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A evolutionary method for finding communities in bipartite networks

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Common practice in community structure detection is to develop different methods for different classes of networks. Here, we first show that unipartite networks and directed networks can be uniformly represented as bipartite networks, and their modularity completely consist with that for bipartite networks. To optimize the bipartite modularity, we then present a modified adaptive genetic algorithm, called as MMOGA, which is especially suited for community structure detection. In MMOGA, we introduce a new measure for the informativeness of a locus instead of the standard deviation, which can exactly determine those loci to mutate. This measure is the bias between the distribution of a locus over the current population and the uniform distribution of the locus, i.e., Kull-back Divergence between them. Moreover, we develop a reassignment technique for differentiating the informative state a locus has attained from the random state at initial phase. Also we present a modified mutation rule which incorporating related operation can guarantee MMOGA the convergence to the global optima and can speed up the convergence process. Experimental results show that MMOGA is superior to MOGA and standard genetic algorithms as well as BRIM when applied to bipartite networks.

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