A special case of the data arrangement problem on binary trees

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16th June 2015

The *data arrangement problem on regular trees* (*DAPT*) consists of assigning the vertices of a given guest graph G to the leaves of a d-regular tree T (host graph) such that the sum of the pairwise distances of all pairs of leaves in T which correspond to the edges of G is minimised. Luczak and Noble [1] have shown that this problem is NP-hard for every fixed $d \geq 2$. The question about the computational complexity of the DAPT in the case where the guest graph is a tree is still open.

We deal with one special case of this problem where both the guest and the host graph are binary regular trees. First, we provide a solution algorithm which clearly yields an upper bound. Then we introduce and solve the *k-balanced partitioning problem* (*k-BPP*) of a binary regular tree for particular choices of k and show that a lower bound for the original problem can be derived by solving h instances of k-BPP, where h is the height of the host graph T.

By combining both bounds we obtain an approximation algorithm for the special case of DAPT.

References

[1] M.J. Luczak and S.D. Noble, Optimal arrangement of data in a tree directory, *Discrete Applied Mathematics* **121 (1–3)**, 307–315, 2002.

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