

Community Detection: Metaheuristic

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I. INTRODUCTION

Communities are found in networks everywhere in the world, due to the rise of social networks and the collection of other graph data over the last decade these networks have been growing exponentially. Communities can be seen as fairly independent parts of the graph. The information these graphs contain can be very valuable for a variety of reasons. Faster algorithms are required to deal with this increase of data. The problem has been proven to be NP-hard [2].

II. OVERVIEW

Text requiring further explanation[1].

III. METHODS

Based on previous algorithms that have been used detect overlapping communities in large networks, the intention is to use techniques from outside of the Genetic Algorithm domain to improve the efficiency and performance of a recently used Multi-Agent approach [3]. The main method that will be used to facilitate is Node Clustering [4]. In the locus-based adjacency representation of the graph structure, all of the nodes are represented separately which leads to a very large data structure when being used on large but realistic network graphs. By clustering some of the obvious communities into new nodes prior to using the Genetic Algorithm, the space and time complexity should decrease. Edge contraction based on node clustering should keep the general structure of the graph without much information

loss if the relationship between the merged nodes in the graph is transitive. Multiple methods of link clustering will be tested to see its performance compared to the original set-ups. A possible problem might be that by doing this it will become harder to find nodes that are in several communities. Further research is required to see how this can be prevented while still improving the efficiency of the Genetic Algorithm.

REFERENCES

- [1] Pizzuti Clara. Overlapped community detection in complex networks. *GECCO*, pages 859–866, 2009.
- [2] S. Fortunato. Community detection in graphs. *Physics Reports*, 486:75–174, February 2010.
- [3] Zhangtao Li and Jing Liu. A multi-agent genetic algorithm for community detection in complex networks. *Physica A*, 449:336–347, 2016.
- [4] Dengdi Sun Zhuanlian Ding, Xingyi Zhang and Bin Luo. Overlapping community detection based on network decomposition. *Scientific Reports*, 2016.