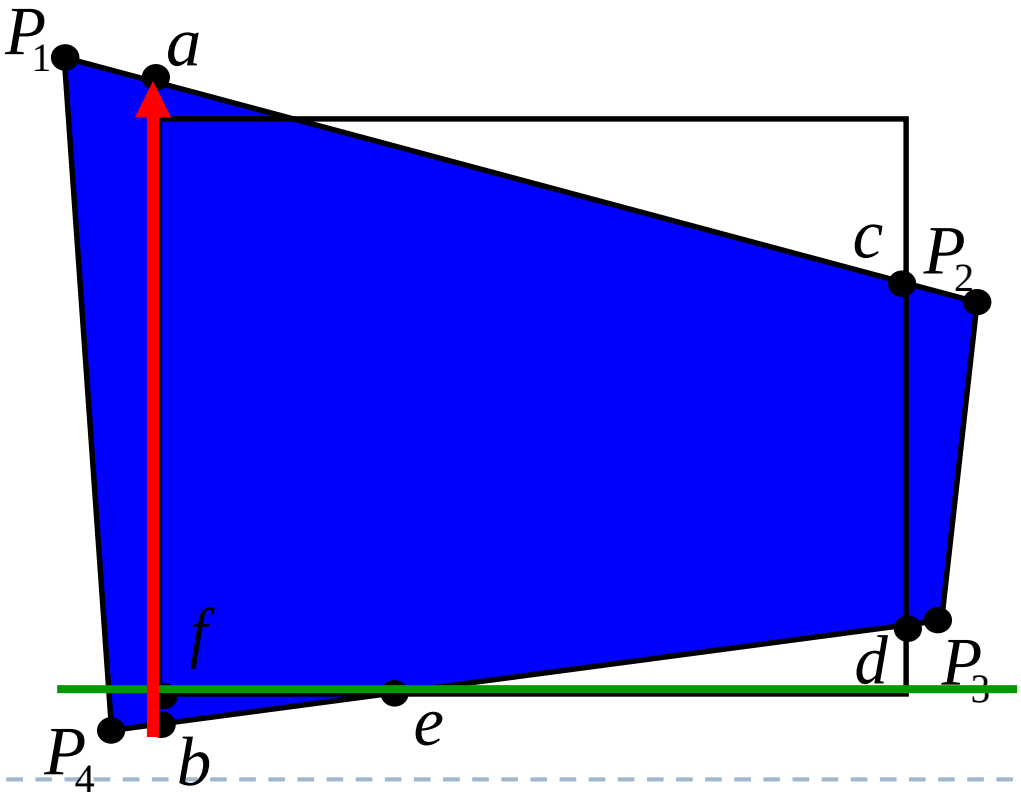

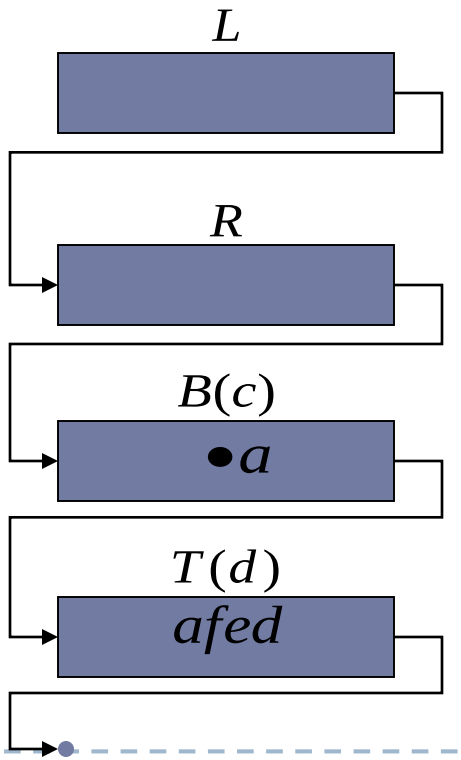

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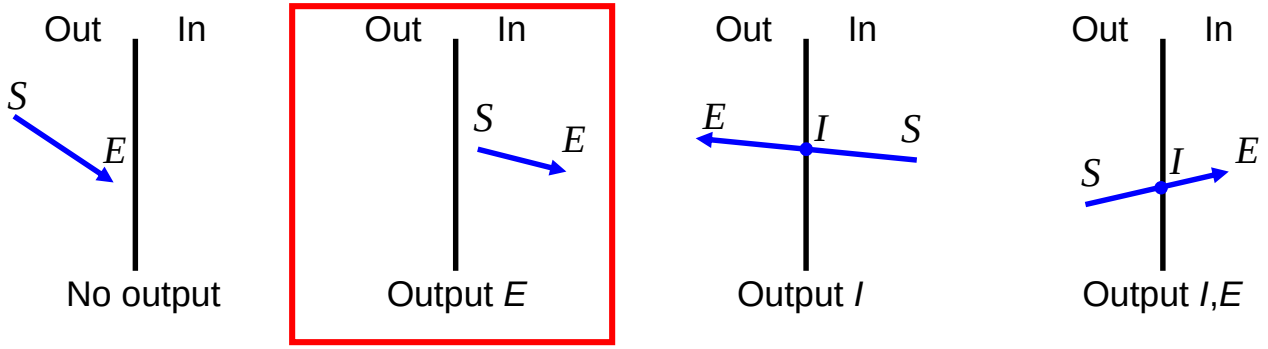

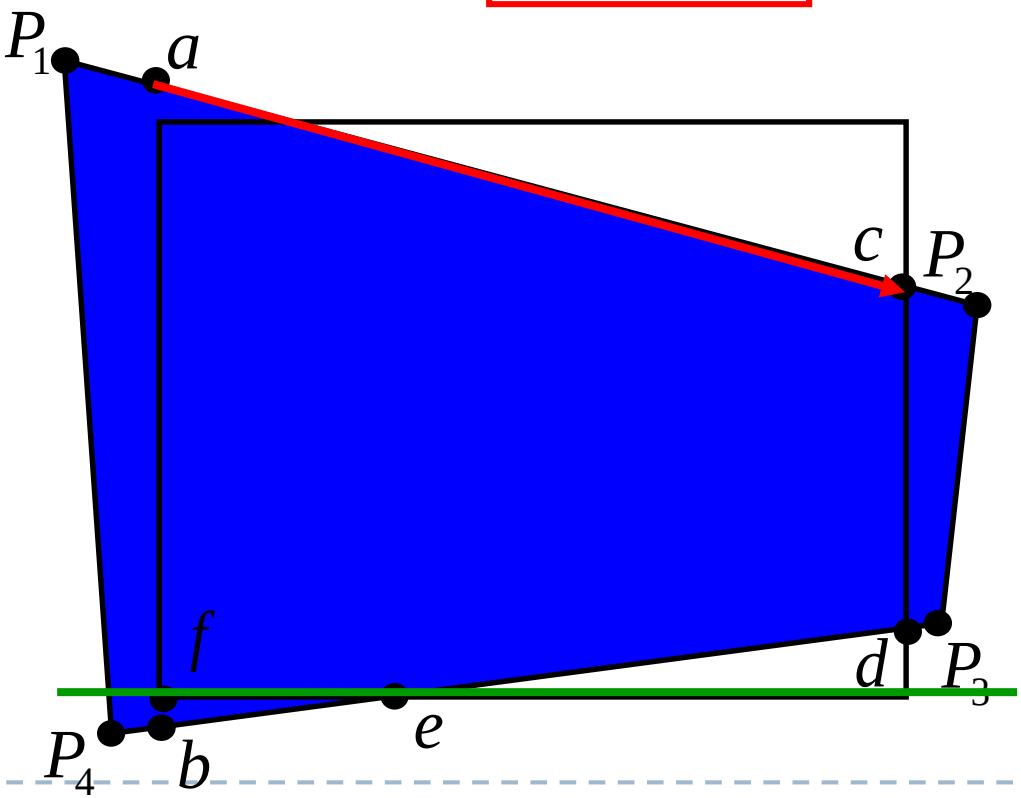

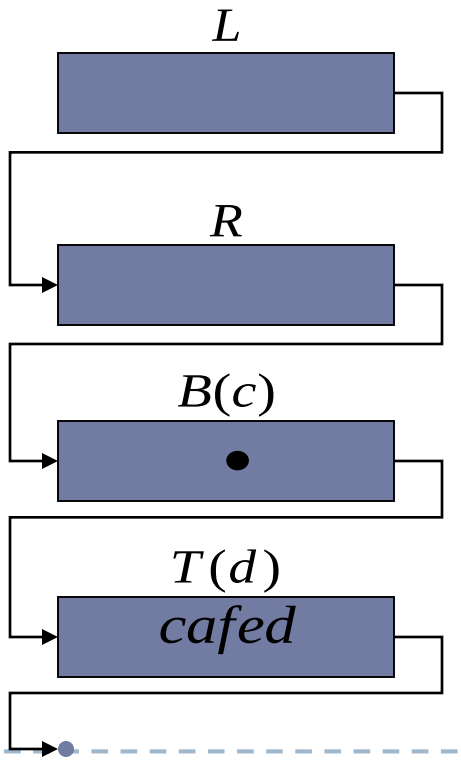

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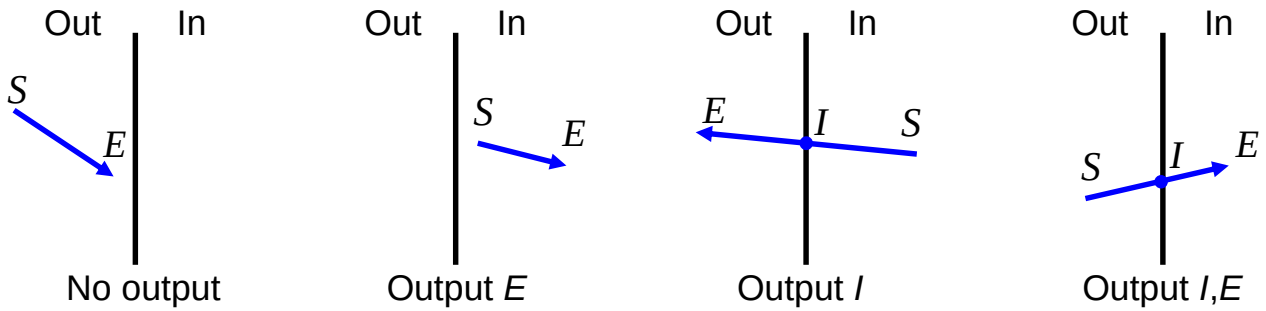

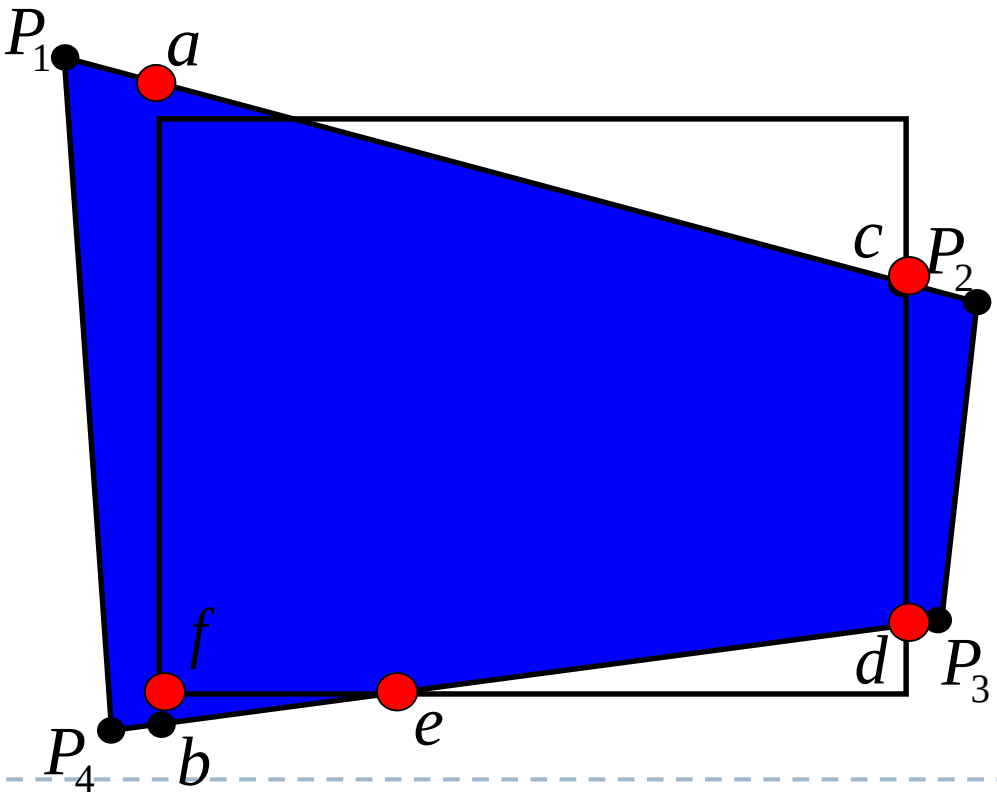

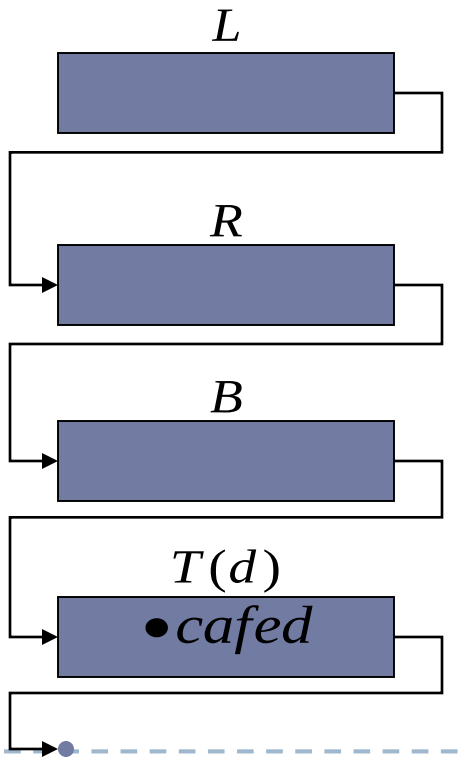

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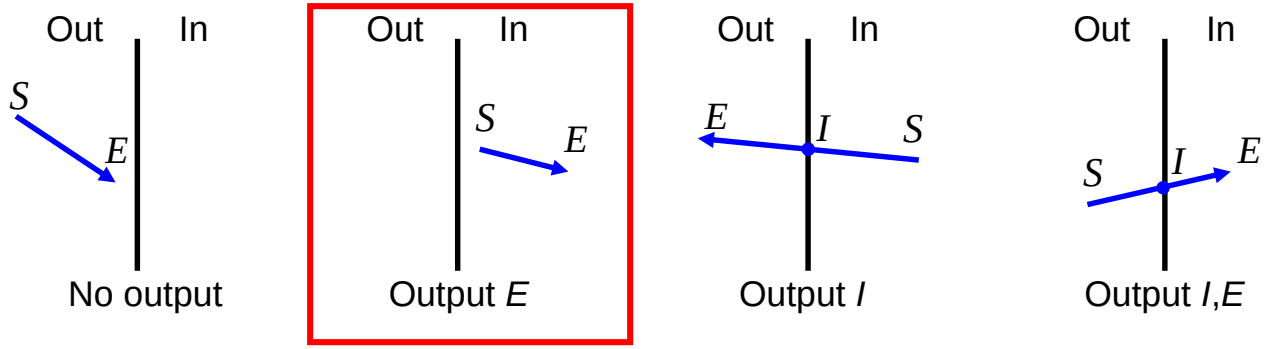

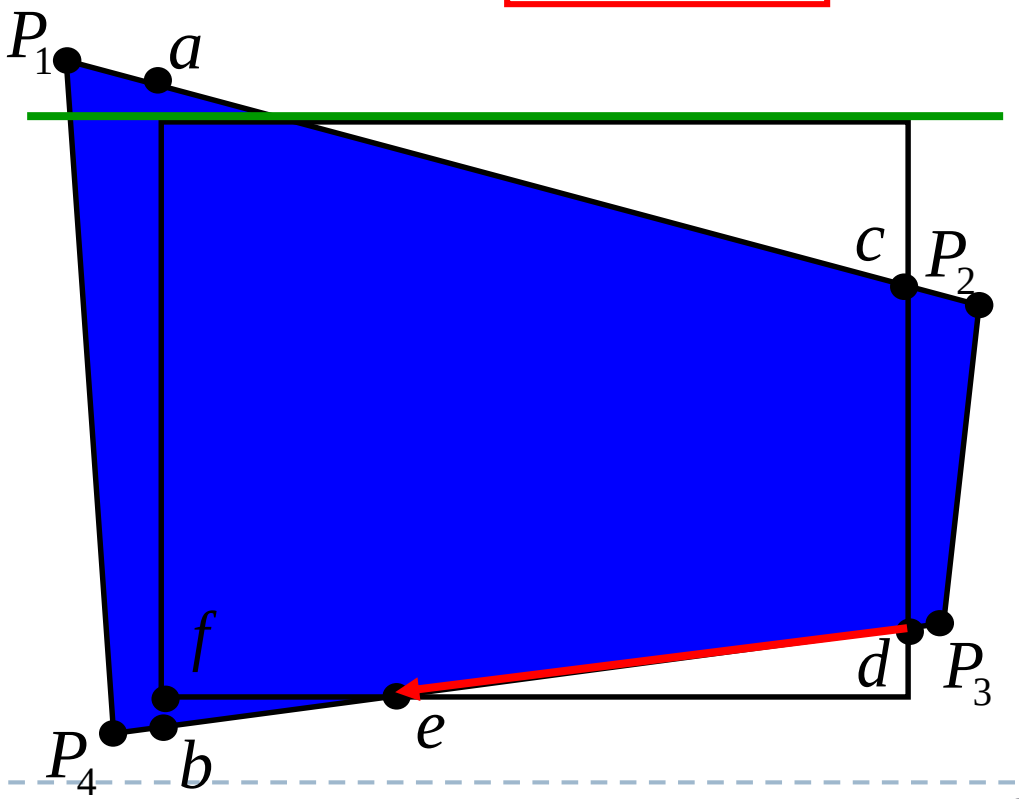

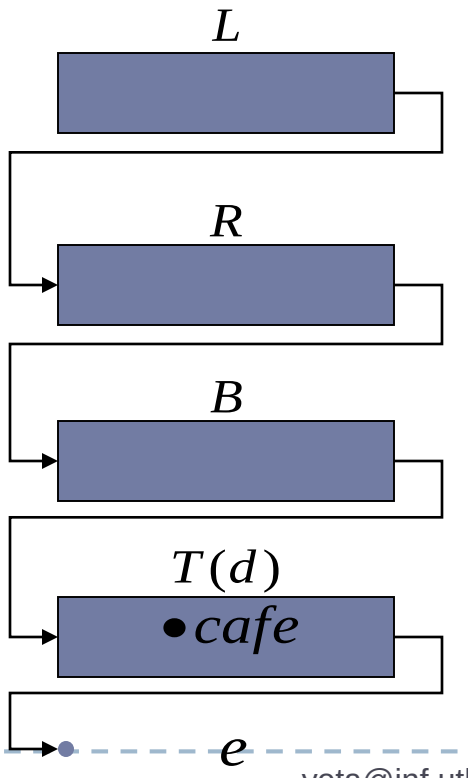

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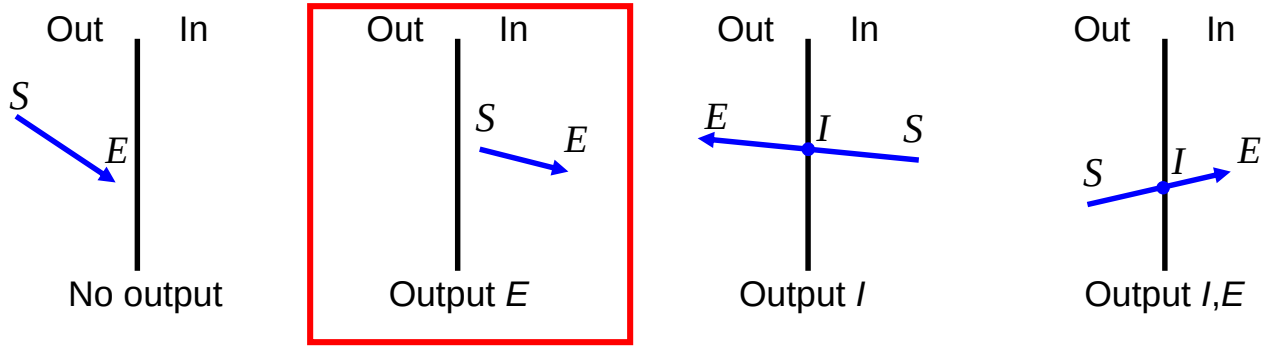

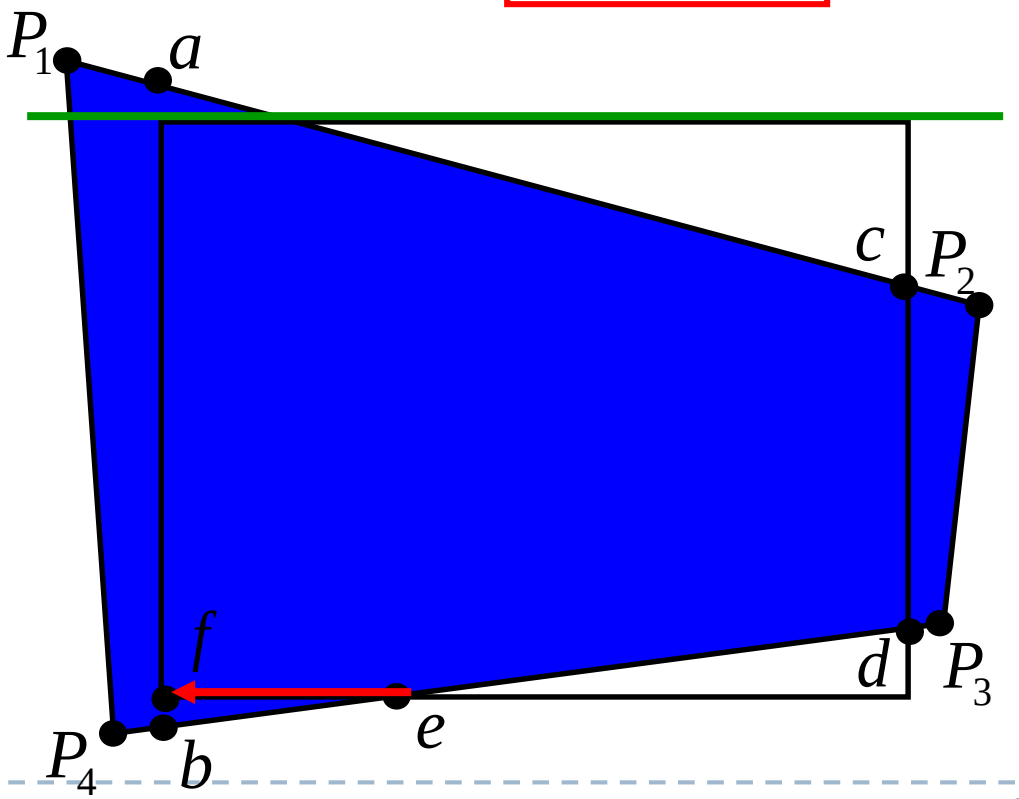

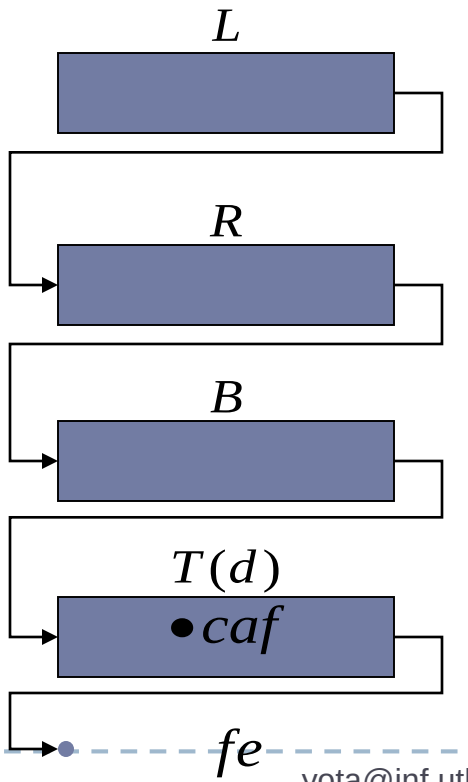

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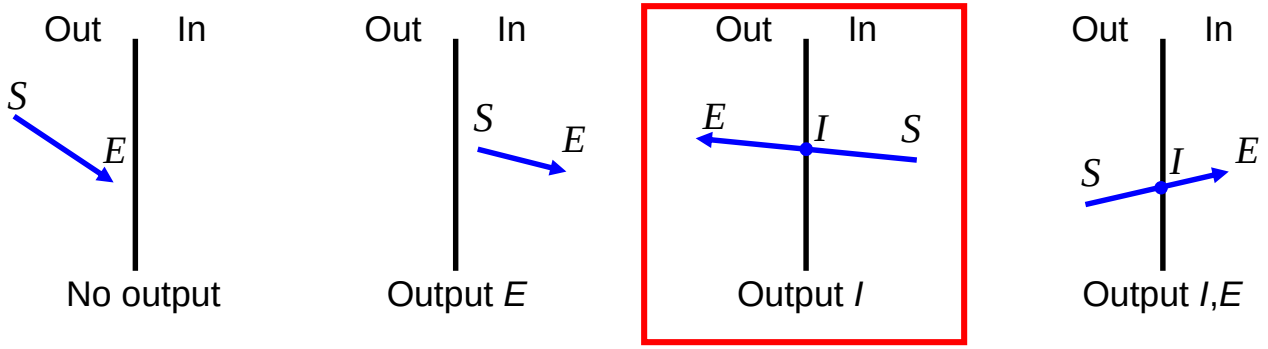

