Land

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Roadmap

- Problem
- Statistics
- Observations

Problem

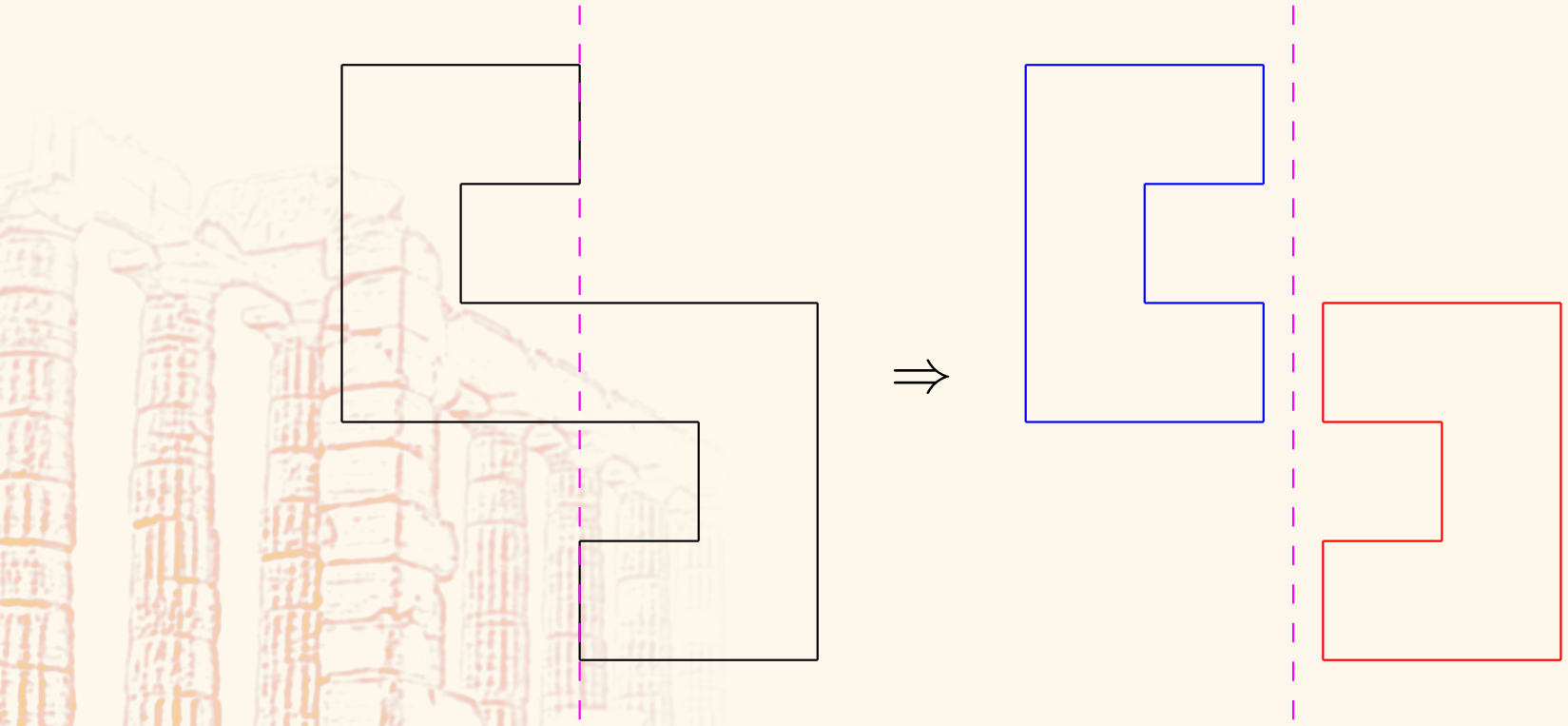
- Given a simple polygon
- Find a vertical line of the form $x = K$, where K is an integer
- Divides the polygon into left and right parts, so that they share the same perimeter

