

Daten verstehen und visualisieren

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@dominikus

Kunstuni Linz SoSe'15

Daten verstehen und visualisieren #3

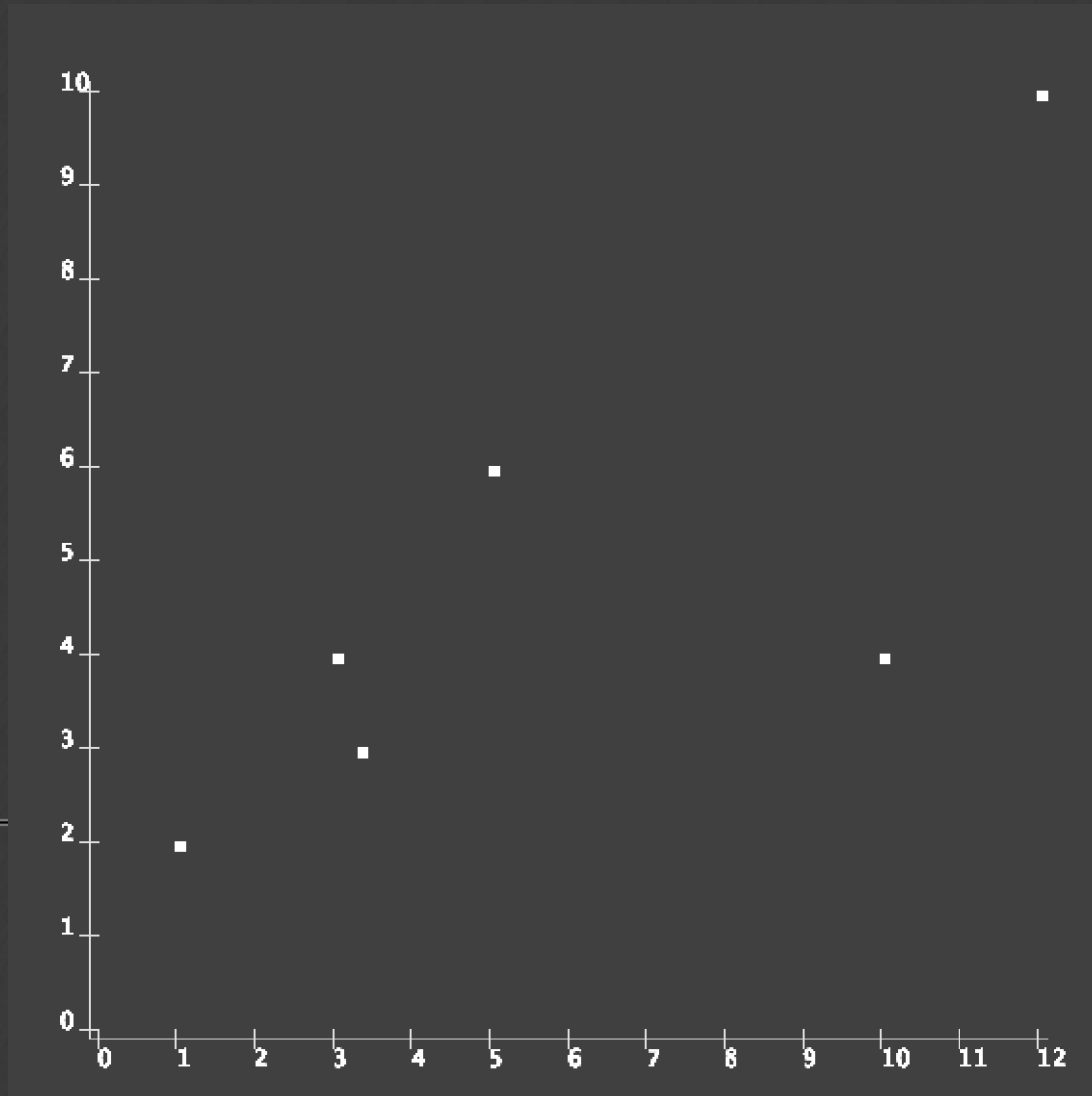
Bis heute (1):

Schaut euch mindestens eines der Processing-Tutorials auf <https://processing.org/tutorials/> an.