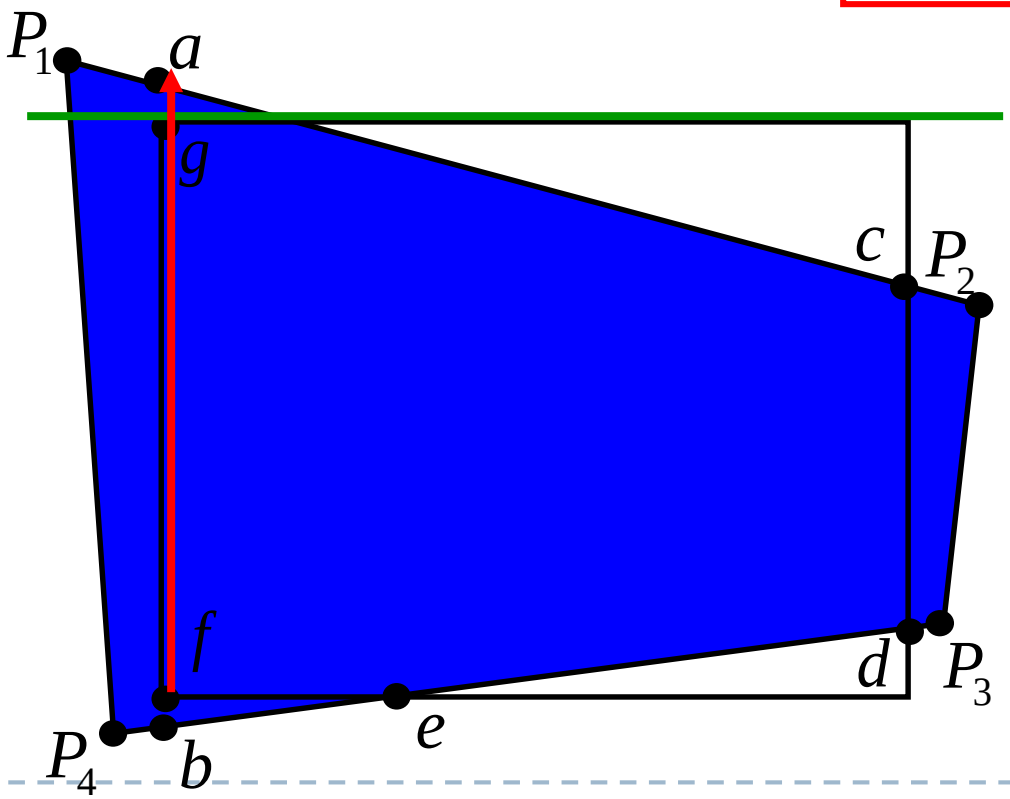

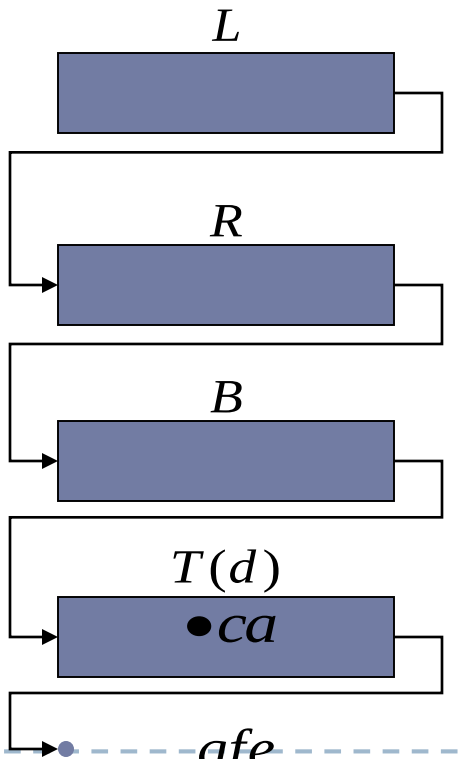

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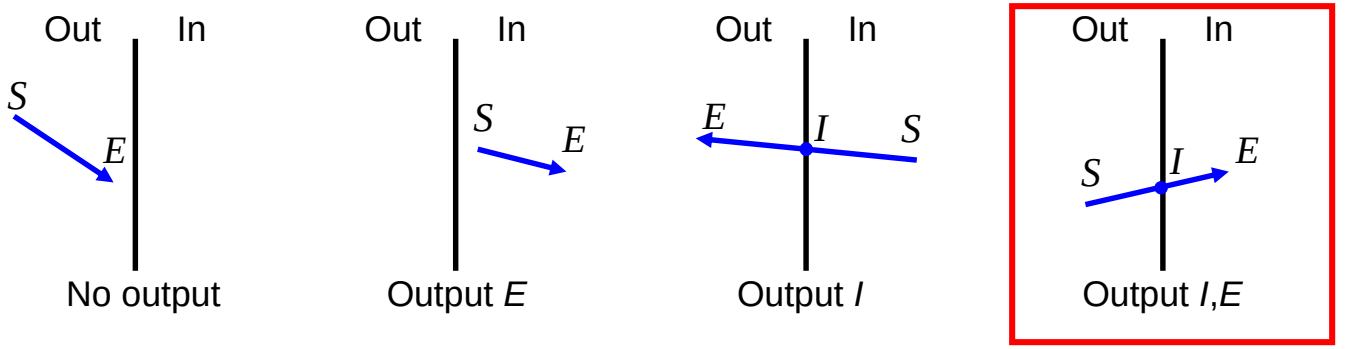

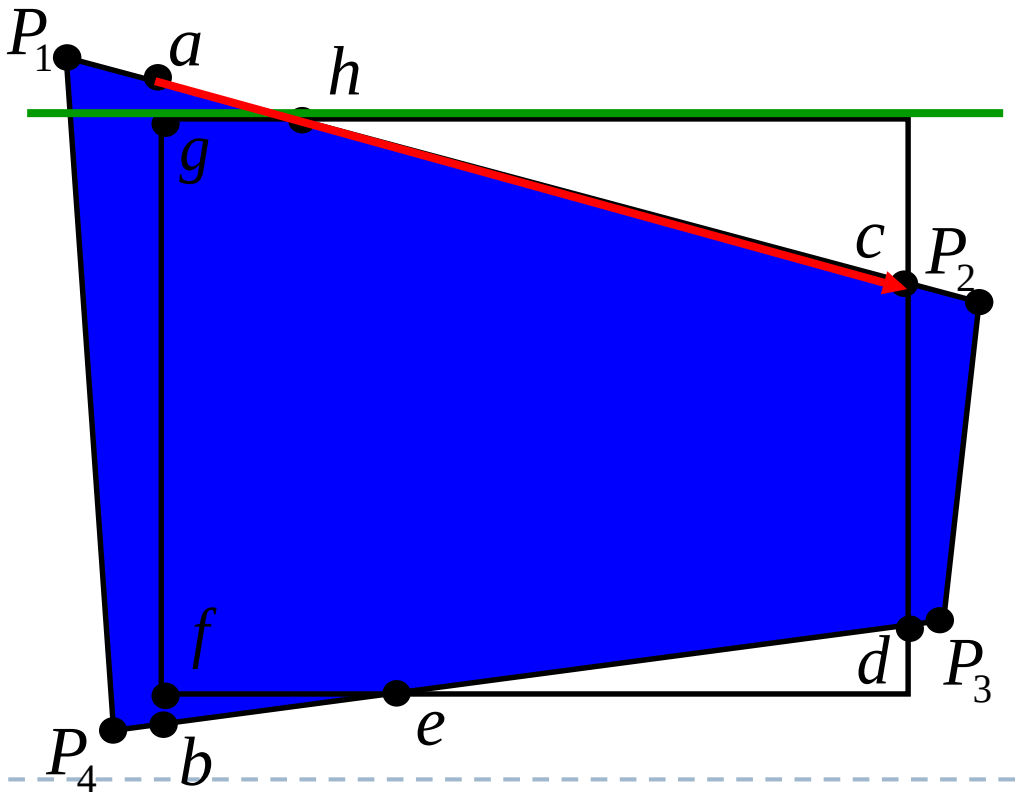

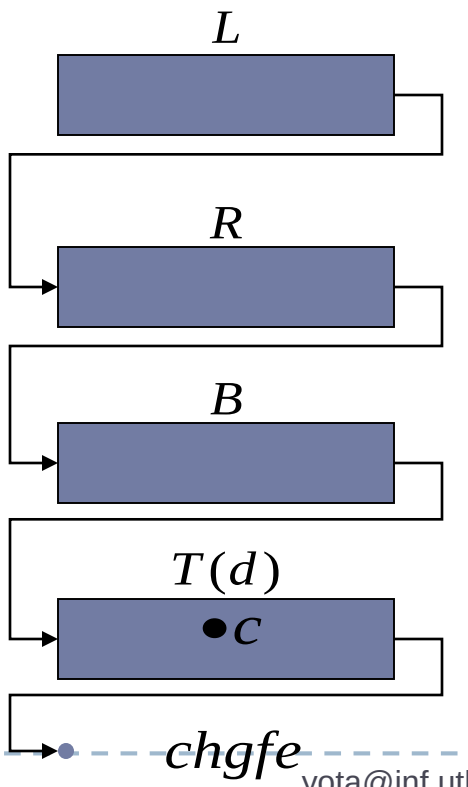

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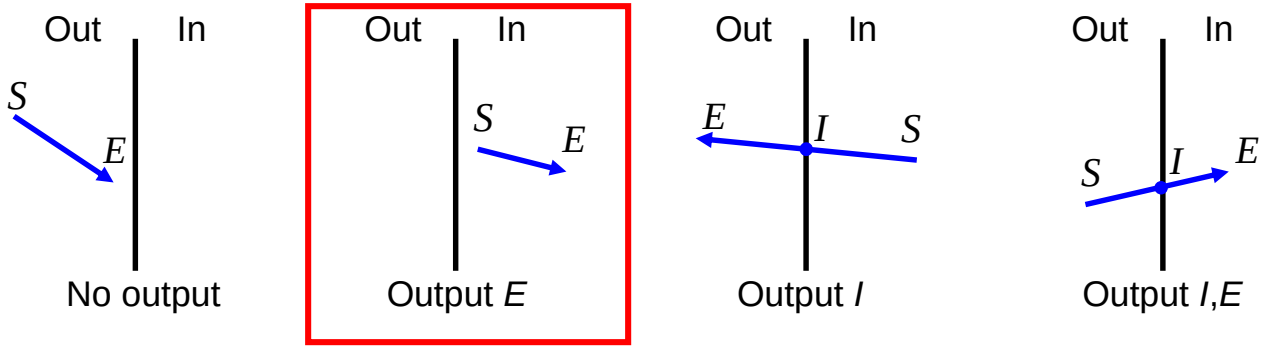
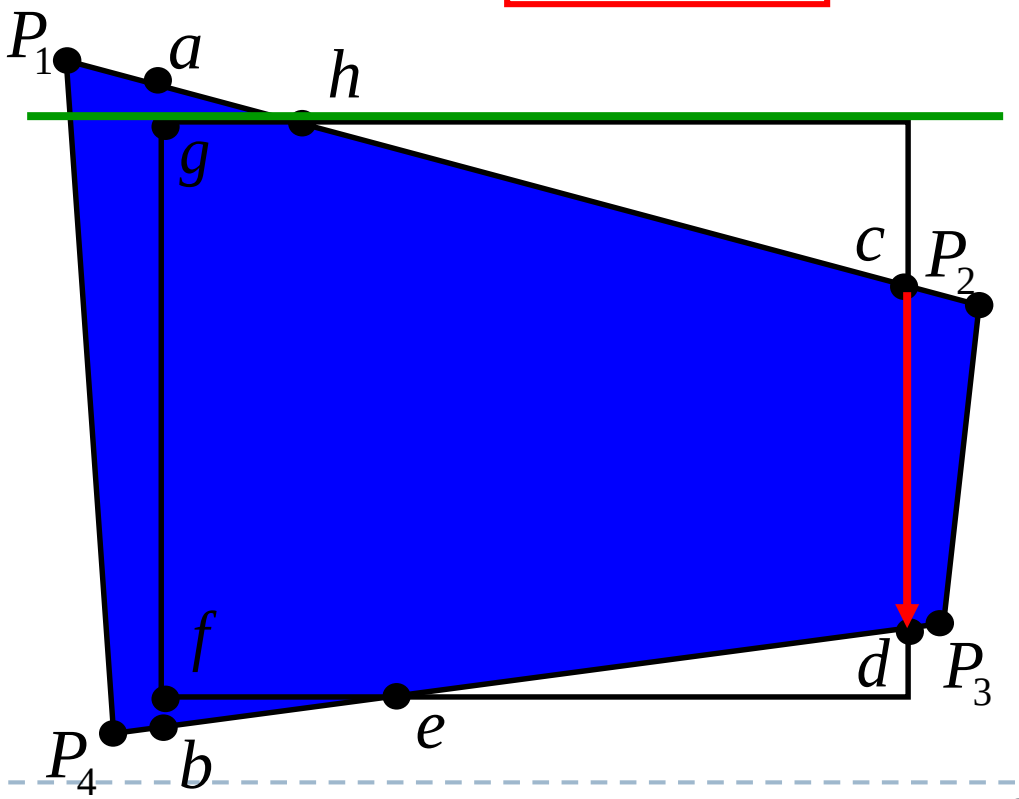
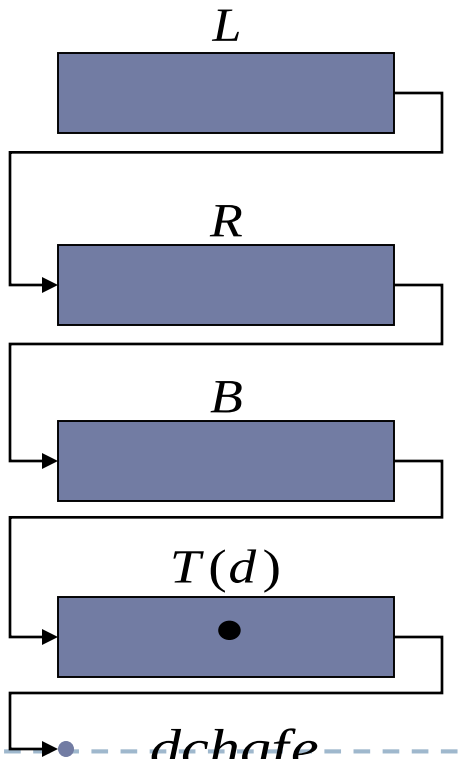
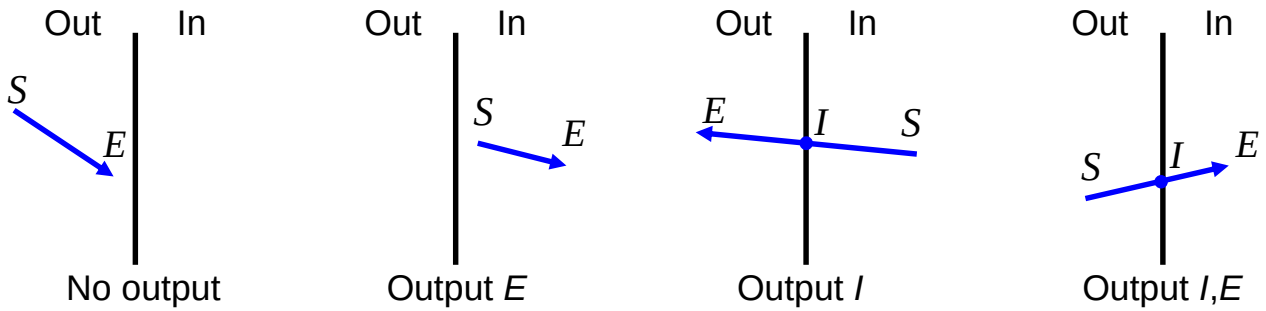
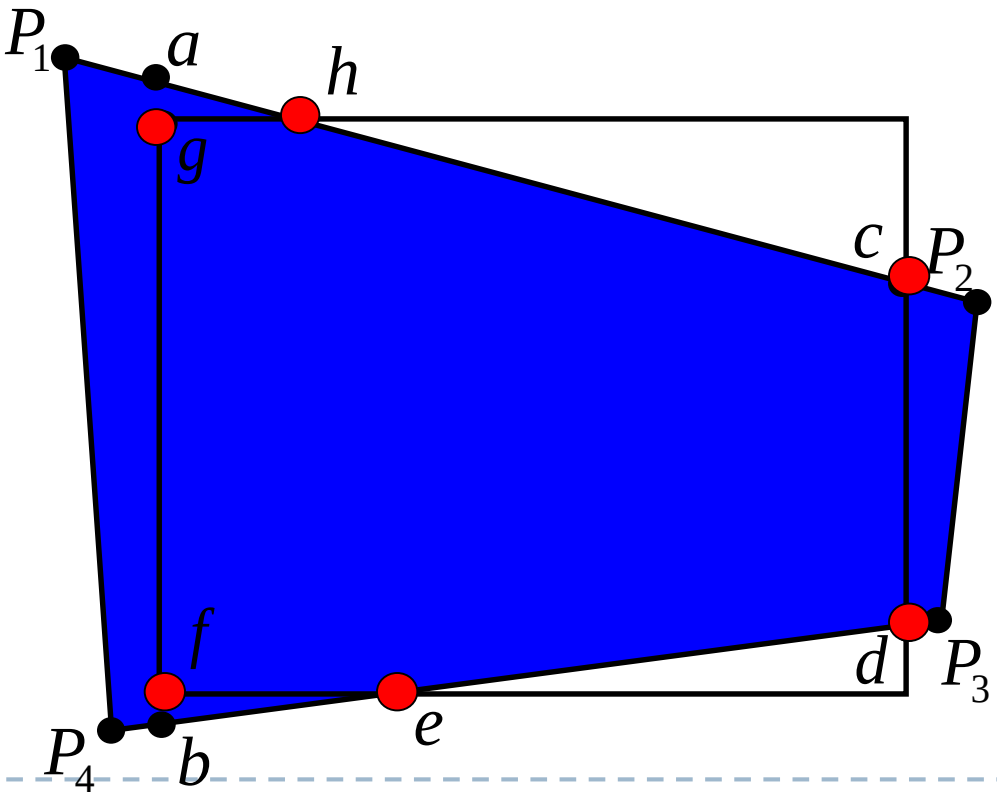


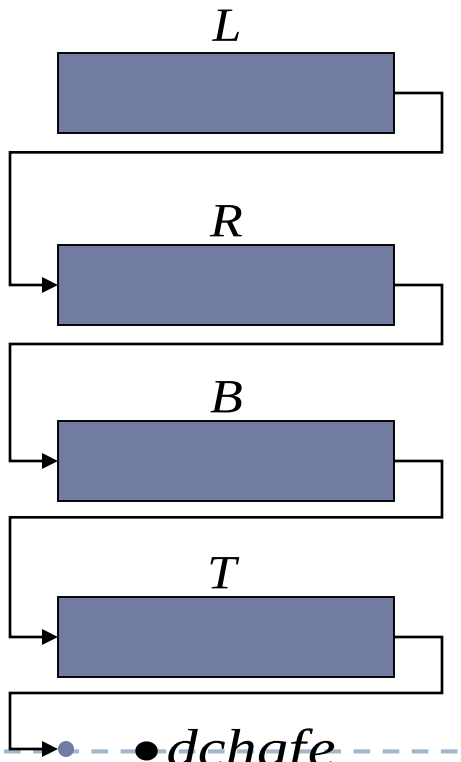




Sutherland-Hodgman Algorithm







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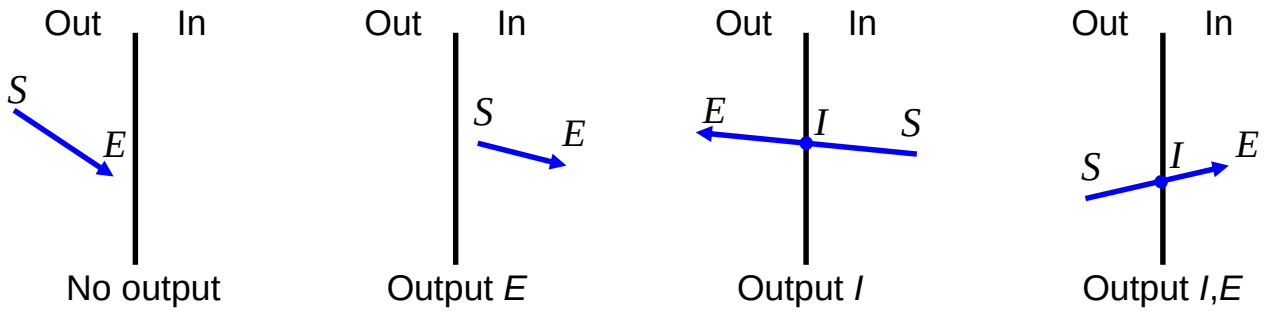

