Investigating solvability and complexity of linear active networks by means of matroids

The solvability and complexity problems of linear active networks are approached from a purely combinatorial point of view, using the concepts of matroid theory. Since the method is purely combinatorial, we take into account the network topology alone. Under this assumption necessary and sufficient conditions are given for the unique solvability of linear active networks. The complexity and the number of dc-eigenfrequencies are also given. The method enables you to decide if degeneracies are due to the topology alone, or if they are caused by special relations among network parameter values. If the network parameter values are taken into account, the complexity and number of dc-eigenfrequencies given by the method, are only upper and lower bounds, respectively. The above conditions are fairly easily checked, and the complexity and number of dc-eigenfrequencies are found, using polynomially bounded algorithms (matroid partition and intersection algorithms).

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