Schaut euch mindestens eines der Processing-Beispielprogramme an (Processing Menü -> File -> Examples)

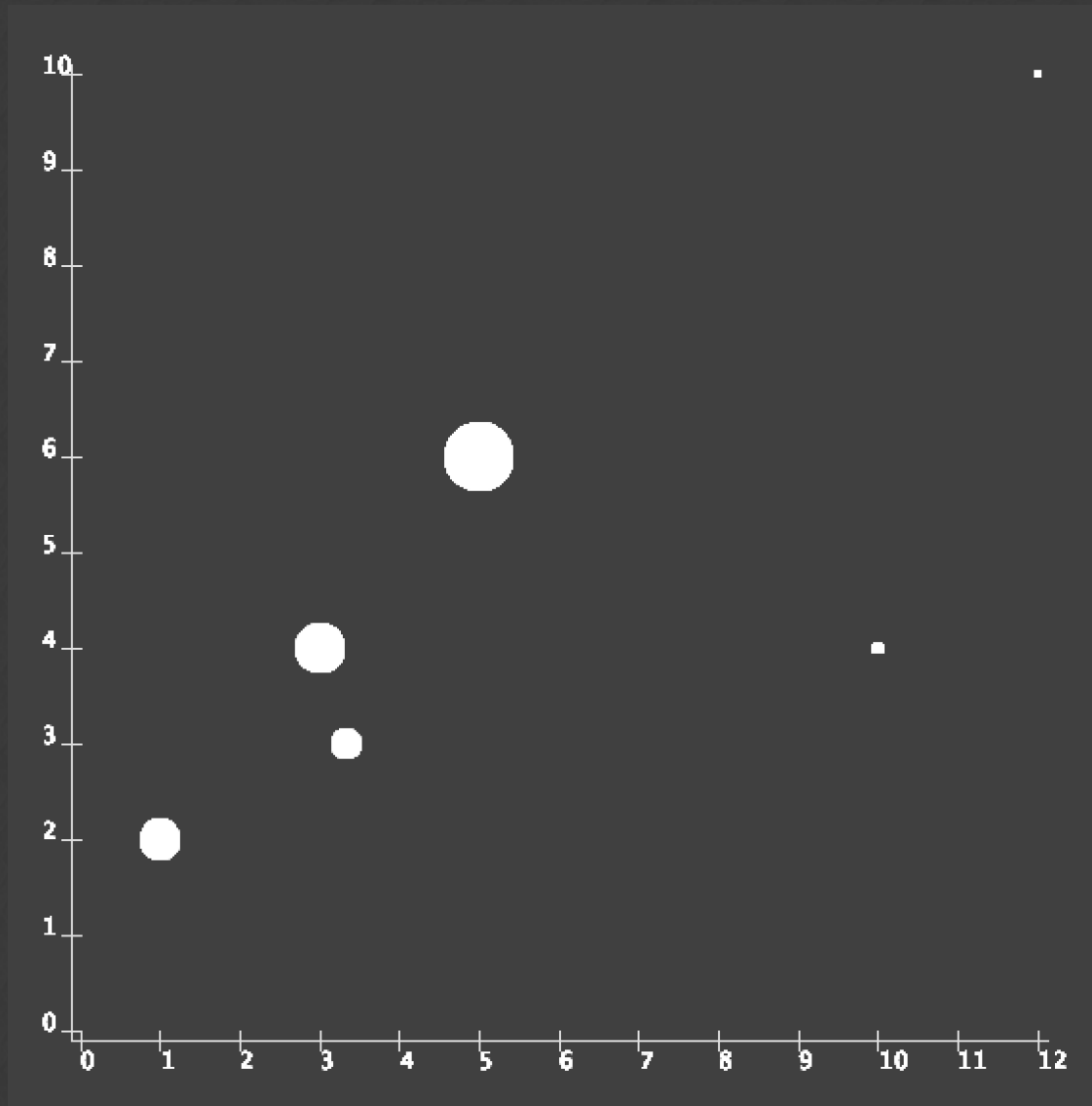
Bis heute (2):

Erweitert das Scatterplot-Beispiel und zeigt Achsen, Tickmarks und Beschriftungen an:



Bis heute (3):

Fügt ein weiteres (fiktives) Attribut in das Programm ein. Mapt dieses Attribut auf die Größe der Kreise (= Bubble chart). Achtet auf die korrekte Skalierung der Kreise!