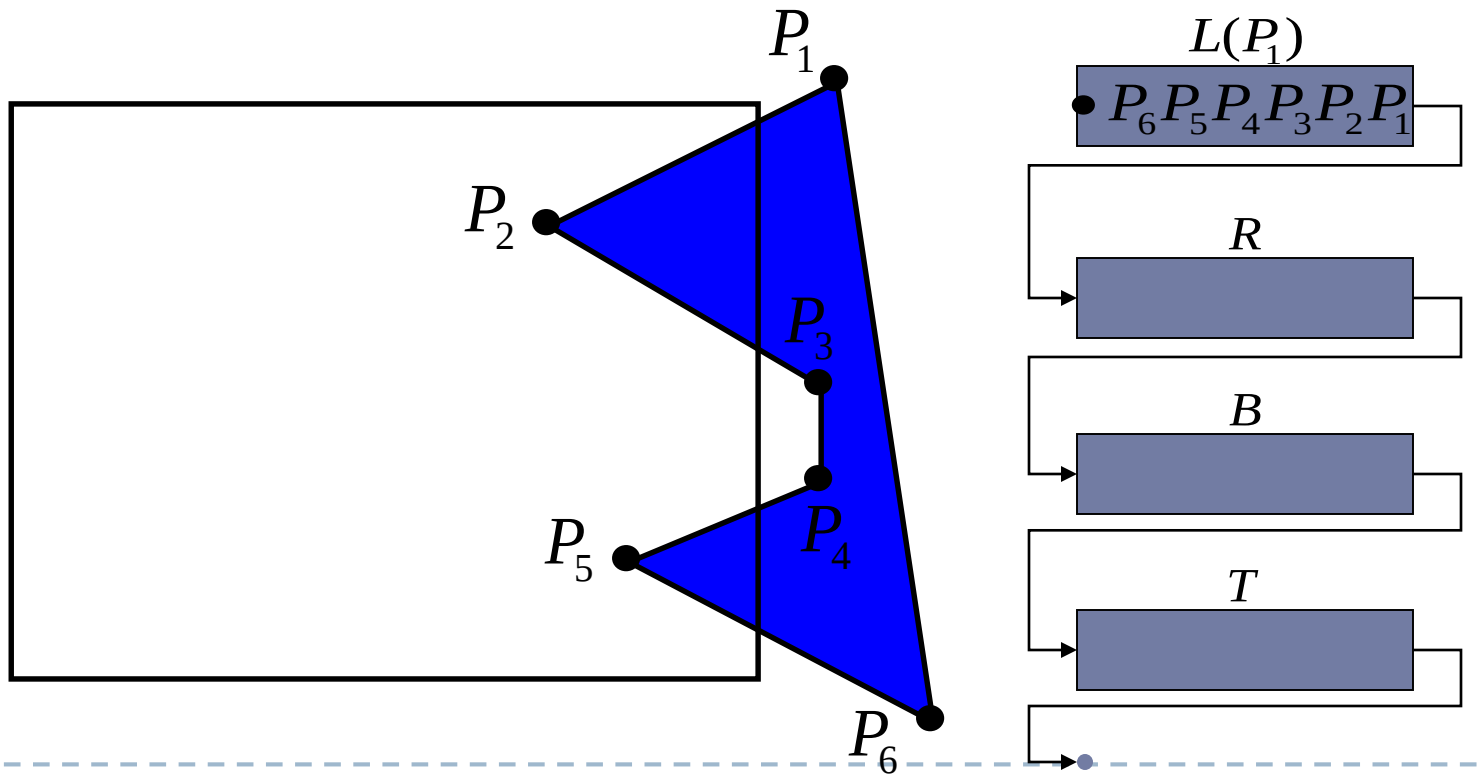

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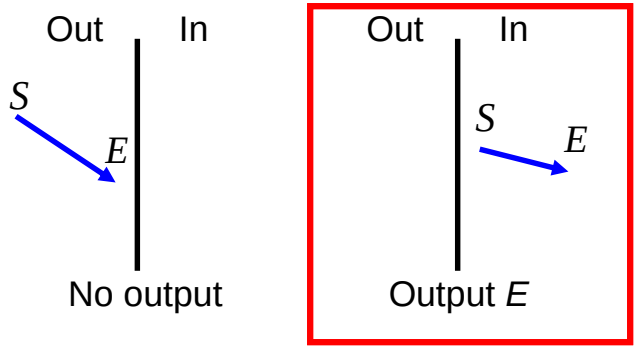

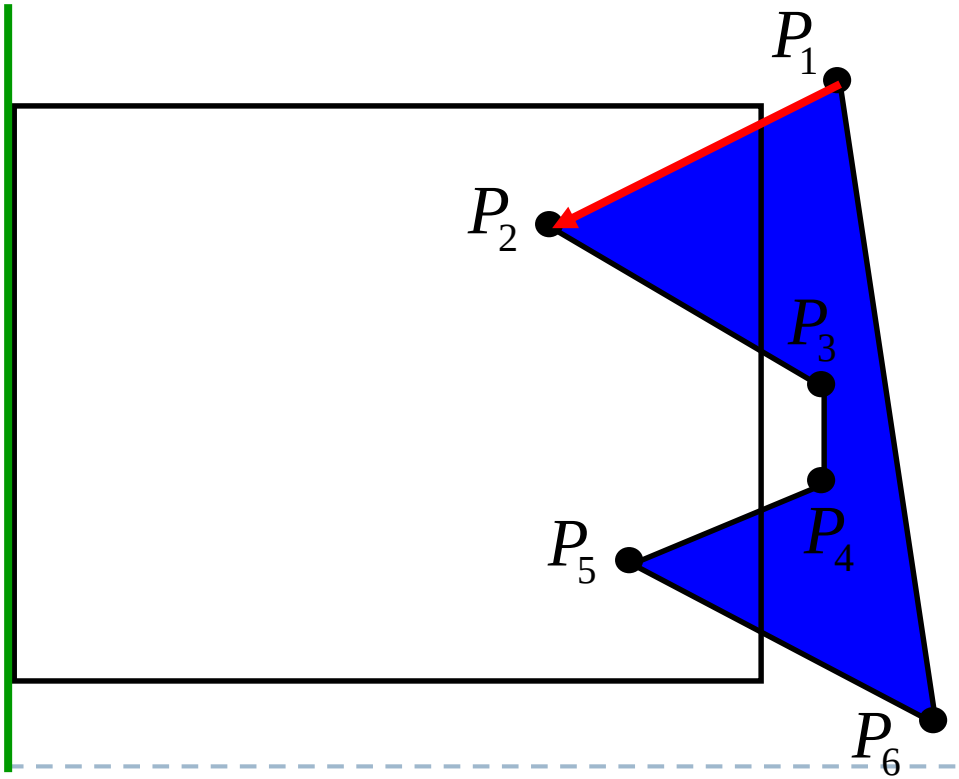

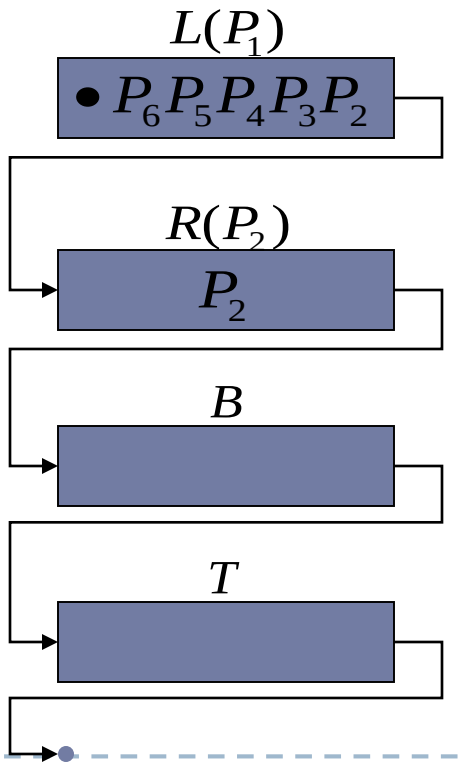

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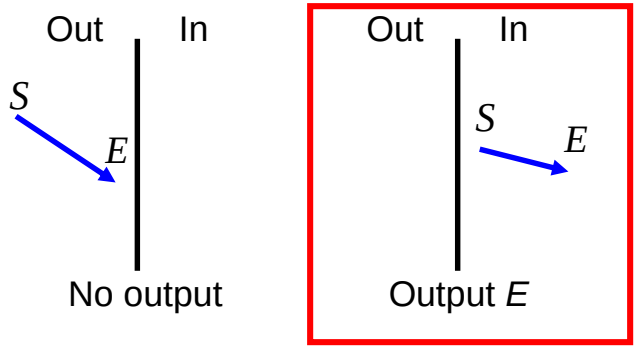

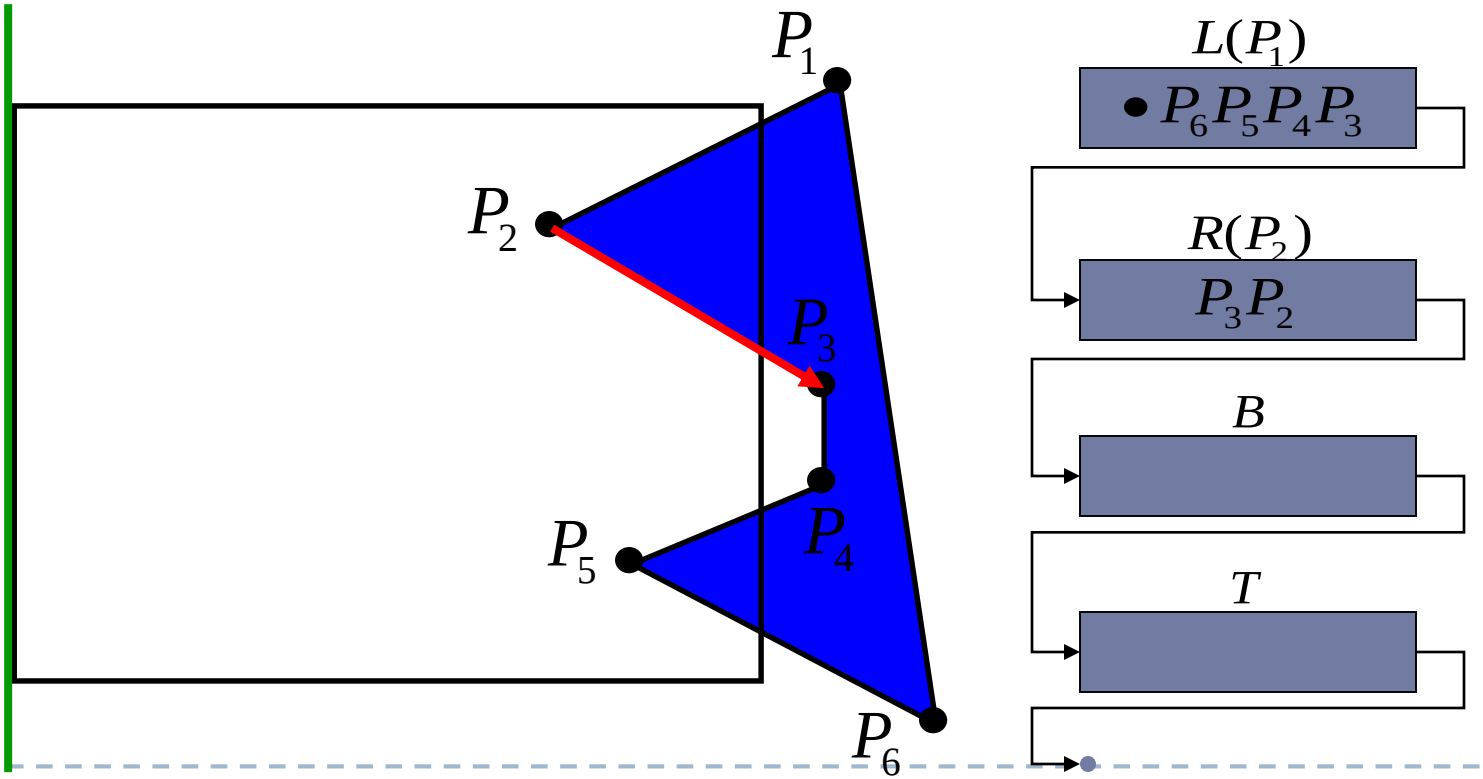

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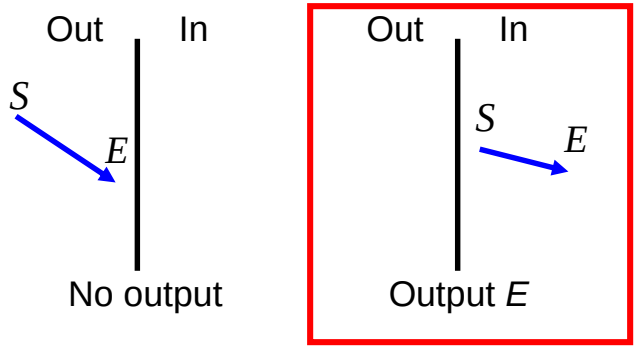

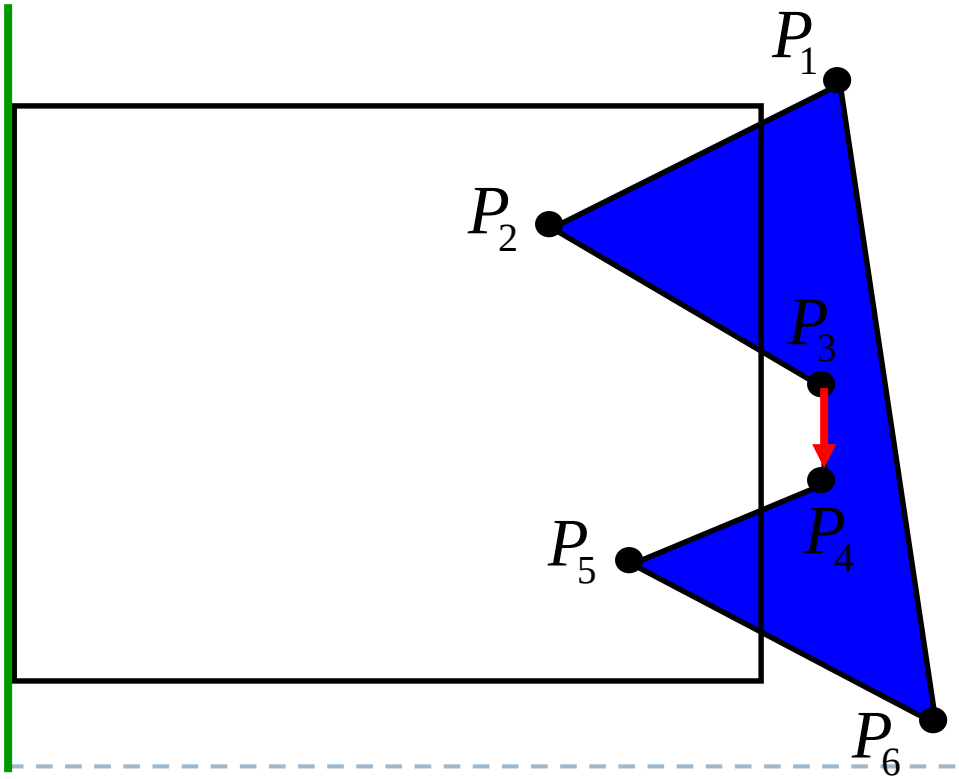

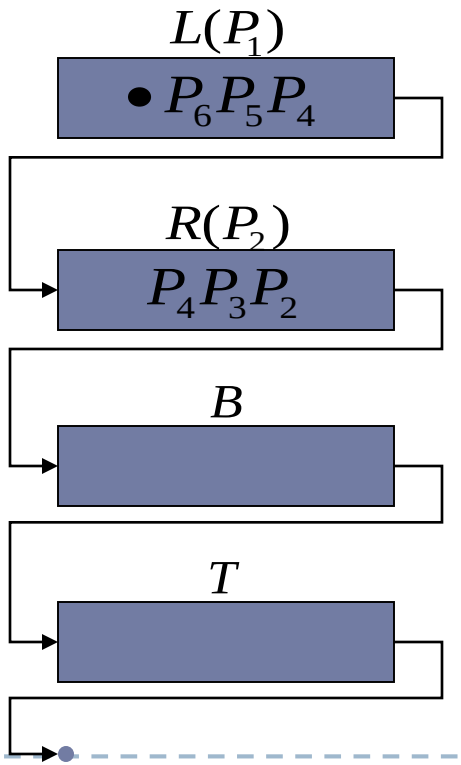

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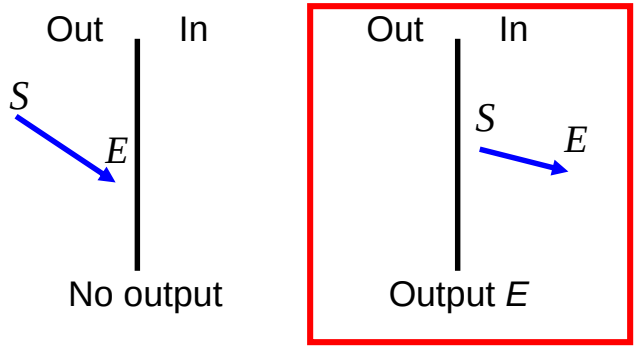

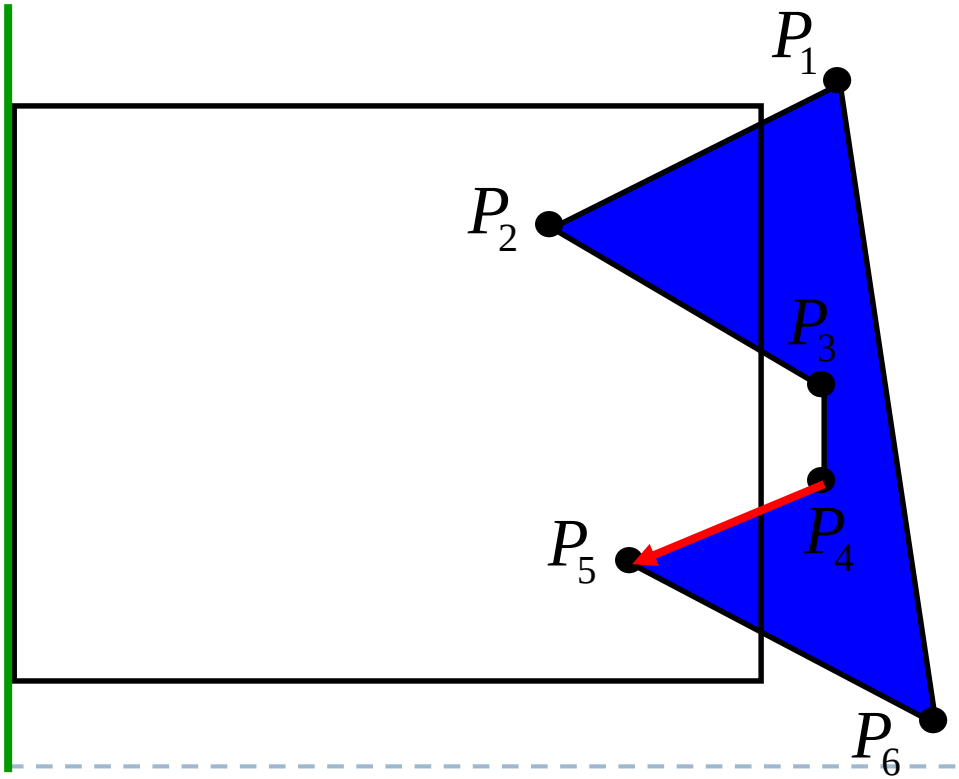

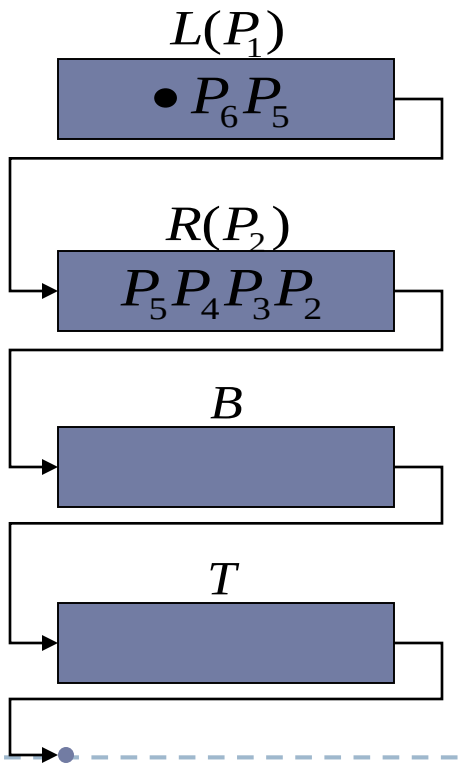

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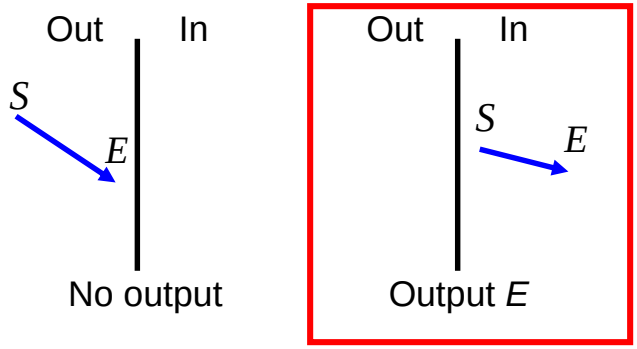

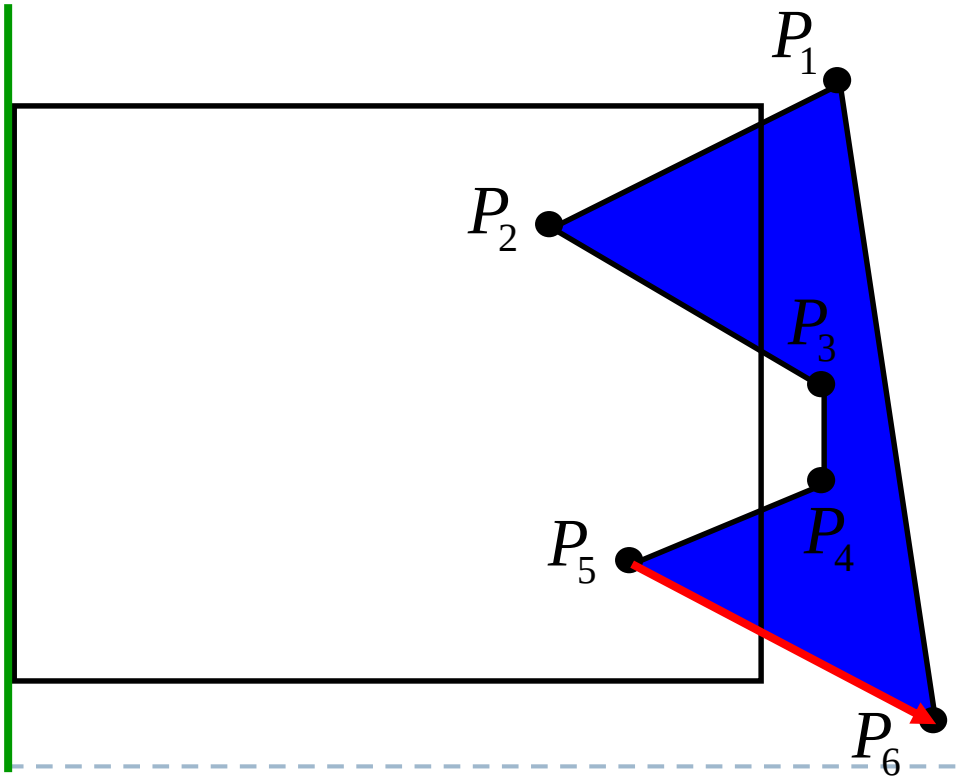

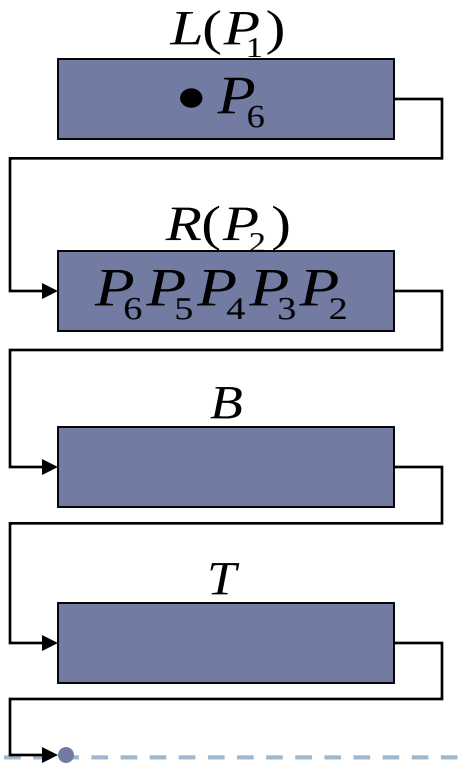

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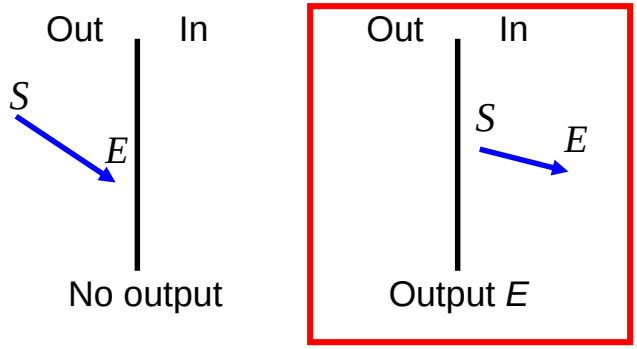

