

Data Visualization

Week 08

TCNJ Web Design 2

Jean Chu

Information Overload!



Erik Kessels, 24 hours in photos:

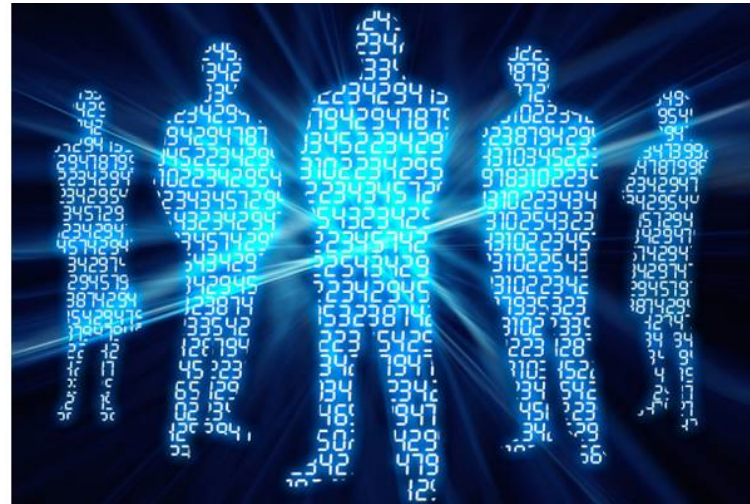
<http://www.creativereview.co.uk/cr-blog/2011/november/24-hours-in-photos>



What is Data Visualization?

- Visualization is the graphical presentation of information, with the goal of providing the viewer with a qualitative understanding of the information contents.
- Information may be data, processes, relations, or concepts and they are abstracted in some schematic form

Data of our lives are being stored



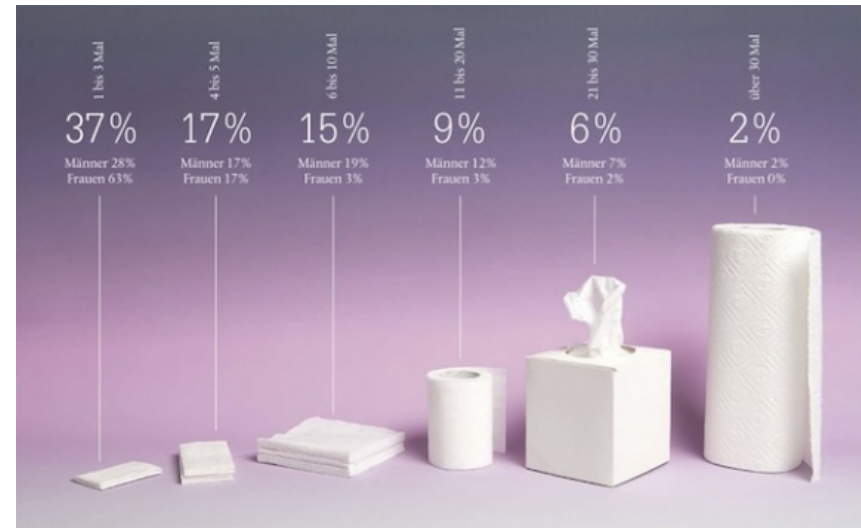
Infographic VS Data Visualization?

Infographics :

Any visual representation of data that is:

- manually drawn (and therefore a custom treatment of the information)
- specific to the data at hand (and therefore nontrivial to recreate with different data)
- aesthetically rich (strong visual content meant to draw the eye and hold interest)
- relatively data-poor (because each piece of information must be manually encoded).

- Example of infographics



Data Flow 2, Gestalten

1 bis 3 Mal

37%

Männer 28%
Frauen 63%

4 bis 5 Mal

17%

Männer 17%
Frauen 17%

6 bis 10 Mal

15%

Männer 19%
Frauen 3%

11 bis 20 Mal

9%

Männer 12%
Frauen 3%

21 bis 30 Mal

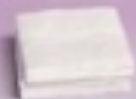
6%

Männer 7%
Frauen 2%

über 30 Mal

2%

Männer 2%
Frauen 0%

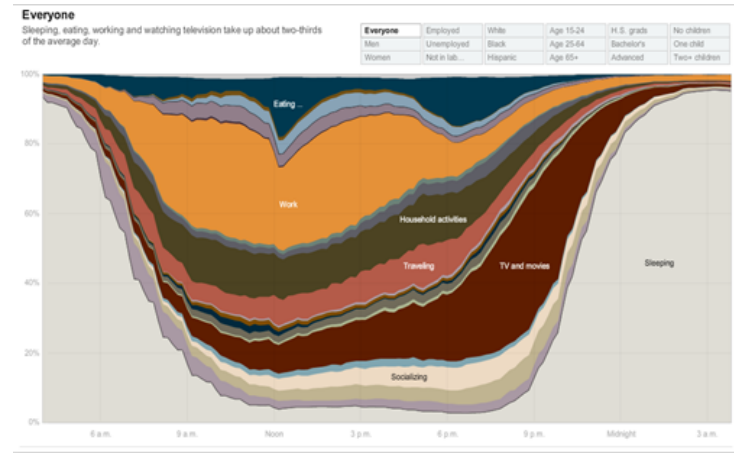


Infographic VS Data Visualization?

Data visualization and information visualization

Any visual representation of data that is:

- algorithmically drawn (may have custom touches but is largely rendered with the help of computerized methods);
- easy to regenerate with different data (the same form may be repurposed to represent different datasets with similar dimensions or characteristics);
- often aesthetically barren (data is not decorated); and
- relatively data-rich (large volumes of data are welcome and viable, in contrast to infographics).



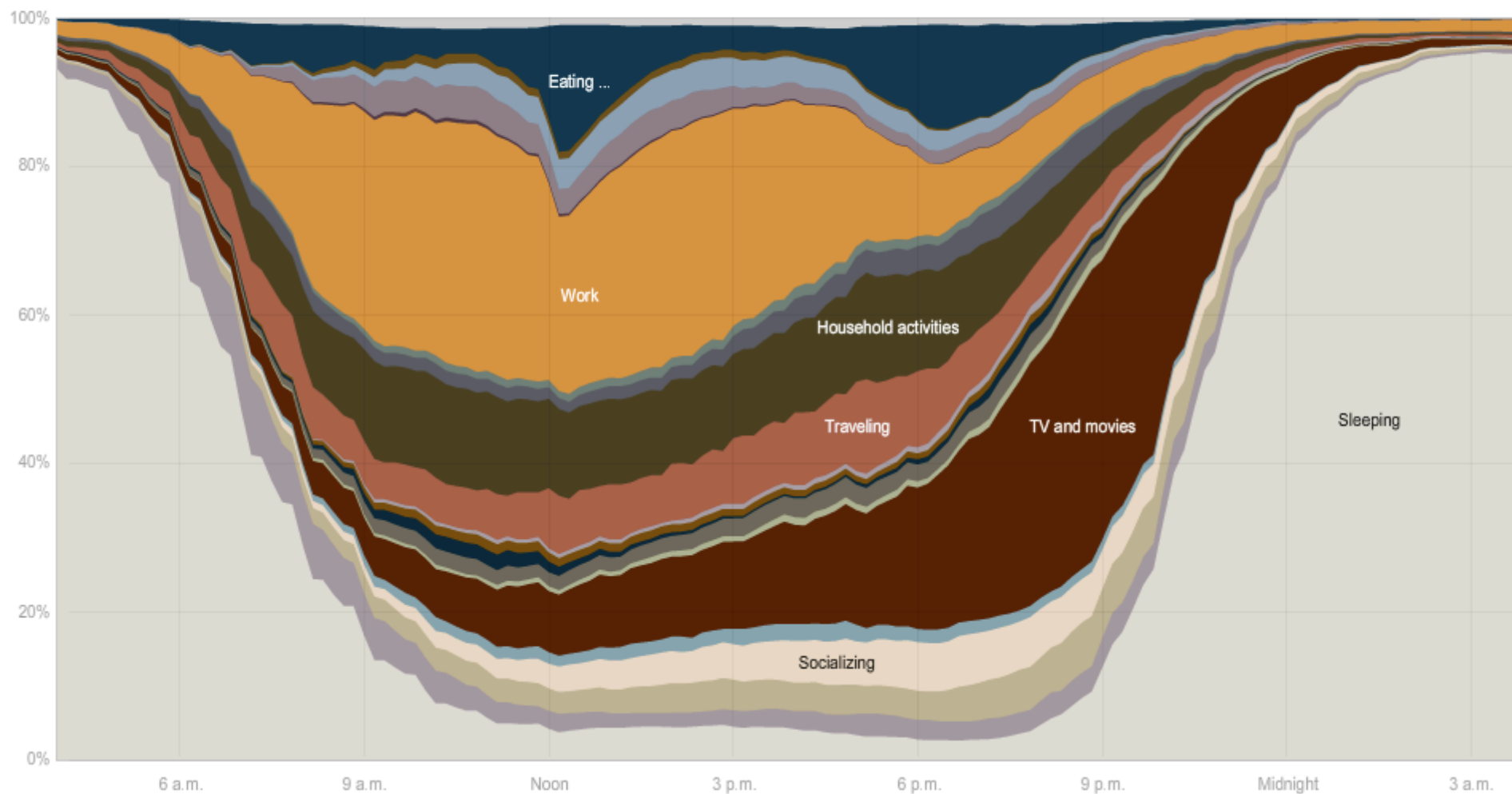
NYTimes

<http://www.nytimes.com/interactive/2009/07/31/business/20080801-metrics-graphic.html>

Everyone

Sleeping, eating, working and watching television take up about two-thirds of the average day.

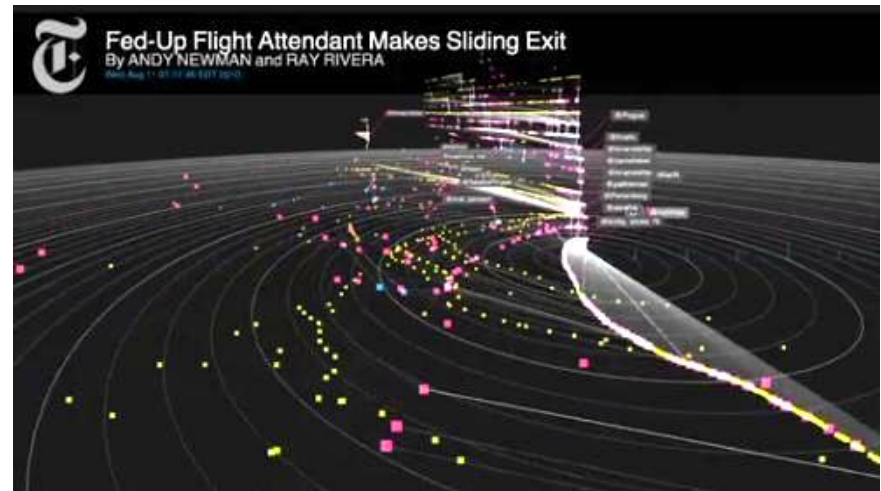
Everyone	Employed	White	Age 15-24	H.S. grads	No children
Men	Unemployed	Black	Age 25-64	Bachelor's	One child
Women	Not in lab...	Hispanic	Age 65+	Advanced	Two+ children



Purpose of Data Visualization

Exploration

- **Data analysis phase**
- **Translating data set into a visual medium to help you get a sense of what's inside your data set.**
- **Used to find the story the data has to tell you.**
- Exploration is generally best done at a high level of granularity. There may be a whole lot of noise in your data, but if you oversimplify or strip out too much information, you could end up missing something important.



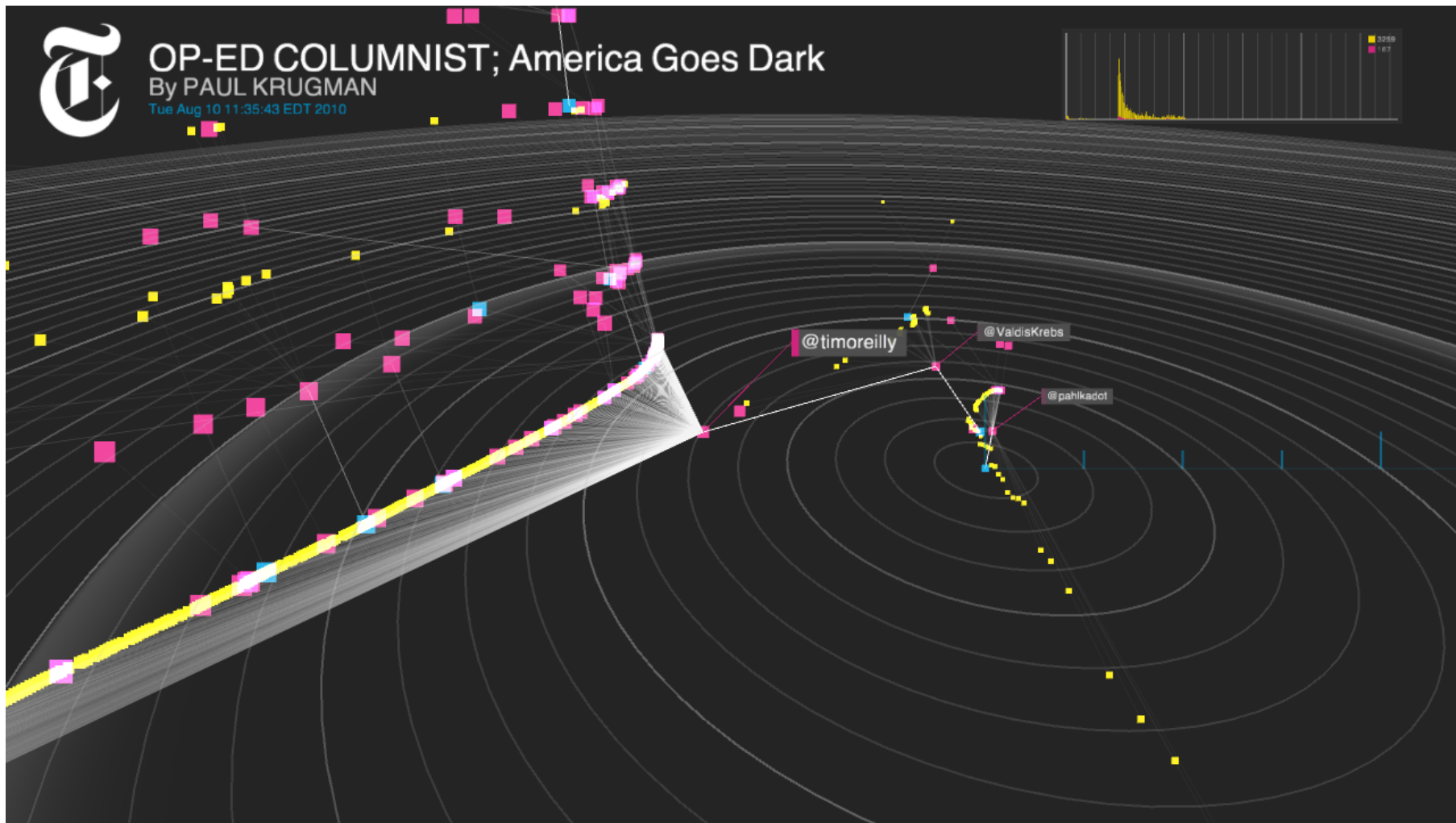
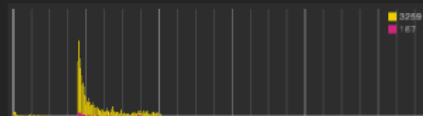
NYTimes Project Cascade



OP-ED COLUMNIST; America Goes Dark

By PAUL KRUGMAN

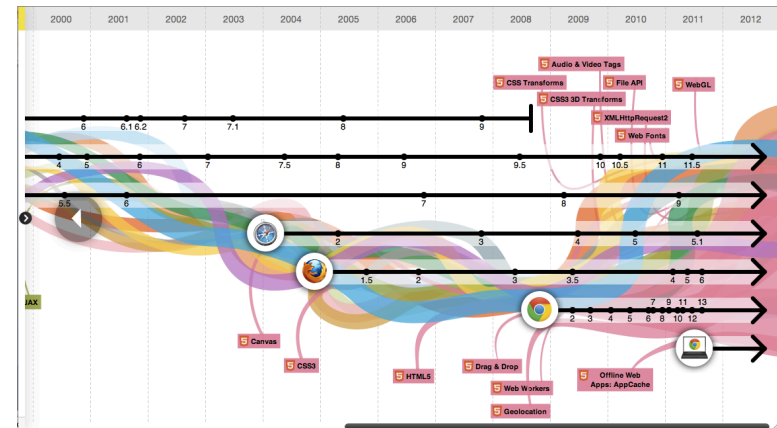
Tue Aug 10 11:35:43 EDT 2010



Purpose of Data Visualization

Explanation

- **Part of the presentation phase.**
- **Selecting focused data that will support the story you are trying to tell.**
- **You already know what the data has to say, and you are trying to tell that story to somebody else.**
- Such a visualization may stand on its own, or may be part of a larger presentation, such as a speech, a newspaper article, or a report. In these scenarios, there is some supporting narrative—written or verbal— that further explains things.



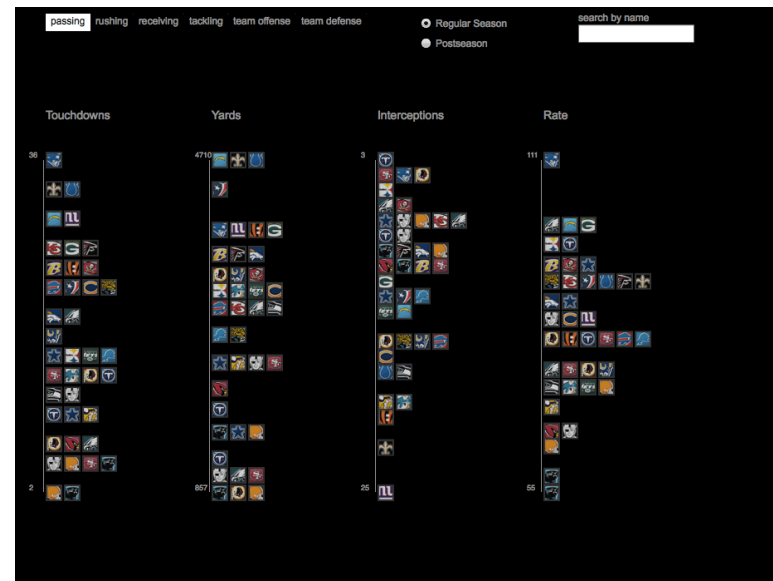
<http://evolutionofweb.appspot.com/>

Purpose of Data Visualization

Hybrid

- A curated dataset that is nonetheless presented with the intention to allow some exploration on the reader's part.
- There is a certain freedom-of-discovery aspect to the information presented.

- The data is usually not totally raw; it has been distilled and facilitated to some extent.
- These might even be insights the creator of the visualization hasn't come across yet.



