Interactive Visual Exploration Interface for Large Bipartite Networks

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Motivation & Problem

We introduce BiCFlows, a novel interactive visualization approach to explore large bipartite graphs. We were motivated by the Media Transparency Database, a public database established by the Austrian government to provide information about governmental advertising and subsidies expenses, which holds the characteristics of a large, weighted bipartite graph.

Current approaches that deal with the visualization of the Media Transparency Database are limited by the fact that they do not offer a sufficient overview of the whole dataset. Other existing approaches that are not particularly designed for the Media Transparency Database, but deal with the visualization of bipartite graphs are in addition limited by their lack of scalability for large datasets.

Methodology

**Aggregation** is an often used concept in reducing the amount of data by grouping together similar data objects. Since we are dealing with bipartite graphs in our approach, we use the concept of biclustering.

**Biclustering** is a technique that simultaneously clusters rows and columns of a biadjacency matrix to form groups of similar entities.

For our visual encoding, we used two parallel lists of nodes, which are grouped according to the biclusters. The thickness of an edge connecting two nodes is defined by its edge weight.

Evaluation

**User Study:**
In our insight-based user study, we compared BiCFlows to an unclustered approach, using the Media Transparency Database as input data.

The main research question were:

Q1: Will users gain more insights when using BiCFlows?
Q2: Will BiCFlows be perceived as more complex?

**Case Study:**
We also tested BiCFlows with different data sets that all hold the characteristics of a weighted bipartite graph.

* Media Transparency Database
* Author-Keyword IEEE Publication Database
* Movie-Viewer Database

Results

In our user study, we showed that BiCFlows leads to

* longer exploration times,
* more unexpected findings, and
* generally more insights.

However, the user interface was also perceived as more complex.