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Addendum to "Bicolored Matchings in Some Classes of Graphs"

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In [1] a polynomial algorithm is given to construct in a bipartite multigraph G two maximum matchings M, M' such that $|M \cap M'|$ is minimum. This algorithm is based on network flows. In section 4 a specialization to the case where G is a tree is presented and it is claimed that there is a linear time algorithm to handle this case.

It turns out that the procedure given in [1] may not be applied as it is to general trees. Consider for instance the tree given in the example 1 of Fig. 1. At step 4.4, when considering v, the algorithm introduces edges a and c into M and into M'. Then we obtain (using the even chain formed by j, i, e, f, g and h) $M = \{a, c, j, e, g\}$ and $M' = \{a, c, i, f, h\}$ with $|M \cap M'| = 2$. But there exists another maximum matching $\bar{M}' = \{j, b, d, f, h\}$ with $|M \cap \bar{M}'| = 1$.

In fact one has to consider two cases at a vertex v when there are two even legs left (but no odd legs): either alternate edges of M and M' in the even chain formed by the two legs (as in the example 1 of Fig. 1) or introduce into M and into M' the even numbered edges of the legs (as in the example 2 of Fig. 1) where we have $M = \{a, d, e\} = M'$.

As a consequence a procedure of dynamic programming type could be designed but with a higher complexity. But the algorithm based on network flows for the more general case of bipartite graphs would certainly be a more elegant solution procedure.

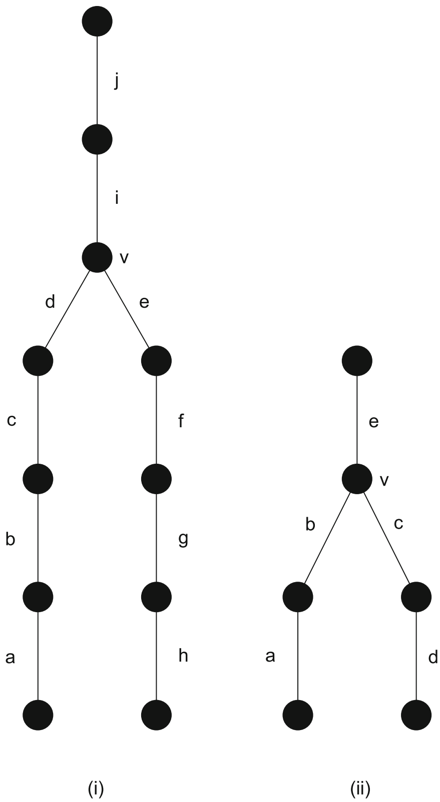

Fig. 1. (i) Example 1. (ii) Example 2.

Reference

1. Costa, M.-C., Picouleau, C., de Werra, D., Ries, B.: Bicolored matchings in some classes of graphs. Graphs and Combin **23**, 47–60 (2007)

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