Statistics

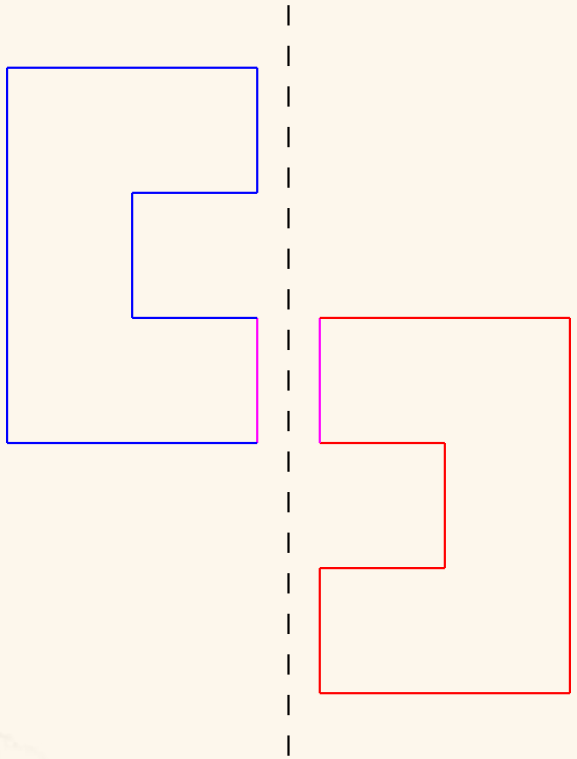
- Maximum score obtained: 50
- Lowest mean
- Lowest standard deviation

Idea

- Fix an integer K
- Computes the perimeters of left and right parts
- Pick another K if the two perimeters do not match



Observations



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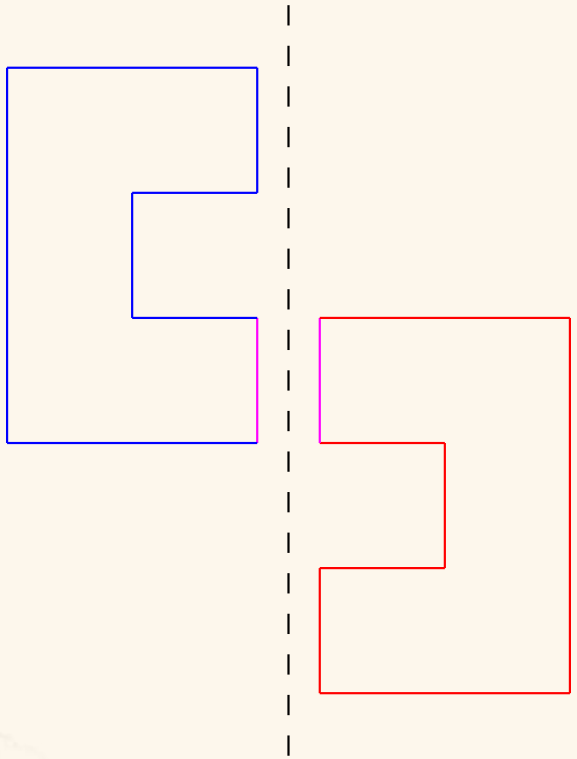


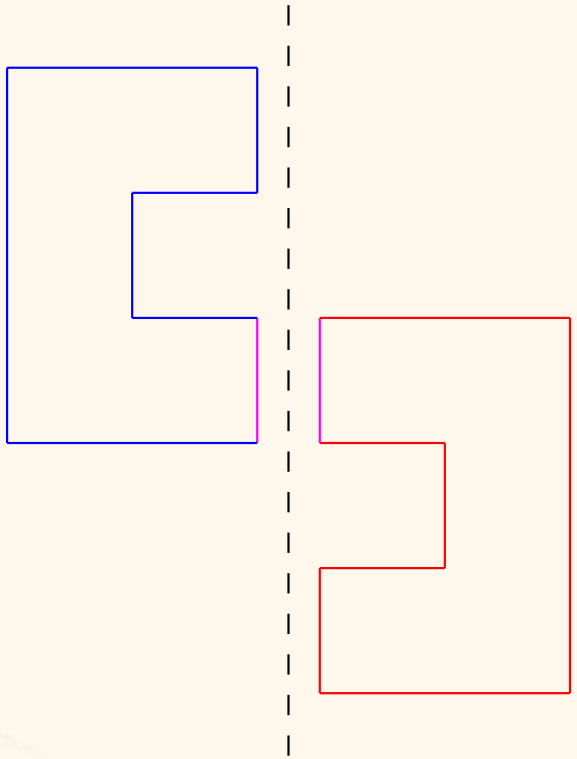
Observation 1

Need to consider the original boundary only

Corollary

- No need to compute perimeters of both left and right parts
- Only need to check whether the perimeter of the left part equals half of the total perimeter
- How to handle vertical line segments with $x = K$?