Heute:

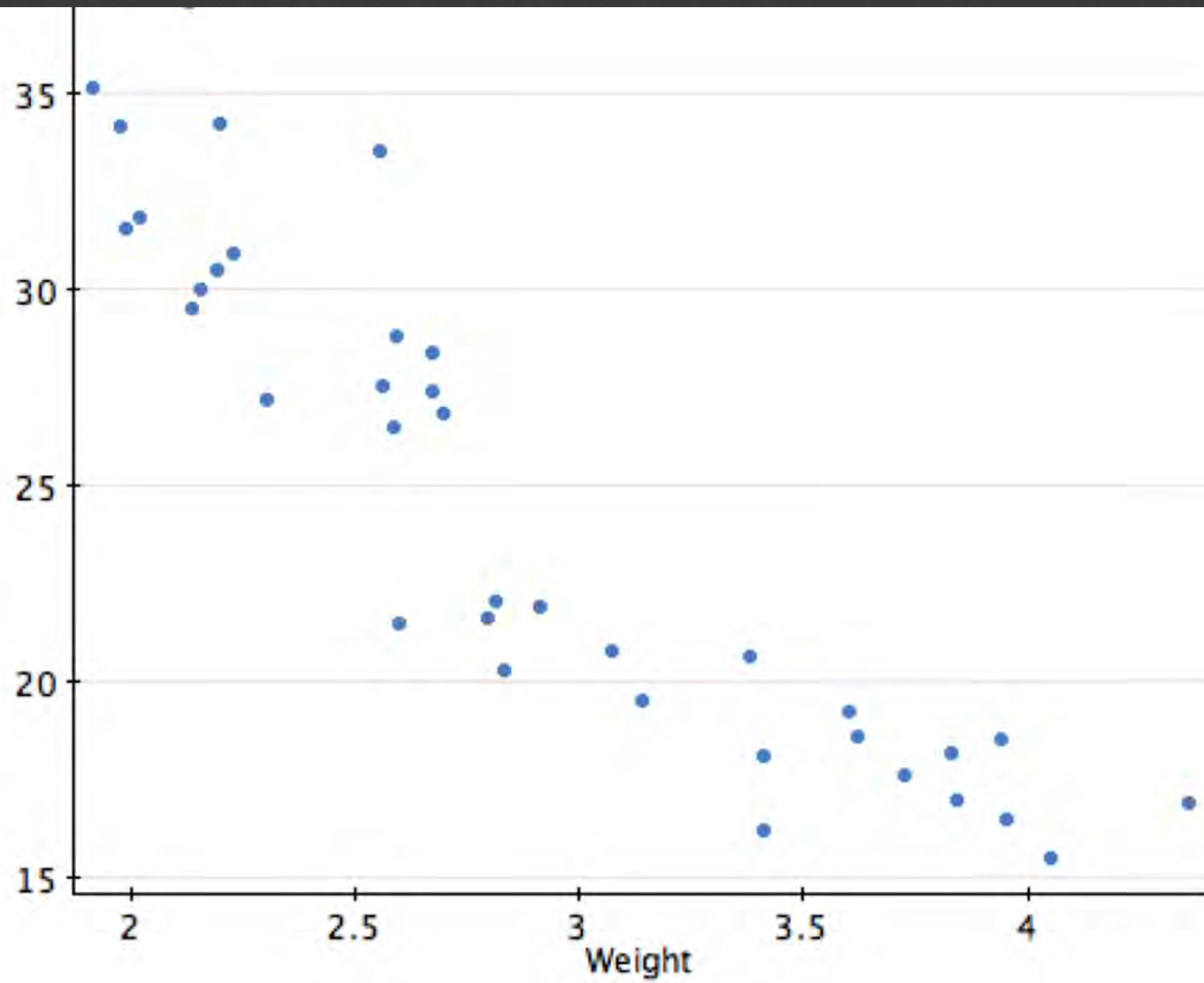
Grundlegende Visualisierungstechniken

Was ist Interaktion?