Visualizing NFL Statistics

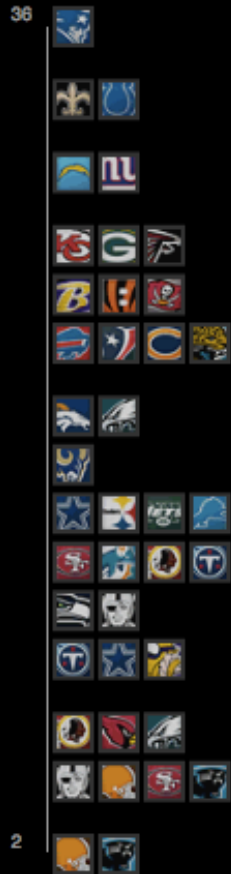
<http://www.juiceanalytics.com/nfl-visualization/>

passing rushing receiving tackling team offense team defense

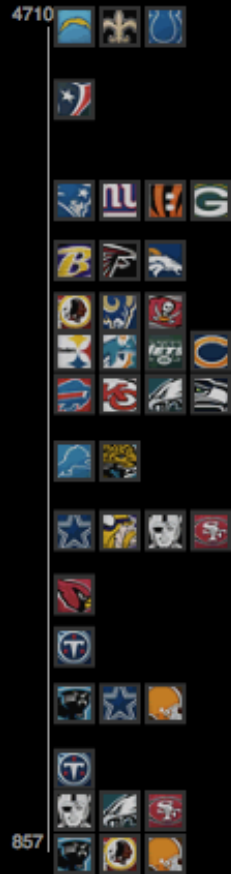
- Regular Season
- Postseason

search by name

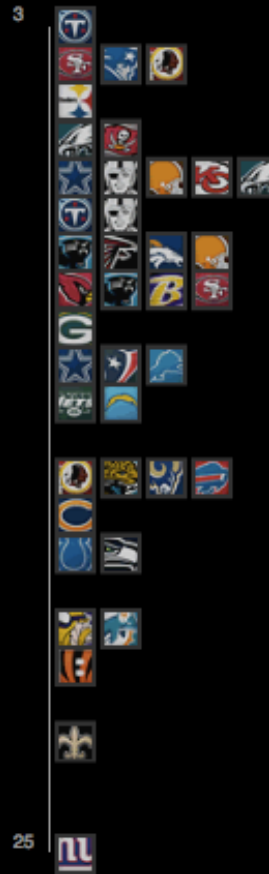
Touchdowns



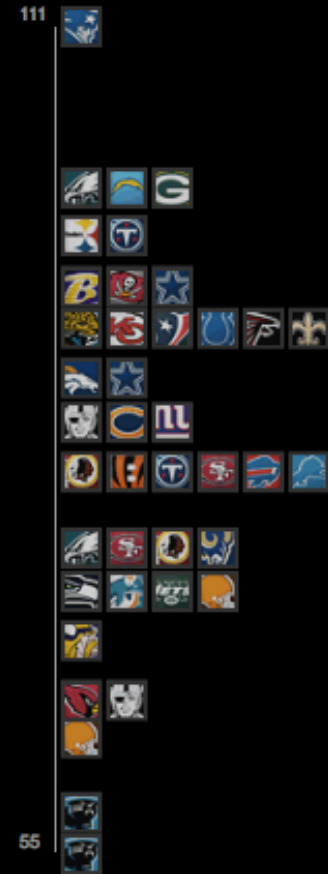
Yards



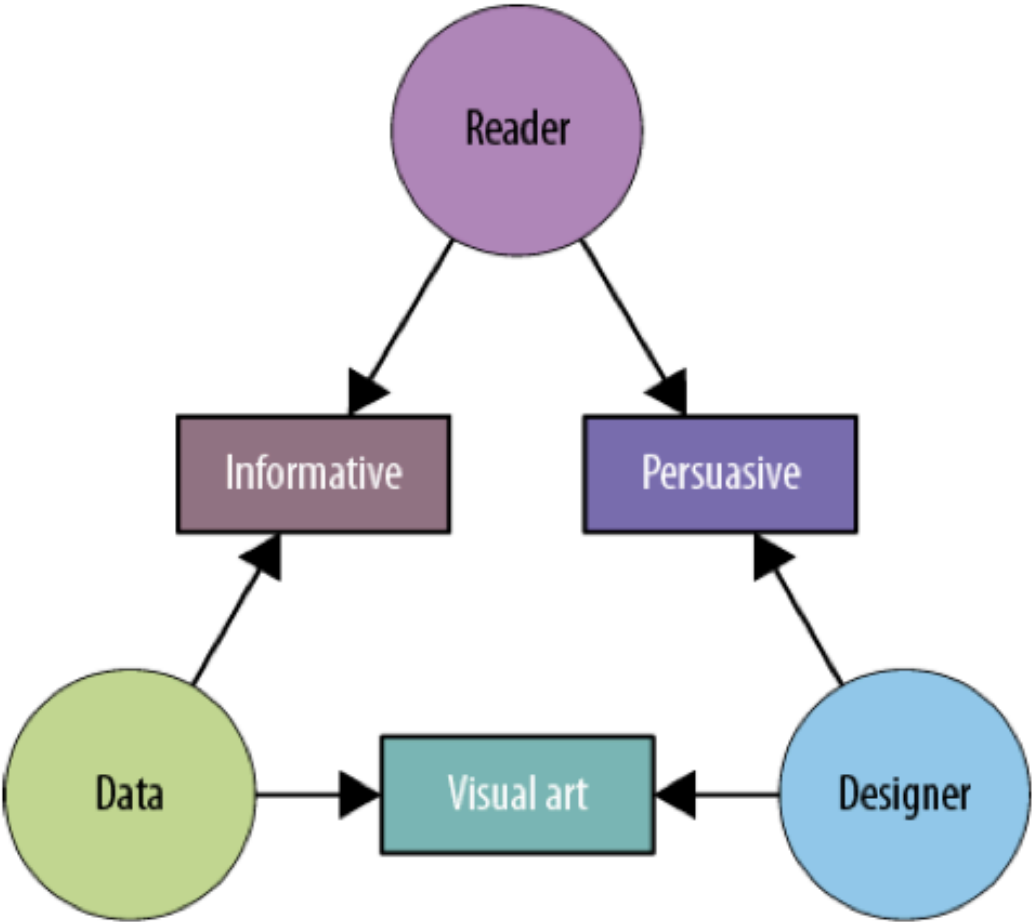
Interceptions



Rate



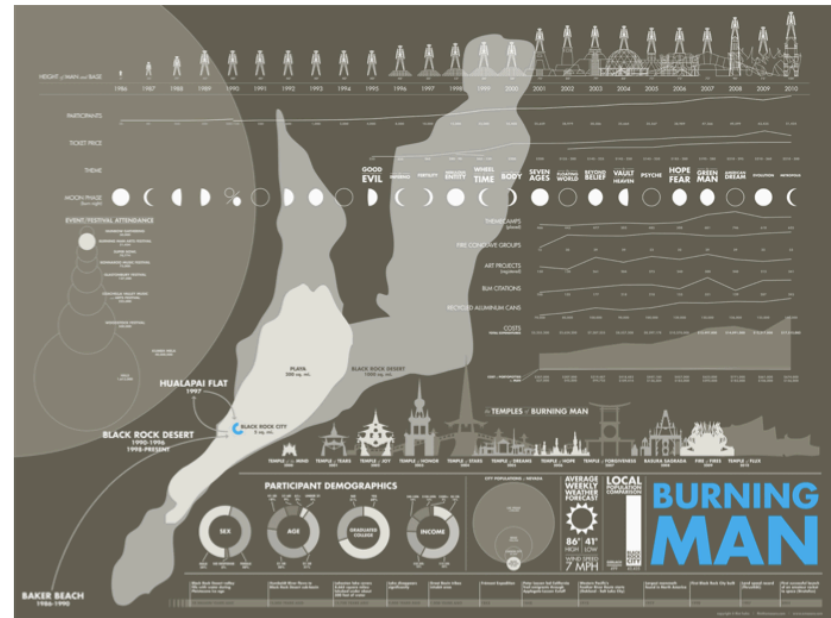
Categories of Explanatory Visualizations



Categories of Explanatory Visualizations

Informative

- It aims for a neutral presentation of the facts in such a way that will educate the reader (though not necessarily persuade him)
- Informative visualizations are often associated with broad data sets, and seek to distill the content into a manageably consumable form

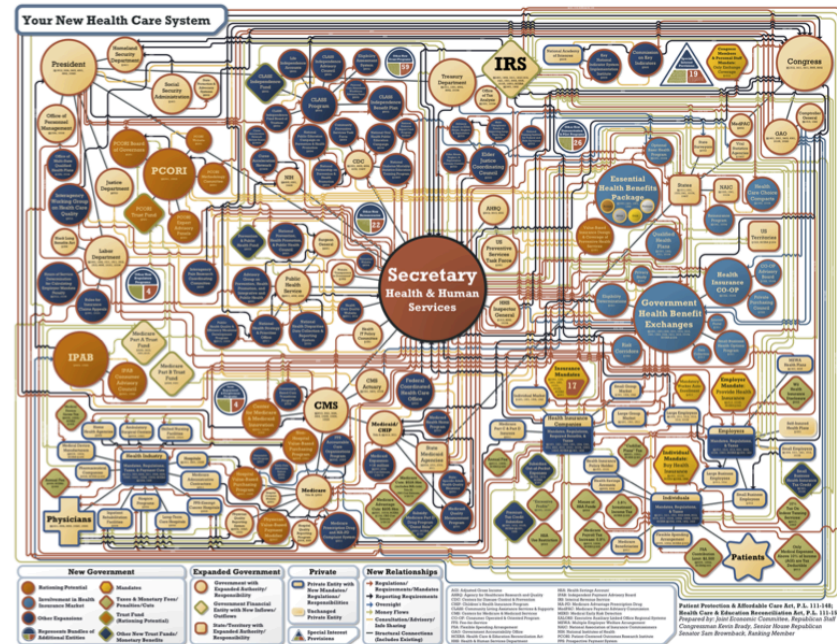


Flint Hahn's Burning Man infographic is a great example of an aesthetically rich, manually-drawn piece

Categories of Explanatory Visualizations

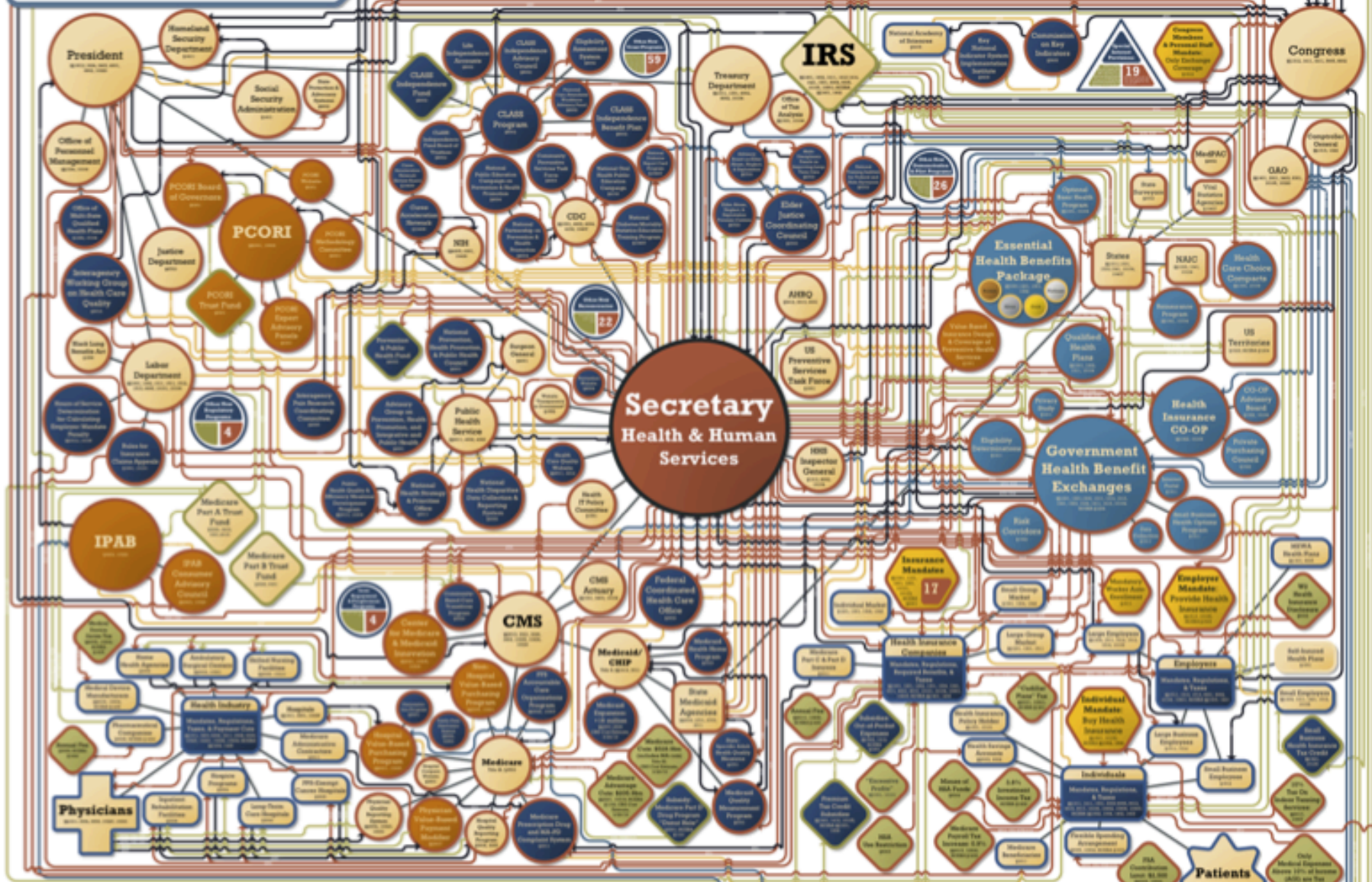
Persuasive

- It represents a very specific point of view, and advocates a change of opinion or action on the part of the reader.
- In this category of visualization, the data represented is specifically chosen for the purpose of supporting the designer's point of view, and is presented carefully so as to convince the reader of same.



Your New Health Care System, Joint Economic Committee minority, Republicans. This rendition of the healthcare plan clearly reveals in and aims to exaggerate the system's complexity.

Your New Health Care System



New Government	Expanded Government	Private	New Relationships
<ul style="list-style-type: none"> Reluctant Potential Investment in Health Insurance Market Other Expansions Reorganizes Boundaries of Additional Entities 	<ul style="list-style-type: none"> Mandates Taxes & Monetary Fees/ Penalties/Cuts Trust Fund (Strategic Potential) Other New Trust Funds/ Monetary Benefits Government with Expanded Authority/ Responsibility Government Financial Entity with New Inflows/ Outflows State/Territory with Expanded Authority/ Responsibility 	<ul style="list-style-type: none"> Private Entity with New Mandates/ Responsibilities Unchanged Private Entity Special Interest Provisions 	<ul style="list-style-type: none"> Regulations/ Requirements/Mandates Reporting Requirements Oversight Money Flows Consultation/Advisory/ Safe Sharing Structural Connections (Includes Existing)

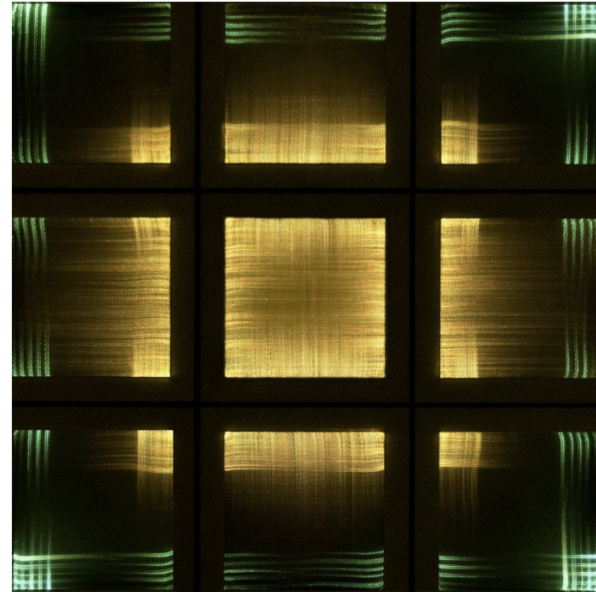
Abbreviations:
 AHCJ: Adjusted-Coverage Income; AMRQ: Agency for Healthcare Research and Quality; CDC: Centers for Disease Control & Prevention; CHIP: Children's Health Insurance Program; CLASS: Community Living Assistance Services & Supports; CMS: Centers for Medicare & Medicaid Services; CO-OP: Consumer Operated & Oriented Program; FFE: Fee-For-Service; FSA: Flexible Spending Account; GAO: Government Accountability Office; HHS: Health & Human Services Department; IRIS: Health Savings Account; IPAB: Independent Payment Advisory Board; IRA: Internal Revenue Service; MA-FF: Medicare Advantage Prescription Drug; MA-PD: Medicare Payment Advisory Commission; MIPD: Medical Injury Risk Pool; MIPD: Medical Injury Risk Pool; SALCBO: Executive Secretary-Led Office Regional Network; NEMRA: Multiple Employer Welfare Arrangement; NBER: National Bureau of Economic Research; NIK: National Institute of Health; PCORI: Patient-Centered Outcomes Research Institute; PHS: Prescription Payment System.

