

A General Approximation Algorithm for Bicriteria Minimization Problems

Stefan Ruzika

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Abstract

We present a general technique for approximating bicriteria minimization problems with positive-valued, polynomially computable objective functions. Given $0 < \epsilon \leq 1$ and a polynomial-time α -approximation algorithm for the corresponding weighted sum problem, we show how to obtain a bicriteria $(\alpha \cdot (1 + 2\epsilon), \alpha \cdot (1 + \frac{2}{\epsilon}))$ -approximation algorithm for the budget-constrained problem whose running time is polynomial in the encoding length of the input and linear in $\frac{1}{\epsilon}$. In particular, by choosing $\epsilon := 1$, our result shows that it is possible to obtain a bicriteria $(3\alpha, 3\alpha)$ -approximation in polynomial time, whenever a polynomial-time α -approximation algorithm exists for the weighted sum problem.