Exact and Approximation Multidimensional Subset Sum Algorithms

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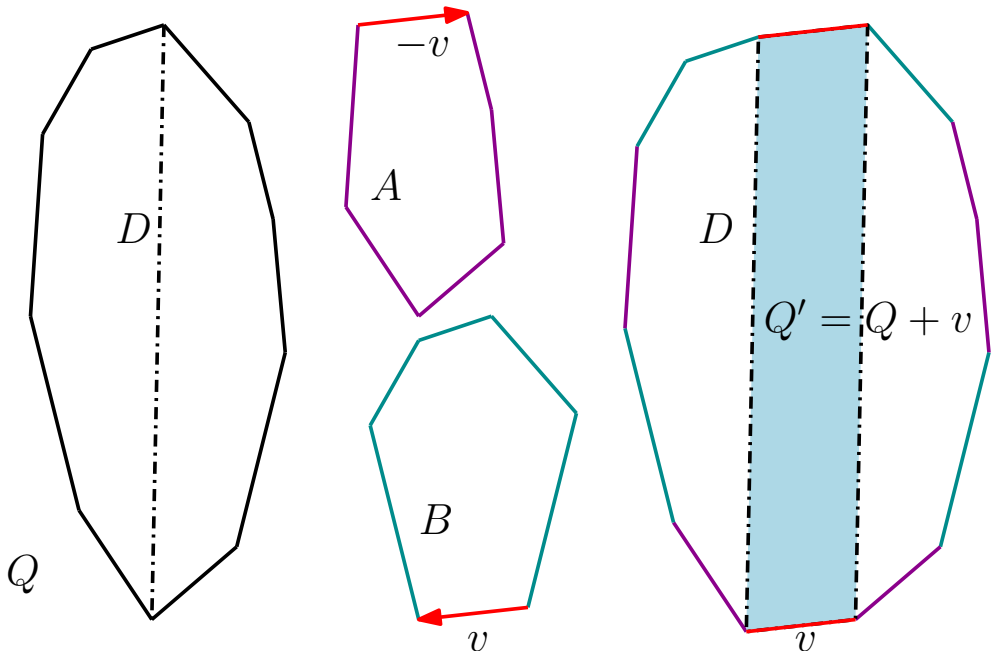
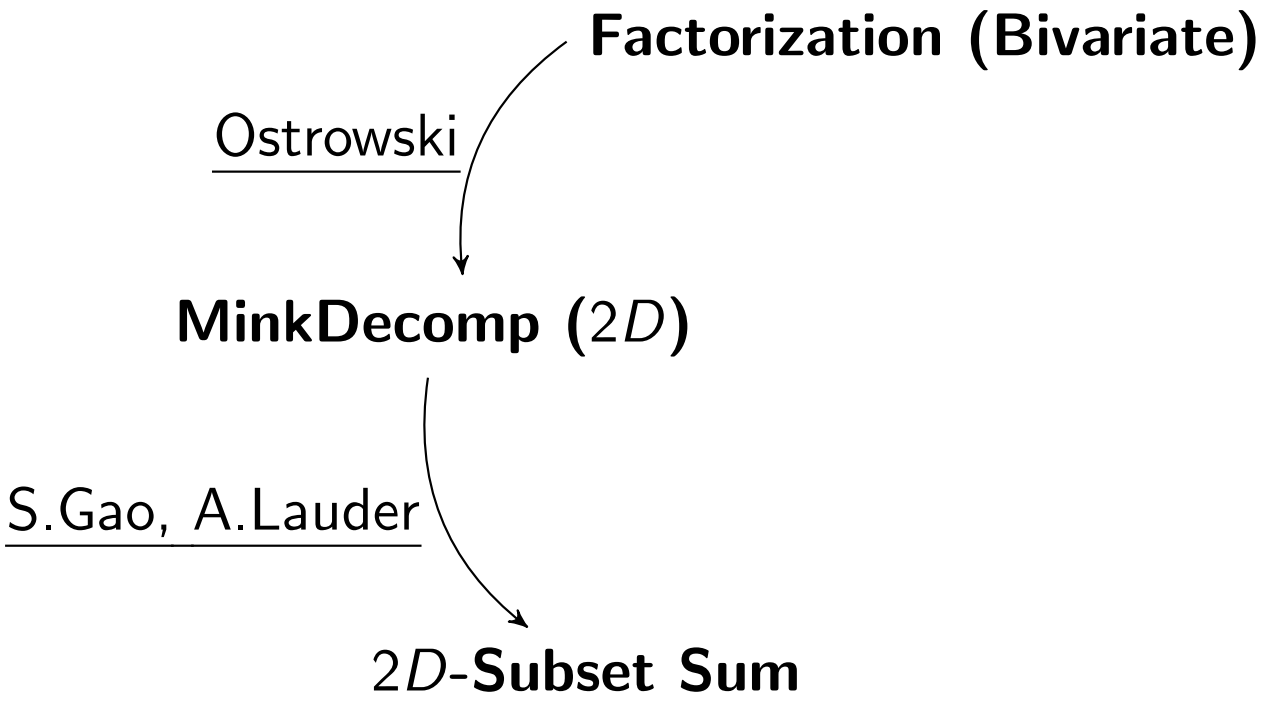
Given a polygon Q our approximation algorithm, can return in polynomial time two polygons A and B such that their Minkowski sum almost equals to Q.