Legislation:
 Patient Protection and Affordable Care Act, P.L. 111-148;
 Health Care and Education Reconciliation Act, P.L. 111-149
 Prepared by: Joint Economic Committee, Republican Staff
 Congressman Kevin Brady, Senior House Republican
 Senator Sam Brownback, Ranking Member

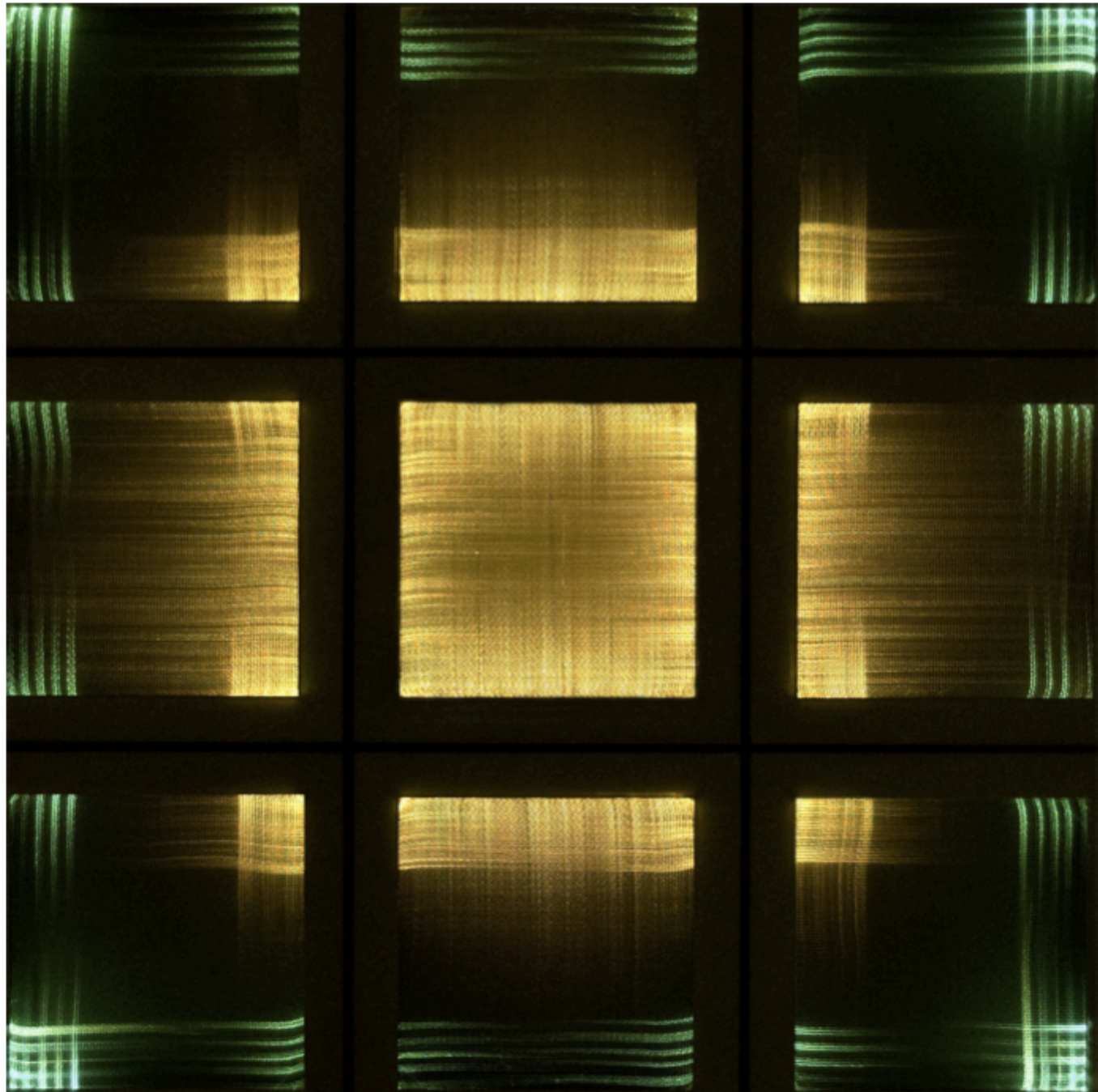
Categories of Explanatory Visualizations

Visual Art

- Visual art merely translates the data into a visual form. The designer may intend only to condense it, translate it into a new medium, or make it beautiful; she may not intend for the reader to be able to extract anything from it other than enjoyment.



Nora Ligorano and Marshall Reese designed a project that converts Twitter streams into a woven fiber-optic tapestry



Steps to Data Visualization

- *By putting data into a human context, it gains meaning.*
- *These Data become our histories*

Jer Thorp

<http://blprnt.com/>

Visualization Stories

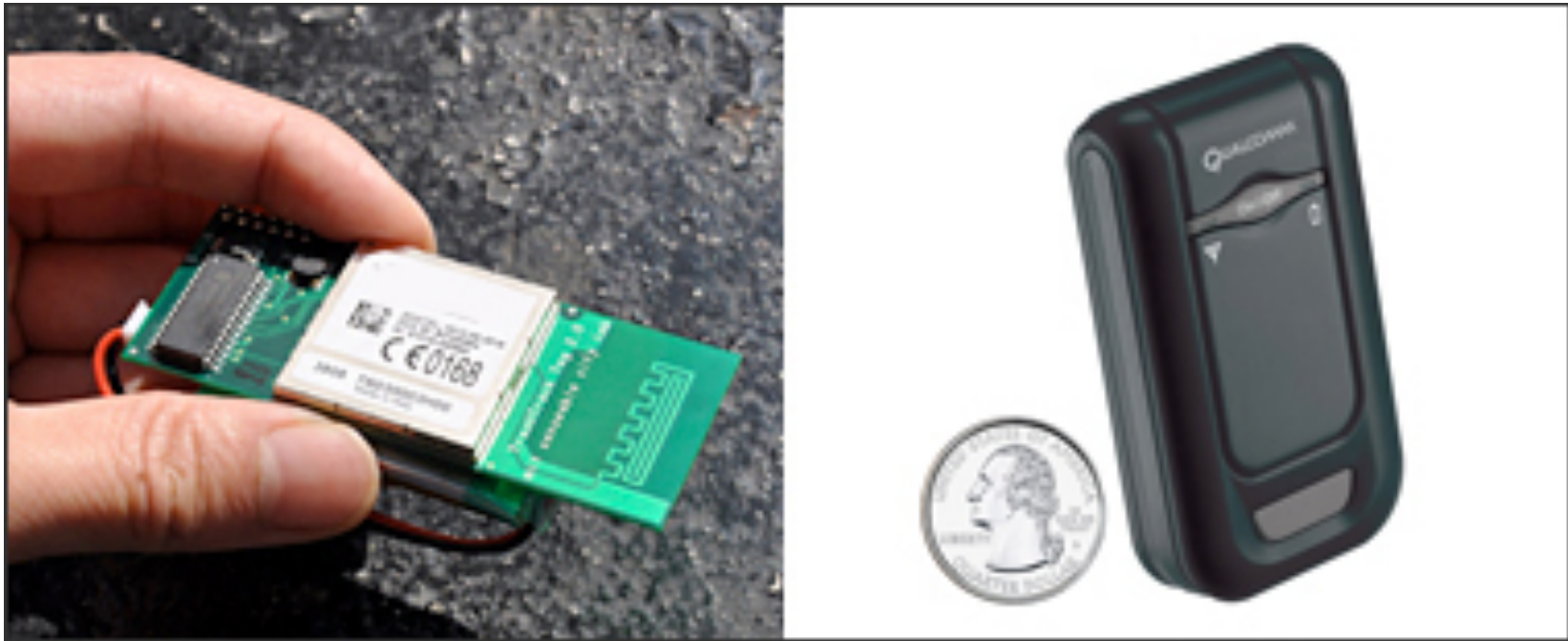
Question + Visual Data + Context = Story

Steps

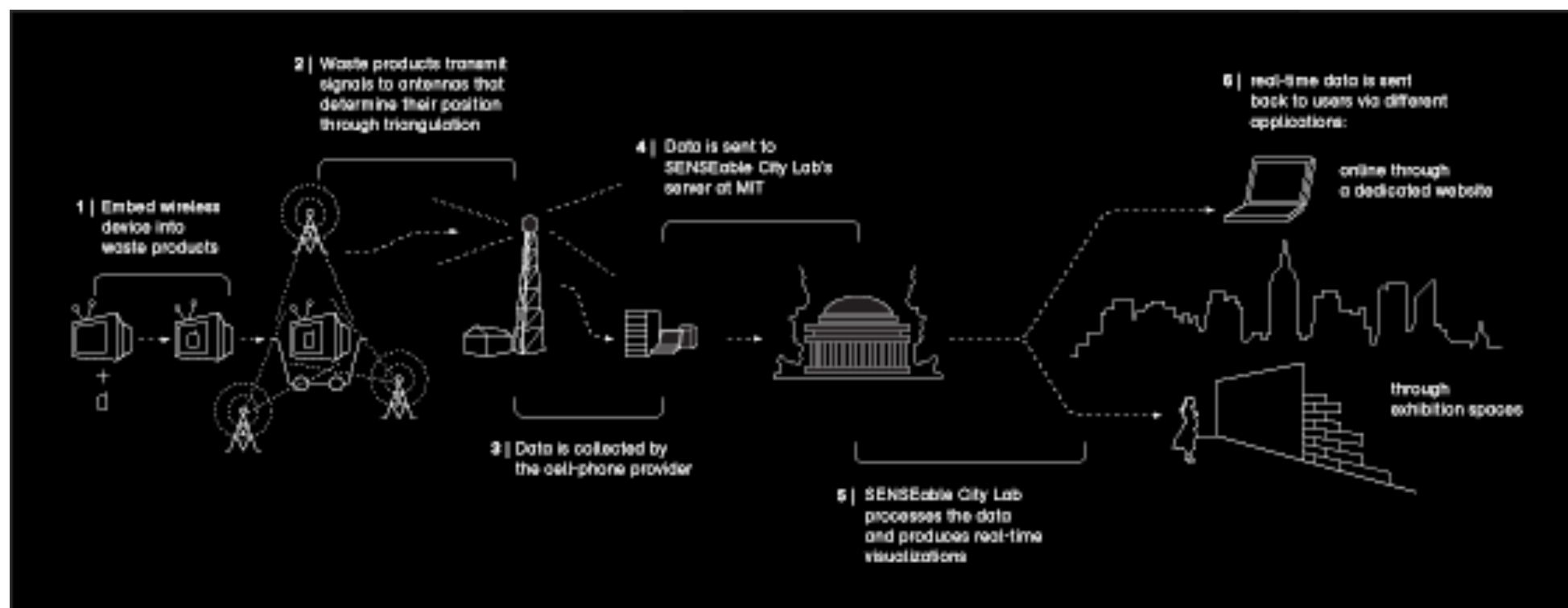
- Formulate the Question
- Gather the Data
- Apply Visual Representation

Gather Data

Build your own system



<http://senseable.mit.edu/trashtrack/>

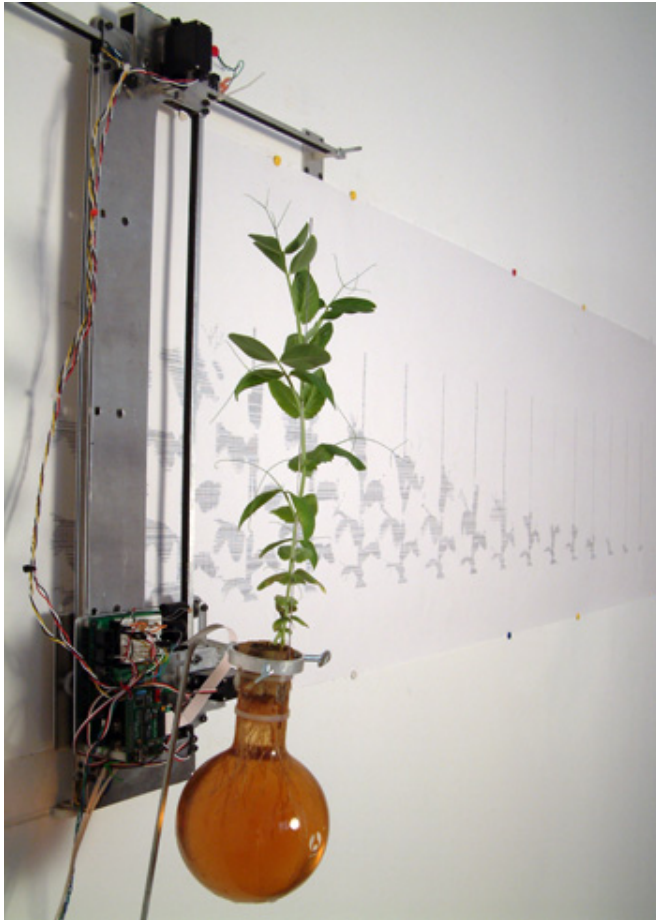




<http://senseable.mit.edu/trashtrack/>

Gather Data

Build your own system



Growth Rendering Machine, David Brown
<http://www.dwbowen.com/growth.html>

Gather Data

You could fake the data (Under a certain purpose)



If the world were a village of 100 people

The statistics were derived from Donella Meadows "State of the Village Report" first published in 1990)

A VILLAGE OF
100 PEOPLE



Gather Data

Interview or do a survey



Wonderland. 2005 , Yeon Doo Jung

http://www.yeondoojung.com/artworks_view_wonderland.php?no=88



Wonderland. 2005 , Yeon Doo Jung



Wonderland. 2005 , Yeon Doo Jung



Wonderland. 2005 , Yeon Doo Jung

Gather Data

Interview or do a survey



Balloons of Bhutan is a portrait of happiness in the last Himalayan kingdom

Balloons of Bhutan, Jonathan Harris

<http://balloonsofbhutan.org/>

- **Question** : what makes them happy, what is their happiest memory, what is their favorite joke, what is their level of happiness between 1 and 10, and, if they could make one wish, what would it be.
- **Result** : Based on each person's stated level of happiness, I inflated that number of balloons, so very happy people would be given 10 balloons and very sad people would be given only one (but hey, it's still a balloon). Then I wrote each person's wish onto a balloon of their favorite color. I repeated this process for 117 different people, from all different ages and backgrounds.

BALLOONS OF BHUTAN



Balloons of Bhutan, Jonathan Harris

<http://balloonsofbhutan.org/>

Gather Data

You could fake the data (Under a certain purpose)



Maps, Paul Sacher

<http://www.paulaschermaps.com/>



Gather Data

Create your own data



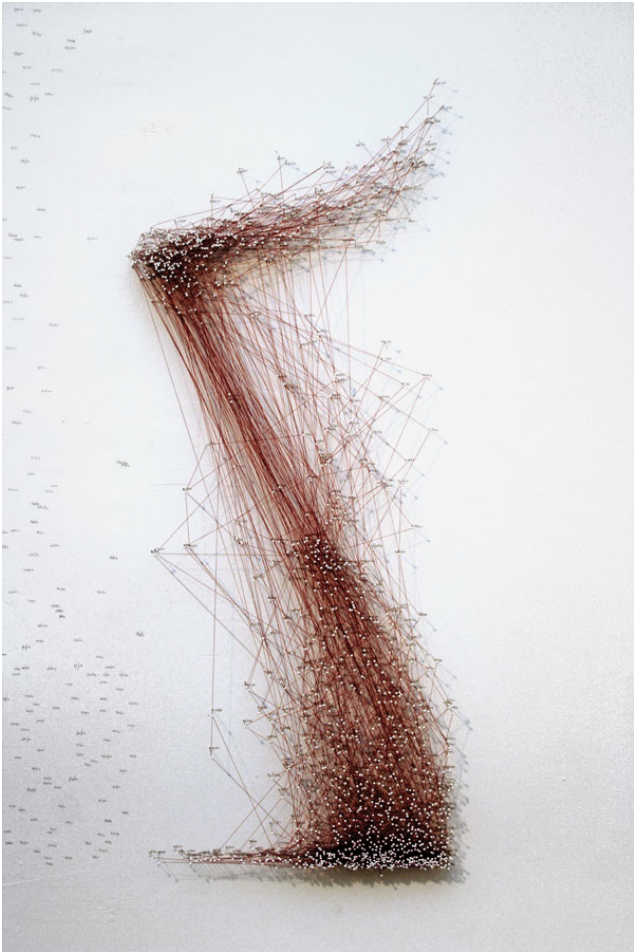
encrypted love letter, crocheted yarn

If a Mouth were to Whisper.. , Jeane Jo

<http://www.jeanejo.com/portfolio/if-a-mouth-were-to-whisper/>

Gather Data

Create your own data



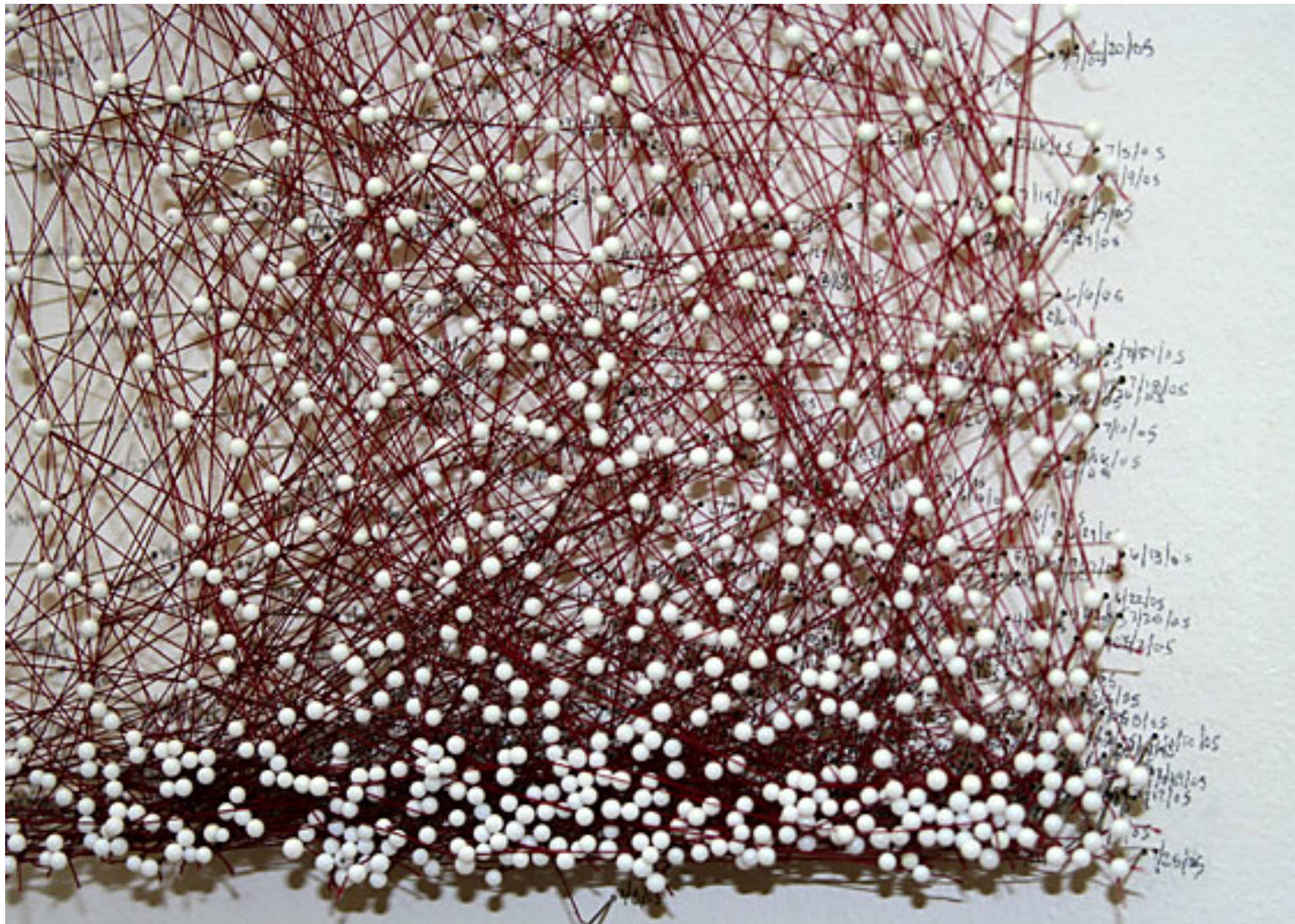
Using simple tools like pins, thread and a pencil she mapped her sentiments on a invisible grid.

