

Point Location

Introduction

- A Global View

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1D Point Location

❖ Given a subdivision of the real line into $n + 1$ intervals,
in which interval does a given query point q lie?

algorithm/structures	preprocessing time	storage cost	query time
linear search	-	-	$O(n)$
binary search	$O(n \log n)$	$O(n)$	$O(\log n)$
randomized tree	expected- $O(n \log n)$	$O(n)$	expected- $O(\log n)$
van Emde Boas tree	expected- $O(n)$	$O(n)$	$O(\log \log U)$
bucketing	$O(n + b)$	$O(n + b)$	$O(1)$

2D Point Location

- ❖ Let \mathcal{S} be a planar **polygonal subdivision** represented as a connected **PSLG**
- ❖ Preprocess \mathcal{S} so that given a query point q ,
we can efficiently determine **which face** of \mathcal{S} contains q

algorithm/structures	preprocessing time	storage cost	query time
slab	$O(n \log n)$	$O(n^2)$	$O(\log n)$
path copying		$O(n \log n)$	$O(\log n)$
node copying		$O(n)$	$O(\log^2 n)$
limited node copying		$O(n)$	$O(\log n)$
Kirkpatrick structure			
trapezoidal map	expected- $O(n \log n)$	expected- $O(n)$	expected- $O(\log n)$