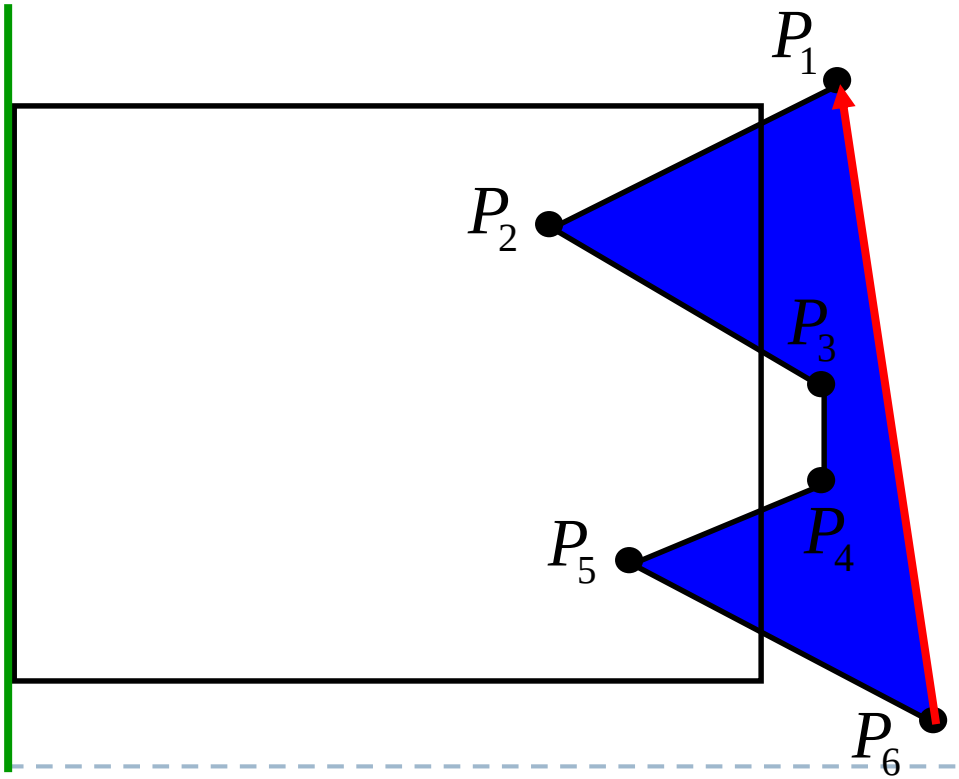

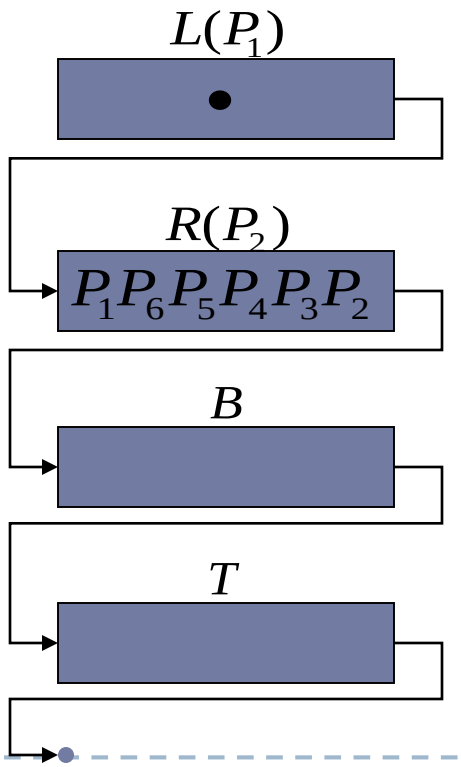

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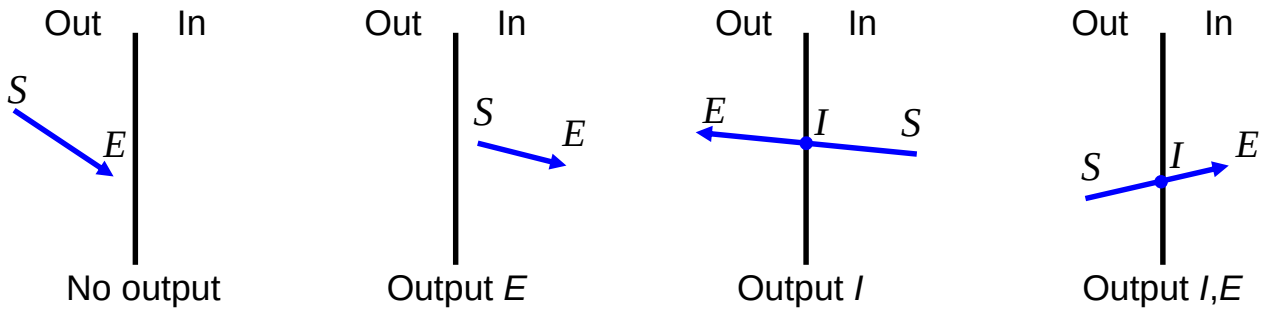
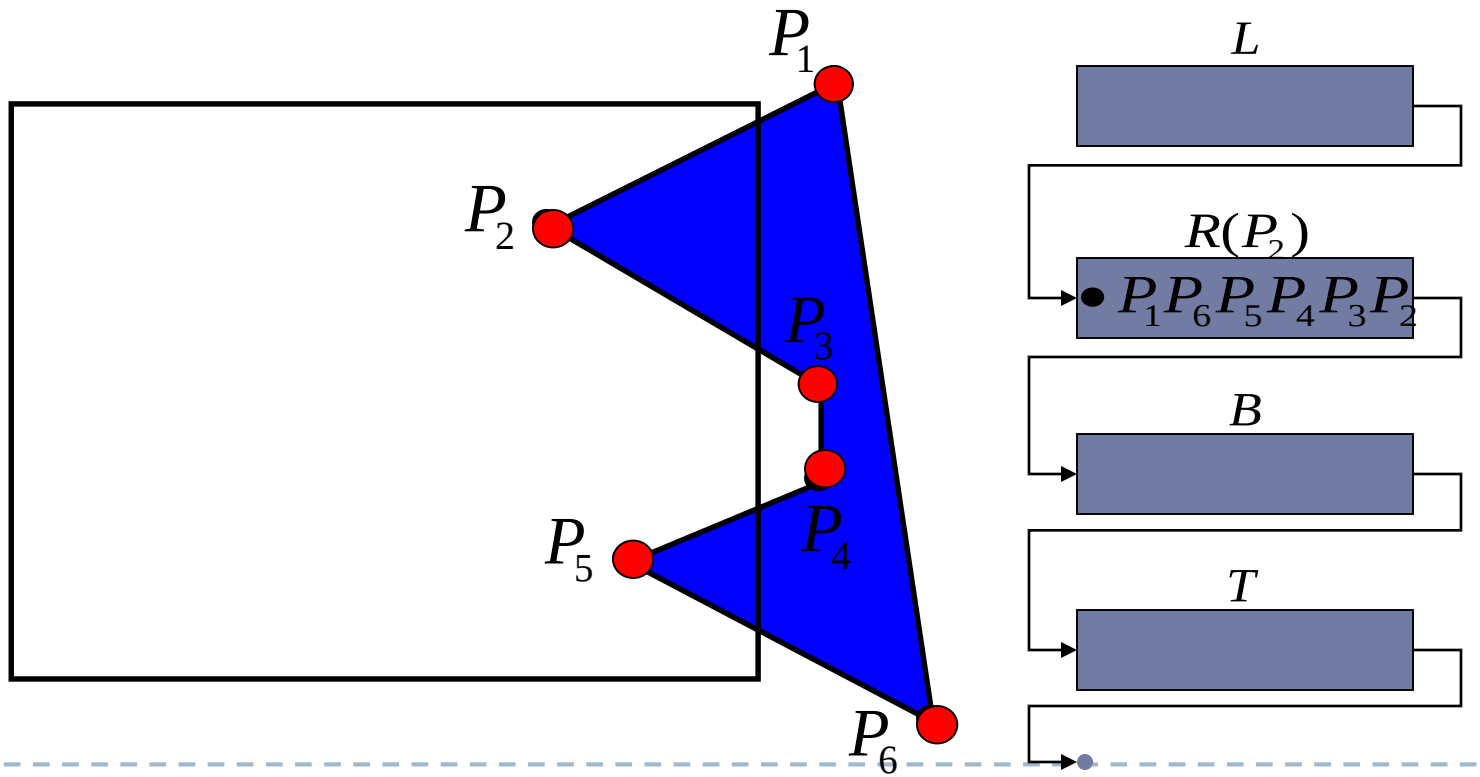
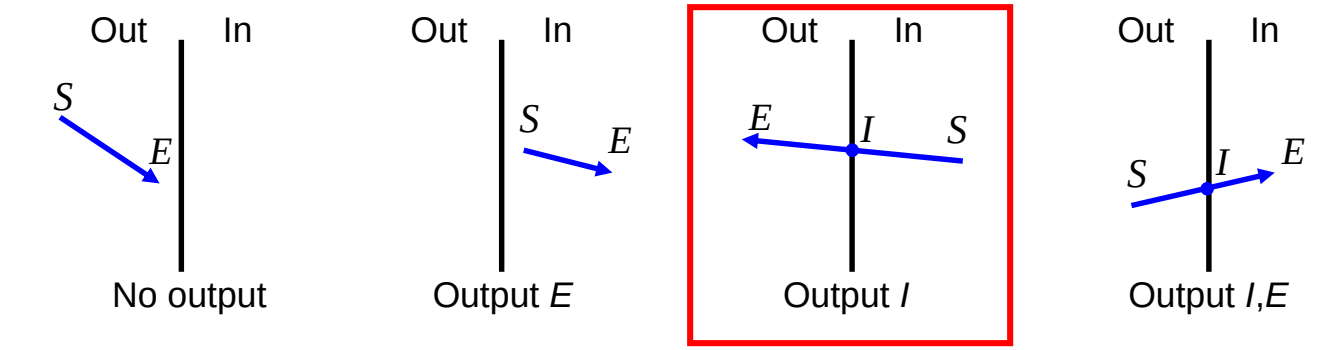
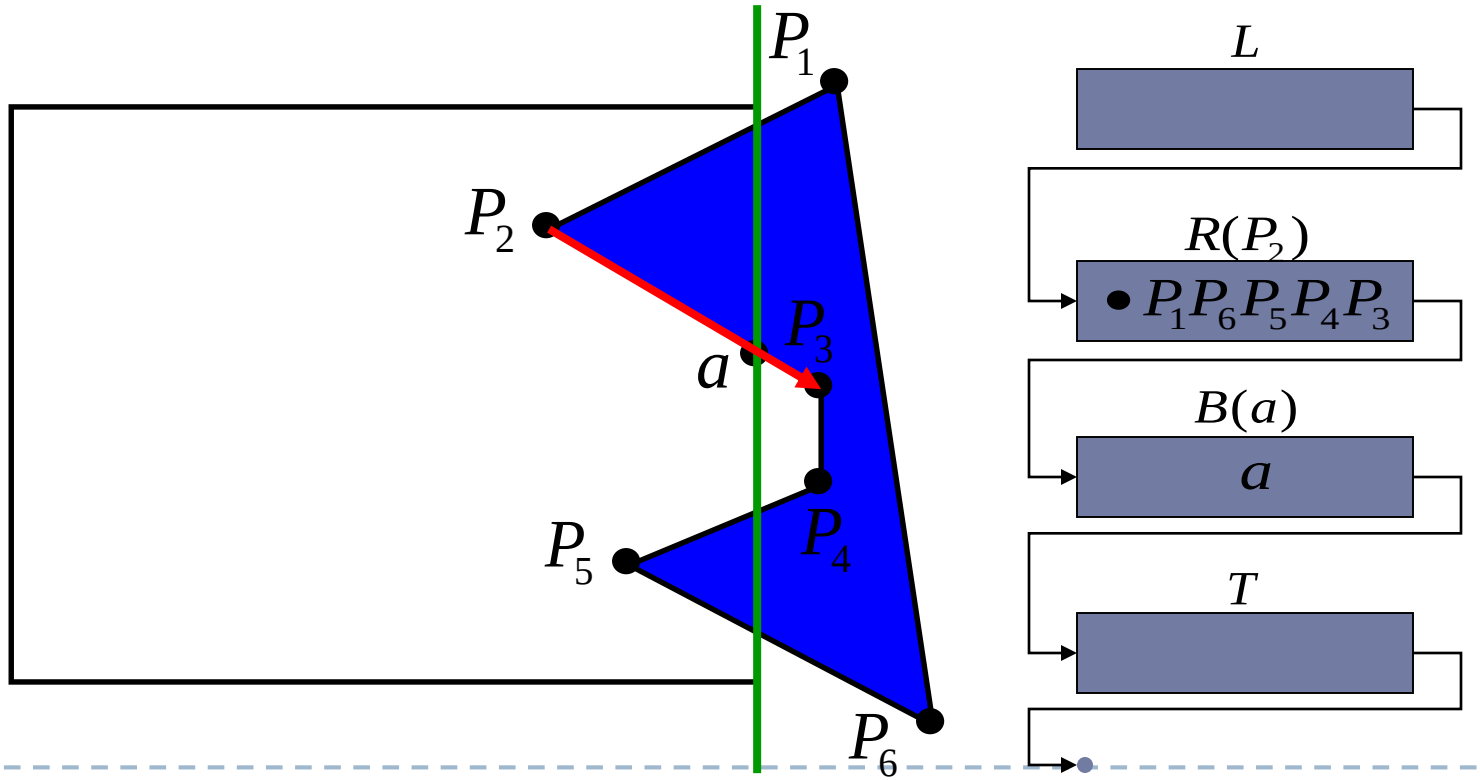




Sutherland-Hodgman Algorithm





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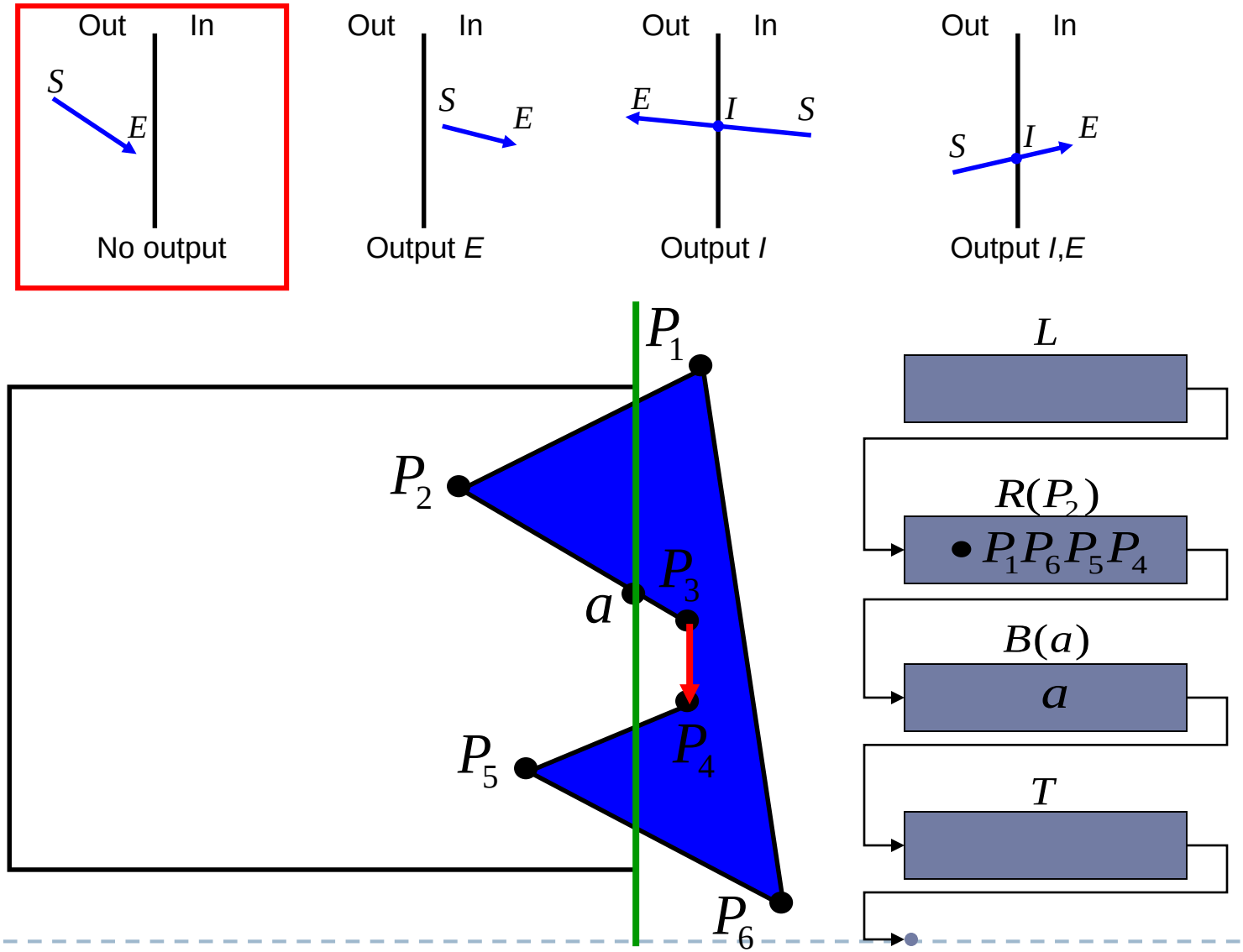

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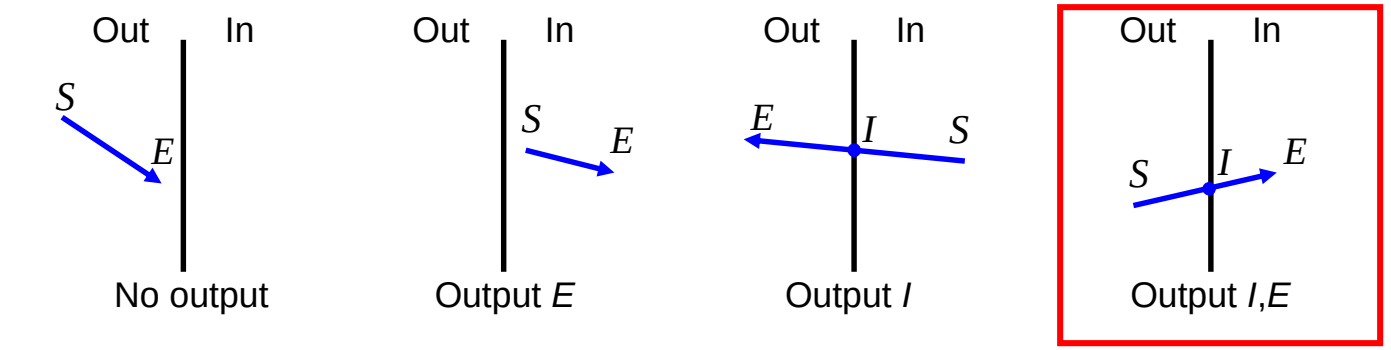

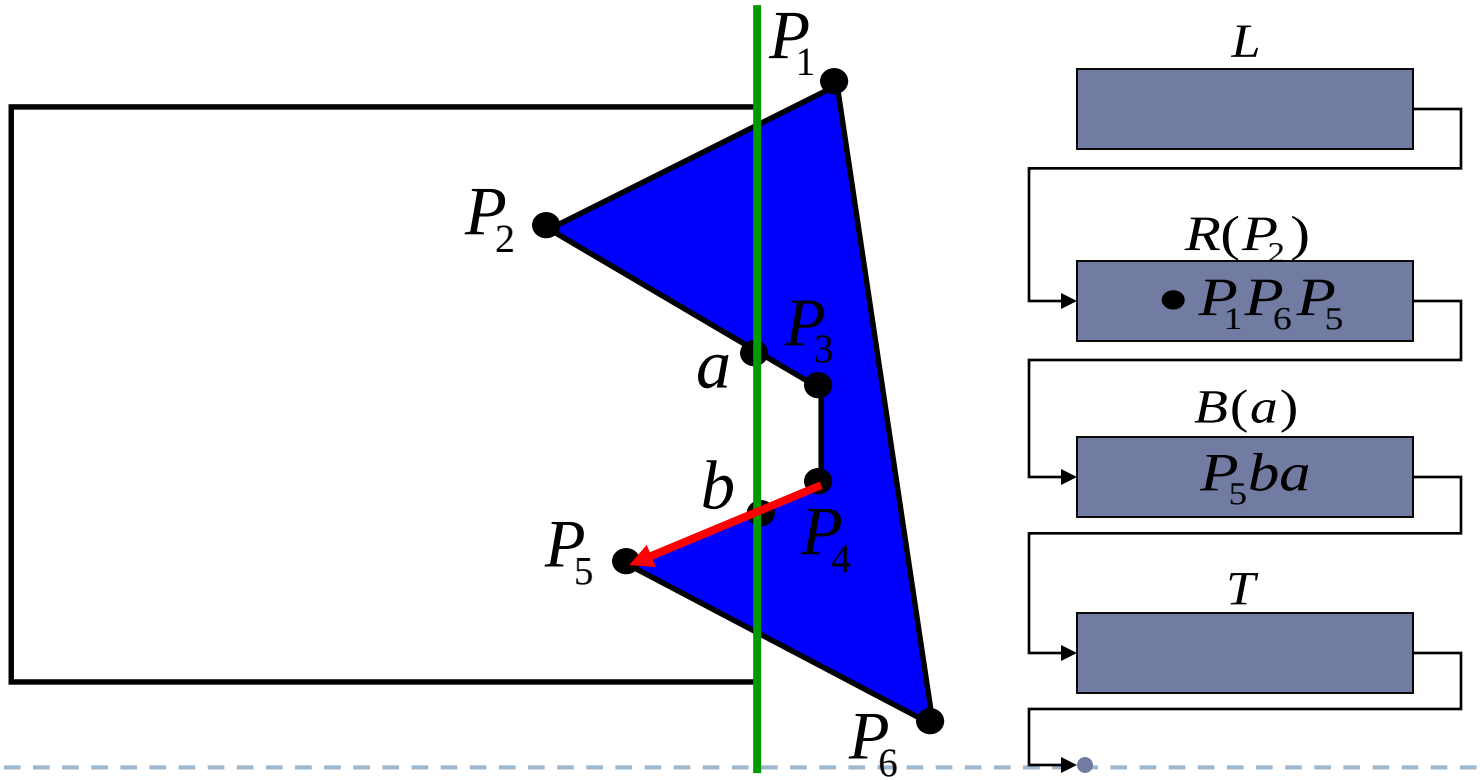

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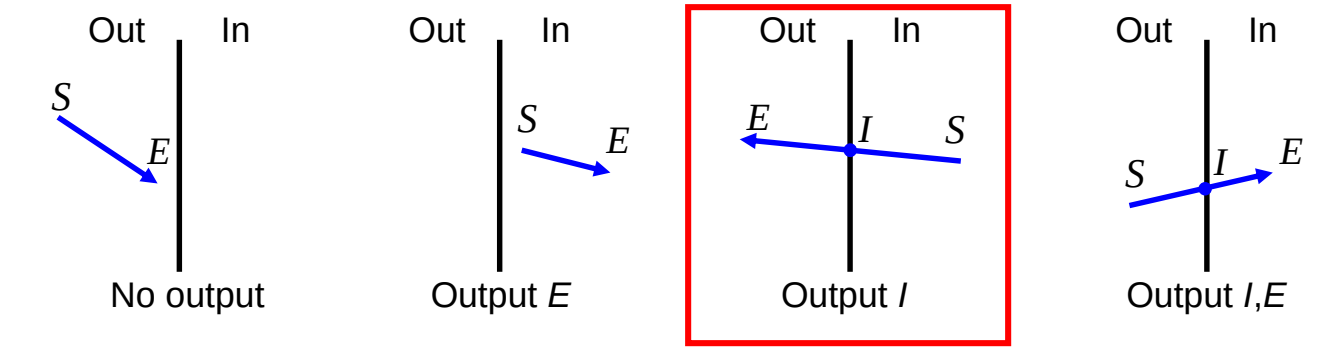