Each section of the grid on the wall is correlated with a different part of the body. Every time she felt a sensation in a particular area on her body, she documented the feeling onto the corresponding place on the grid with a pin and the date.

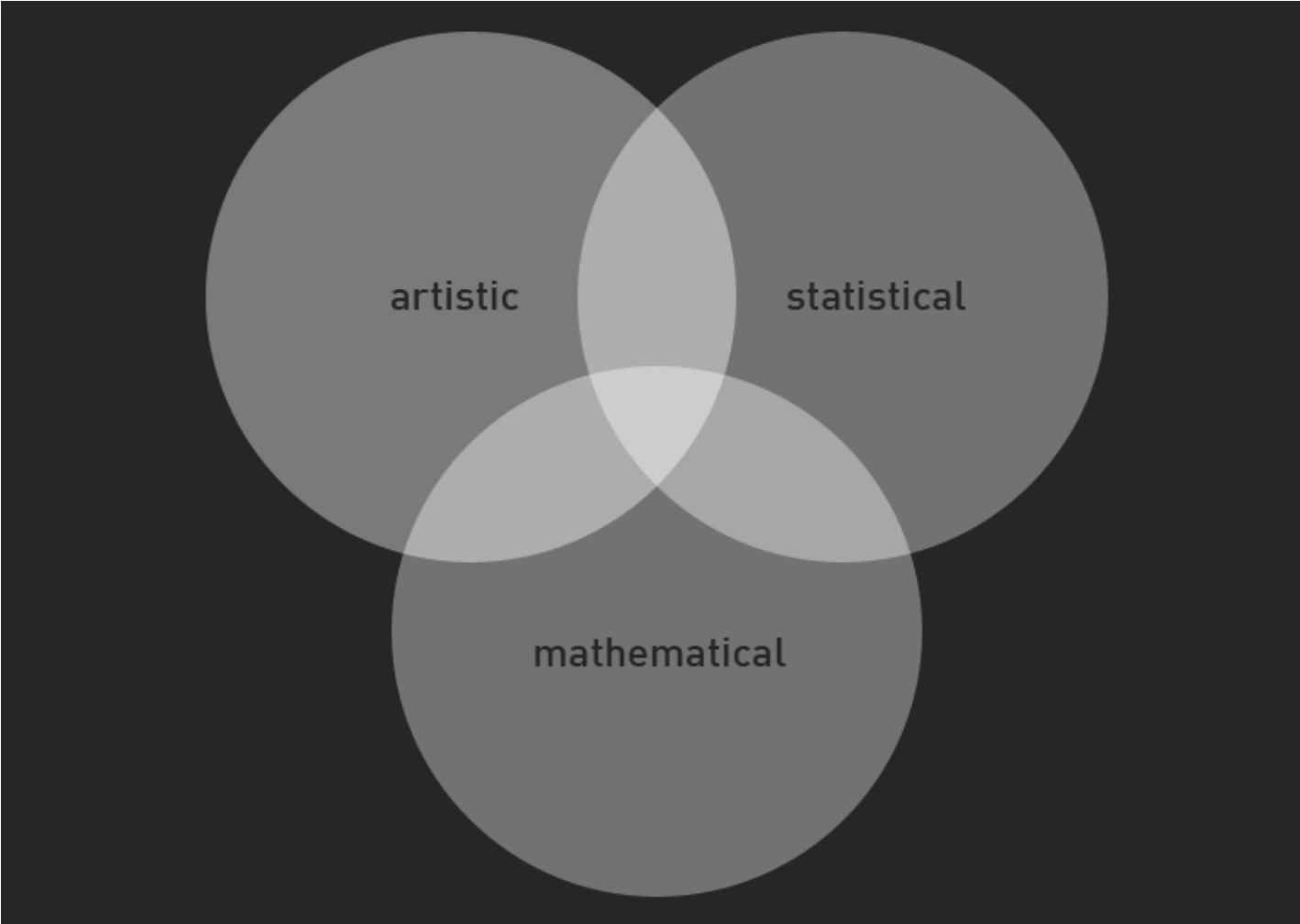
201 Days. pins, pencil, thread;

Mappin 201 days, Katie Lewis

<http://katiehollandlewis.com/>



APPLY VISUAL REPRESENTATION



Edward Tufte

- Edward Tufte : a pioneer in the field of data visualization

Graphical Excellence

“Excellence in statistical graphics consists of complex ideas communicated with clarity, precision, and efficiency.”

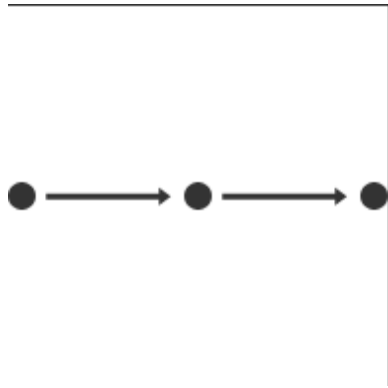
Edward R. Tufte

<http://www.edwardtufte.com/>

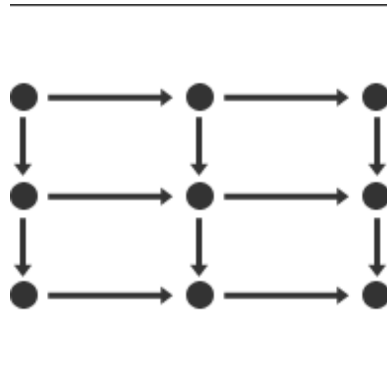
Edward Tufte

- Publications
 - The Visual Display of Quantitative Information
 - Envisioning Information
 - Visual Explanations
 - Powerpoint is Evil

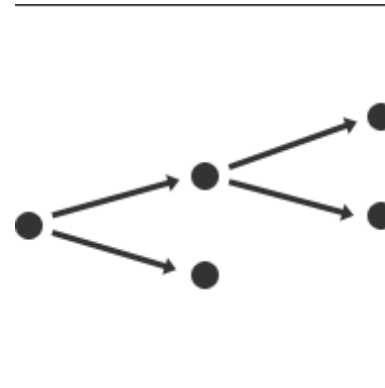
How is your data organized?



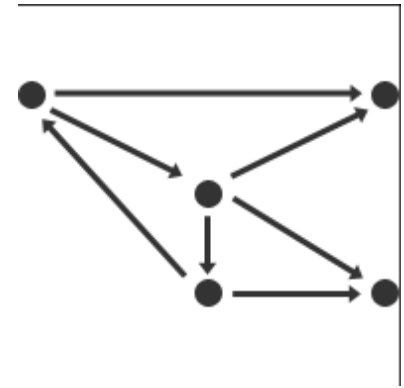
linear



tabular



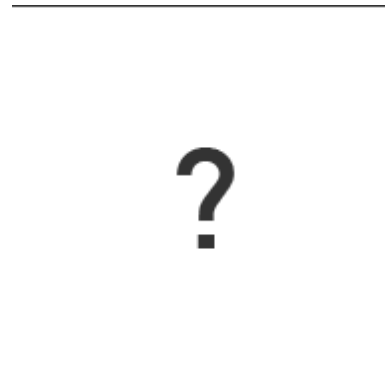
hierarchical



networked



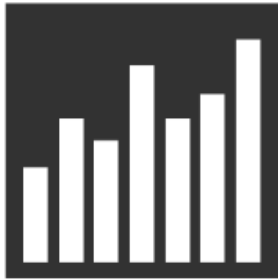
geographic



other

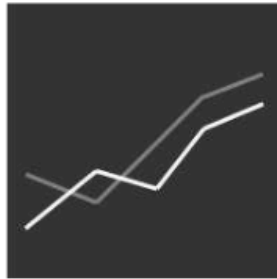
Data Visualization Patterns

INDEPENDENT



Bar charts

CONTINUOUS



Line graphs



Stacked area

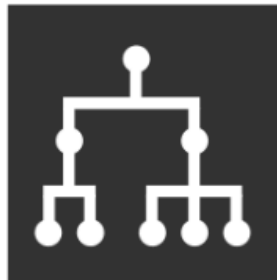
PROPORTIONS



Pie charts



Ring charts



Tree diagrams



Diagram map



Scatterplots



Bubble charts



Maps

HIERARCHIES

NETWORKS

CORRELATIONS

CARTOGRAPHICS

8 Presentative Variables

Color hue



Color brightness



Color saturation



Texture



Size



Shape



Position



Orientation



Apply Visual Representation

Subject Matters and
Corresponding Output Formats

TEXT

Subject Matter : Inaugural Words



| 1789 | 1800 | 1820 | 1840 | 1860 | 1880 | 1900 | 1920 | 1940 | 1960 | 1980 | 2000



2009

Barack Obama

[Full text of the address](#)

Mr. Obama called on Americans to work together to rebuild a faltering economy. "For everywhere we look, there is work to be done. The state of the economy calls for action, bold and swift, and we will act," he said. He also promised to restore America's place in the world. "Know that America is a friend of each nation and every man, woman, and child who seeks a future of peace and dignity, and that we are ready to lead once more."

nation America people
work **generation** world common time
seek spirit day American peace **crisis** **hard** greater
meet men remain **job** power moment **women** father
endure government short hour life hope freedom carried journey
forward force prosperity courage man question future friend service
age history God oath understand ideal pass economy care promise
children Earth stand demand purpose faith hand found interest war call duty

Inaugural Words: 1789 to the Present, NYTimes

http://www.nytimes.com/interactive/2009/01/17/washington/20090117_ADDRESSES.html

Subject Matter : Highlighted words during presidency

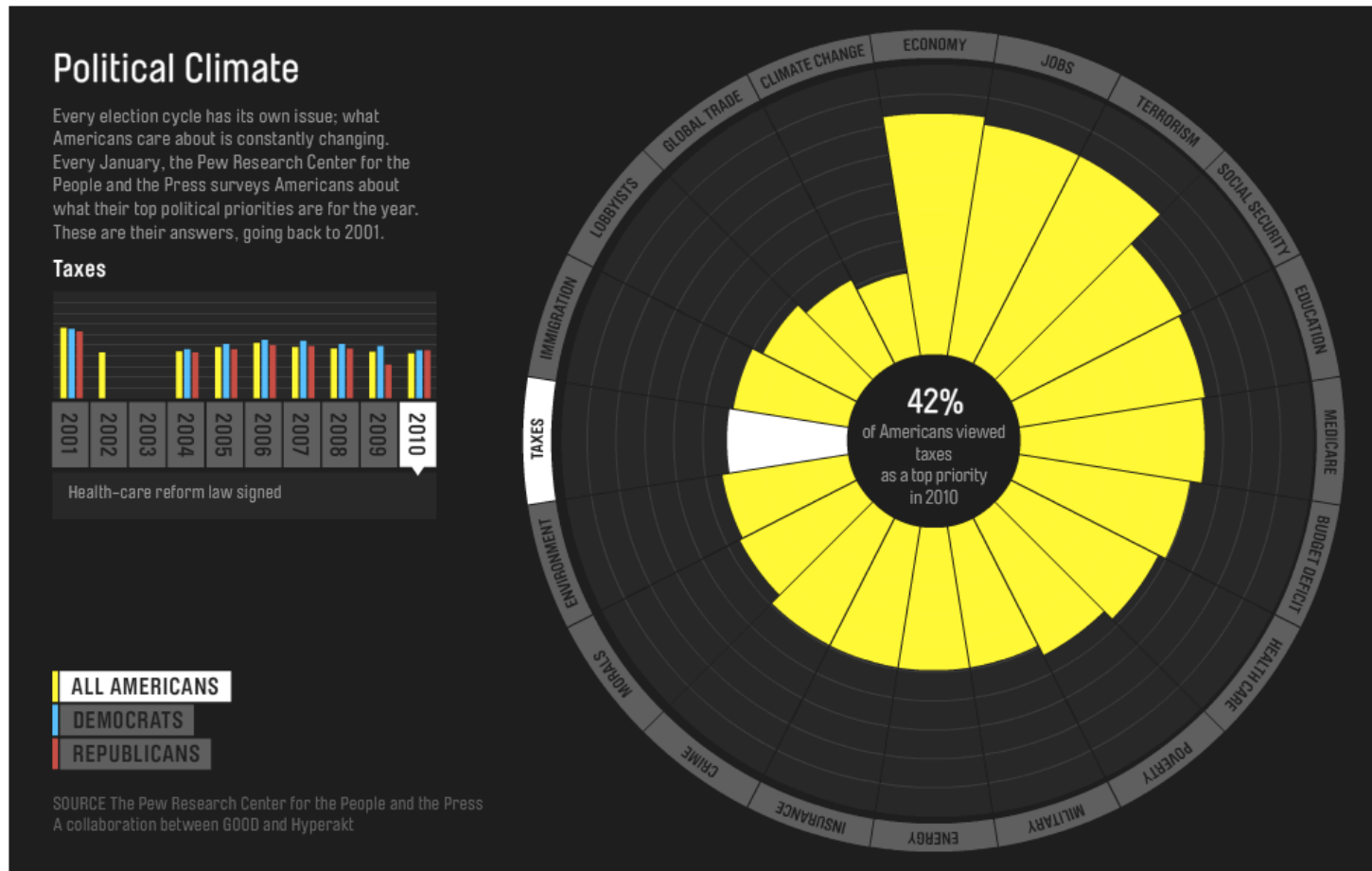
$\frac{20}{200}$	GENTLEMEN	$\frac{200\text{ rr}}{61\text{ w}}$	1
$\frac{20}{100}$	PROVISION FELLOW	$\frac{100\text{ rr}}{30.5\text{ w}}$	2
$\frac{20}{70}$	INFORMATION INDIANS PARTICULAR	$\frac{70\text{ rr}}{21.3\text{ w}}$	3
$\frac{20}{50}$	LAI D MILITIA OUGHT OBJECT	$\frac{50\text{ rr}}{15.2\text{ w}}$	4
$\frac{20}{40}$	WHETHER CIRCUMSTANCES CONSTITUTION OBJECTS REGARD	$\frac{40\text{ rr}}{12.2\text{ w}}$	5
$\frac{20}{30}$	TRIBES HAPPINESS SATISFACTION ESTABLISHMENT PROVISIONS WELFARE	$\frac{30\text{ rr}}{8.14\text{ w}}$	6
	<hr/>		
$\frac{20}{25}$	SITUATION EXECUTION SUCCESS FOUND ORDER REQUISITE AFFORD	$\frac{25\text{ rr}}{7.62\text{ w}}$	7
$\frac{20}{20}$	TERMS VALUABLE PRINCIPLES WISH AFFAIRS PLACED PLAN RESPECT	$\frac{20\text{ rr}}{8.10\text{ w}}$	8
	<hr/>		
$\frac{20}{15}$	POST OFFICE DELIBERATIONS EXPENSE OCCASION SAFETY CONSIDERATIONS COMMUNITY SECURITY	$\frac{15\text{ rr}}{4.57\text{ w}}$	9
$\frac{20}{13}$	SPIRIT ADD COOPERATION DIRECTED ESTIMATE NECESSITY TRANQUILITY CREDIT CONSTITUENTS BLESSINGS	$\frac{13\text{ rr}}{3.96\text{ w}}$	10
$\frac{20}{10}$	ESSENTIAL PARTICULARLY ARRANGEMENTS WESTERN TRUST CONFERENCE LEGISLATURE EQUAL THROUGH ARLE ACTS	$\frac{10\text{ rr}}{3.05\text{ w}}$	11

Hindsight is Always 20/20, Luke DuBois

<http://hindsightisalways2020.net/>

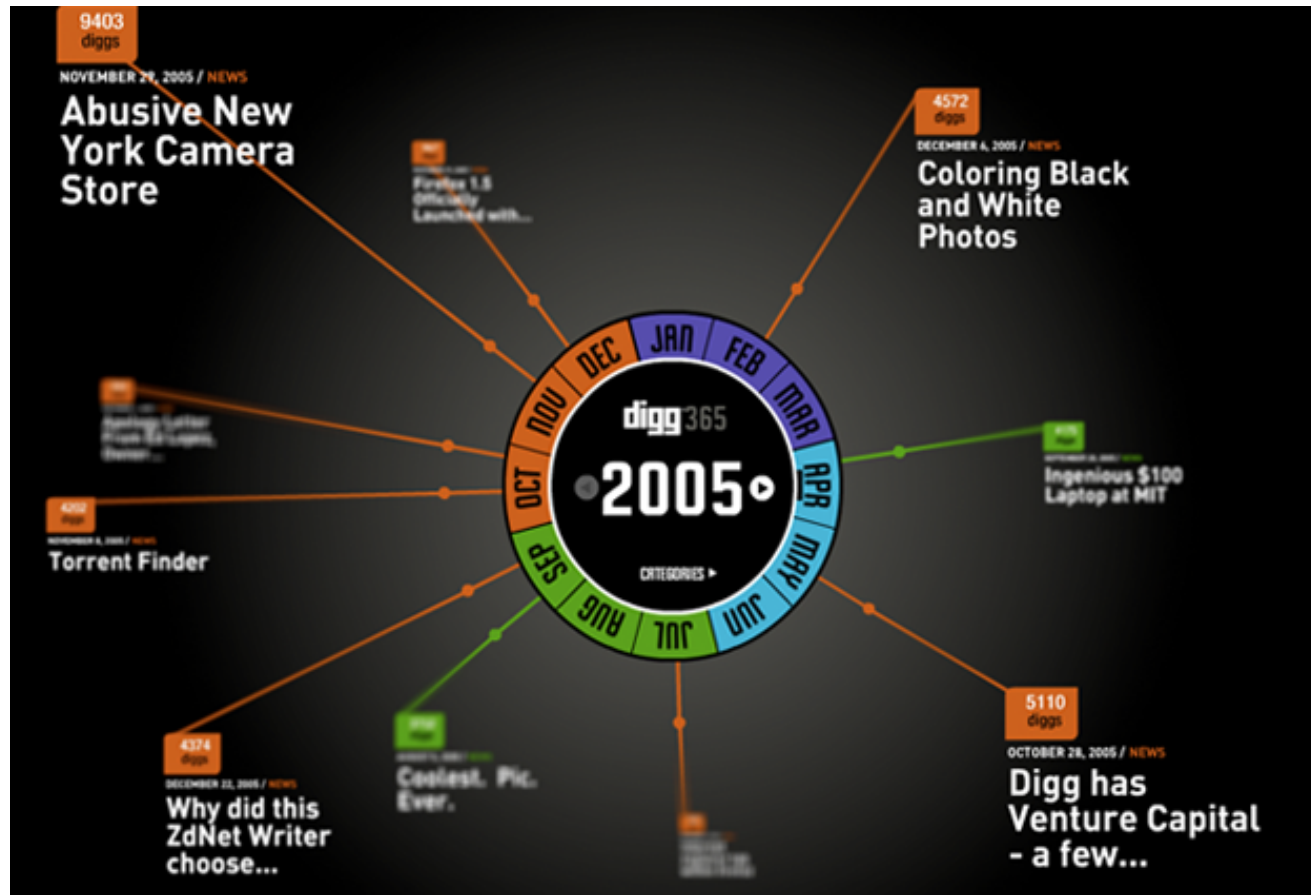
CIRCULAR FORMS

Subject Matter : Political Climate



<http://awesome.good.is/transparency/web/1010/political-climate-chart/interactive.html>

