

Complexity lower bounds for DSS problems

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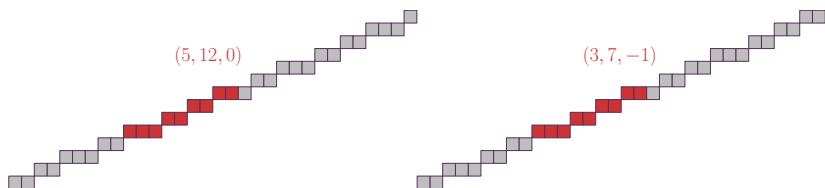
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1. DSS Subsegment

The problem

Given a DSS (or DSL) S of known characteristics (a, b, μ) , and two points P and Q on S , compute the minimal characteristics of the subsegment $[PQ]$.

(introduced in Said, M., Lachaud, J. O. (2011). Computing the characteristics of a subsegment of a digital straight line in logarithmic time. In DGCI (pp. 320-332). Springer.)



1. DSS Subsegment

What we know

► Several algorithms:

- Lachaud, J. O., Said, M. (2013). Two efficient algorithms for computing the characteristics of a subsegment of a digital straight line. *Discrete Applied Mathematics*, 161(15), 2293-2315
↪ **output-sensitive** $\mathcal{O}(\sum_i u'_i)$, and $\mathcal{O}(\log(b-l))$
- Sivignon, I. (2015). Fast recognition of a Digital Straight Line subsegment: Two algorithms of logarithmic time complexity. *Discrete Applied Mathematics*, 183, 130-146.: ↪ $\mathcal{O}(\log l)$
- Ouattara, J. S. D., et al. (2015). Remainder approach for the computation of digital straight line subsegment characteristics. *Discrete Applied Mathematics*, 183, 90-101.: ↪ $\mathcal{O}(\log l)$
- Roussillon, T. (2014). An Arithmetical Characterization of the Convex Hull of Digital Straight Segments. In *DGCI* (pp. 150-161). Springer.: ↪ $\mathcal{O}(\log l)$

Question

⇒ *Lower bound on the complexity ? Is it possible in constant time ?*

2. Union of DSSs

The problem

Given two DSSs S_1 and S_2 of known characteristics, compute the minimal characteristics of $S_1 \cup S_2$. (introduced in Damiand, G.,

Coeurjolly, D. (2011). A generic and parallel algorithm for 2d digital curve polygonal approximation. Journal of Real-Time Image Processing, 6(3), 145-157.)

What we know

Several algorithms

- ▶ O'Rourke, J. (1981). An on-line algorithm for fitting straight lines between data ranges. Communications of the ACM, 24(9), 574-578.
- ▶ Sivignon, I. (2014). Algorithms for Fast Digital Straight Segments Union. In DGCI (pp. 344-357). Springer.
 $\hookrightarrow \mathcal{O}(\log(n))$

Question

\Rightarrow *Lower bound on the complexity ?*