Back to the Graphs: A Collection of Datasets and Quality Criteria for Temporal Networks Layout and Visualization

Velitchko Filipov¹  Alessio Arleo¹  Tatiana von Landesberger²  Daniel Archambault³

Problem Statement:
As the dynamic network visualization discipline evolves, different time abstractions are introduced:

1. **Temporal Networks** model the dynamics of nodes and edges (e.g., addition/deletion) as events with real time coordinates and duration.

2. **Timesliced Networks** model snapshots of the graph at equally spaced, discrete moments in time (the timeslices)

Quality criteria and benchmark datasets are lacking to enable comparative evaluations of different dynamic network visualization techniques.

We propose quality criteria for evaluating timesliced and temporal dynamic graph layouts.

We also present real world datasets included as benchmark sets for future researchers to use in their evaluations.

Quality Criteria:

(A) **Node Movement** tracks the average distance traveled by a node during the graph’s evolution. This metric is related to layout stability which is required to support the cognitive map of the viewer.

(B) **Crowding** counts the times a node passes close to another one during the evolution. This means that nodes could be confused.

Low crowding means that nodes are easily distinguishable.

High crowding indicates that it could be hard to follow the node through network’s evolution.

(C) **Stress** measures the difference between the Euclidean and graph theoretic distance in the drawing.

It has been used to evaluate dynamic graph drawings. We identify two methods for computing stress:

(i) Timesliced Stress

(ii) Continuous Stress.

Datasets:

<table>
<thead>
<tr>
<th>Dataset Name</th>
<th>Van DeBunt</th>
<th>Newcomb</th>
<th>InfoVis</th>
<th>Rugby</th>
<th>Pride</th>
<th>MOOC</th>
<th>RM</th>
<th>MSG</th>
<th>KAMP</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Events</td>
<td>0.1k</td>
<td>0.0k</td>
<td>2.8k</td>
<td>3.1k</td>
<td>4.0k</td>
<td>15k</td>
<td>28k</td>
<td>15k</td>
<td>0.8k</td>
</tr>
</tbody>
</table>

Events Distribution:

References:


