

INNOVATE VISUALIZATIONS OF TEMPORAL PROCESSES

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2/26/2012: added "Articles" section, www.wessa.net/tsa.wasp, Facebook Timeline.

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Introduction:

Post-modernism of the 1980s, the web of the 1990s, and social media of the 2000s all focused on the space in favor of time. The spatial relations between multiple objects all present *now* became more exiting than their histories.

Browsing through popular visualization galleries infoaesthetics.com, visualcomplexity.com, visualizing.org and others, I am also struck by the dominance of geo visualizations and network visualizations. Ocassionally, you see visualizations of temporal processes but they rarely go beynd nicely designed line graphs or other basic techniques which already were popular in the 19th century.

And yet, we live in time and history still matters (from history of the planet to the list of links saved in the History of your web browser.) To help us think us of new ways to represent time, here are my curated examples of examples which I put together for my students in the undergraduate class on cultural visualization. If you already know some

or most of them, you may still find a few fresh links. The categories below represent my initial attempt to divide these examples in some meaningful way. I also added some well-known media art projects which normally are not considered visualizations - but in fact, they are.

Please email me at manovich@ucsd.edu if I miss some important project which should be part of this list.

For another wonderful and much more detailed resource on this topic, visit Michael Friendly's [Timelines and Visual Histories](#).

Early time visualizations

(some are much more interesting than what people visualize today with all this computer power...)

[Time lines and visual histories](#)

Singular temporal streams:

While one of the most famous visualizations of the last 200 years - Charles Joseph Minard's 1869 representation of Napoleon's 1812 Russian Campaign - represents a single "event stream," it offers other innovative solutions to show time flow:

[Charles Joseph Minard](#) - [visualization of Napoleon's Russian Campaign](#)

Parallel temporal streams:

Here are a few examples of well-known innovative visualization techniques/projects which represent **multiple "event streams"** (multiple events which are taking place at the same time):

Fernanda B. Viégas and Martin Wattenberg.

The classic information visualization of a cultural process - development of a wikipedia page over time:

[History Flow](#)

Ben Rubin and Mark Hanson.

This classic of media art created a truly innovative way to show multiple streams of voices on the Internet as a spatial matrix staged as an opera with multiple acts, each with its own rhythm:

[Listening Post](#)

An alternative to bar charts and timelines, this visualization presents the designer's history of music listening as a single multi-layered wave:

[Last.fm listening history](#)

Same technique applied to historical movie sales data:

[The Ebb and Flow of Movies](#)

Famous project which combined geo map and infovis vector aesthetics:

[Flight patterns](#)

More than anybody, Hans Rosling was responsible to popularizing the importance of temporal visualization for understanding society:

[Hans Rosling TED 2006](#) lecture

recent Ben Fry's work -: simple and effective:

[Ben Fry: energy use in a kitchen](#)

I know many of you don't like Facebook Timeline view, but it's changing how people think of temporal events (two parallel columns as opposed to a single 1D timeline):

<https://www.facebook.com/about/timeline>

Visualizations of temporal links

(links between events in single or multiple temporal streams):

This well-known visualization shows science as a spatial field of connections

[Map of Science](#)

This more recent visualization adds the time dimension:

[Citeology: Visualizing the Relationships between Research Publications](#)

Pixels and Lines: Visualization meets media art

Normally infovis uses the language of vector graphics: vectors, point clouds, curves. In contrast, media art uses bitmap format: lens-based pixel grids (photography, video). In other words, it uses every pixel on a canvas, as opposed to only drawing lines over the canvas (think Photoshop vs Illustrator). These projects created a new hybrid genre which I call media visualization:

Jason Salavon.

The perfect example of media visualization - a film presented as a grid of sample frames revealing patterns in cinematography and content:

[The Top Grossing Film of All Time. 1 x 1](#)

Jussi Angeslev and Ross Cooper.

[Last Clock](#)

This unique project is taking the temporal process which we normally we think as a single stream (video capture) and representing at multiple scales. (Because project page is no longer online, check the images and discussion of this project in [Beyond Artistic Visualization](#) article by Fernanda B. Viégas and Martin Wattenberg):

Another “visualization opera” from Ben Rubin and Mark Hansen - this one for a panorama screen:

[Terre Natale](#)

Ben Fry.

Why nobody thought of this before? I wish we can visualize all famous texts like this:

[The Preservation of Favored Traces](#)

Mapping time in films

Film is a classic “time-based” medium. These three projects show temporal patterns in films in unique ways:

[Film Dialog Particles](#)

[Movie narrative chart](#)

[Cinematics project](#)

Software tools for visualizing temporal processes:

Free tools:

[Flare](#) - for example, see this example of the [bar chart](#)

[Sparklines in Excel](#)

[Motion Chart](#) in Google Spreadsheets

[Timeline](#) (developed by Simile project)

[streamgraph generator](#) (software used to make [The Ebb and Flow of Movies](#) project)

[Cube: Time Series Visualization](#)

[ImagePlot](#) (developed by me and my collaborators at [softwarestudies.com](#))

Commercial software:

[Timebinder](#)

[Tableau](#)

Time series analysis:

[Interactive web interface to time-series analysis in R](#)

Articles about new ways to visualize time-based data

Stephen Few. [Visualizing Change: An Innovation in Time-Series Analysis](#). 2007.

Lev Manovich. [NURBS theory | conceptualizing cultural processes: from discrete categories to continuous curves](#). 2008.