Processing II - Interaktion

Prozess und Kritik

Grundlegende Visualisierungen

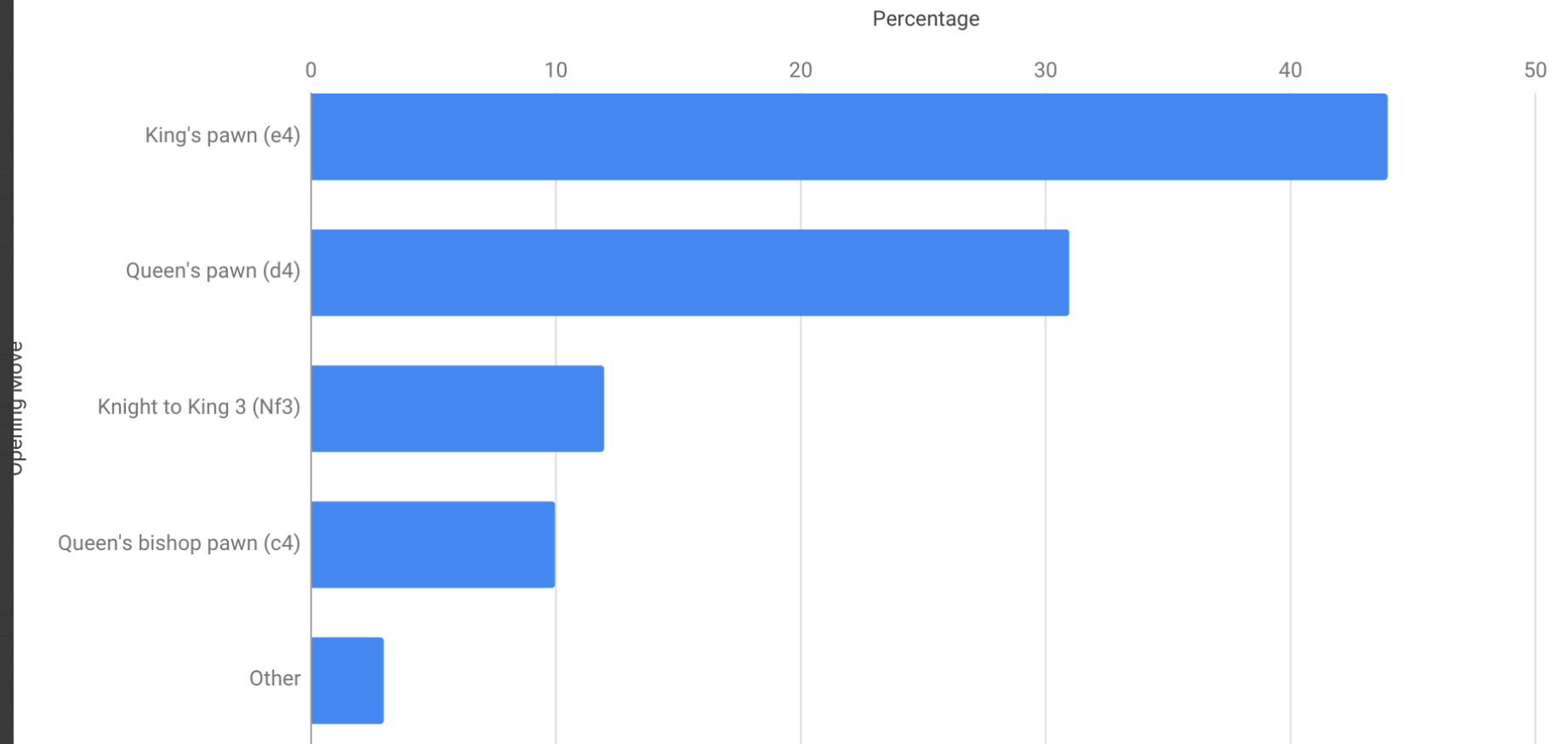


Scatterplot

Scatterplots:

- **Machen es leicht, Korrelationen zu sehen!**
- **Geben ein generelles Bild über die Daten**