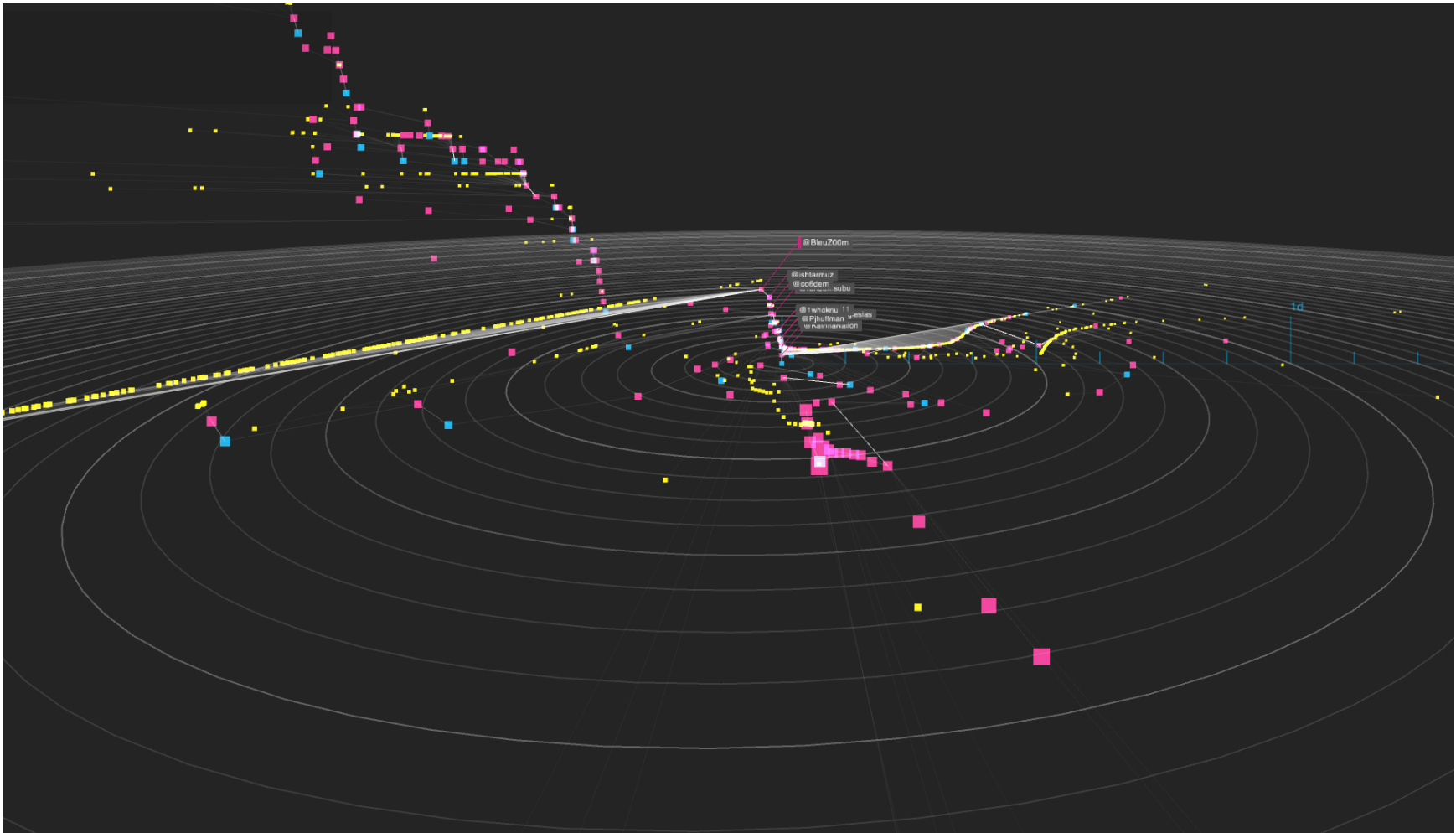
Subject Matter : Digg?



Barbarian Group Digg

http://barbariangroup.com/portfolio/digg_showcase

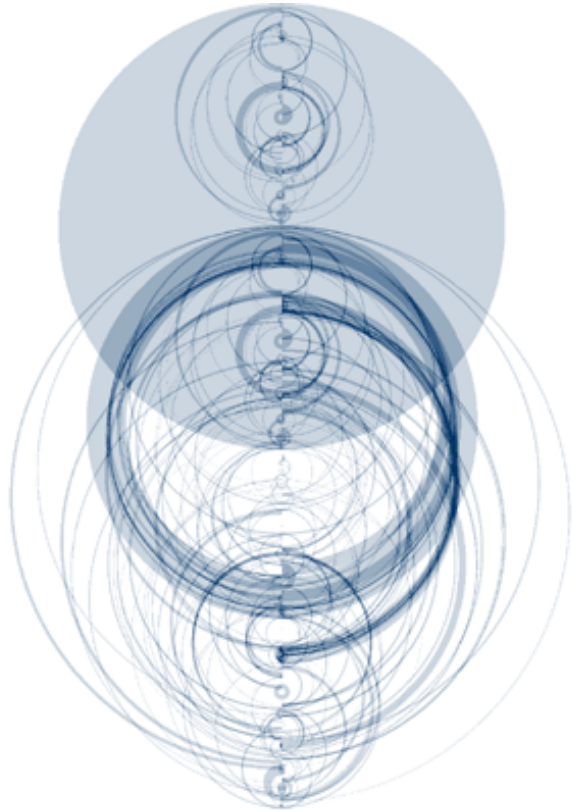
Subject Matter : Sharing pattern of the news



NYTimes Cascade

<http://nytlabs.com/projects/cascade.html>

Subject Matter : Song

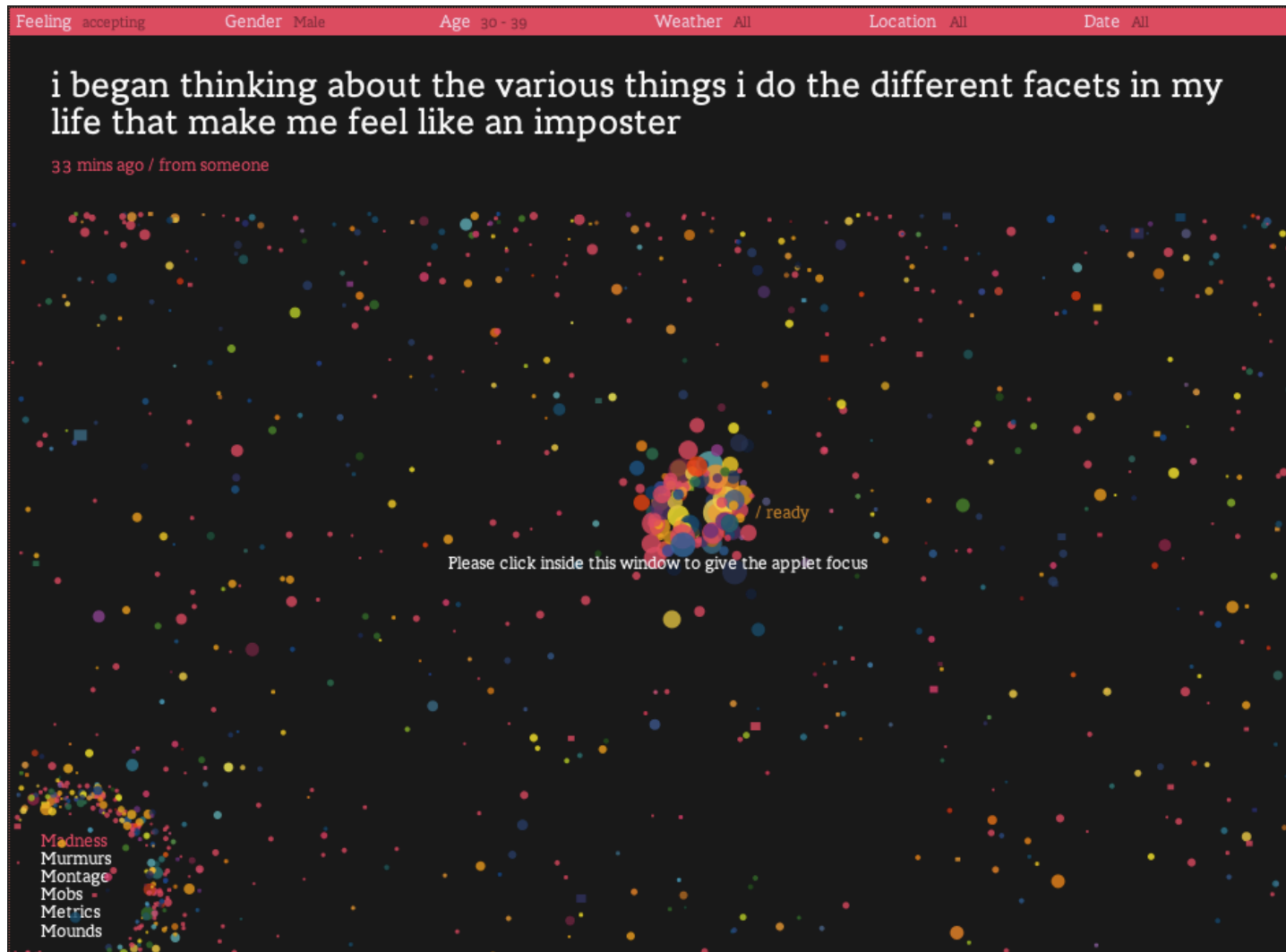


Shape of Song, MartinWattenberg

<http://www.bewitched.com/song.html>

PARTICLES

Subject Matter : Emotional Contents on the Web



Jonathan Harris

<http://wefeelfine.org/>

Subject Matter : Obama's Budget Proposal

- All Spending
- Types of Spending
- Changes
- Department Totals

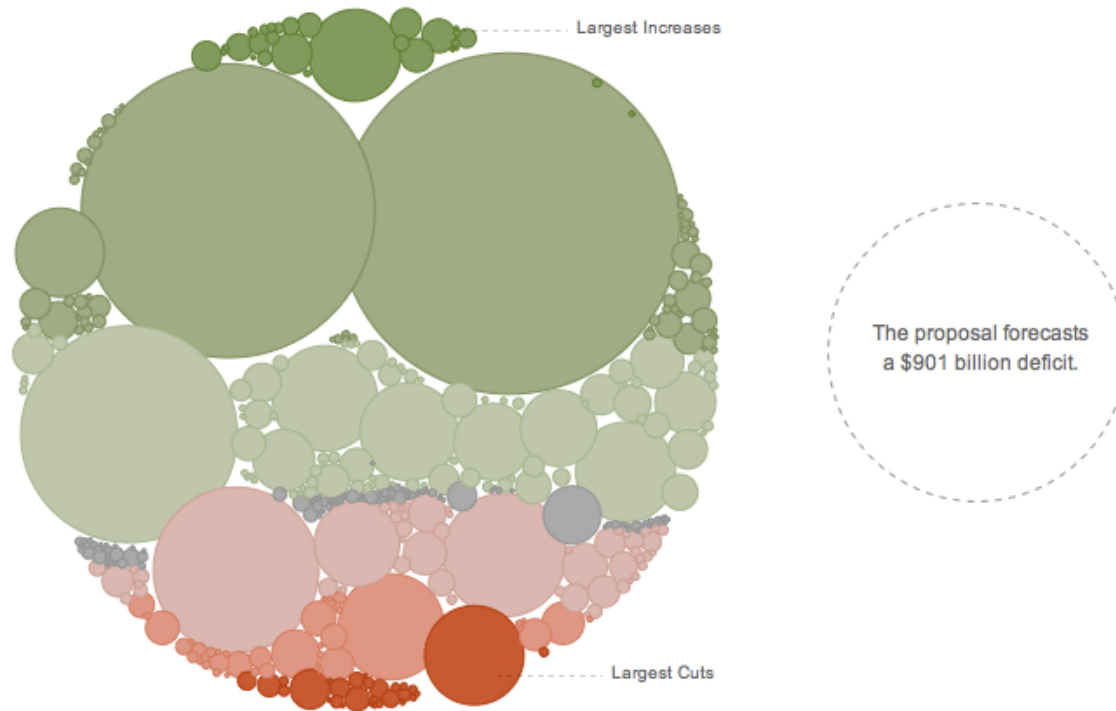
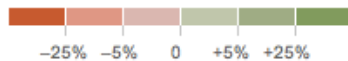
How \$3.7 Trillion Is Spent

Mr. Obama's budget proposal includes \$3.7 trillion in spending in 2013, and forecasts a \$901 billion deficit.

Circles are sized according to the proposed spending.



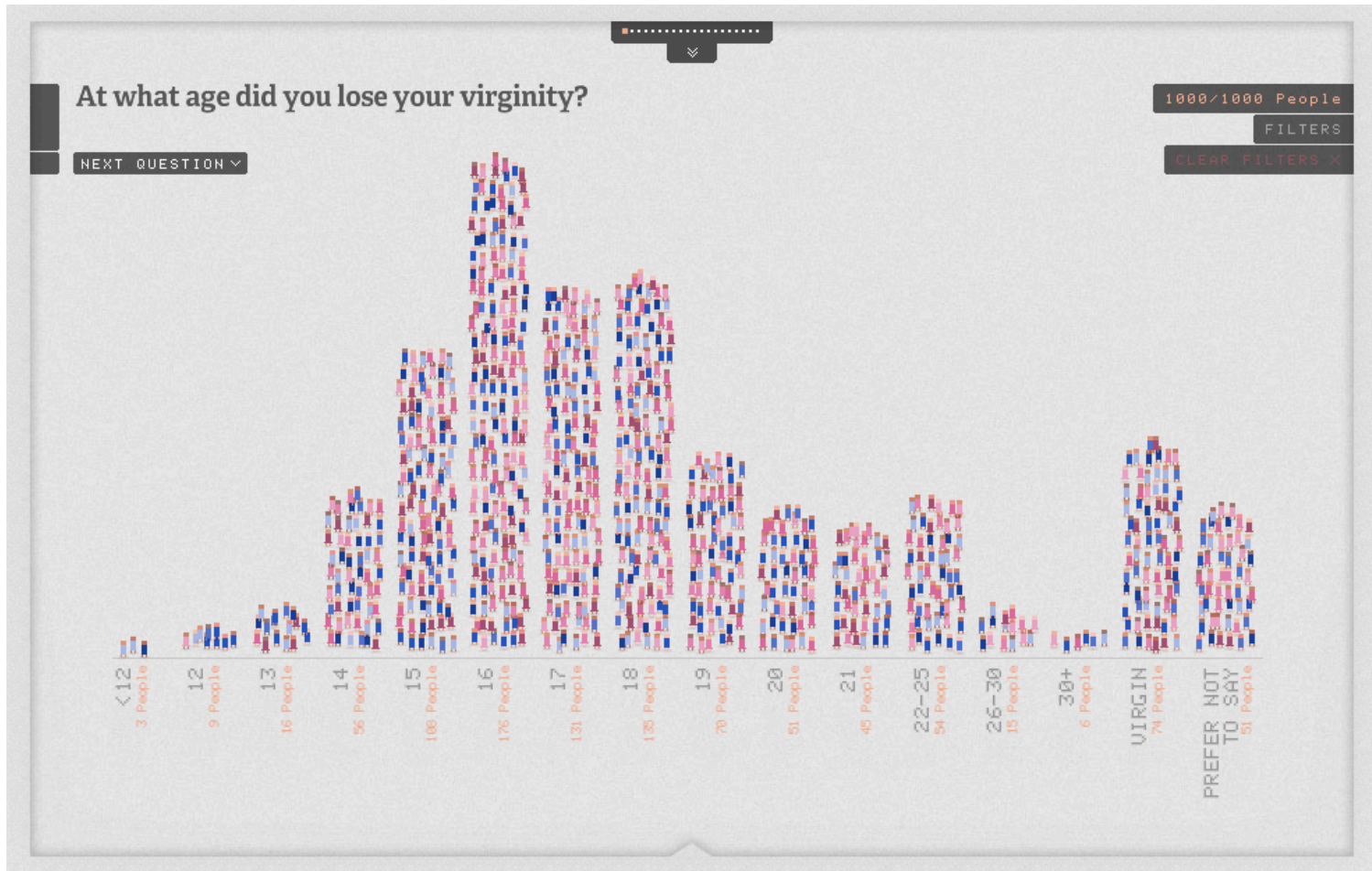
Color shows amount of cut or increase from 2012.



