WOLFRAM SUMMER SCHOOL 2018

Algorithm Development for Maximally - Stable Time - Dependent Graph Layout

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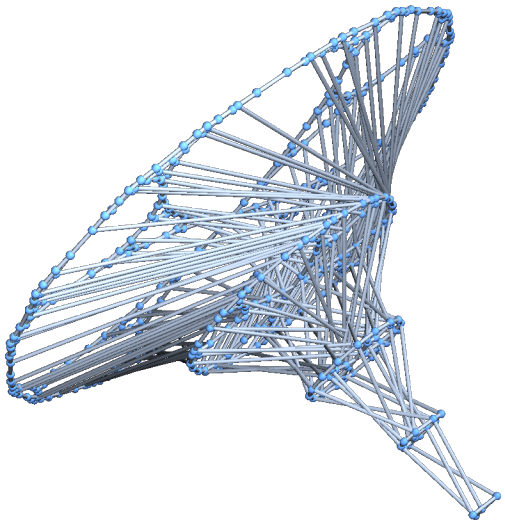
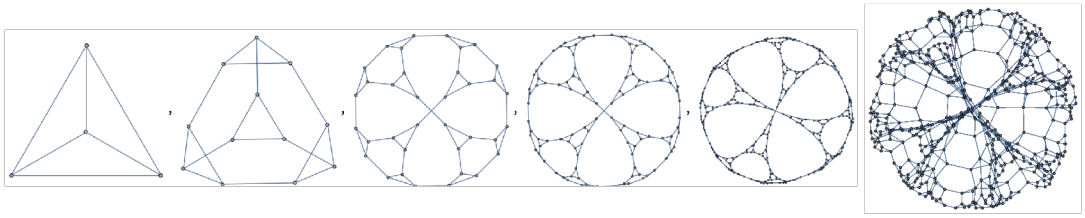


GOAL OF THE PROJECT: Develop foundations for understanding, layout, and display of time-dependent graphs. Preserve or develop the ability to understand the graph and the changes to it across the time-line. Take into account discontinuous graph structure, node, or edge changes.

SUMMARY OF RESULTS: 1) Developed a prototype algorithm for 3D representation of time-dependent graphs evolving according to a rule from the New Kind of Science (Wolfram, 2002, pp. 513).
2) Developed a general maximally-stable time-dependent graph layout problem and algorithm outline for graphs with different evolution rules reflecting different science or application areas.

ADDITIONAL CONTENT:

```
gexample =
 NestList[Fold[ReplaceWithCycle, #, VertexList[#]] &, WheelGraph[4], 4]
```



Standard 2D layout is limited how much it helps understanding the changes, in particular across different graph iterations.
The following operations where performed to enable informative 3D display: transform vertex coordinates based on vertex relative position in individual graph and the evolving graphs timeline, center the graphs, create edges between ancestor and successor nodes, restore coordinates, etc.

FUTURE WORK: 1) Improve 3D graph “untangling”; 2) Incorporate the evolution rules explicitly into the 2D and 3D generation and display; 3) Enable context-specific aggregation and disaggregation; 4) Enable virtual reality display; 5) Represent history and future changes in extended-form games.