Overview of the problem 1



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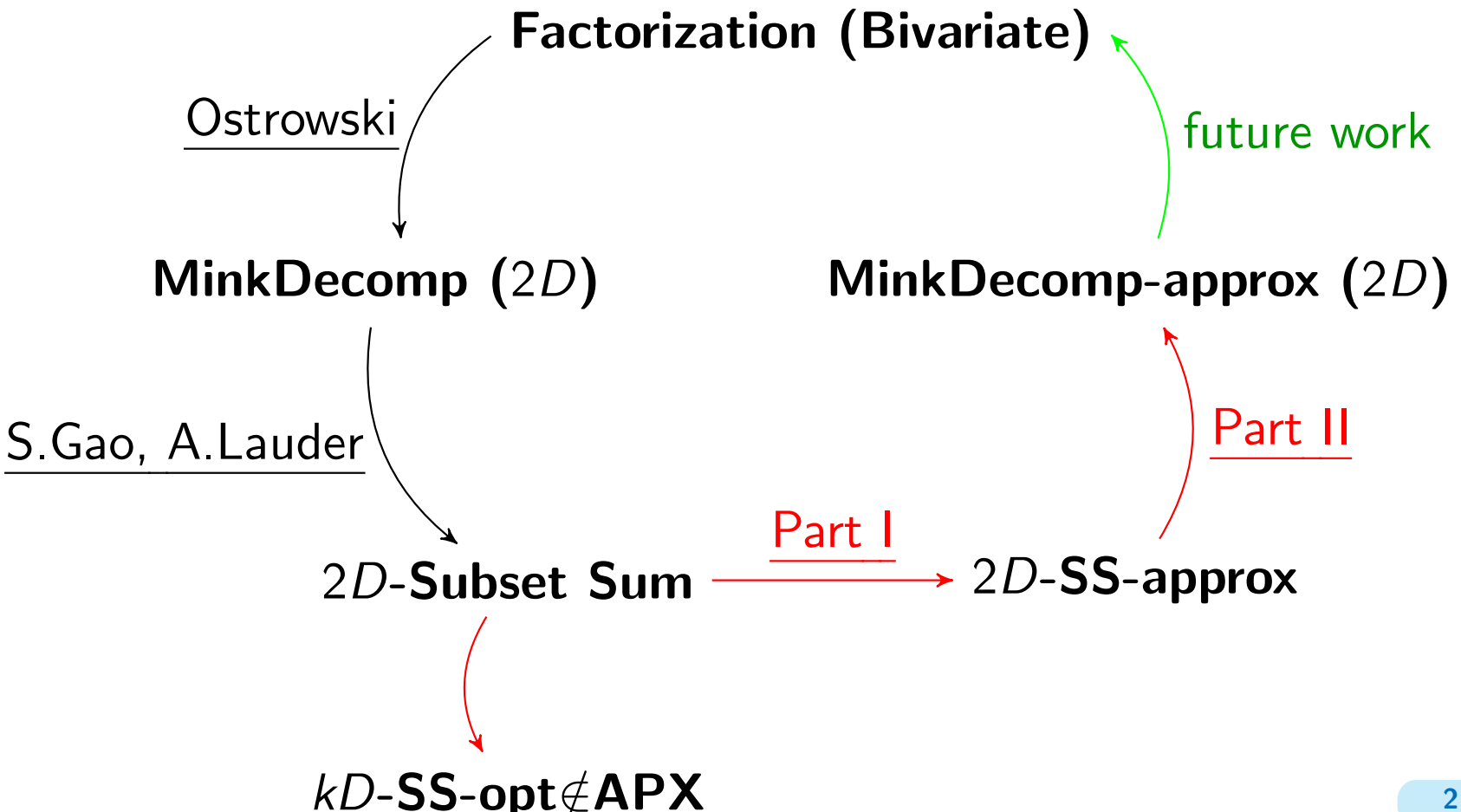
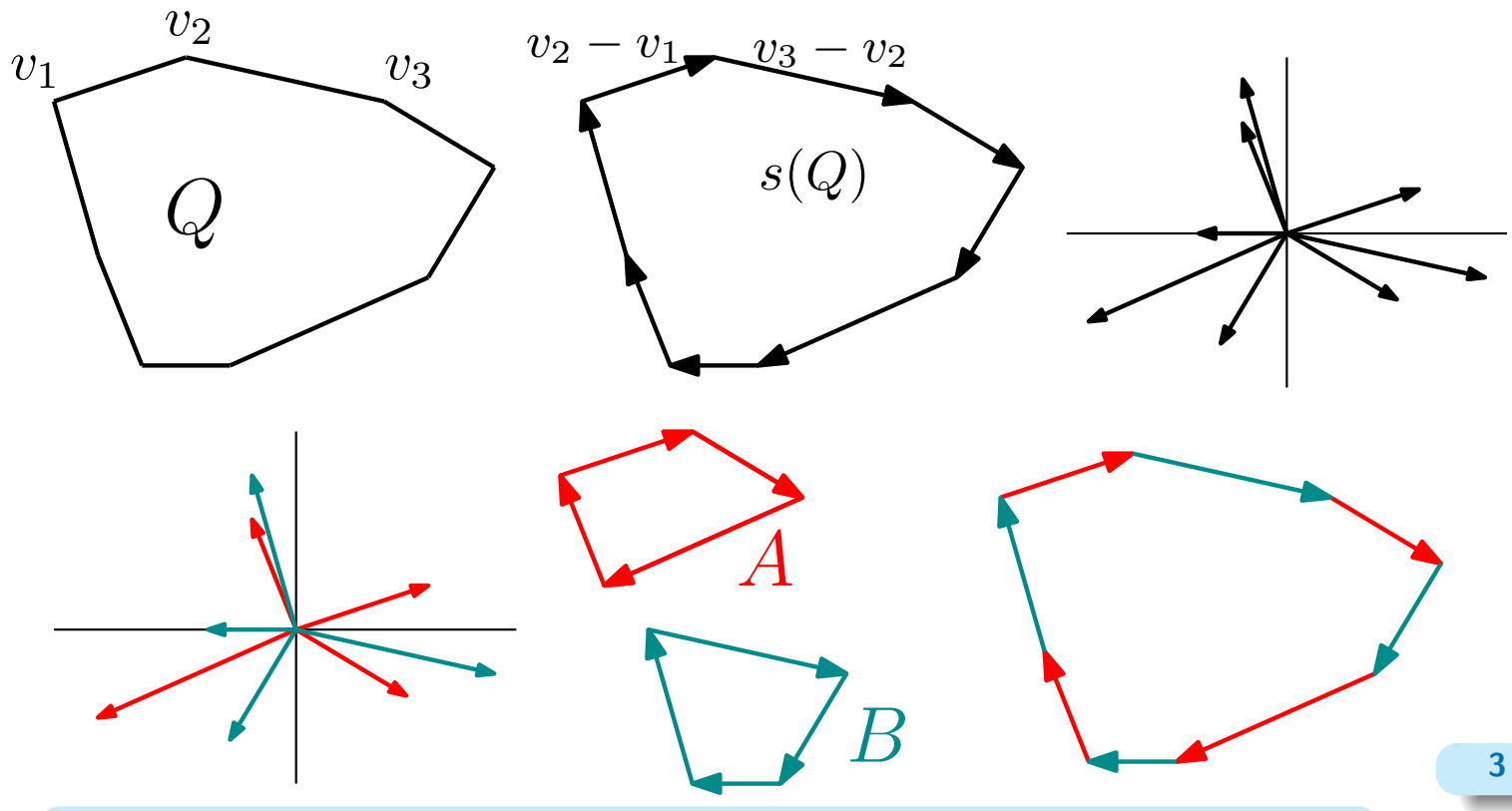


From a polygon to a set of vectors

Given a polygon Q, its **edge sequence s(Q)** is a set of vectors in $\mathbb{Z}^2$.

s(Q): subtract successive vertices, "break" if the edge contains integral points.



kD-Subset Sum (*kD*-SS)

Input: A set of k-dimensional vectors $S = \{v_i \mid v_i \in \mathbb{Z}^k, 1 \leq i \leq n\}$ and a target vector $t \in \mathbb{Z}^k$.

Question: Does there exist a subset of vectors, $S' \subseteq S$, such that

$$\sum_{v_i \in S'} v_i = t?$$

P is the set of all possible vector sums for all subsets of S.