<http://www.nytimes.com/interactive/2012/02/13/us/politics/2013-budget-proposal-graphic.html?scp=3&sq=interactive%20graphics&st=cse>

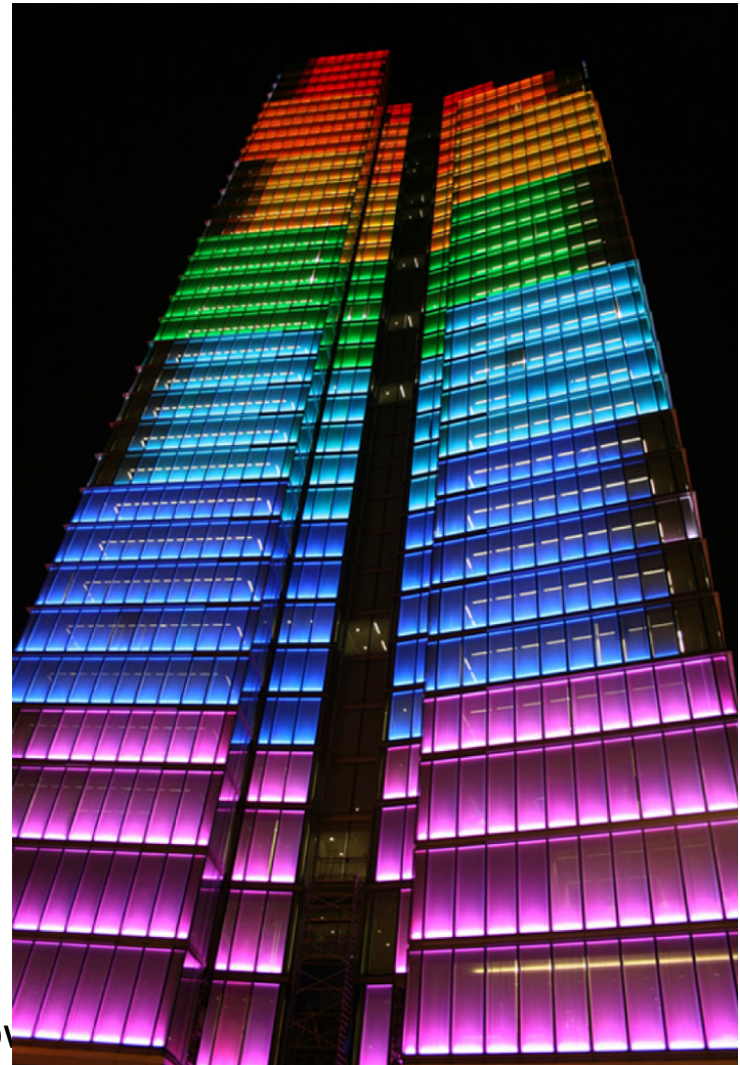
BAR CHART

Subject Matter : Sex Experience of People



<http://sexexperienceuk.channel4.com/the-sexperience-1000#/history/virginity>

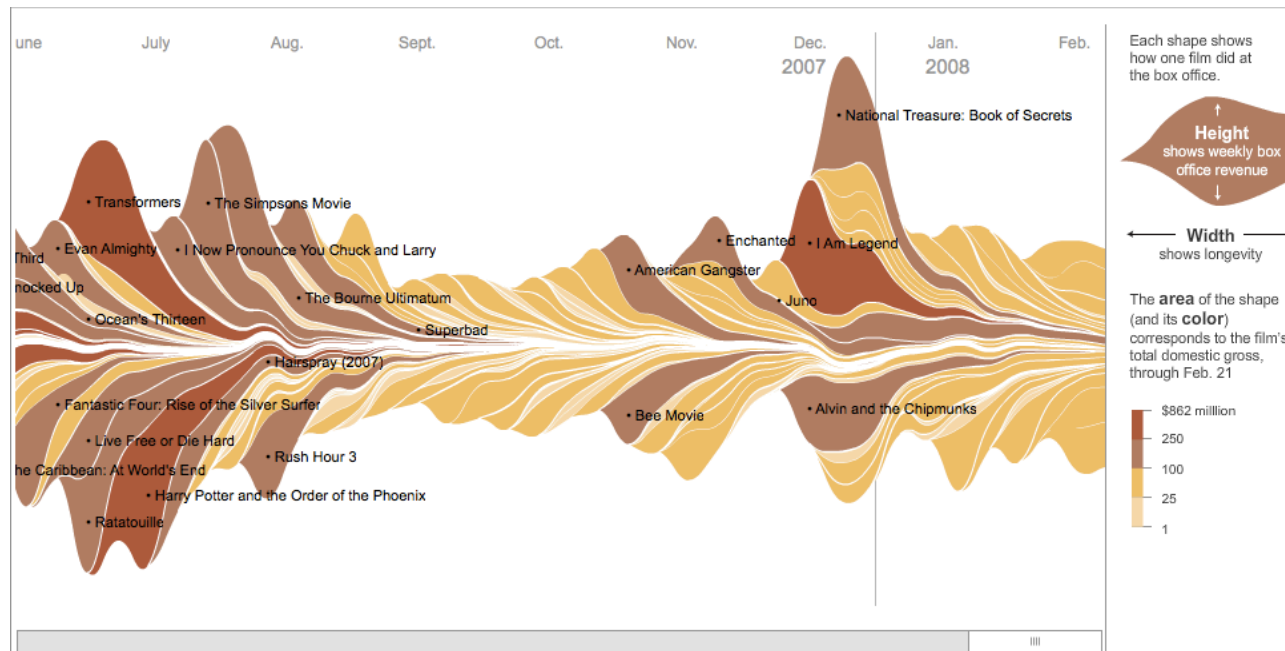
Subject Matter : Weather - Temperature



Weather Tower, Belgian Design Agency Lab [au]
<http://datavisualization.ch/showcases/weather-tow>

GRAPHS

Subject Matter : Box Office Receipts



The Ebb and Flow of Movies: Box Office Receipts 1986 — 2008, NYtimes

http://www.nytimes.com/interactive/2008/02/23/movies/20080223_REVENUE_GRAPHIC.html

ILLUSTRATIONS

Subject Matter : Youtube Video Upload Amount per time



Youtube Visualization

<http://www.onehourpersecond.com/>

Subject Matter : Timeline of Personal Issues



Timeline, Oguz Akin
<http://www.oguzakin.com/ill10.html>

Subject Matter : Need for Blood Donation

BLOOD SIGNAL.CA

48 PATIENTS WITH INTERNAL BLEEDING

6k Like

Call 1 888 2 DONATE (1-888-236-6283) | Visit OneMatch.ca | Visit our YouTube Channel | Français

Canadian Blood Services
it's in you to give

Canadian Blood Services


<http://www.bloodsignal.ca/>

Subject Matter : Slavery Footprint

3 of 11 | Do You Have Children? Login

Slide to change age

Age



Cancel

Done

No / Don't include children in my score. ↓

Everyone in Orlando walks into a kiln.

In 2007, Save the Children reported that 250,000 children live and work in Pakistani brick kilns in complete social isolation. That's more than the population of Irvine, CA, Baton Rouge, LA, or Orlando, FL.

f t 78K

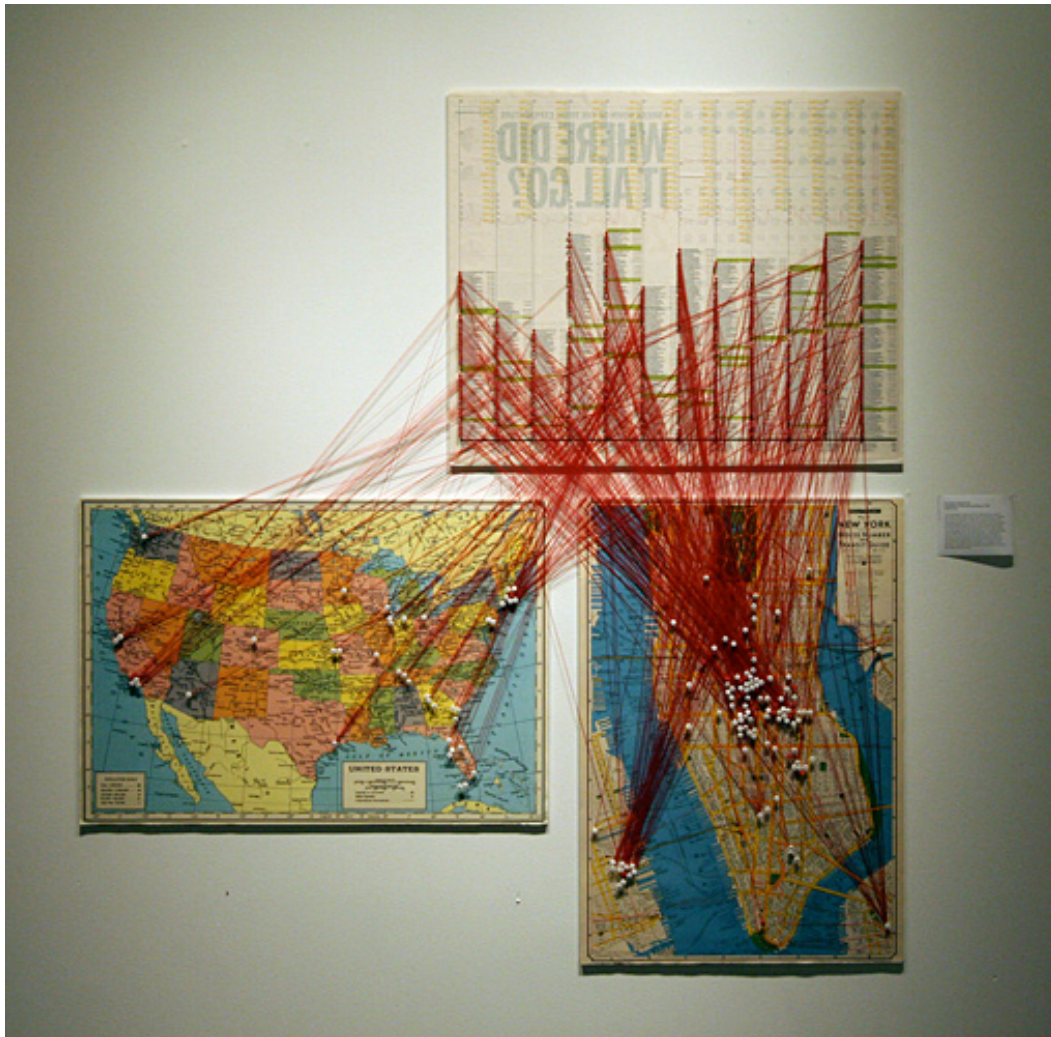
MADE IN A FREE WORLD Slavery Footprint

Get App Methodology Terms and Conditions Privacy Policy f t 78K

Slavery Footprint
<http://slaveryfootprint.org/survey/>

LINES

Subject Matter : Geographically track the money spending of myself



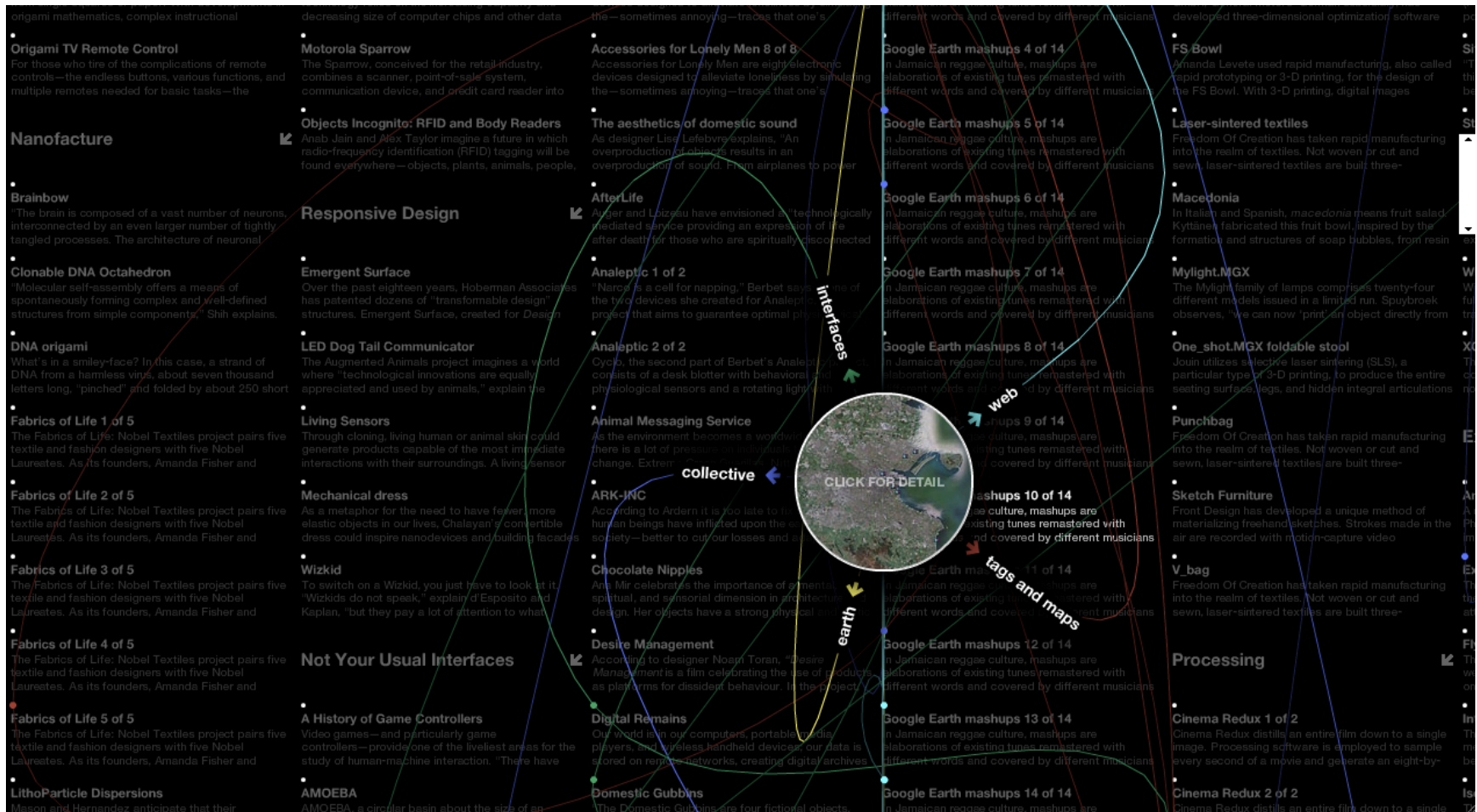
The system, Mapped Out

Eeroon Kang

<http://www.eeroonkang.com/projects/The-System-Mapped-Out/>



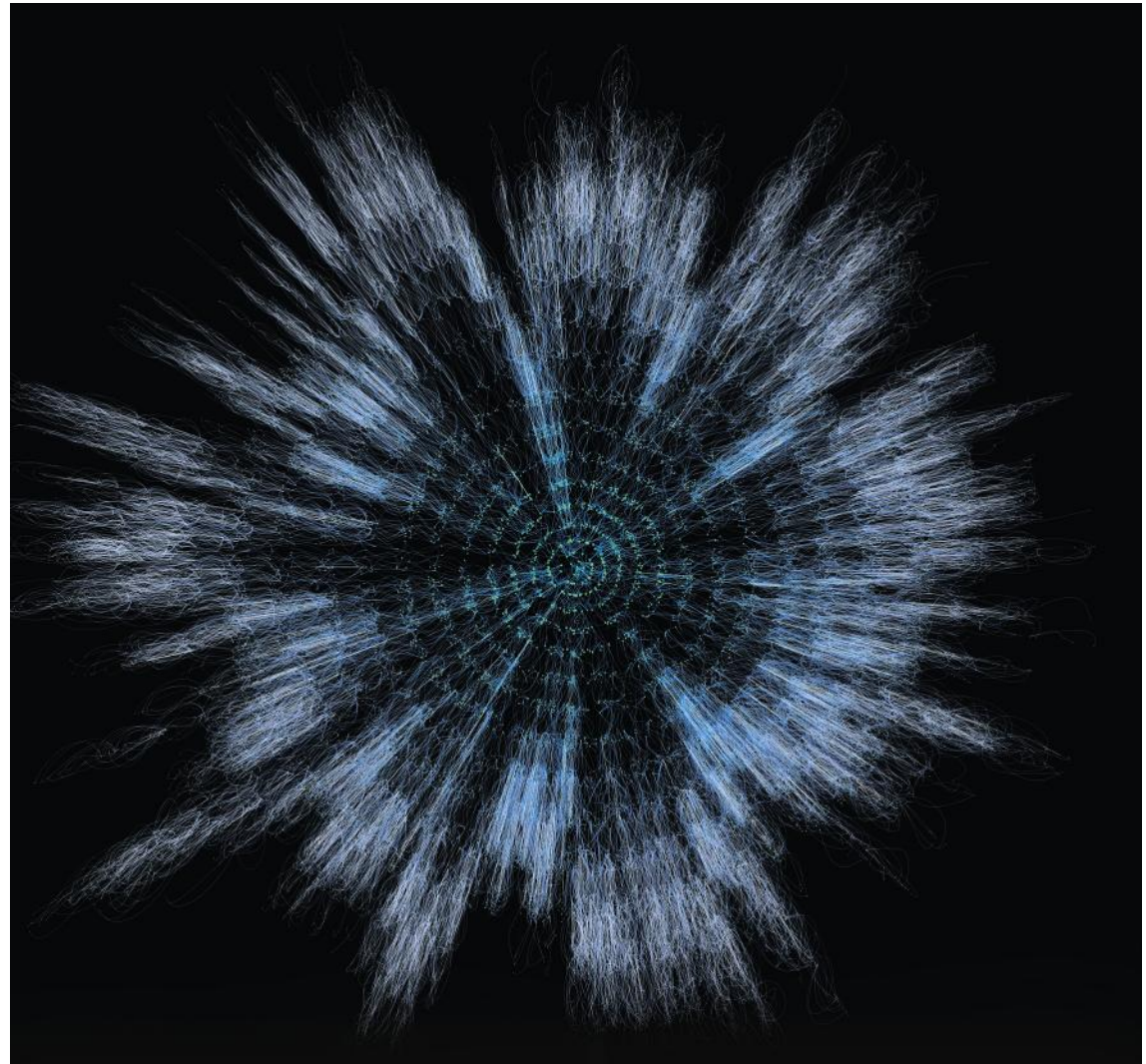
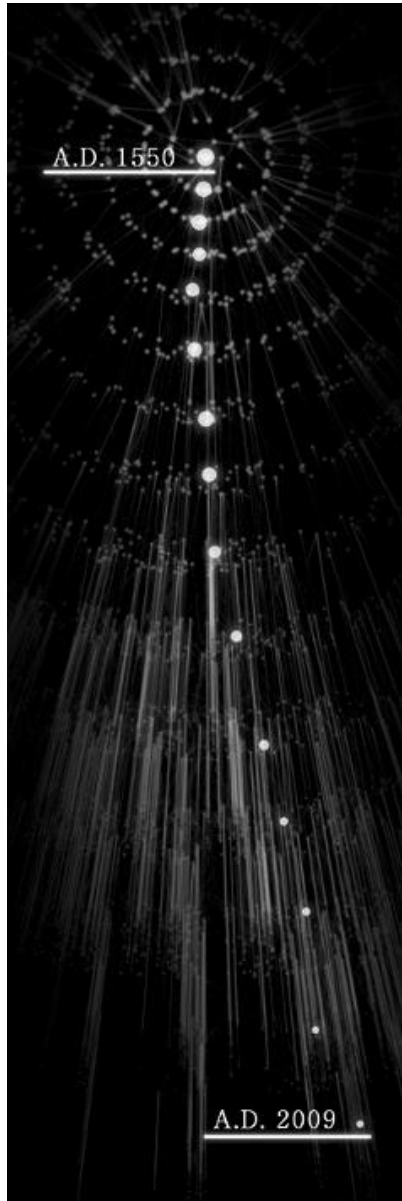
Subject Matter : Relationships of the Subjects