Observations



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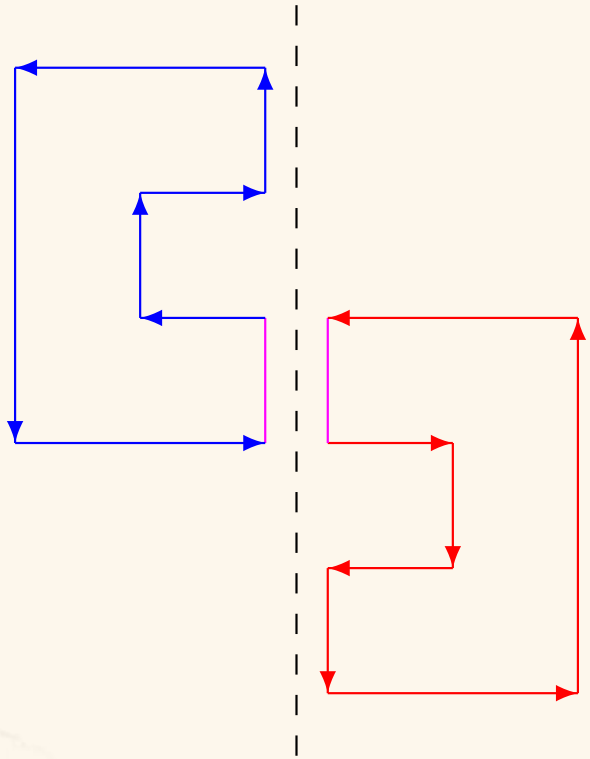

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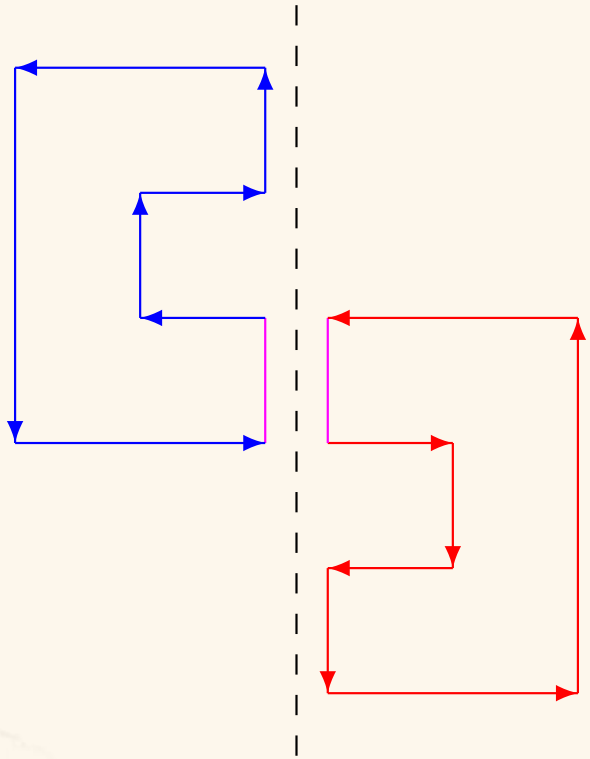

