Linear and Circular Layouts for Network Visualization

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Totally instance-based.
Network Data
Online Social Network, Scientific Collaboration, Software Dependency, Genome ...
Network data is Everywhere.
Conventional Network Layout
Traditional Layout (RAW)

Property-based
Traditional Layout (Property-based)

Algorithm-based
Traditional Layout (Algo-based)

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Linear and Circular Layouts for Network Visualization

Xiao Nan
Hairball Visualization
Hairball Visualization - Beautiful but Useless
Flaws of Traditional Layout

- Unscalable
- Uninterpretable
- Unreproducible
- Unbeautiful
Unscalable
Leads to overplotting
Uninterpretable
Analysis restricted
Unreproducible

That’s fatal
Unreproducible Visualization
Unbeautiful
From aesthetics, to ugliness
Dumping that layout is necessary.
Linear Layout
Linear Layout (hiveplot)
Edge Bundle - Visualizing Ratios
Advantages of Linear Layout
Advantages of Linear Layout

- Scalable
Advantages of Linear Layout

- Scalable
- Interpretable
Advantages of Linear Layout

- Scalable
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- Reproducible
Advantages of Linear Layout

- Scalable
- Interpretable
- Reproducible
- Beautiful
Circular Layout
Curved objects are easier to visually follow. Time yourself to see how long it takes you to scan through the numbers in the two shapes. You will find that effort in interpreting the left shape is higher than the right shape.

Right angles in the top shape require more energy to traverse – you may find that switching eye movement from vertical immediately to horizontal is uncomfortable.

Curve is Better
A histogram, B ideograms, C histogram, D heat map, E links, F highlights, G grid, H ticks. Format of data in tracks A, C, D, E is adjusted by rules based on data values.

Typical Circular Layout (From circos)
Stacking Tracks - Suitable for Publication
Human gene density at resolutions from 50Mb (inner track) to 1Mb (outer track). The circular form naturally supports a range of resolutions.

Circular Fits More Resolutions
The same data set is shown in all panels.

A each link represents one of a subset of 2,500 segmental duplications within the human genome

B rules are used to change link color and thickness

C rules are used to show only links to chrY

D in addition to rules in (C), other rules add a second layer of links from chr8.
E,F adjacent links are grouped into thicker links (*bundles*) to reduce the complexity of the figure.
Examples
Genomic rearrangements from COSMIC (catalogue of somatic mutations in cancer).

Evolutionary relationship between ancestral and modern crucifer genomes.


Born for Genome Visualization
The relationship of characters on Lost. Each character is assigned a segment whose size is proportional to the number of relationships. Characters are categorized in five groups. There are 8 types of relationships.

**Lost Characters’ Relationship**
Car Purchase Paradigm Shift
Implementation
Implementation

- Traditional
  - igraph (python, R)
  - Gephi (Java)
  - Cytoscape (Java)
  - d3.js (Javascript)
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- Linear
  - HiveR (R)
  - d3.js (Javascript, experimental)
  - linnet (perl, outdated)
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- Circular
  - circos (perl)
怎么做是对是科学，怎么做好则是艺术。
可视化不能代替模型，可视化不能代替计算，可视化不能代替分析。但我们总可以试图改善图形，让它更好地辅助建立和解读模型，指示优化方向。
科学有对错，但艺术没有对错。对于网络数据，不妨多尝试一些布局，选取效果最好的一种。形式虽然不重要，但我们总可以把形式做得更好。
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- HiveR. http://cran.r-project.org/web/packages/HiveR/index.html


References

References


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