Moma, Design and Elastic Mind

<http://www.moma.org/interactives/exhibitions/2008/elasticmind/>

Subject Matter : Family Tree

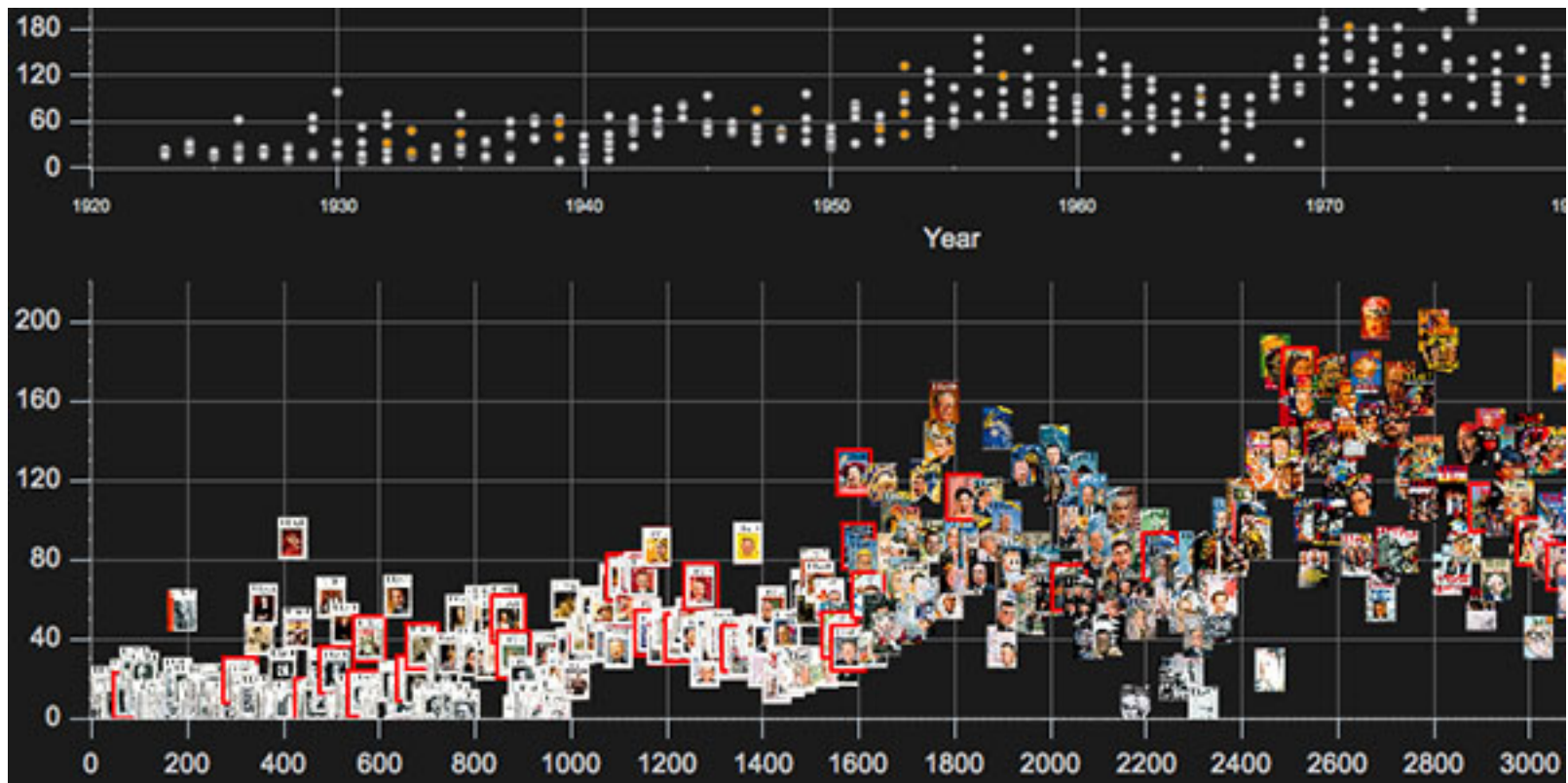


Visual Geneology, Jinwan Park

http://fma.cau.ac.kr/park_web/index.files/Page305.htm

GRAPH /TIMELINE

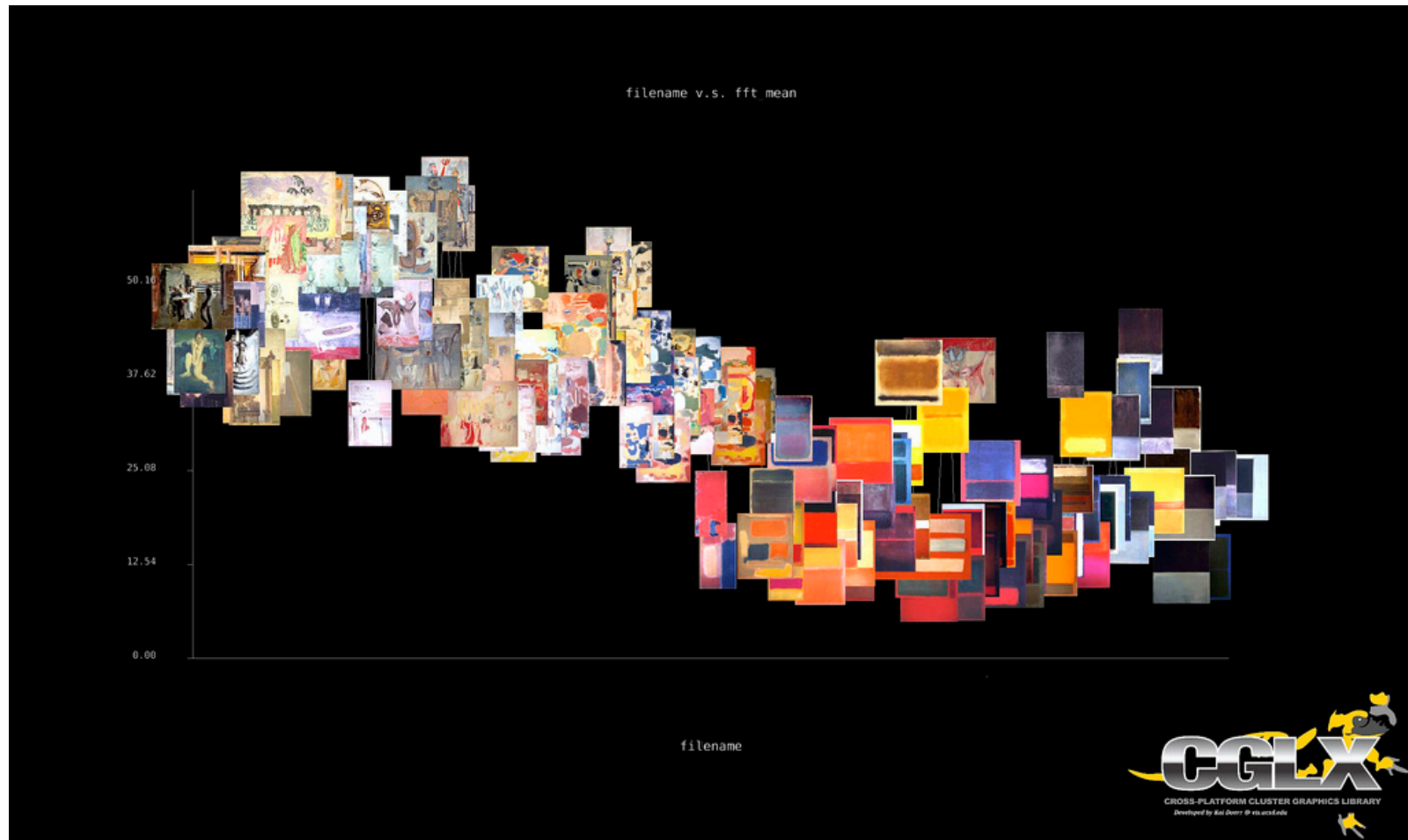
Subject Matter : Time Magazine Cover



Time Magazine Covers, Software Studies (Lev Manovich)

http://lab.softwarestudies.com/p/research_14.html

Subject Matter : Mondrian Painting



Mondrian, Software Studies (Lev Manovich)

http://lab.softwarestudies.com/p/research_14.html

Subject Matter : Google Logo

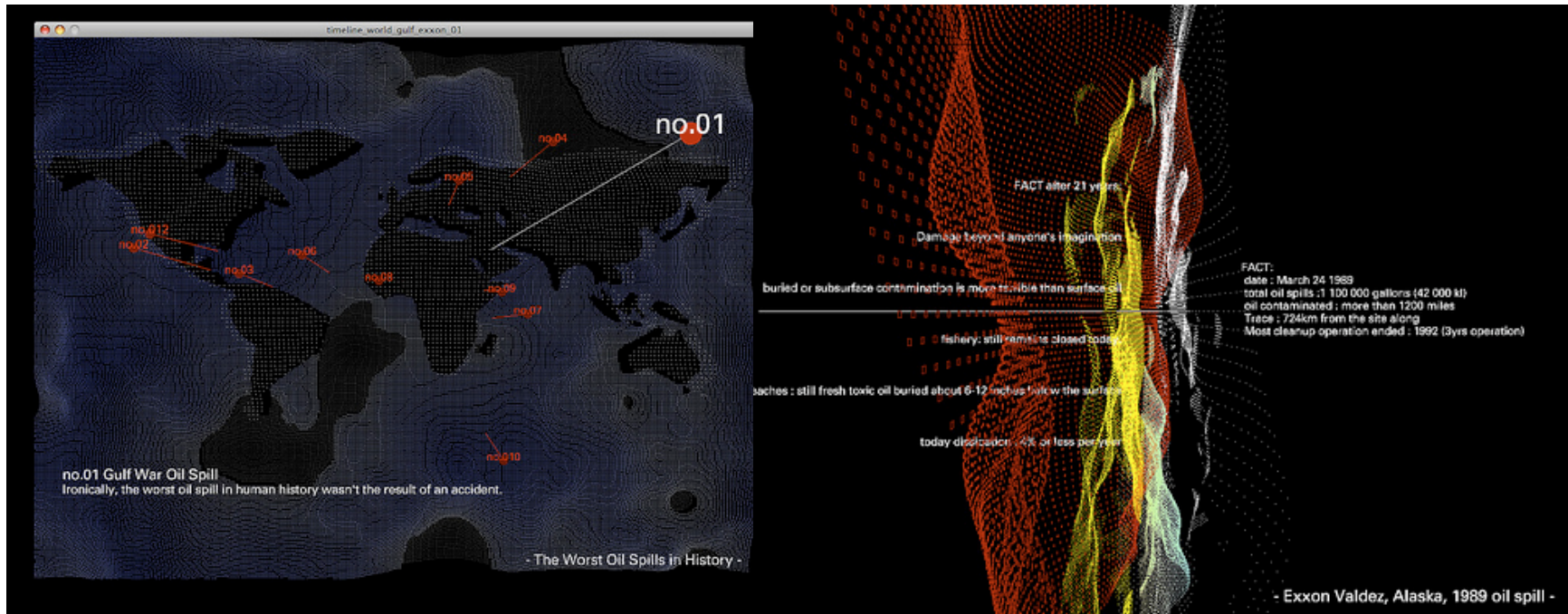


Google, Software Studies (Lev Manovich)

http://lab.softwarestudies.com/p/research_14.html

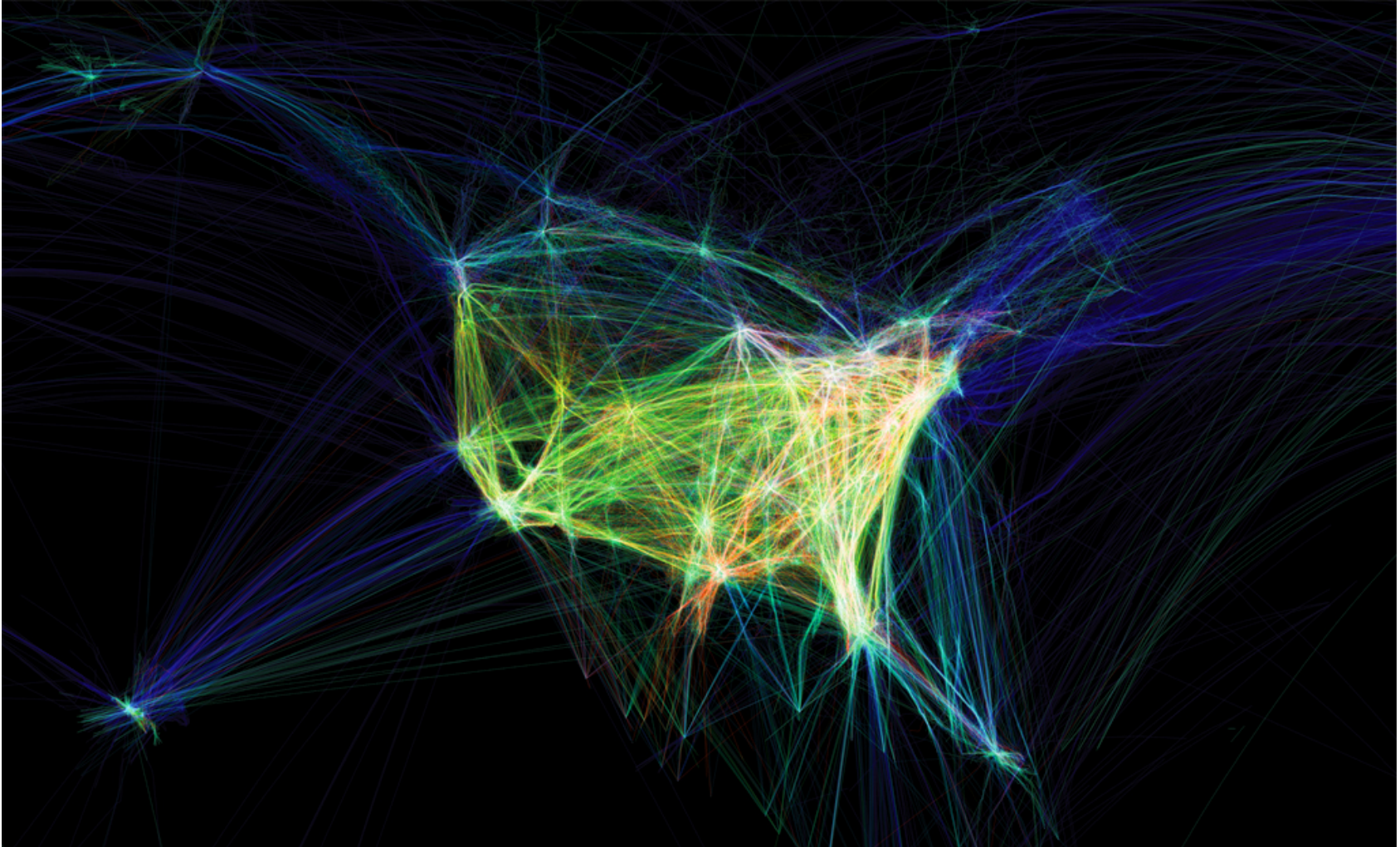
MAP

Subject Matter : Oil Spill



protei _ oil spill visualization, Sey Min
http://ttoky.com/sub/sub_protei.html

Subject Matter : Flight Pattern



Flight Pattern, Aaron Koblin

<http://www.aaronkoblin.com/work/flightpatterns/index.html>

Subject Matter : Cab Spotted Data



In Transit by Amy Balkin

<http://cabspotting.org/>

GRID / PIXELS

Subject Matter : Dead in Iran or Afgan

PHOTOS CHART

DIED 2010-05-11


May, Kenneth B. Jr.