Chess opening moves
popularity by percentage

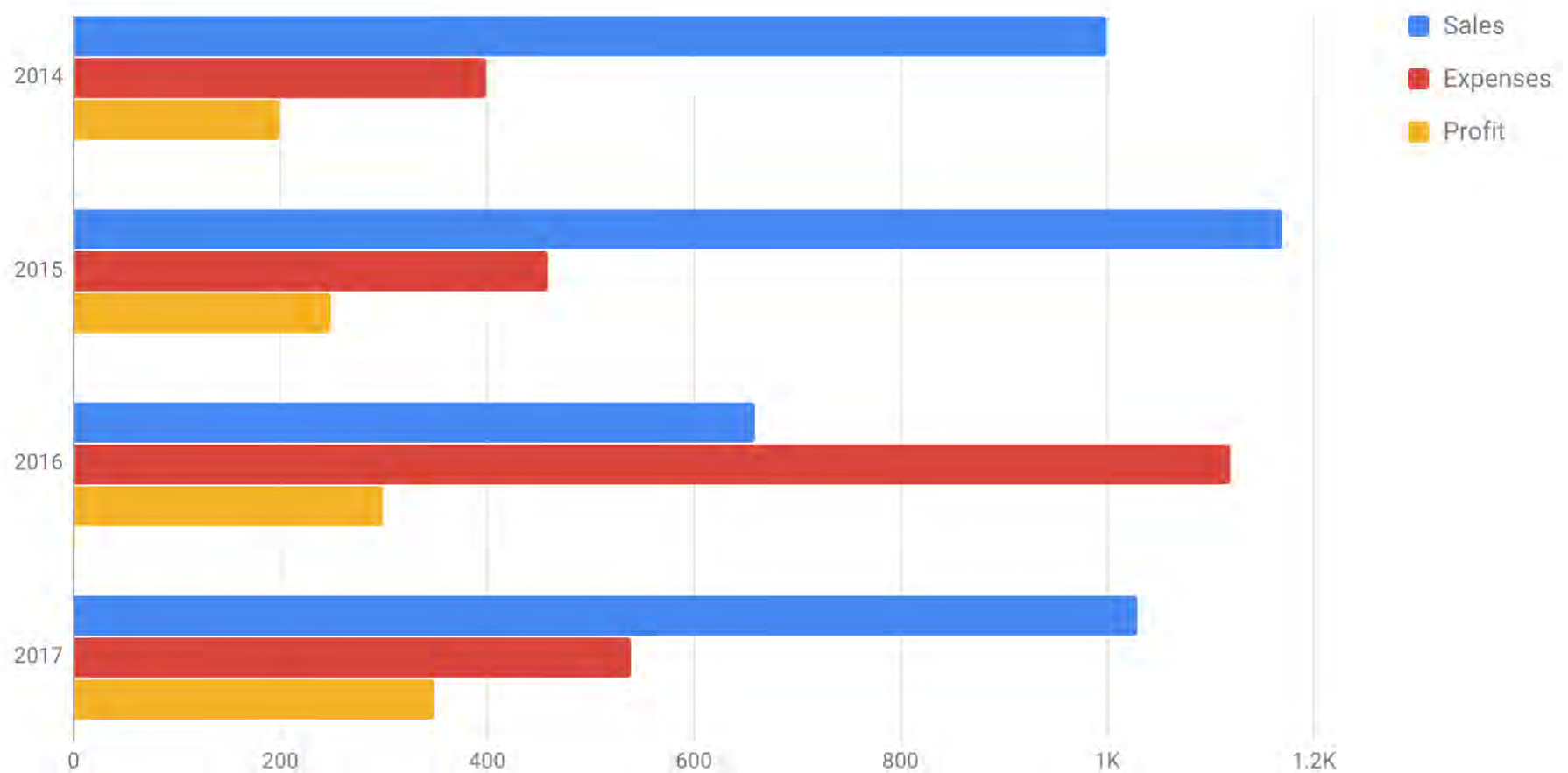


Balkendiagramm (Barchart)