Observation 2

Vertical line segments can be classified by directions

Time analysis

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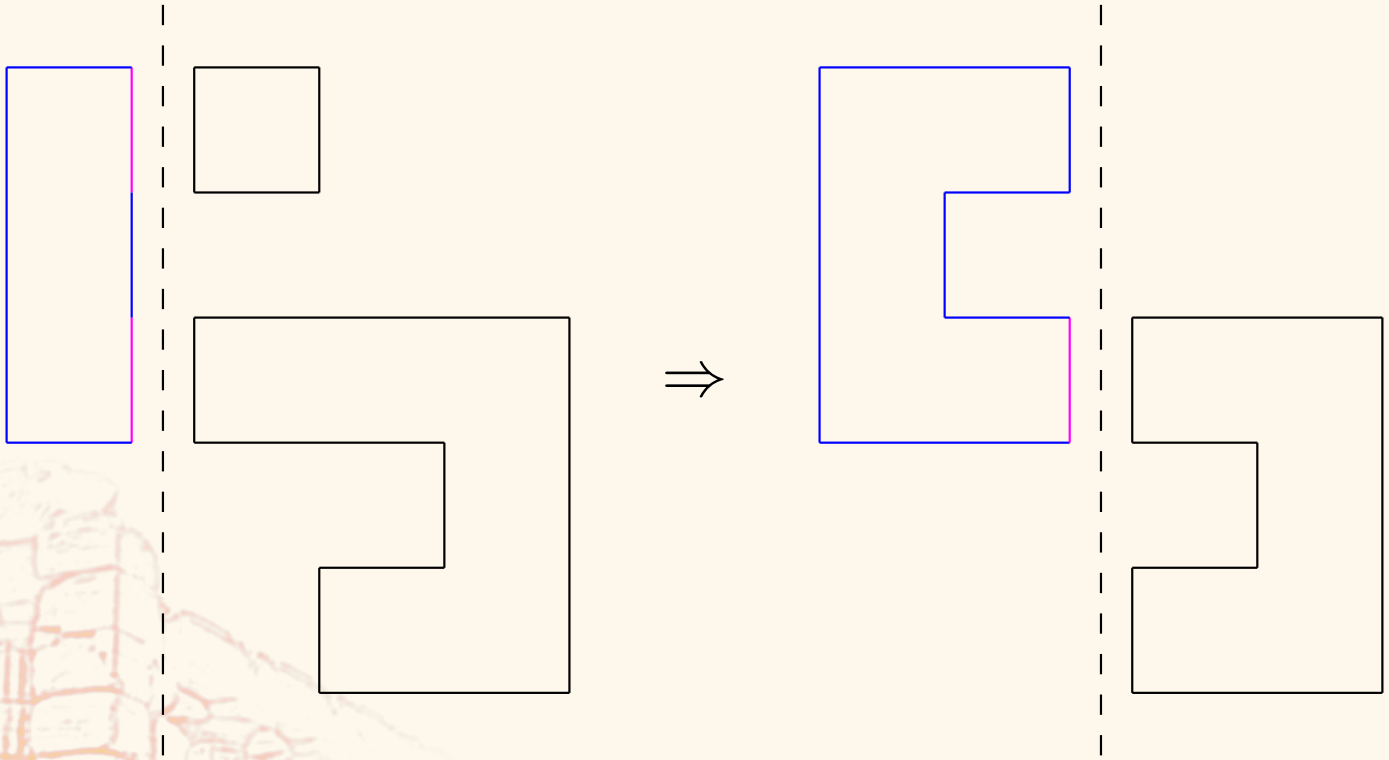
- For 50% of the input, it takes at most about 1000×2000 iterations, which is affordable.