AGE
26

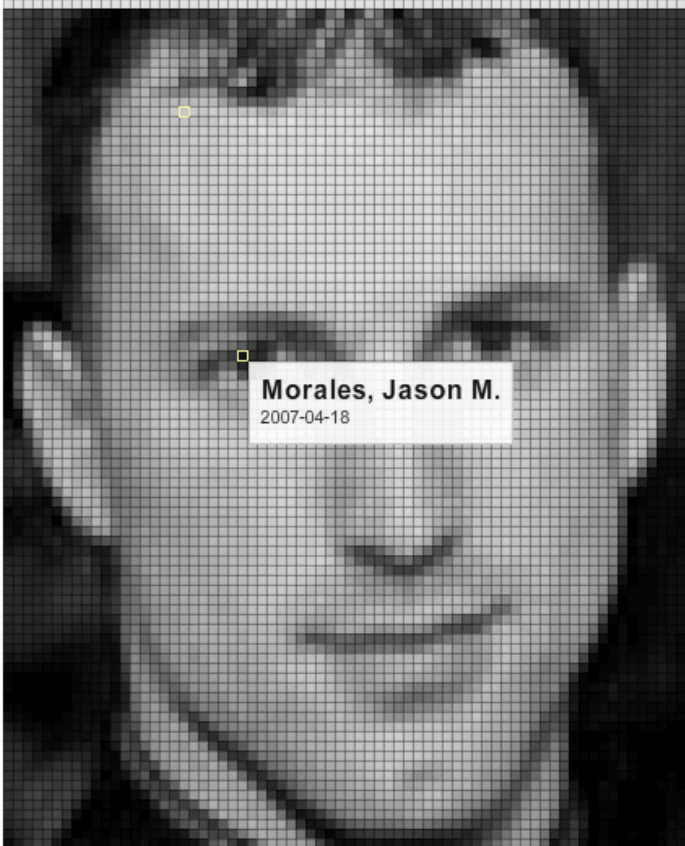
BRANCH
Marine Corps

HOMETOWN
Kilgore, TX

THEATER
Afghanistan



Morales, Jason M.
2007-04-18



Faces of the Dead, NYTimes

http://www.nytimes.com/interactive/us/faces-of-the-dead.html#/may_kenneth_b_jr

Subject Matter : Pixels Drawn by Amazon Turk Users

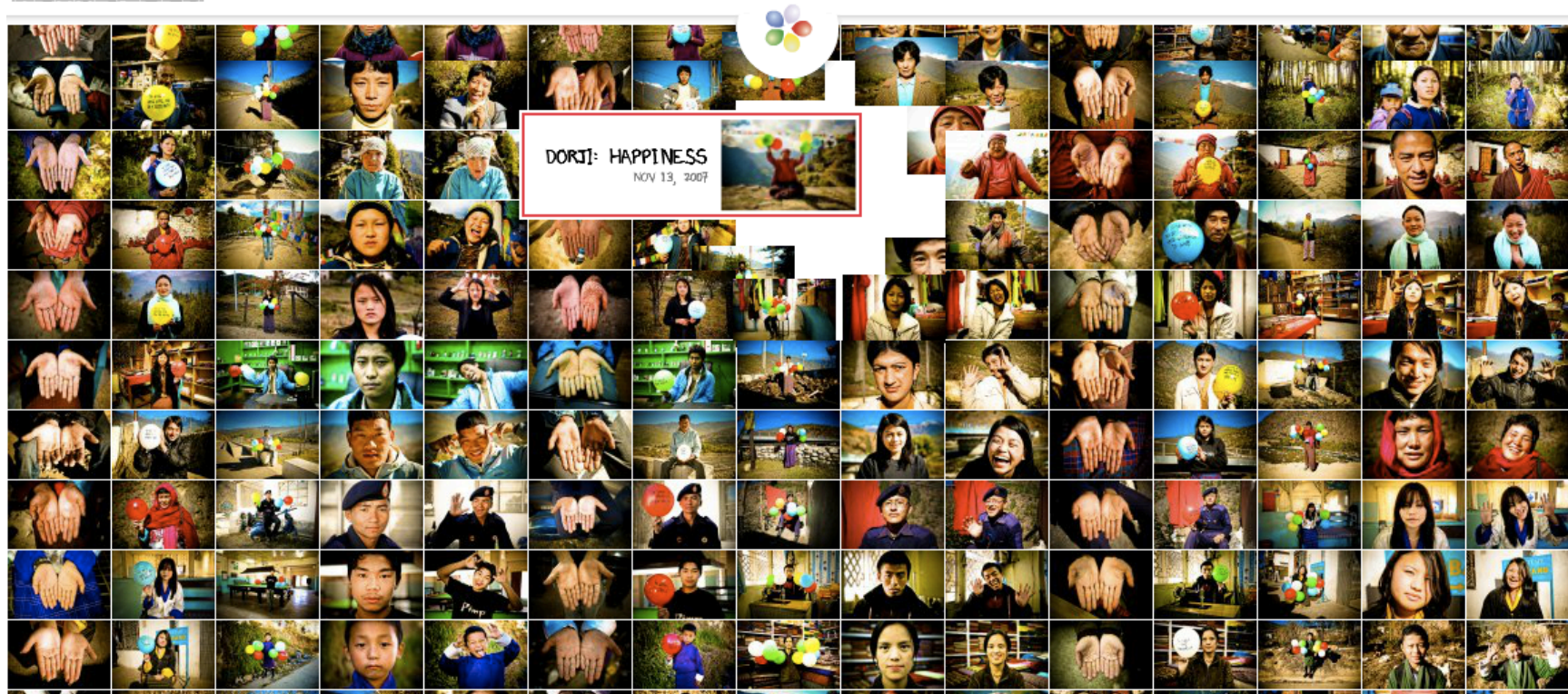


Ten Thousand Cents, Aaron Koblin

<http://www.tenthousandcents.com/>

Subject Matter : Dreams and Happiness of people in Bhutan

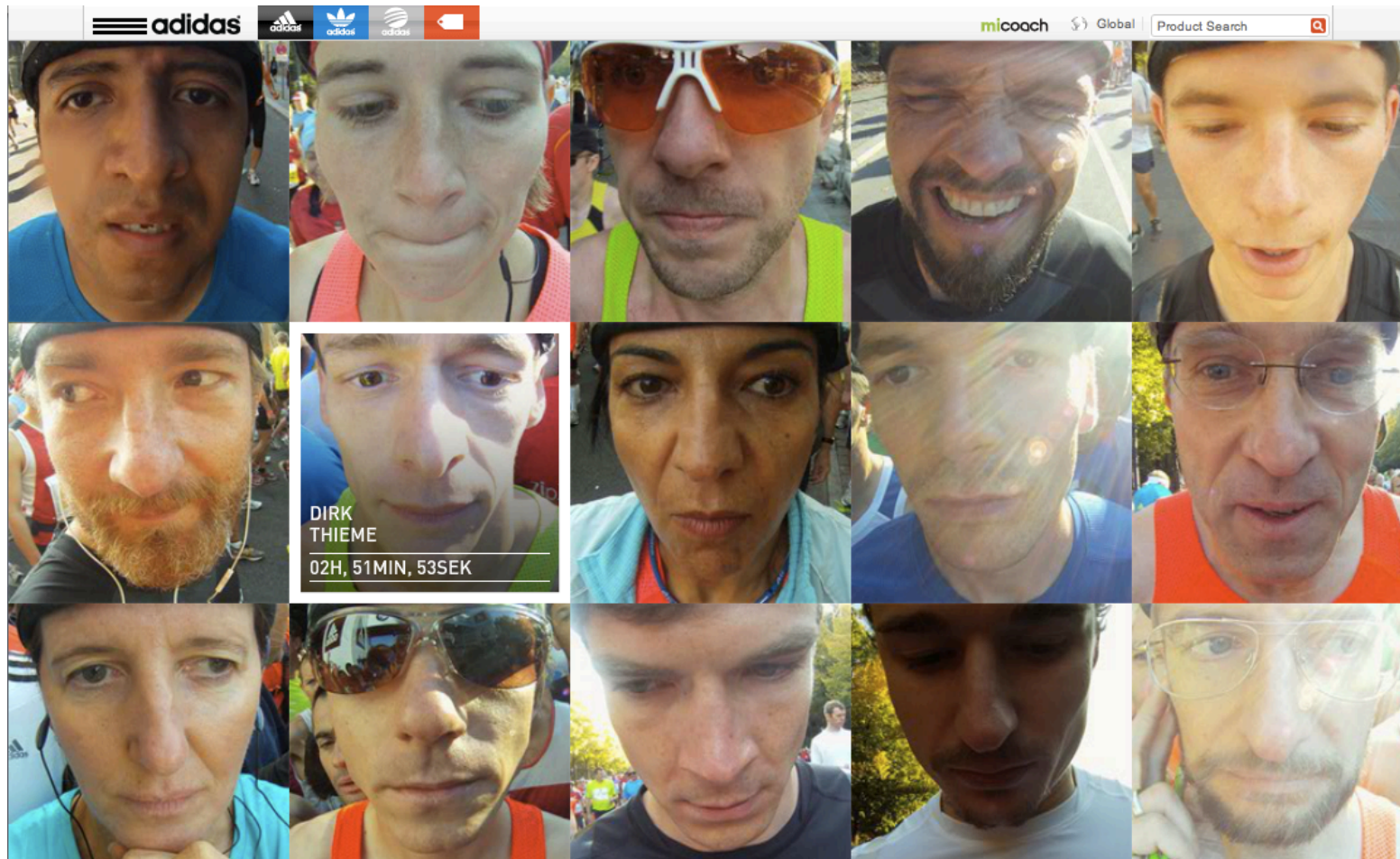
BALLOONS OF BHUTAN



Balloons of Bhutan, Jonathan Harris

<http://balloonsofbhutan.org/>

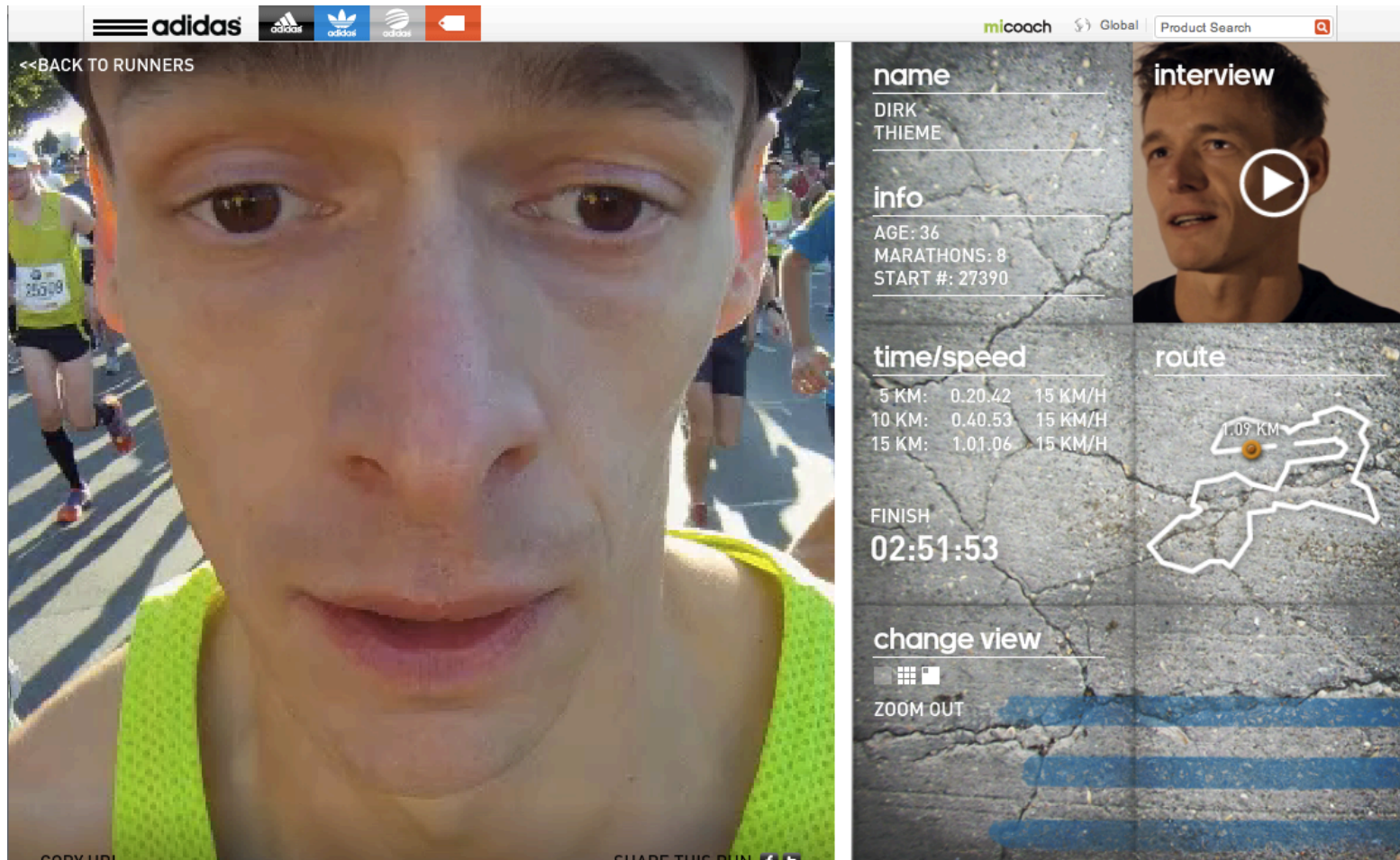
Subject Matter : Face of the Marathon Runners



Addidas, the face of the marathon

<http://www.adidas.com/campaigns/angesichtdesmarathons/content/index.asp?country=en>

Subject Matter : Face of the Marathon Runners



Addidas, the face of the marathon

<http://www.adidas.com/campaigns/angesichtdesmarathons/content/index.asp?country=en>

Subject Matter : Face during the past 8 years

The screenshot shows the website for Jonathan Keller's project. At the top, the name "Jonathan Keller Keller" is displayed in a red box. Navigation links include "About JK", "Shop", "Signup", and "Old Site". A social media bar shows "Like 486", "+1 24", and "Tweet 40". A navigation menu lists years from 2011 to 1998. A video player is embedded, showing a portrait of Jonathan Keller with the caption "Living My Life Faster, 2006, 1:43 minutes". To the right of the video is a large, dense grid of small, repeating images of his face. Below the video player is a section titled "A chronological sampling from the project" which contains a horizontal sequence of seven portrait photos showing the progression of his face from 2006 to the present. At the bottom of the page, there are links for "flickr", "Vimeo", and "Goc".

The Adaption to My Generation, a daily photo project, Jonathan Keller

<http://jk-keller.com/daily-photo/>

ON READY MADE

Subject Matter: Economic crisis and inequality



The income growth disparity in America is wider than it was pre-Great Depression

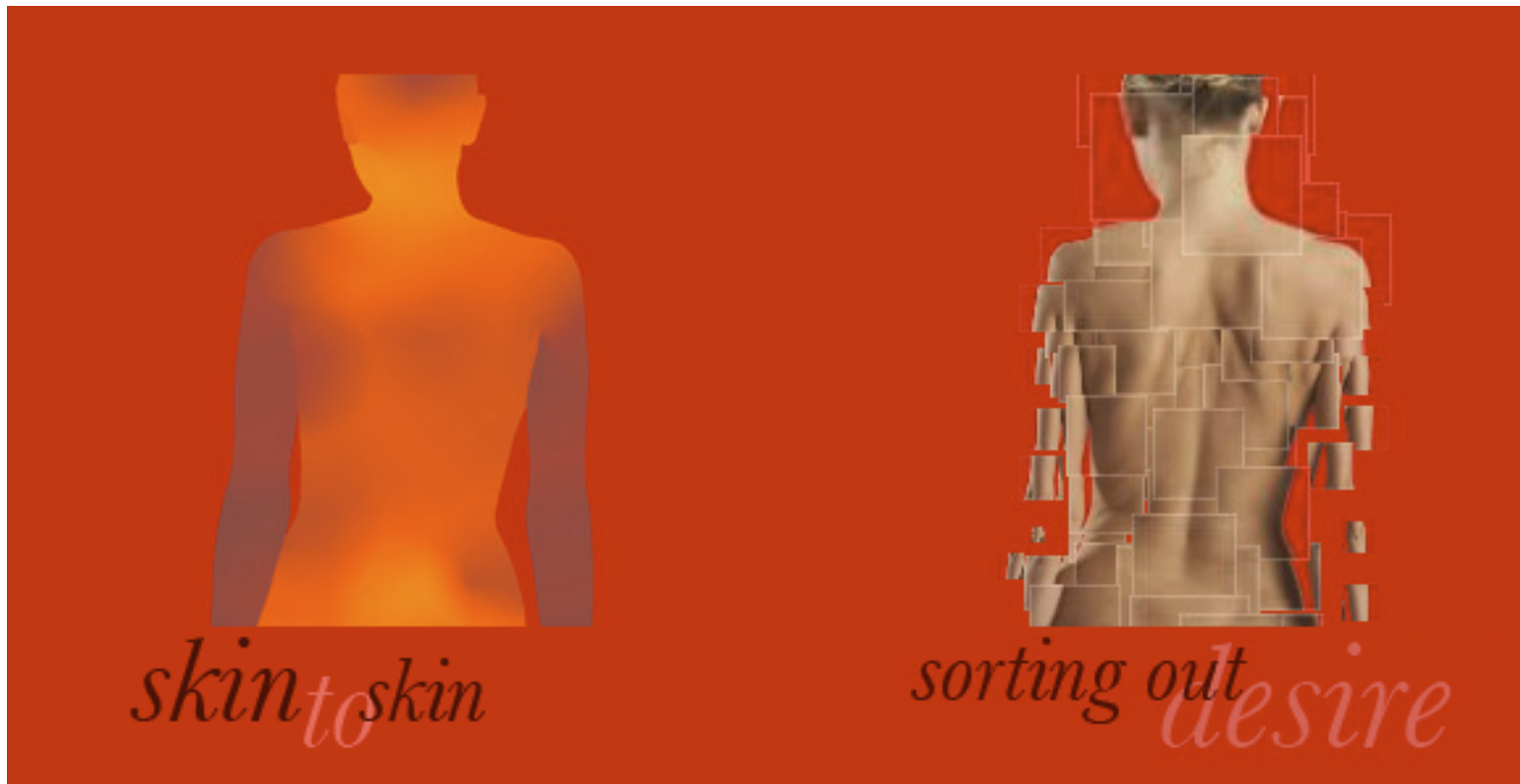
<http://occupygeorge.com/>



In America, the average CEO earns 185 times more than the average worker.

COLLAGE / MISSELANEOUS

Subject Matter: Desire to touch, or be touched



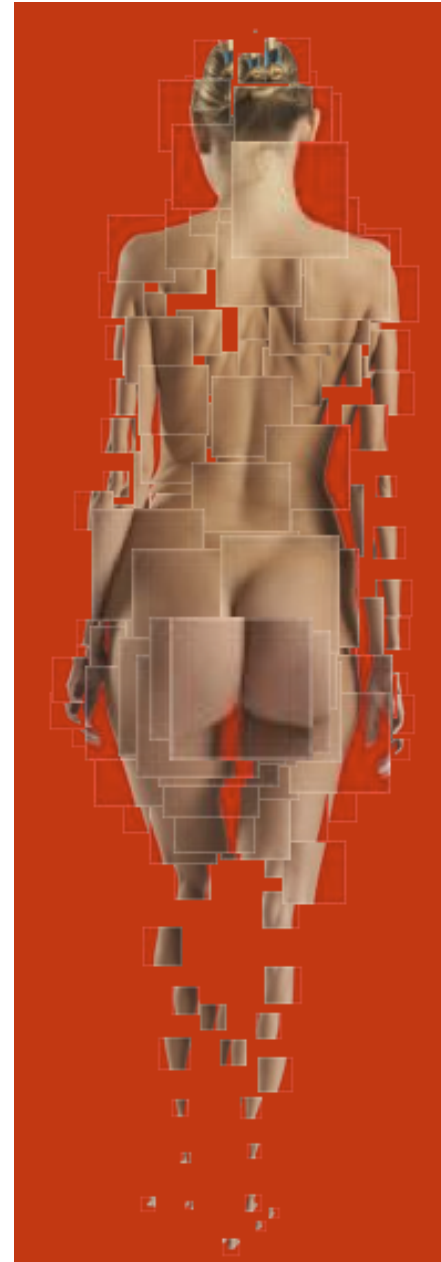
FleshMap, Martin Wattenberg

<http://www.bewitched.com/fleshmap.html>

least exciting



most exciting



Subject Matter: How we believe on incorrect information



Maps, Paul Sacher

<http://www.paulaschermaps.com/>

CONVERTING INTO PHYSICAL

Subject Matter: Urgently Trashed News

Physical Output



Urgently! ,Aristarkh Chernyshev

a physical info-sculpture that displays news stories from the Internet in real time

<http://www.youtube.com/watch?v=onMn9jQAJqc>

Subject Matter: Dynamic Human Movement



Body Cloud



<http://datavisualization.ch/showcases/bodycloud/>

Subject Matter : Long Distance SMS Messages



SMS to paperplanes

Christian Groß

<http://www.christiangross.info/en/sms-to-paper-airplanes/>

Subject Matter : Massive Flickr Uploads



Erik Kessels, 24 hours in photos:

<http://www.creativereview.co.uk/cr-blog/2011/november/24-hours-in-photos>

Subject Matter : Fantasy and dreams of childhood



Wonderland. 2005 , Yeon Doo Jung

Artists & Organizations

- Organizations
 - NYTimes R & D Lab <http://nytlabs.com/>
 - IBM Many Eyes <http://www-958.ibm.com>
 - MIT Sensible City Lab <http://senseable.mit.edu/>
 - Software Studies Lab by Lev Manovich <http://lab.softwarestudies.com/>
- Artist
 - Lev Manovich <http://manovich.net>
 - Aaron Koblin <http://www.aaronkoblin.com/>
 - Jonathan Harris <http://www.number27.org/>
 - Martin Wattenberg <http://www.bewitched.com/>
 - Jer Thorp <http://blog.blprnt.com/>
 - George Legrady <http://www.georgelegrady.com/>
 - Ben Fry <http://benfry.com/>
 - Nicholas Feltron <http://feltron.com> (Information Design)
 - Edward Tufte <http://www.edwardtufte.com/tufte/> (Information Design)

Blog, Websites, Books

- Blog/Websites
 - <http://www.visualcomplexity.com/>
 - <http://infosthetics.com/>
 - <http://flowingdata.com/>
 - <http://www.visualizing.org/>
 - <http://datavisualization.ch/>
- Books
 - Data flow 1, Data flow 2, Gestalten (Information Design)
 - Beautiful Visualization, Oreilly Media
 - Designing Data Visualizations, Oreilly Media