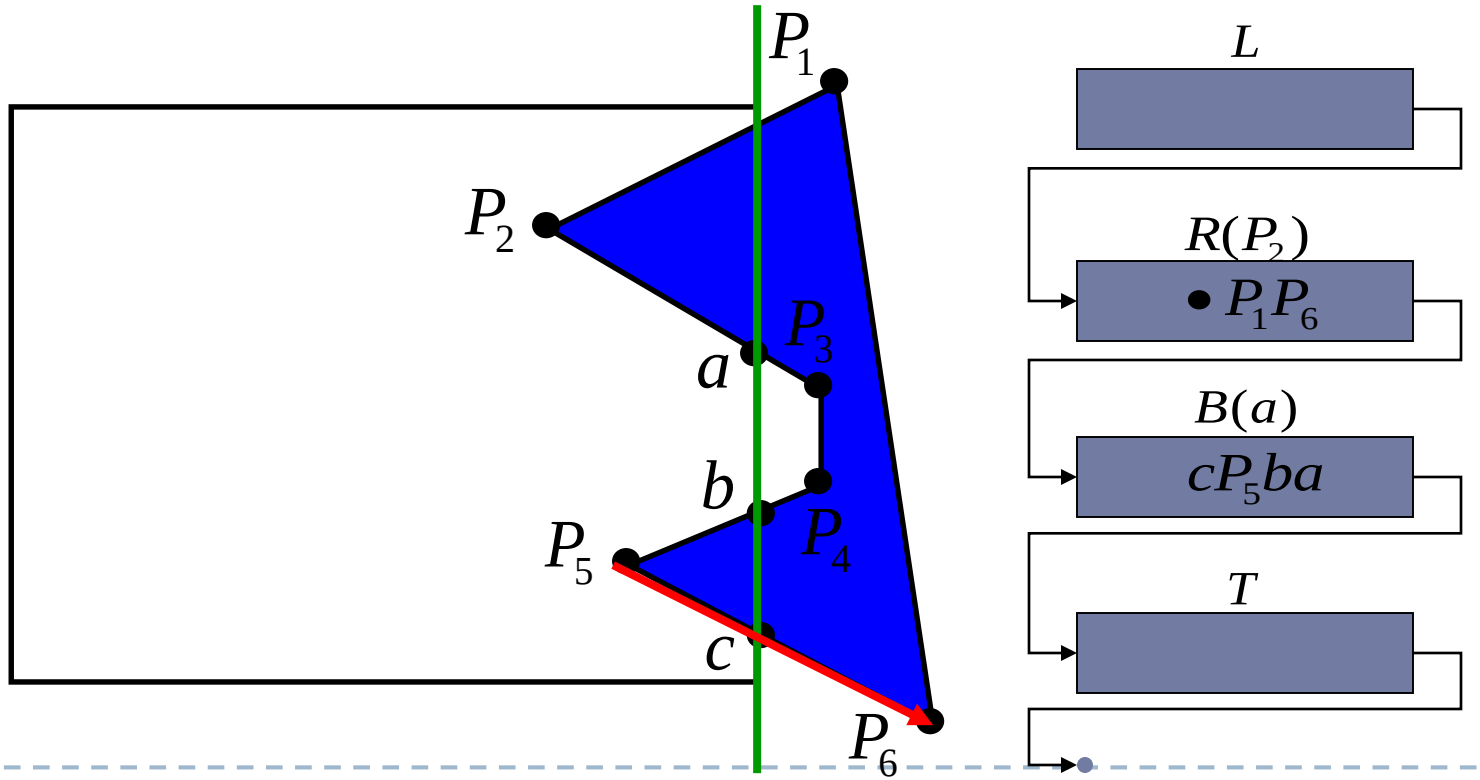

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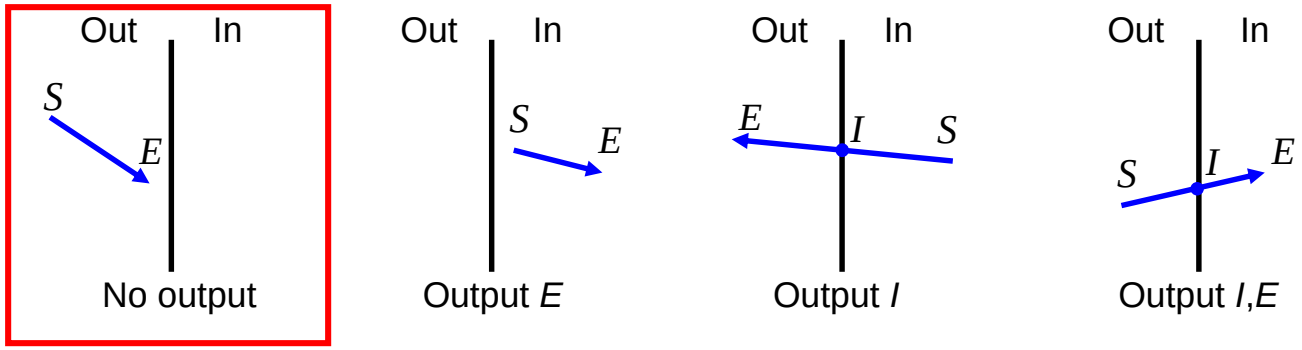

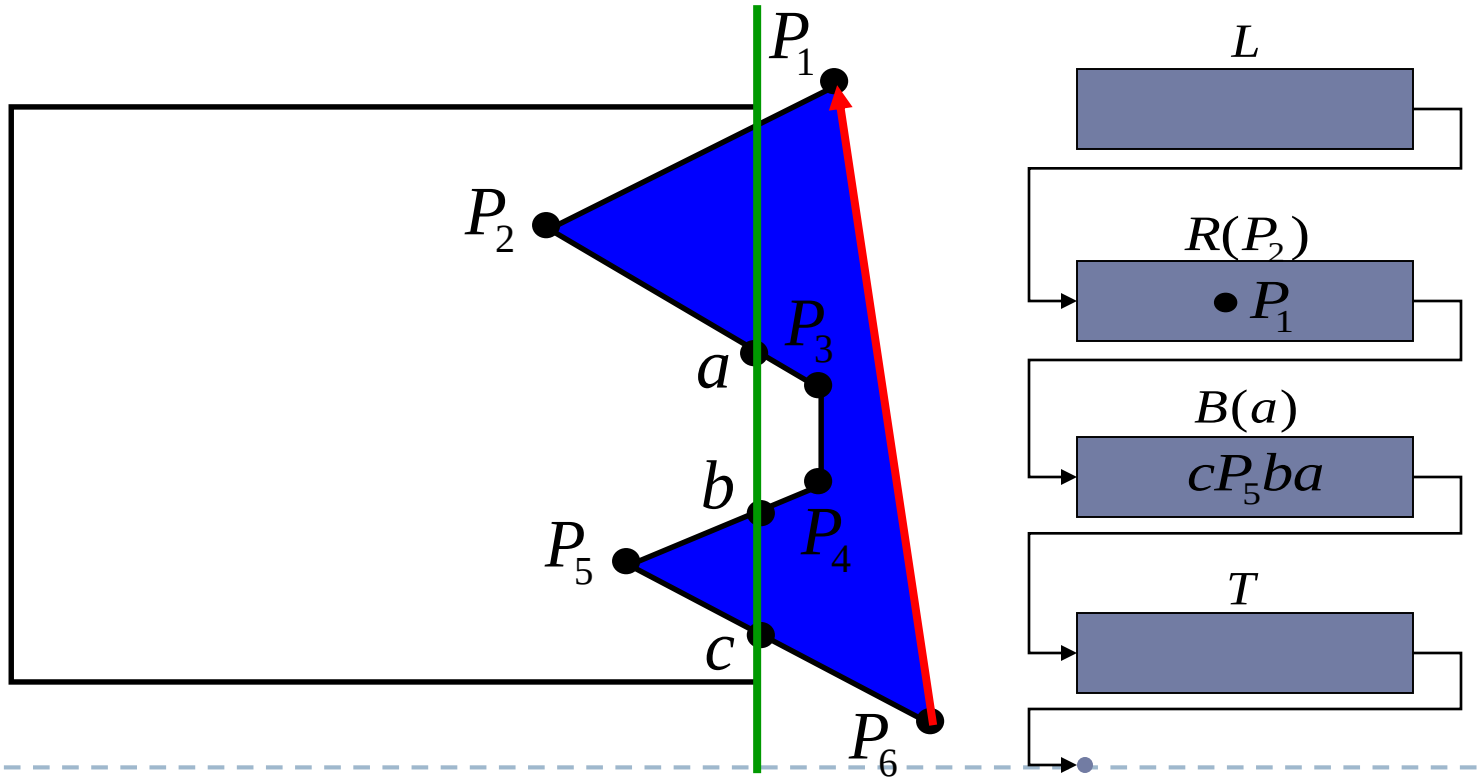

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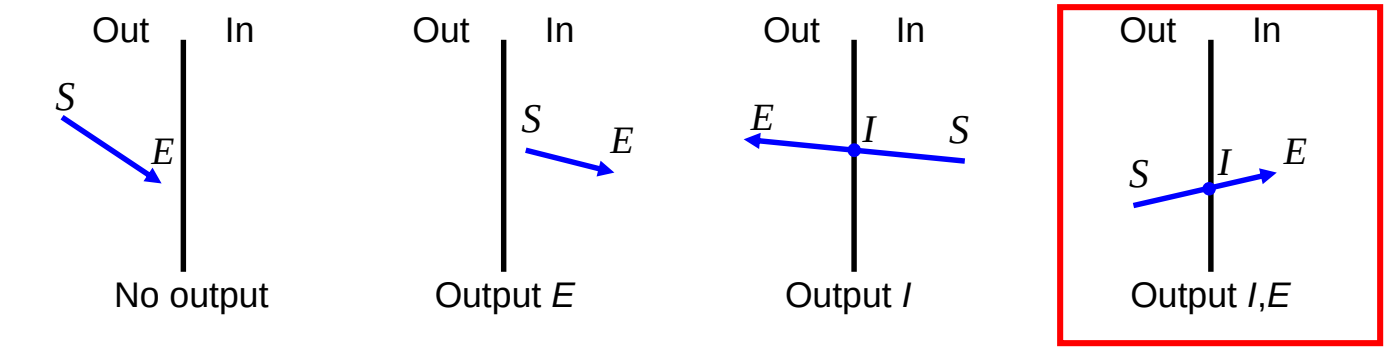

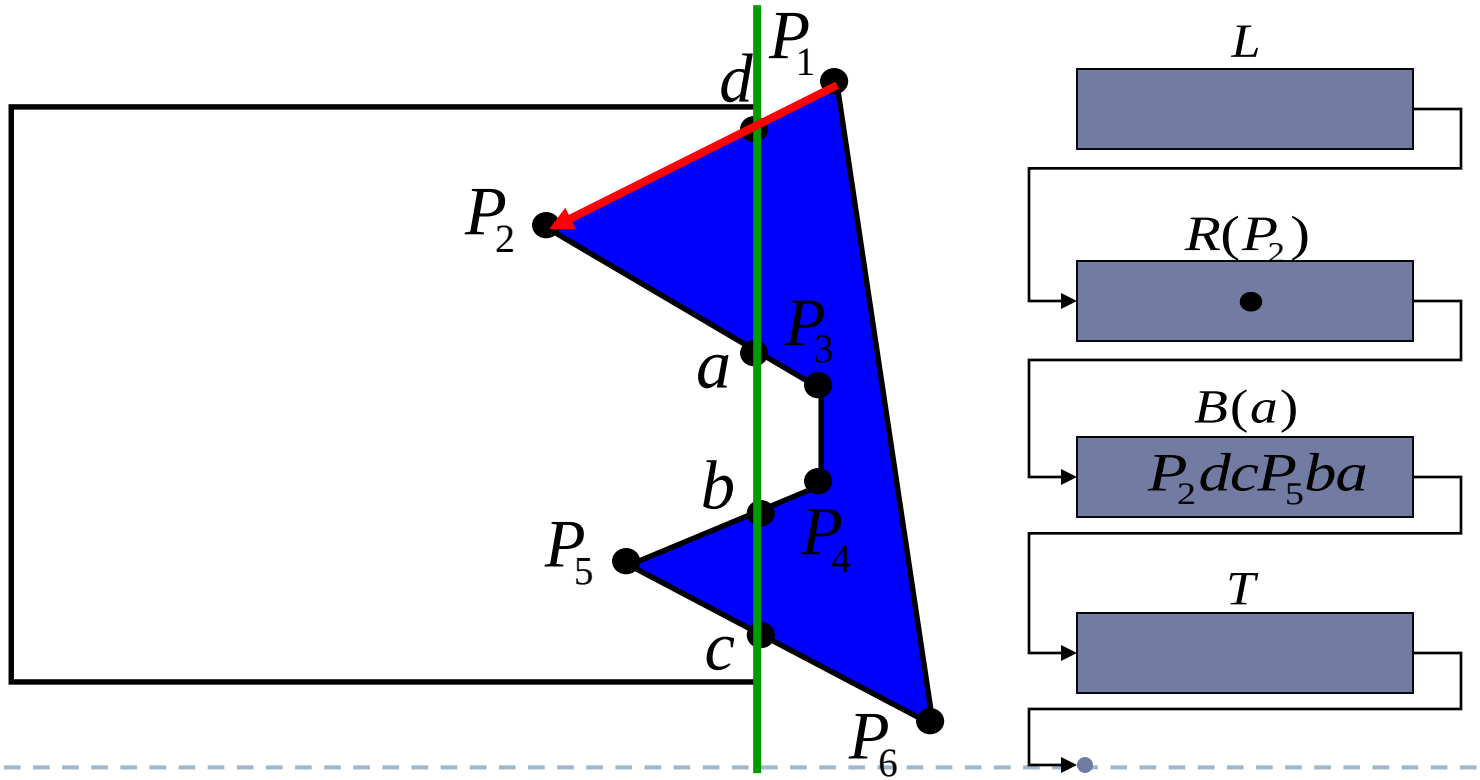

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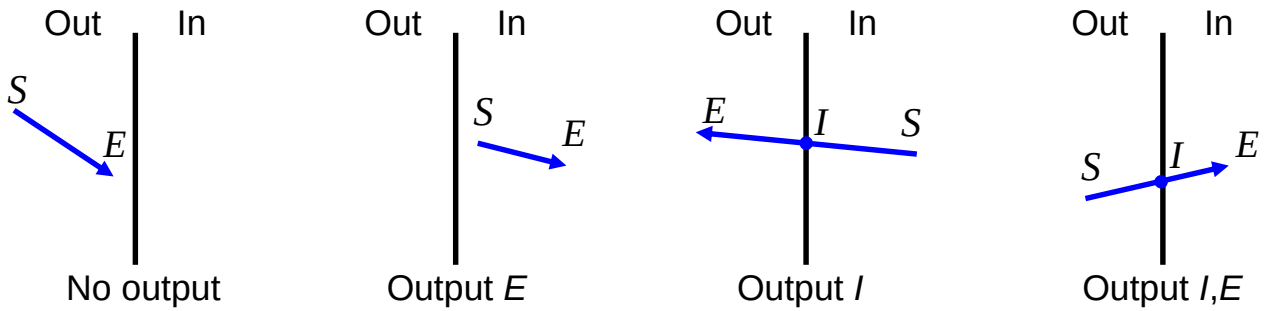

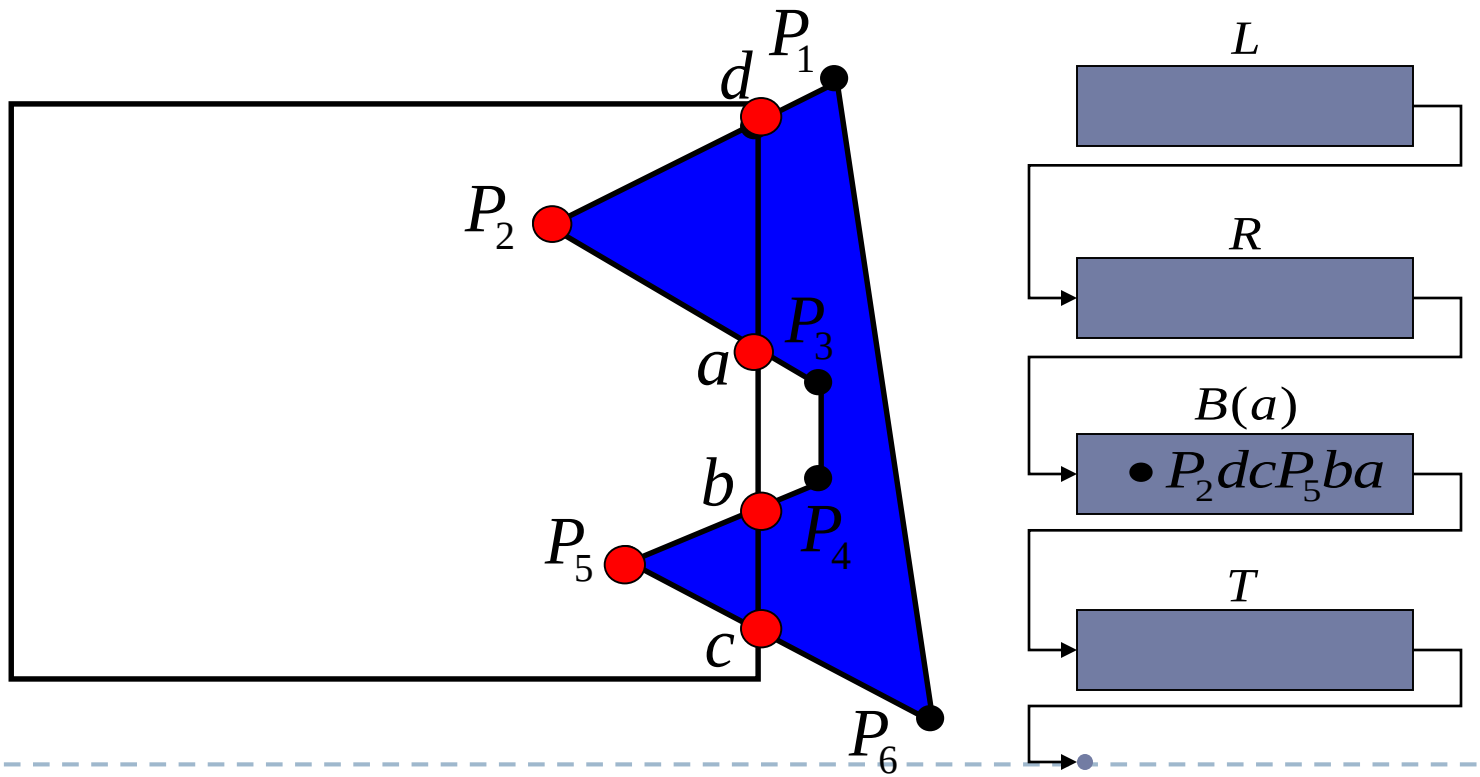

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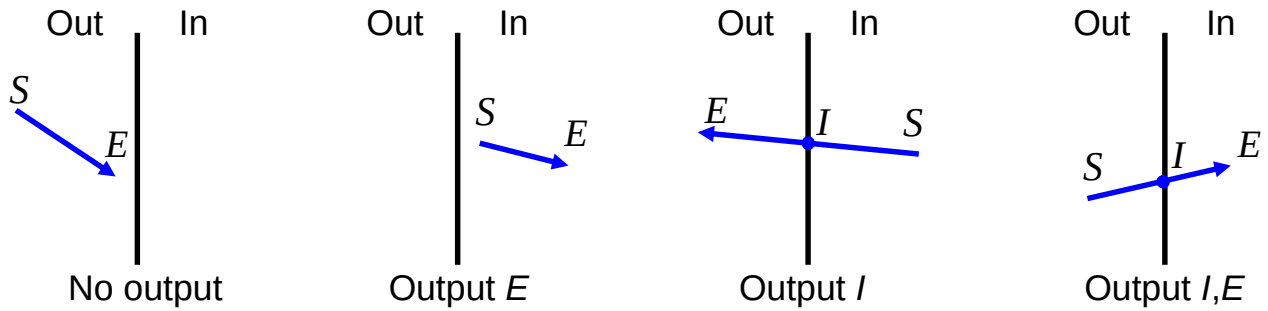

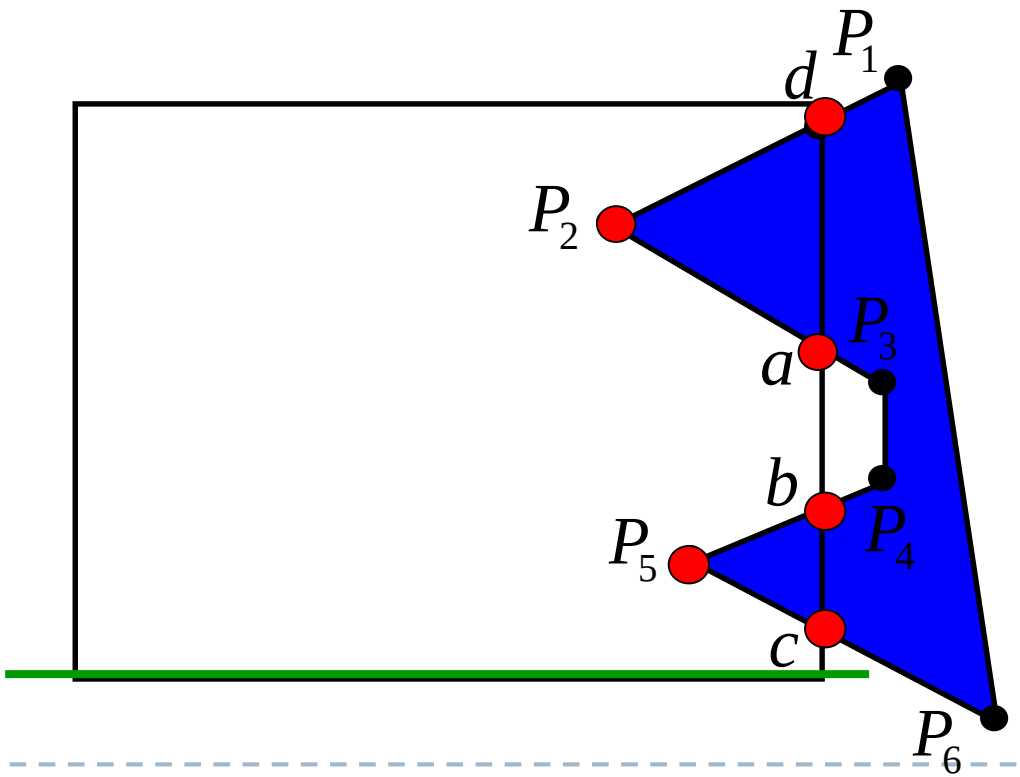

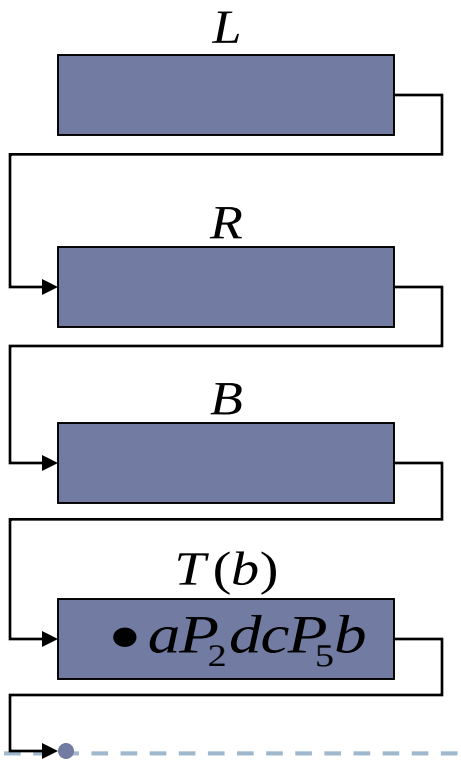

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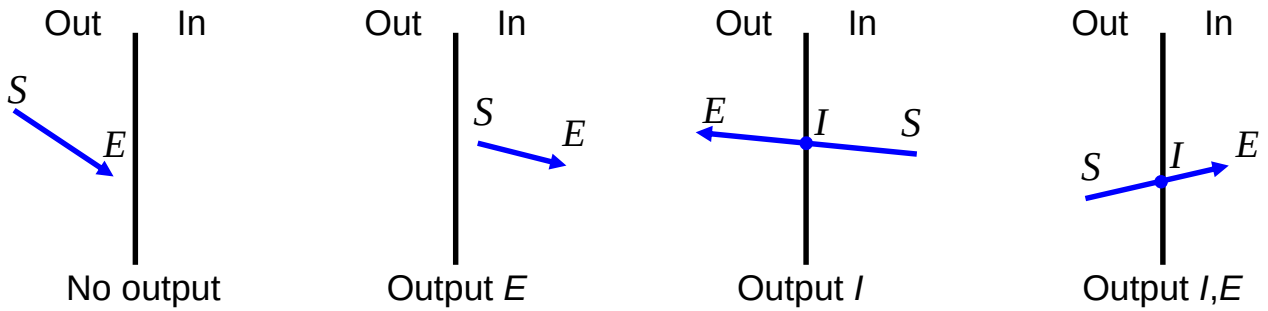

