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Community detection in social and biological networks using differential evolution.

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Summary: The community detection in complex networks is an important problem in many scientific fields, from biology to sociology. This paper proposes a new algorithm, Differential Evolution based Community Detection (DECD), which employs a novel optimization algorithm, differential evolution (DE) for detecting communities in complex networks. DE uses network modularity as the fitness function to search for an optimal partition of a network. Based on the standard DE crossover operator, we design a modified binomial crossover to effectively transmit some important information about the community structure in evolution. Moreover, a biased initialization process and a clean-up operation are employed in DECD to improve the quality of individuals in the population. One of the distinct merits of DECD is that, unlike many other community detection algorithms, DECD does not require any prior knowledge about the community structure, which is particularly useful for its application to real-world complex networks where prior knowledge is usually not available. We evaluate DECD on several artificial and real-world social and biological networks. Experimental results show that DECD has very competitive performance compared with other state-of-the-art community detection algorithms.

Keywords: Community structure; graph partitioning; evolutionary computation; Differential Evolution
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