ON LOCALLY-BALANCED 2-PARTITIONS OF SOME BIPARTITE GRAPHS

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In this article undirected connected graphs without loops and multiple edges [1] are considered. The set of vertices of a graph G is denoted by $V(G)$, the set of edges by $E(G)$. The greatest degree of a vertex of a graph G is denoted by $\Delta(G)$. For $\forall v \in V(G)$ let's set $\lambda(v) \equiv \{\omega \in V(G) / (\omega, v) \in E(G)\}$. *2-partition* of a graph G is a function $f: V(G) \to \{0,1\}$. 2-partition f of a graph G is *locally-balanced*$_1$ iff for $\forall v \in V(G)$

$$|| \{\omega \in \lambda(v) / f(\omega) = 1\} | - | \{\omega \in \lambda(v) / f(\omega) = 0\} || \leq 1, \quad (1)$$

2-partition f of a graph G is *locally-balanced*$_2$ iff for $\forall v \in V(G)$

$$|| \{\omega \in \lambda(v) \cup \{v\} / f(\omega) = 1\} | - | \{\omega \in \lambda(v) \cup \{v\} / f(\omega) = 0\} || \leq 1. \quad (2)$$

The NP-completeness of the problem of existence of locally-balanced$_1$ 2-partition for bipartite graphs G with $\Delta(G) = 3$ was proved in [2]. The NP-completeness of the problem of existence of locally-balanced$_2$ 2-partition for bipartite graphs G with $\Delta(G) = 4$ was proved in [3]. The problems of existence and construction of 2-partitions described above are important since they correspond to the problems concerning distribution of influences of two opposite powers, which minimizes the probability of conflicts. The subjects of a simulated system may or may not have an ability of self-defence, thus during the modeling one should use the definitions (2) or (1) respectively.

Let A be the set of graphs in which arbitrary two simple cycles [1] have at most one common vertex.

Here, for bipartite graphs of A a necessary and sufficient condition for existence of locally-balanced$_1$ 2-partition is obtained.

References

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