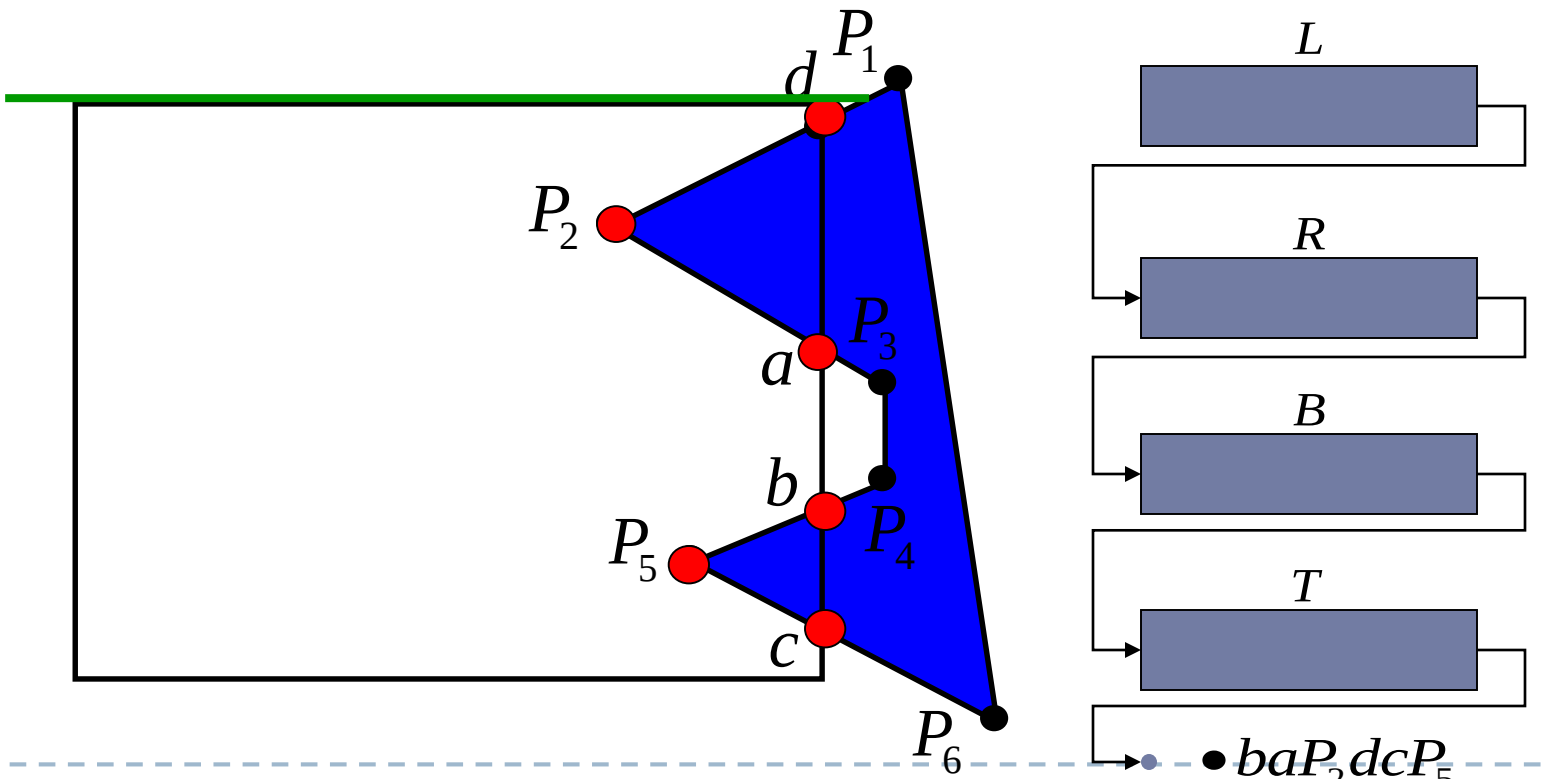

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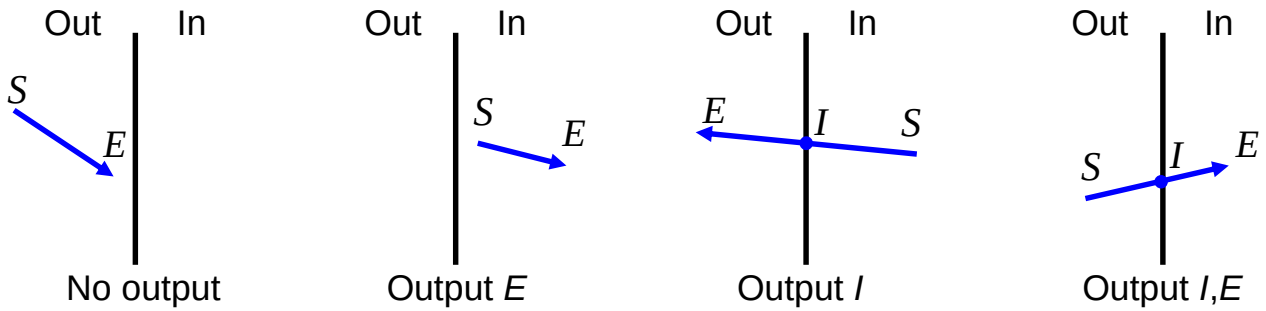
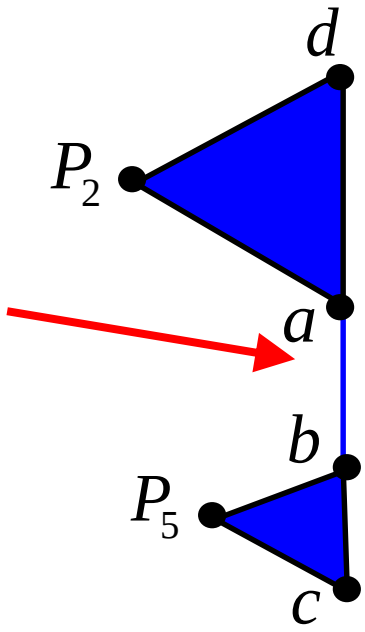
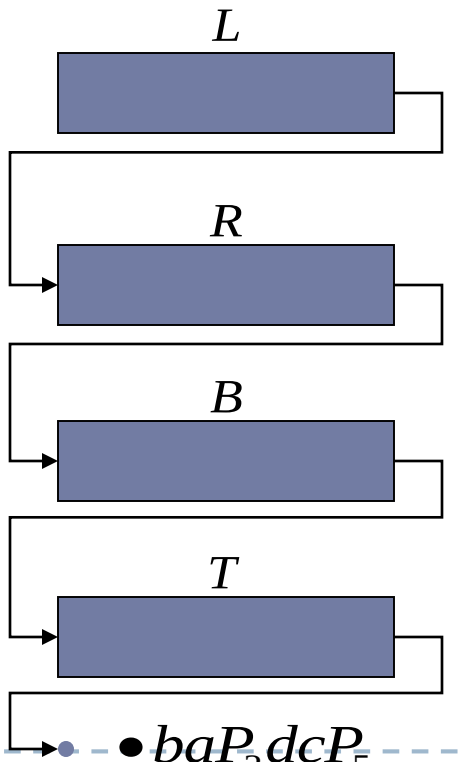


Possible error for non-convex polygons





Sutherland-Hodgman Algorithm

- Easy to pipeline for parallel processing
- Polygon from one boundary does not have to be complete before next boundary starts

- Leads to substantial performance gains

Weiler-Atherton Algorithm

Weiler-Atherton Algorithm

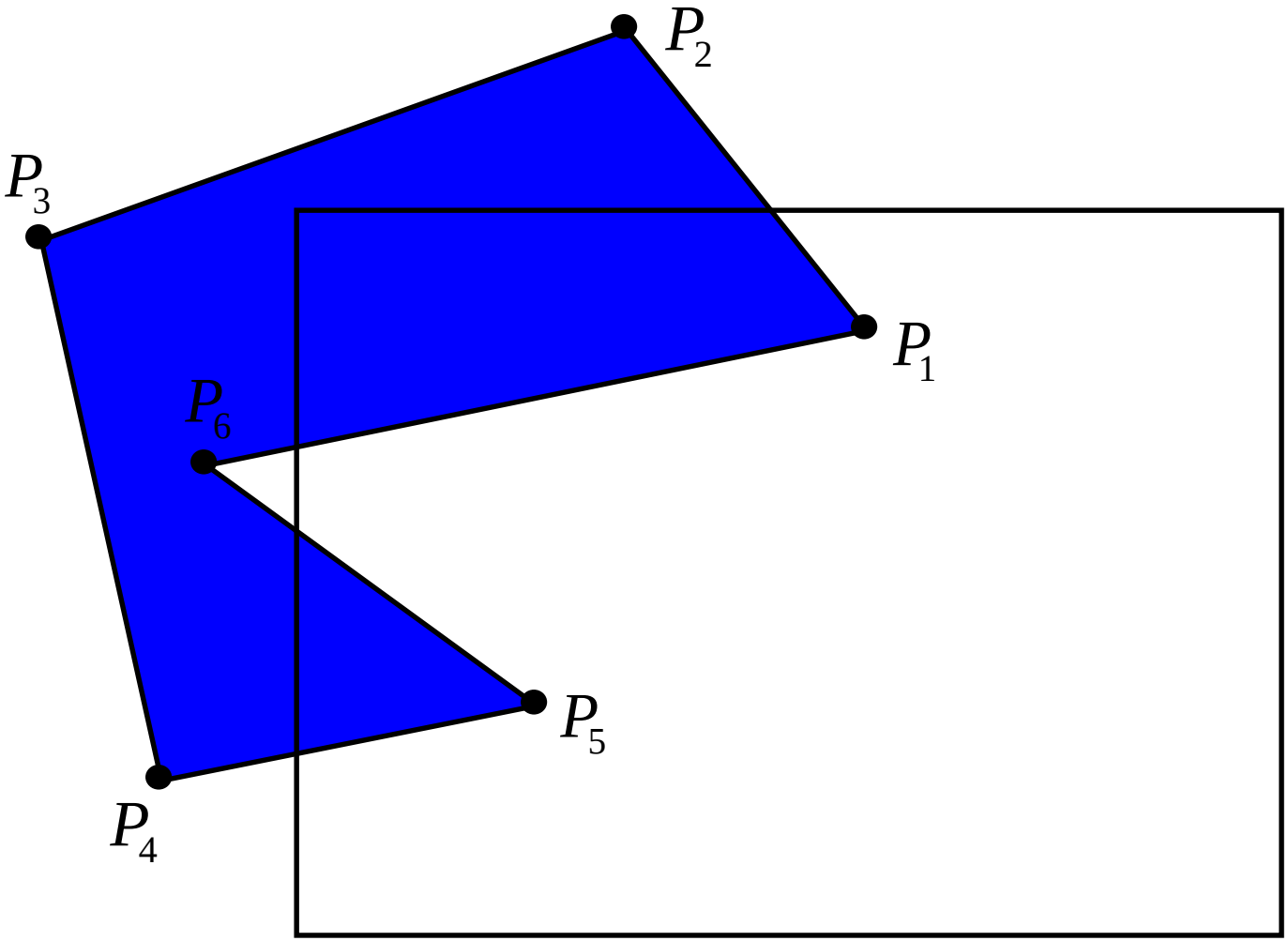
- General polygon vs. polygon clipping
- Handles non-convex shapes

- Not as efficient as Sutherland-Hodgman
- Not easy to parallelize

Weiler-Atherton Algorithm

- Process the edges of the polygon fill area in a counterclockwise order until an inside-outside pair of vertices is encountered
- Follow the window boundaries in a counterclockwise direction from the exit-intersection point to another intersection point with the polygon
  - previously processed?
  - yes, go to the next step
  - no, continue processing polygon until a previously processed vertex is encountered
- Form the vertex list for this section of the clipped fill area
- Return to the exit-intersection point and continue processing the polygon edges in a counterclockwise order

Weiler-Atherton Algorithm



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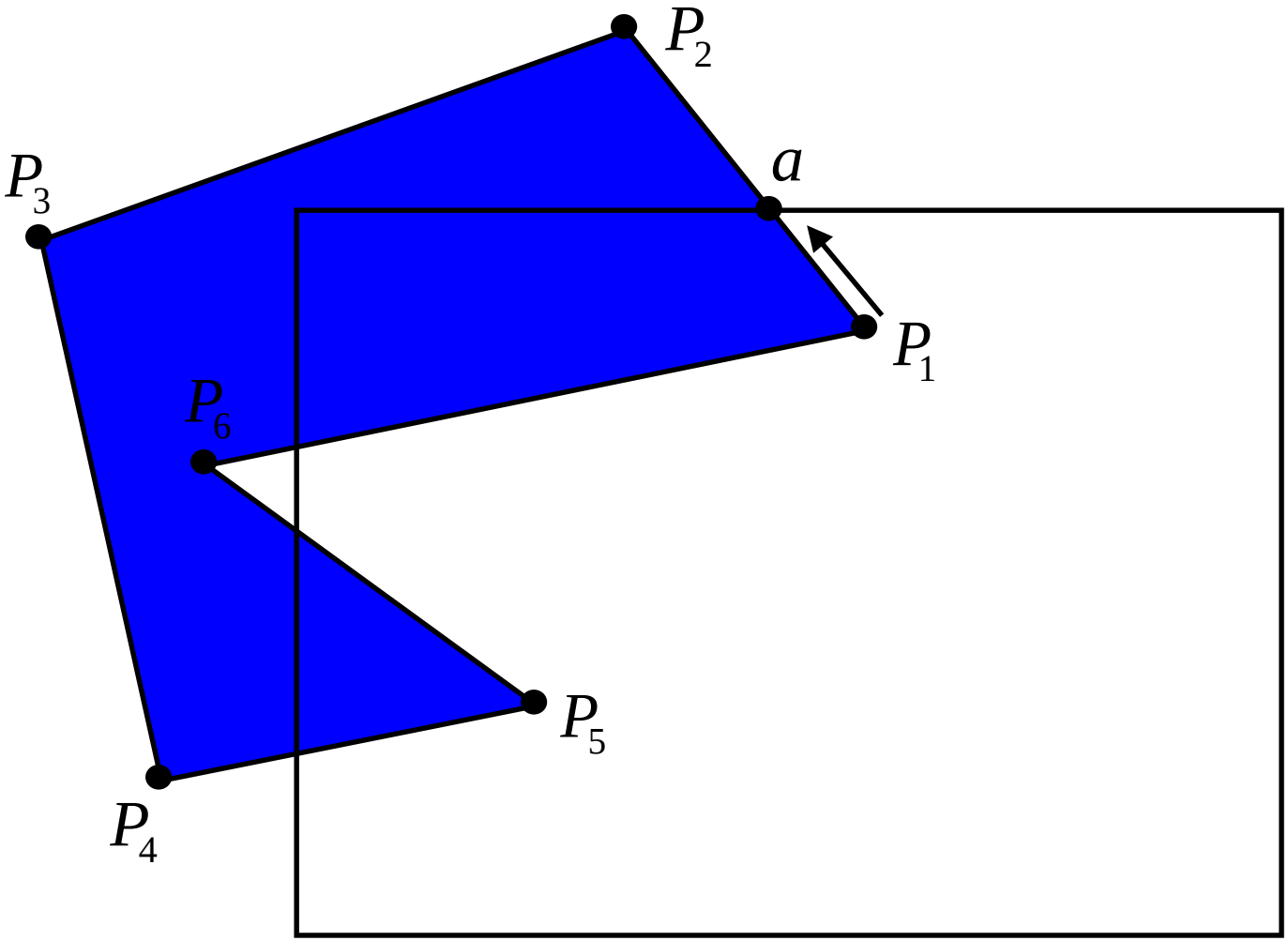

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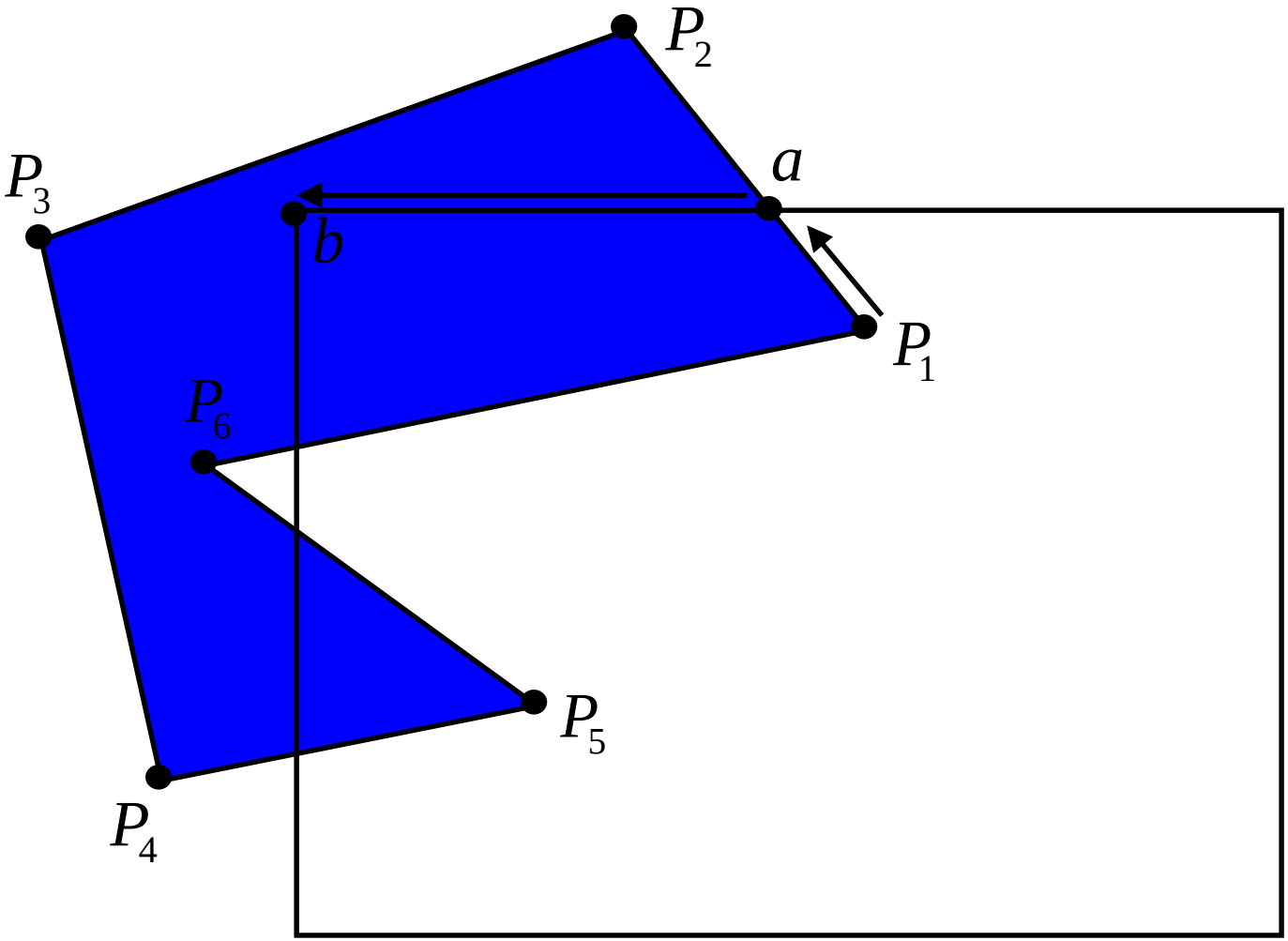

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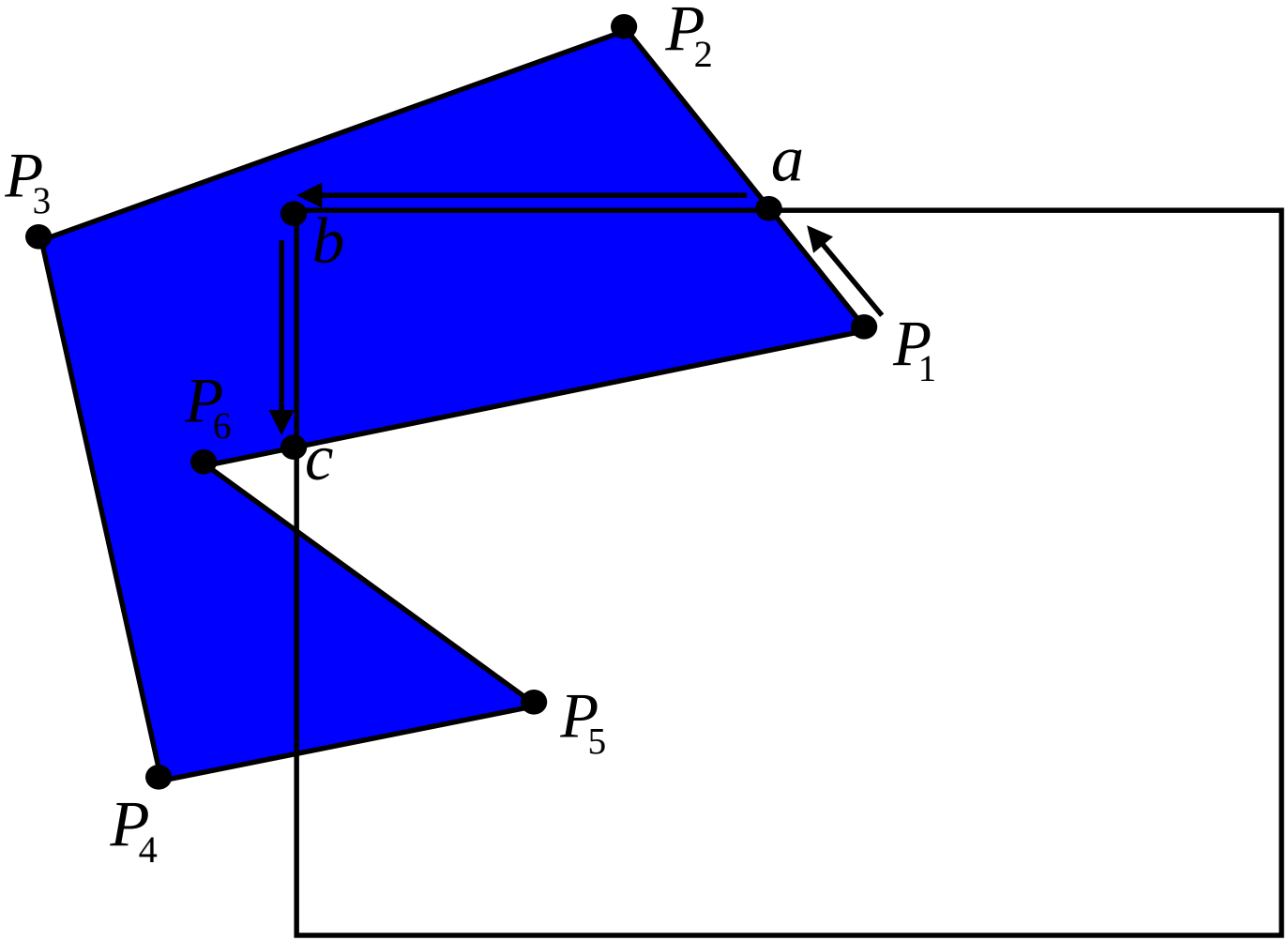

