CHAINED STRUCTURE OF DIRECTED GRAPHS

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The need to determine the structure of a graph arises in many applications.

Recently, in [1, 2] the notions of chained undirected and chained directed graphs has been introduced. For an undirected graph, the notion of chained graph generalizes bipartivity and allows the determination of *central nodes* of the graph; see [1]. The analysis is based on the use of spanning trees for the graph. A generalization to directed graphs is described in [2]. Under suitable conditions, the chained structure can be uncovered by using spanning trees for directed graphs. When applicable, this analysis allows the definition of central nodes, and has been used to shed light on the structure of graphs that arise in a variety of applications [2]. However, some directed graphs do not have a directed spanning tree, and then the approach to define central nodes of an undirected graph proposed in [2] cannot be applied.

In this talk, we present the notion of chained structure for directed graphs presented in [2] and discuss its extension based on spanning forests instead of on spanning trees. This allows us to identify a chained structure, if present, for a general directed graph. Moreover, we allow edge weights different from one. This generalizes results both in [1, 2] and allows us to define weighted chained structures both for undirected and directed graphs.

References

[1] A. Concas, L. Reichel, G. Rodriguez, and Y. Zhang, *Chained graphs and some applications*, Appl. Netw. Sci., 6:39 (2021).

[2] A. Concas, C. Fenu, L. Reichel, G. Rodriguez, and Y. Zhang, *Chained structure of directed graphs with applications to social and transportation networks*, Appl. Netw. Sci., 7:64 (2022).