Observations



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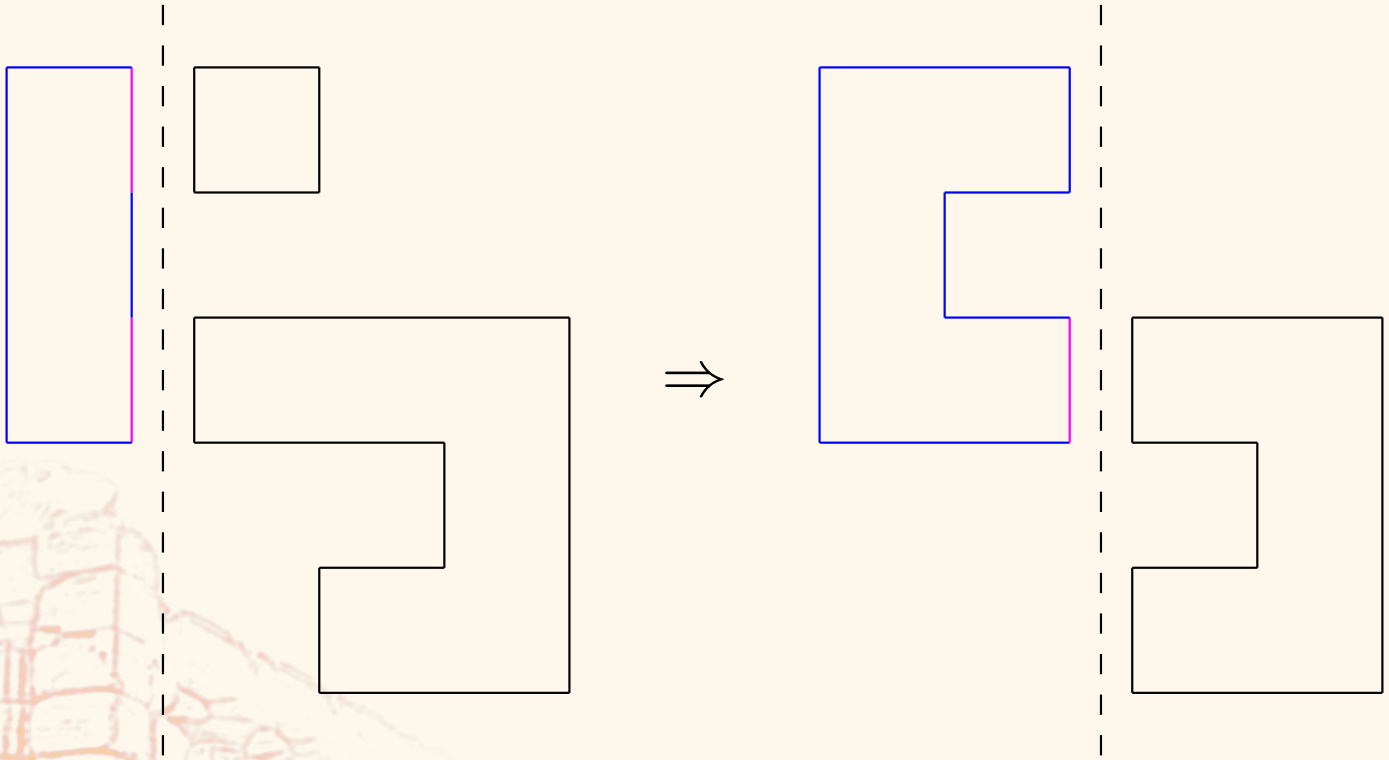


Observation 3

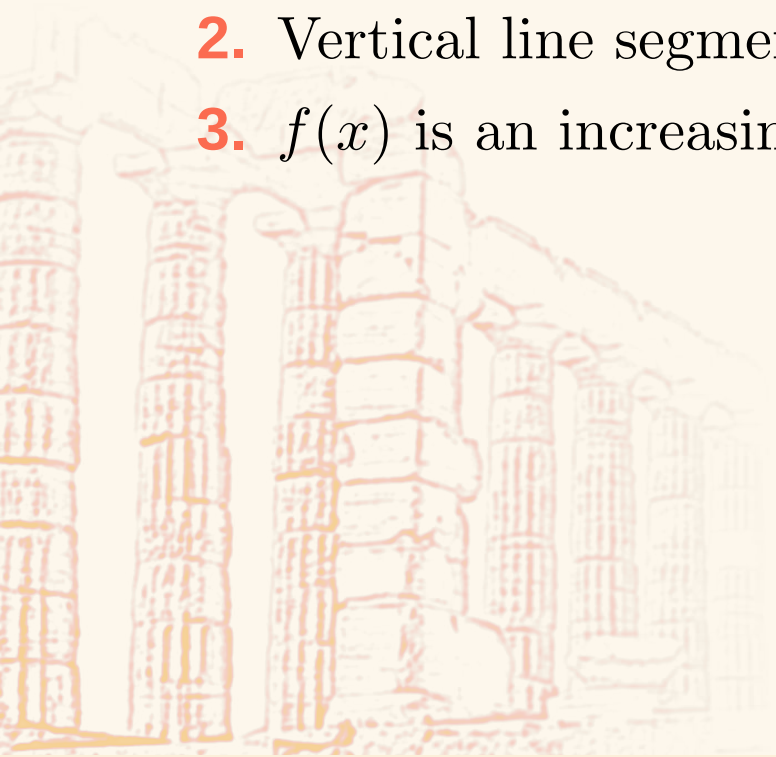
$f(x)$ is an increasing function of $x \Rightarrow$ binary search applies

Time analysis

- Only about $\log_2 60000$ possible values of K need to be tested
- It takes at most $30000 \times \log_2 60000 \leq 500000$ iterations
- Sample solution program takes less than 0.1 seconds to run

Summary

1. Need to consider the original boundary only
2. Vertical line segments can be classified by directions
3. $f(x)$ is an increasing function of $x \Rightarrow$ binary search applies



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