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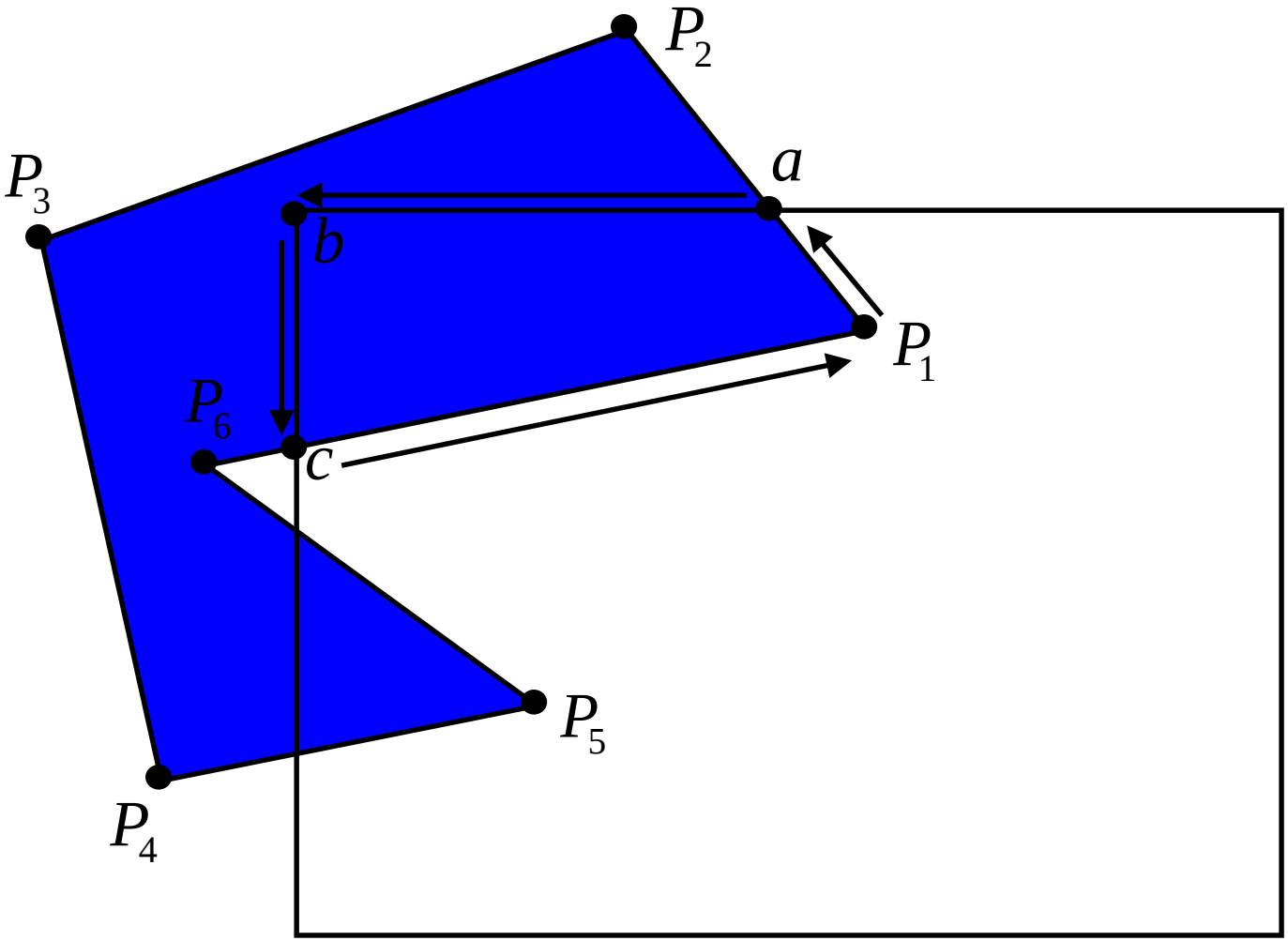

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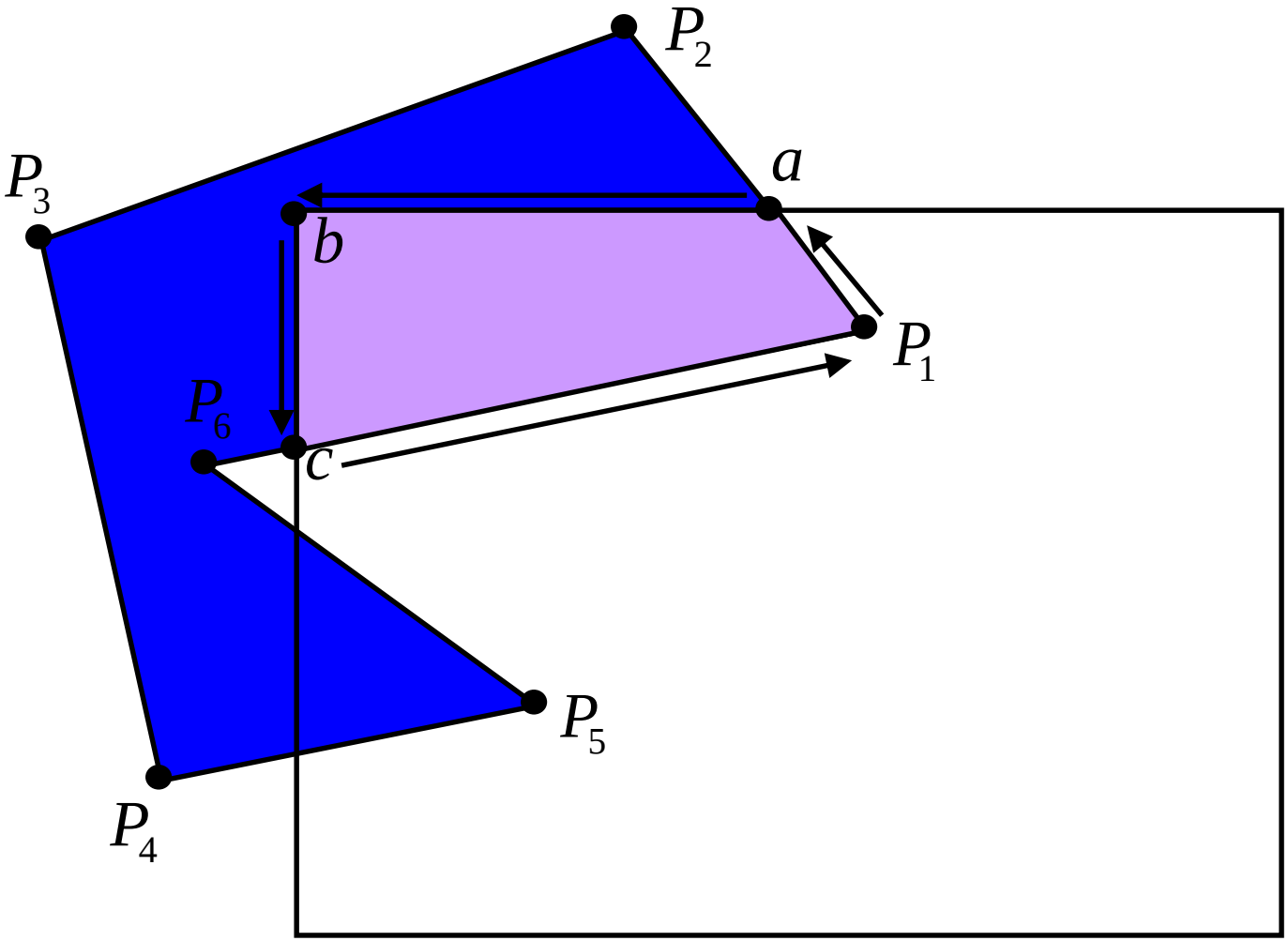
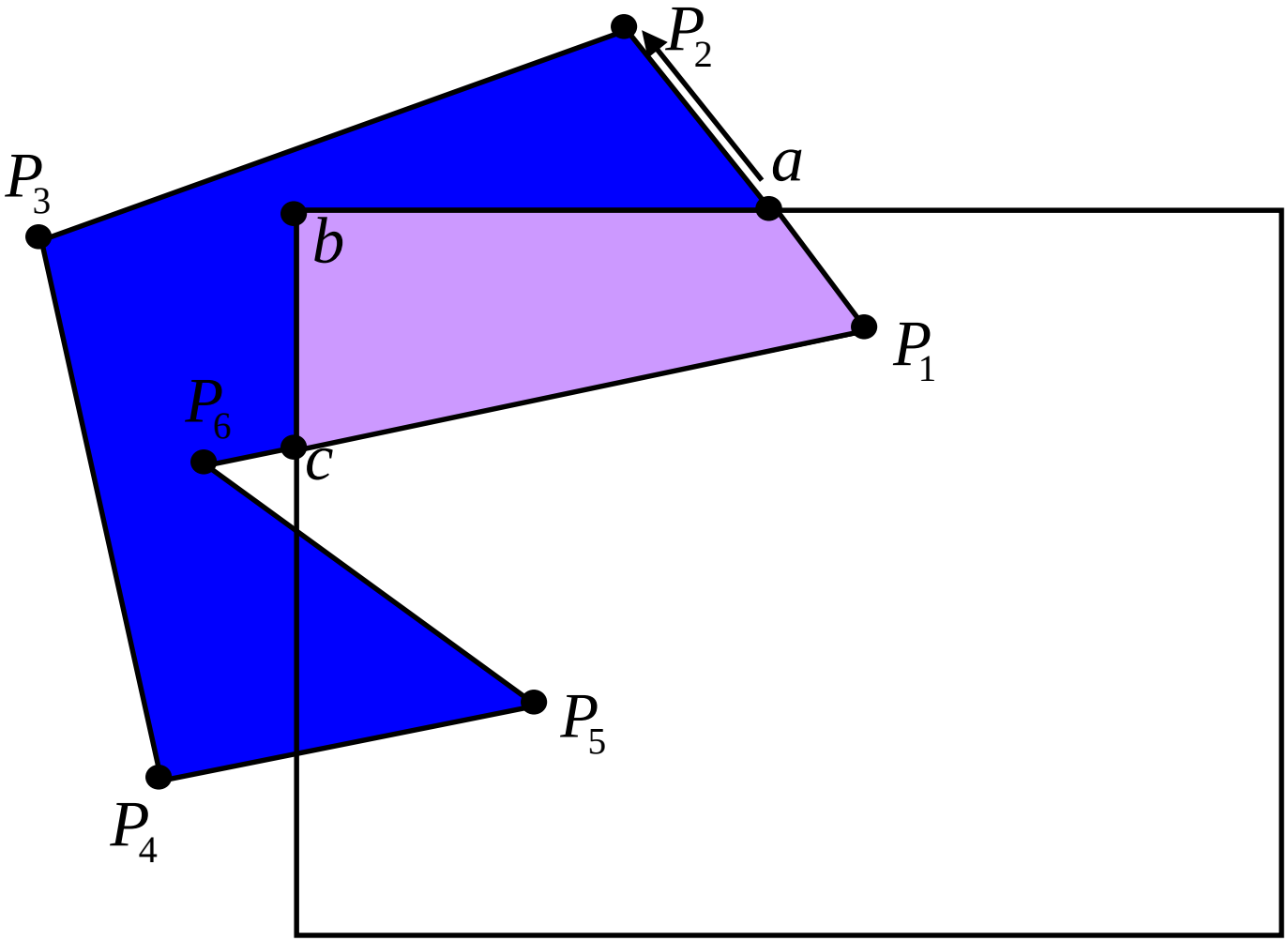


Weiler-Atherton Algorithm



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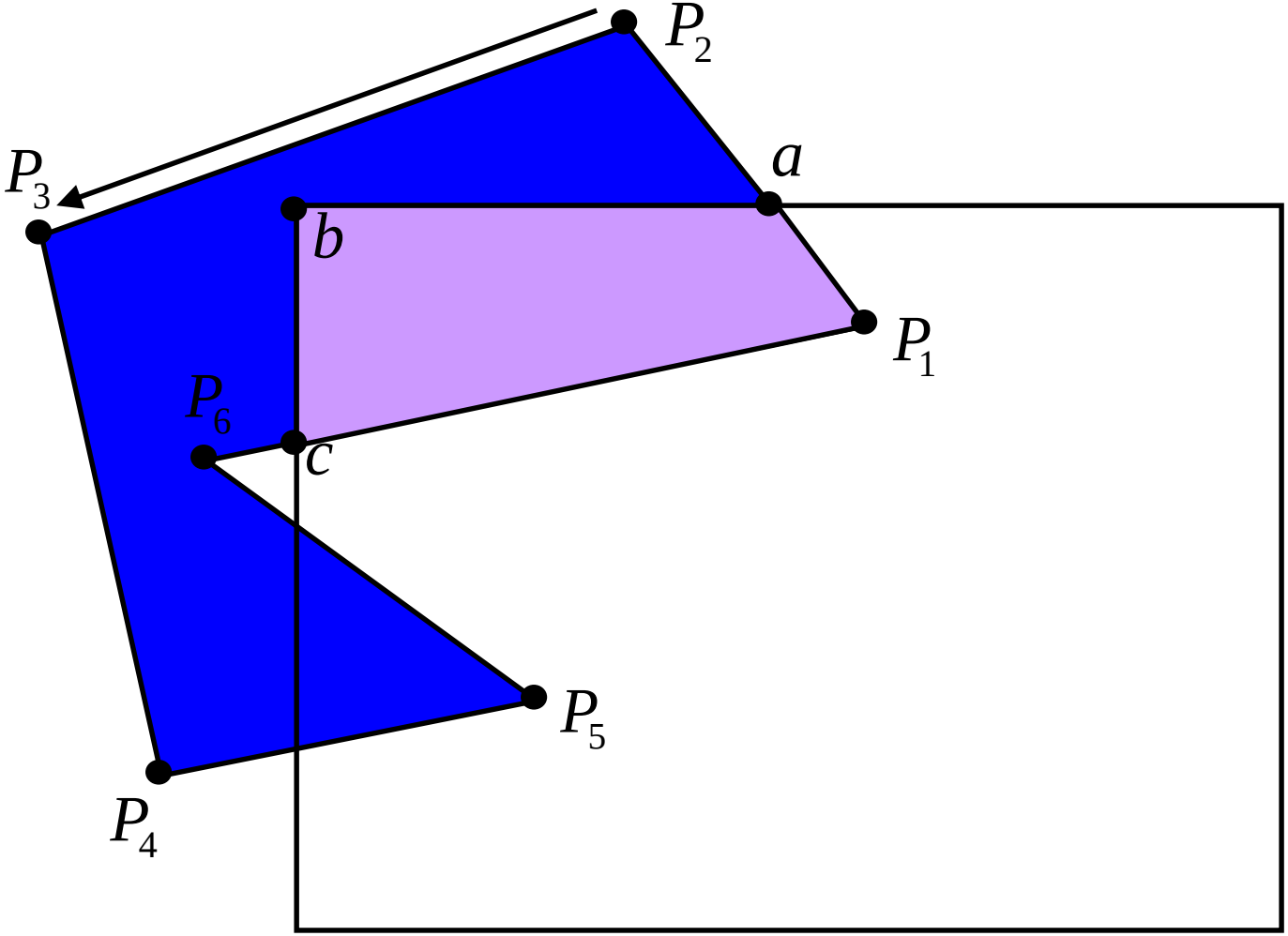

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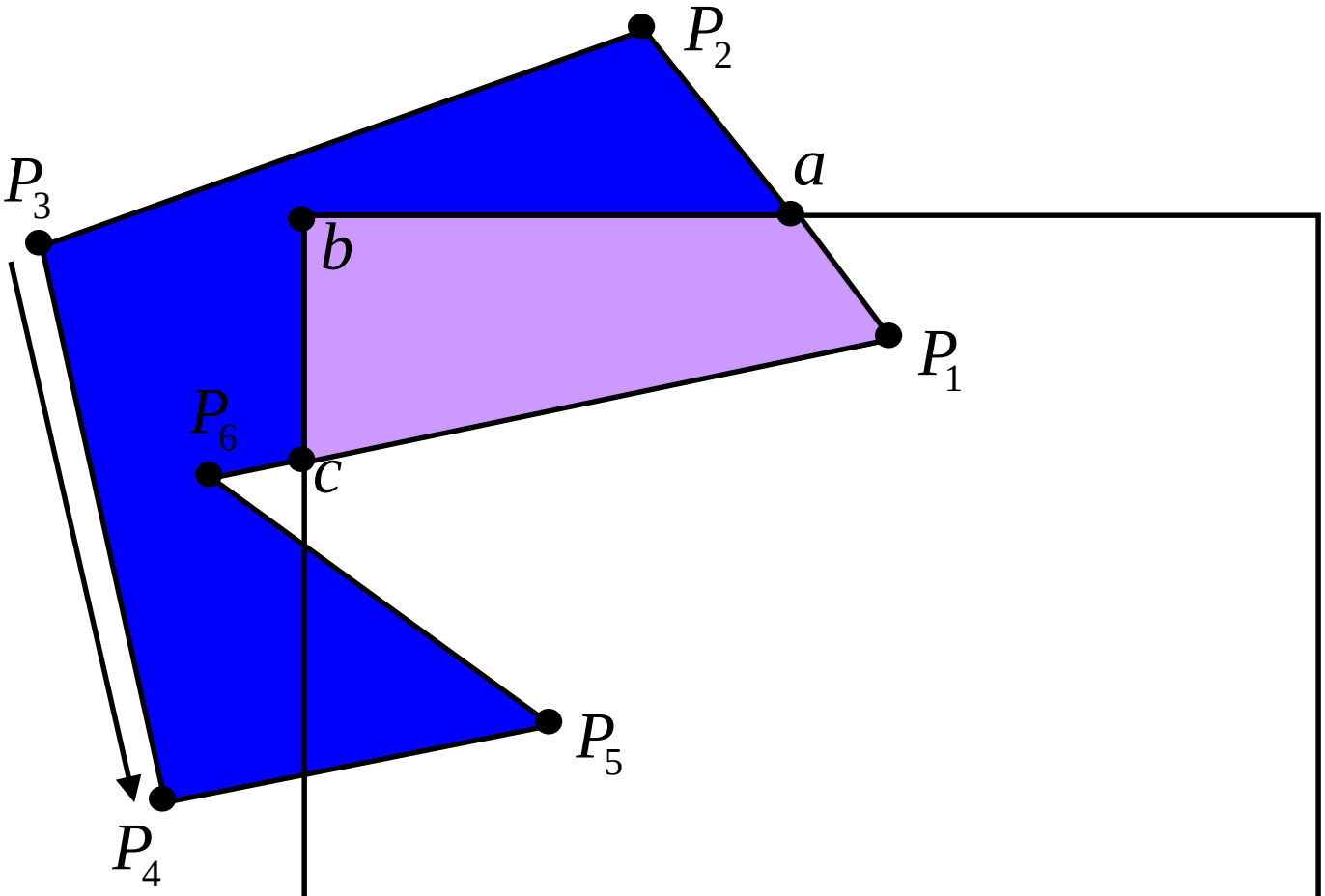

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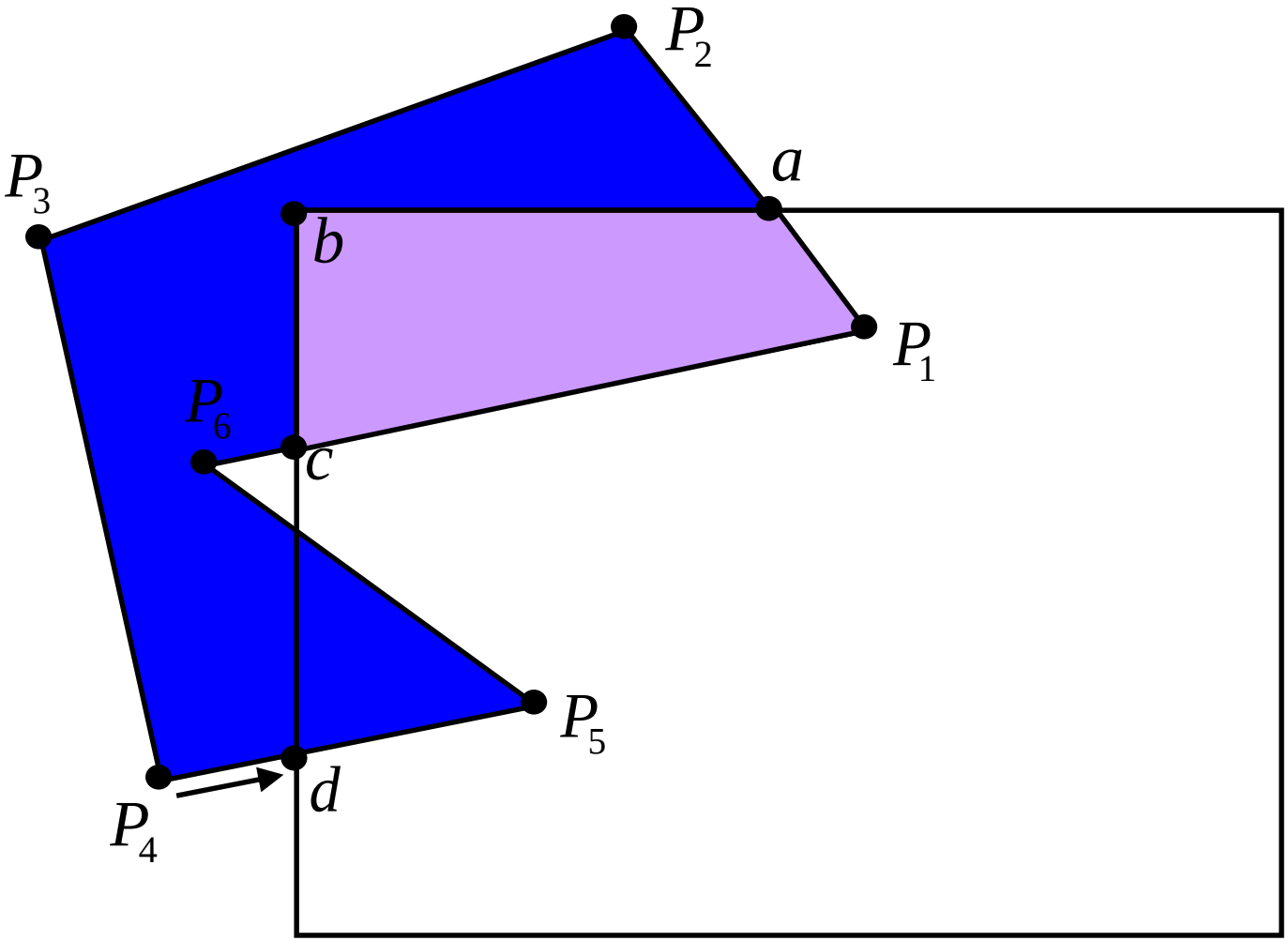

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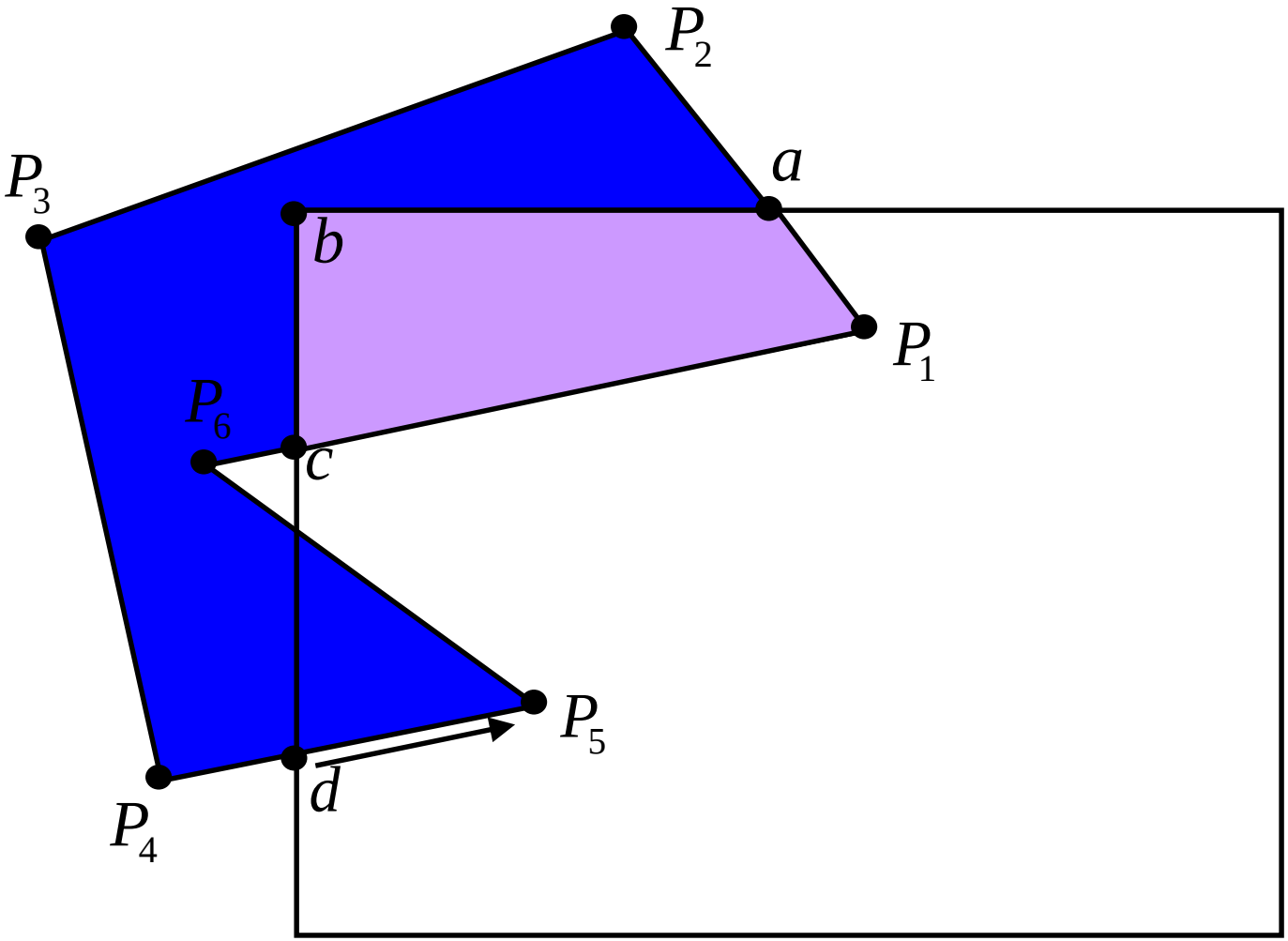

