Communities detection and dynamics: Estonian economic network of payments

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Community detection helps understanding the local organization of the components of networks. In this study, we identify and study the community structure of the Estonian network of payments. We also analyze specific scale-free characteristics and explore certain aspects of the evolution of the traced communities. In this network the nodes are Estonian companies and the links are payments done between the companies. Our results indicate that there is a fair matching between the classification of nodes found through a community detection algorithm and the real economic groups classifications. Moreover, we found that the investigation of the structure and evolution of overlapping communities in our network helped finding ties with economical events.

Community detection is a graph partitioning process that provides insight of the organizational principles of networks. Thus far, recent advances and knowledge of the underlying mechanisms that rule dynamics of communities in networks are limited, and this is why an extensive and wider understanding of communities is important. Locating the underlying community structure in a network allows studying the network more easily and provides clarity on the function of the system represented by the network as communities often correspond to functional units of systems. The study of communities and their properties also helps on revealing relevant groups of nodes, make classifications with them, discover similarities or reveal unknown linkages between them. Communities have a strong impact in the behavior of a network and studying communities, particularly in economic networks, represents an important step towards the knowledge (beyond local organization of their components) of a specific category of complex systems.

In this study, we present a static and dynamic community detection analysis by using the Clique Percolation Method where we examine the structure of the communities of a novel and interesting network: the large-scale payments network of Estonia. The main objective of this study is to detect communities, observe their structures and characteristics, analyze the changes in such structures within a period of time and find if there is any meaningful connection between the communities classifications obtained theoretically and the real economic classifications. Additionally, we observe the evolution of the detected communities during a period of 15 months.

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