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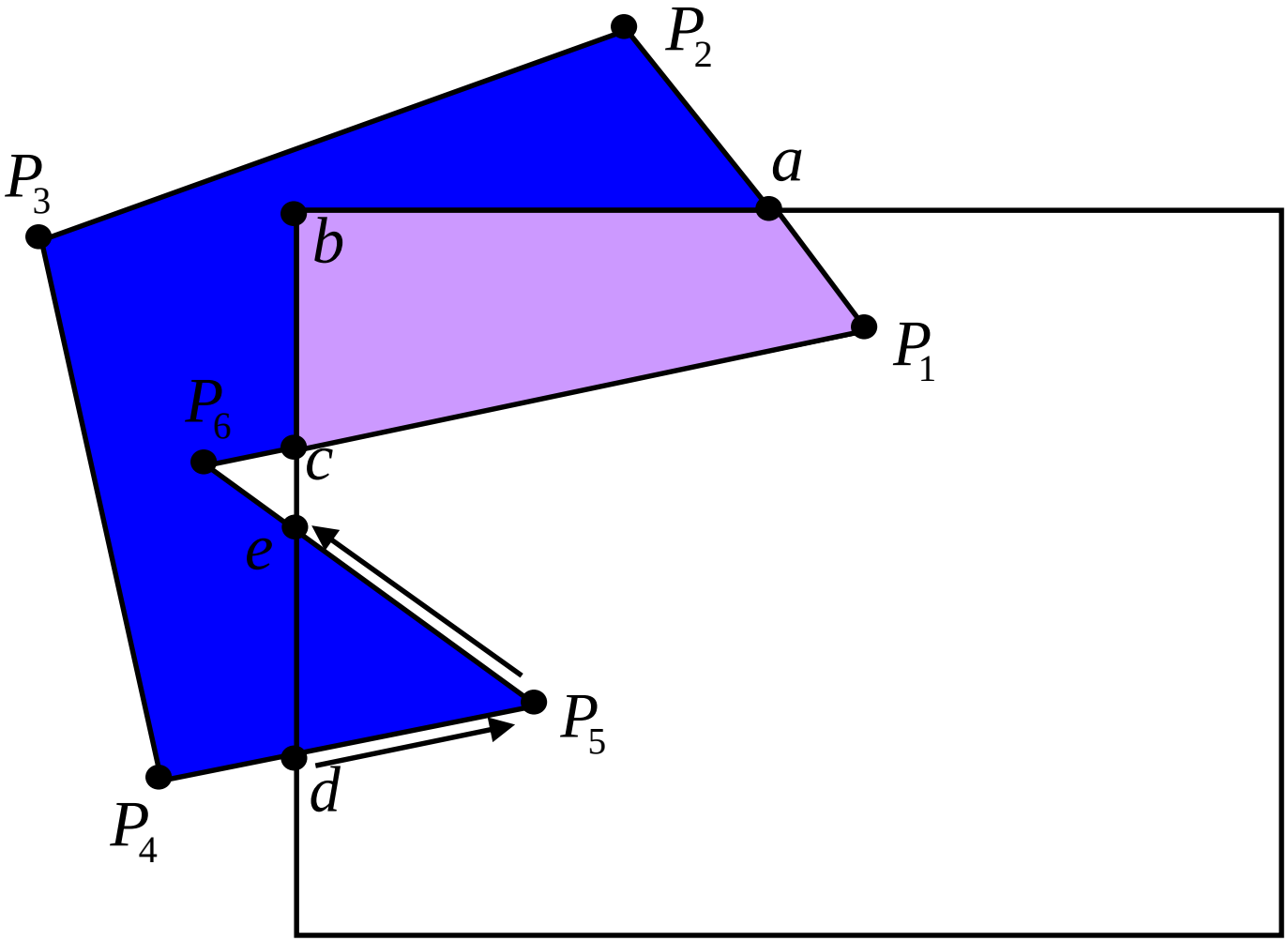

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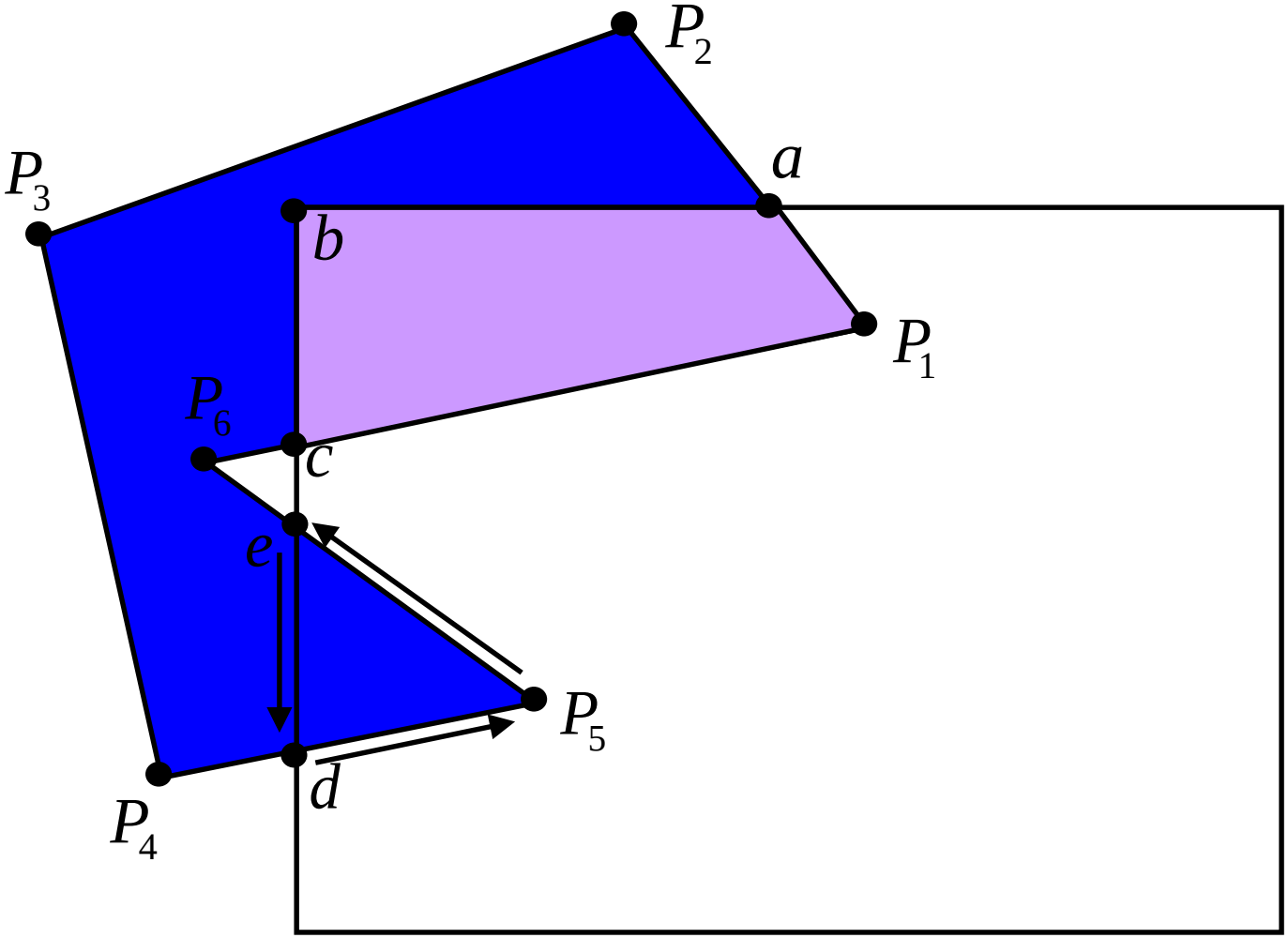

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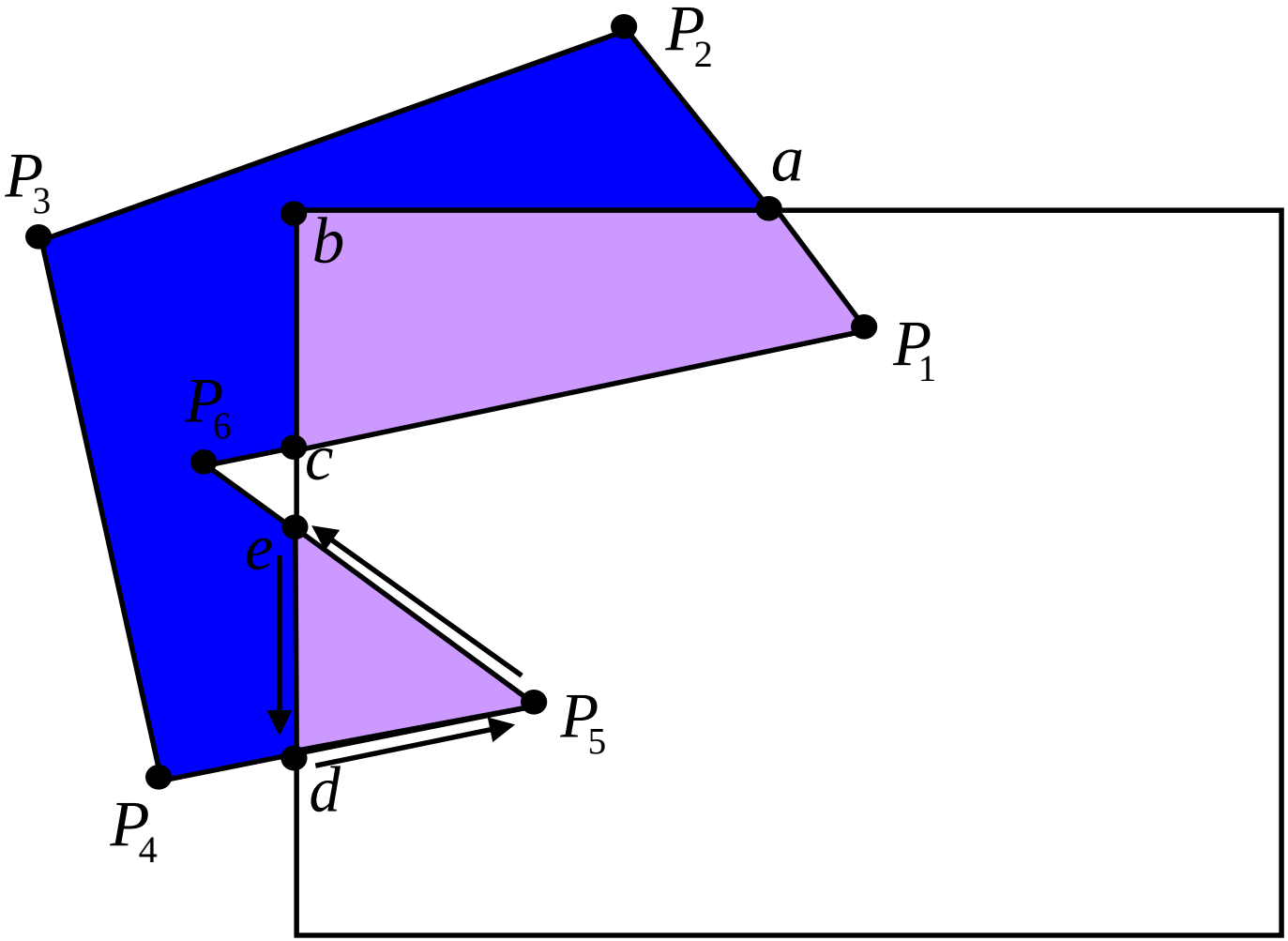

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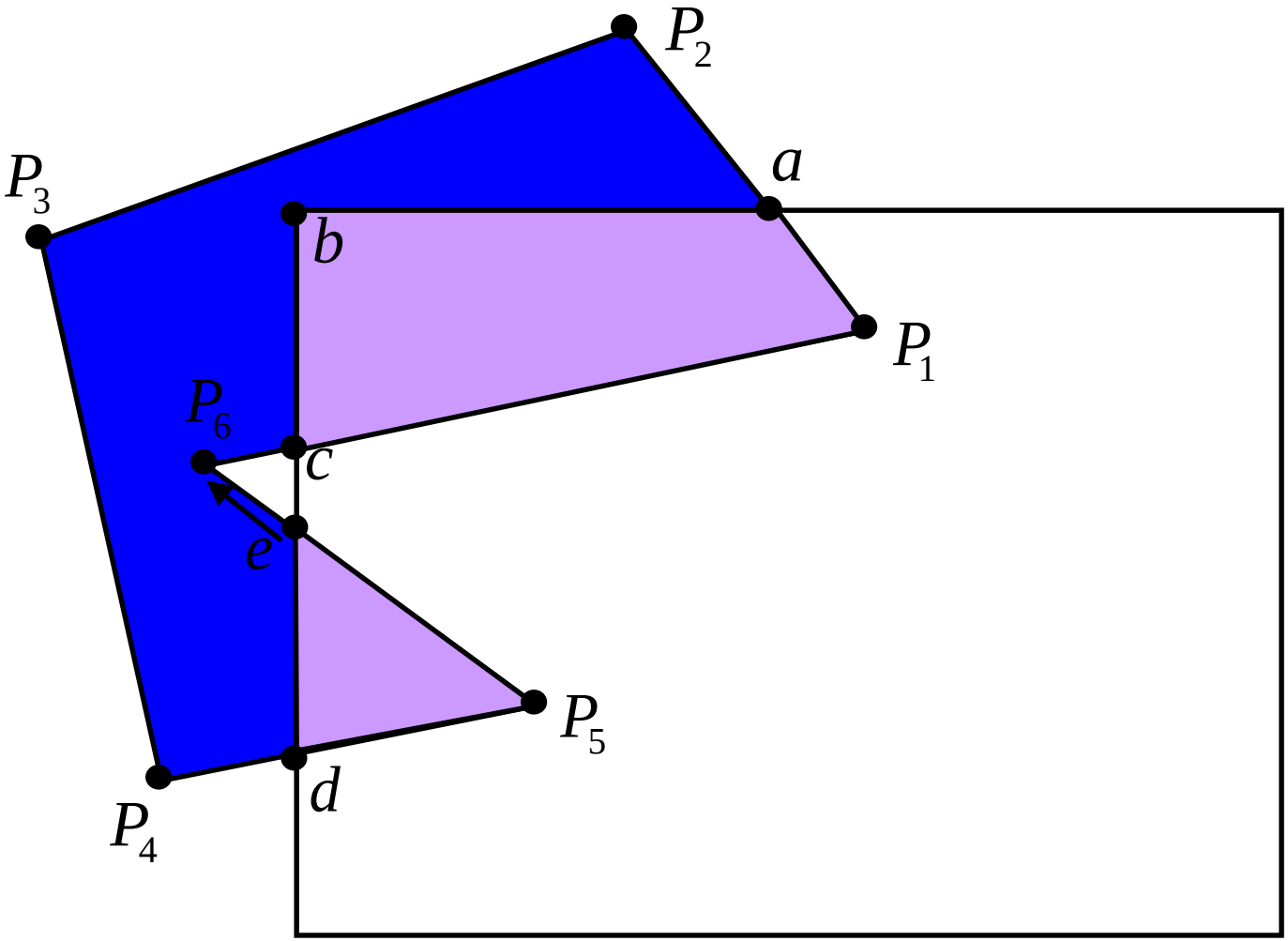

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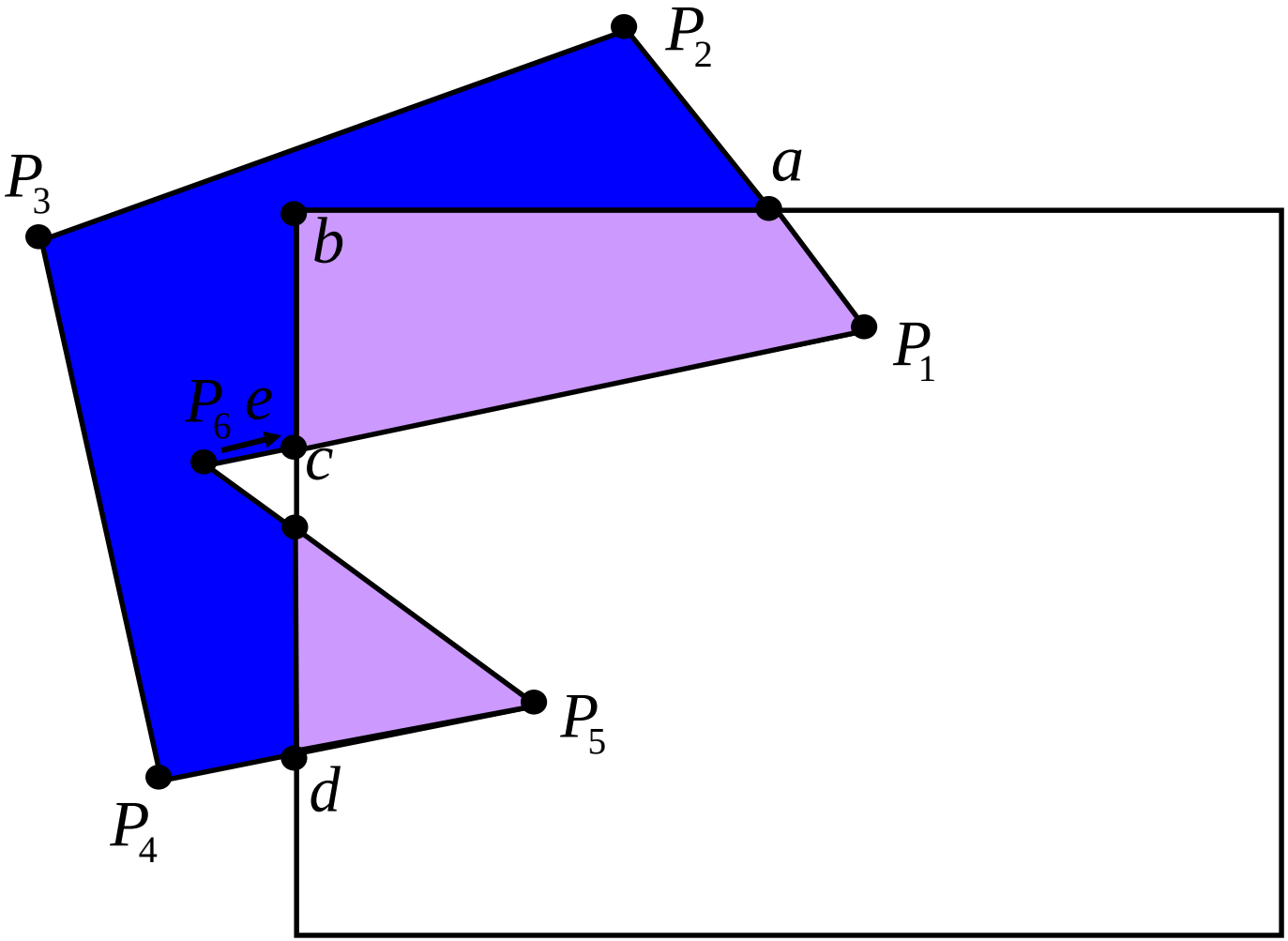

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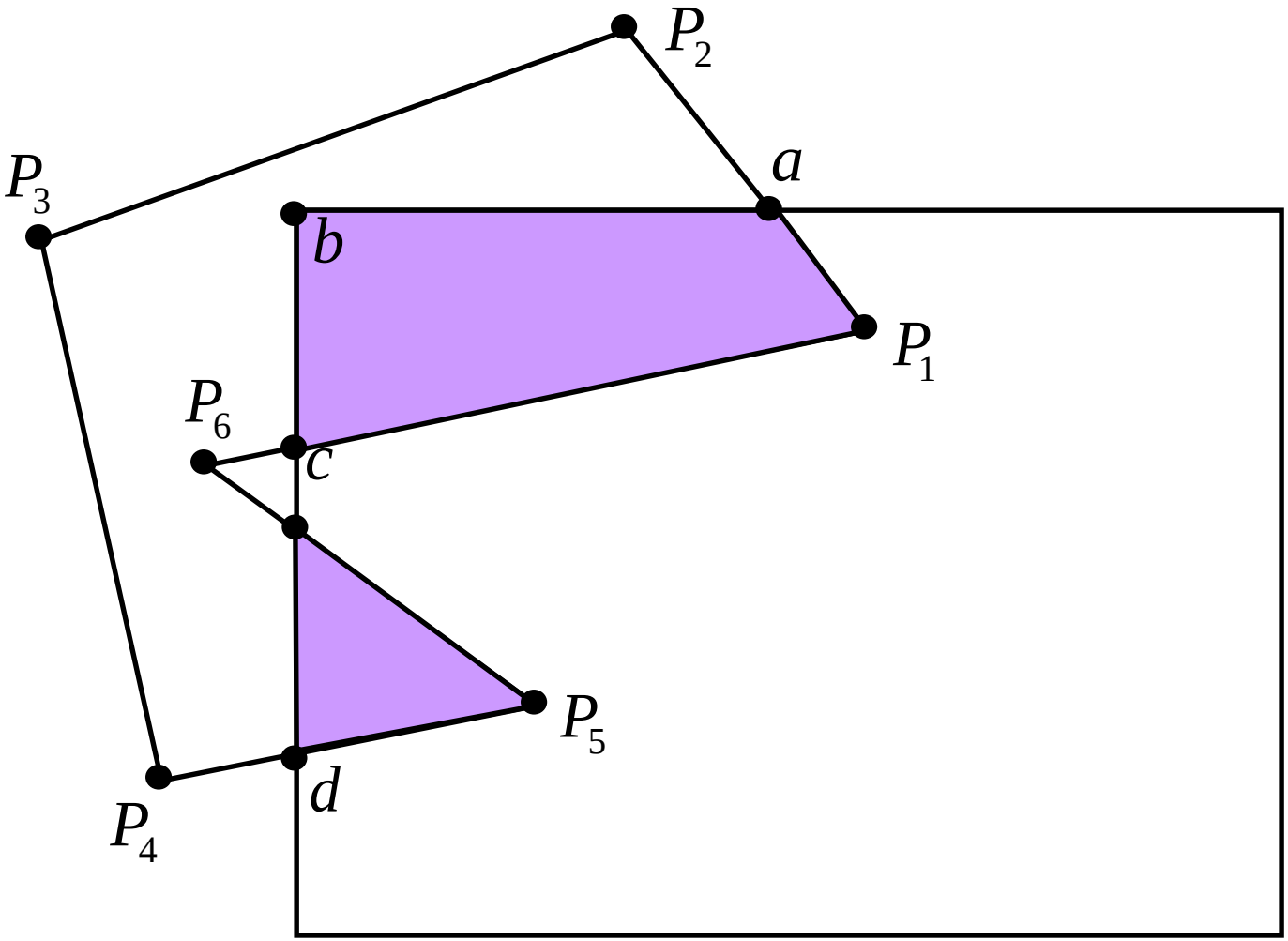

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