<https://developers.google.com/chart/interactive/docs/gallery/barchart>

Company Performance

Sales, Expenses, and Profit: 2014-2017

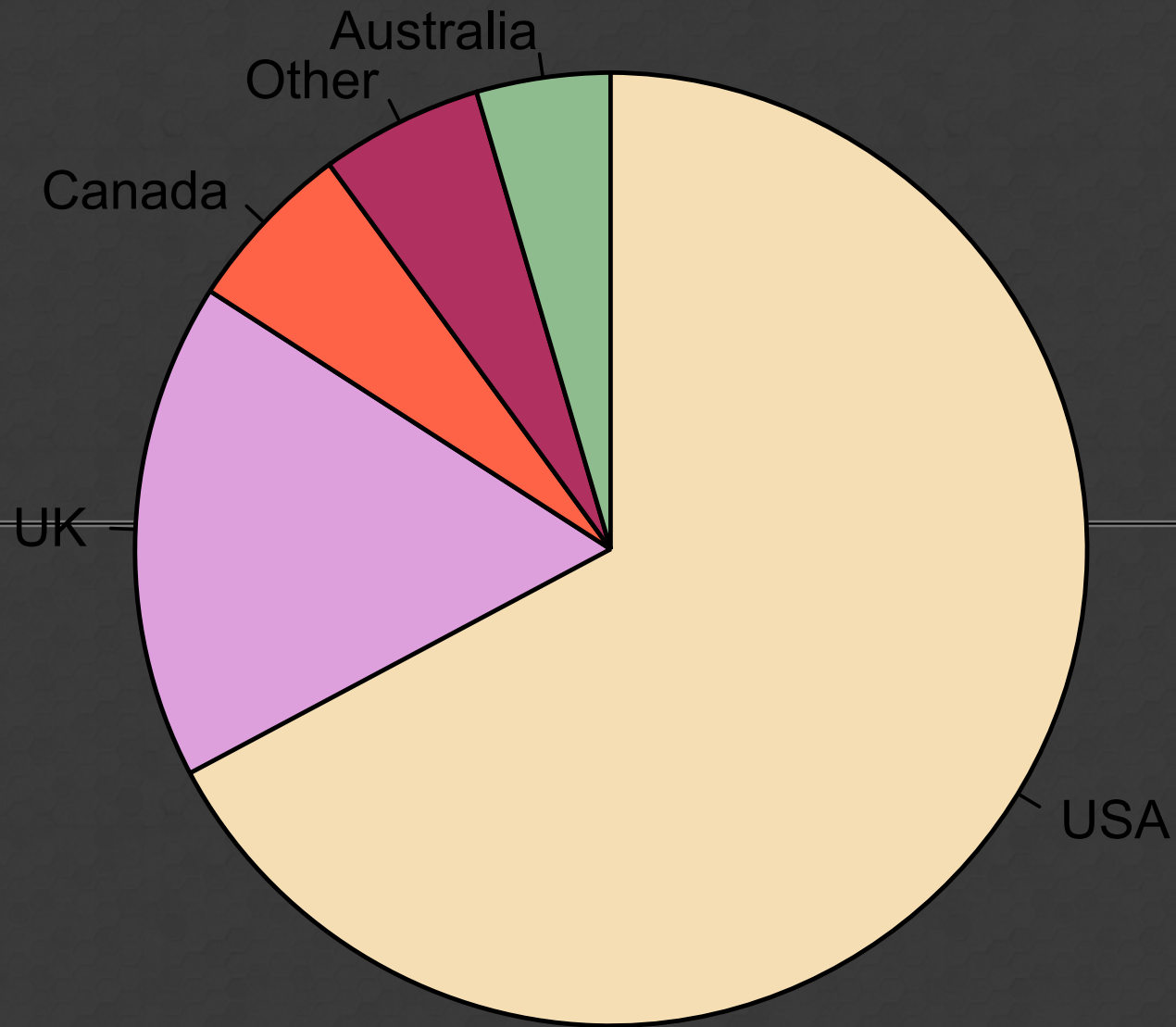


Gruppiertes Balkendiagramm (Grouped barchart)

<https://developers.google.com/chart/interactive/docs/gallery/barchart>

Balkendiagramme:

- Sehr leicht zu lesen!
- Verlässliche Vergleiche
- Eingeschränkt auf eine Dimension

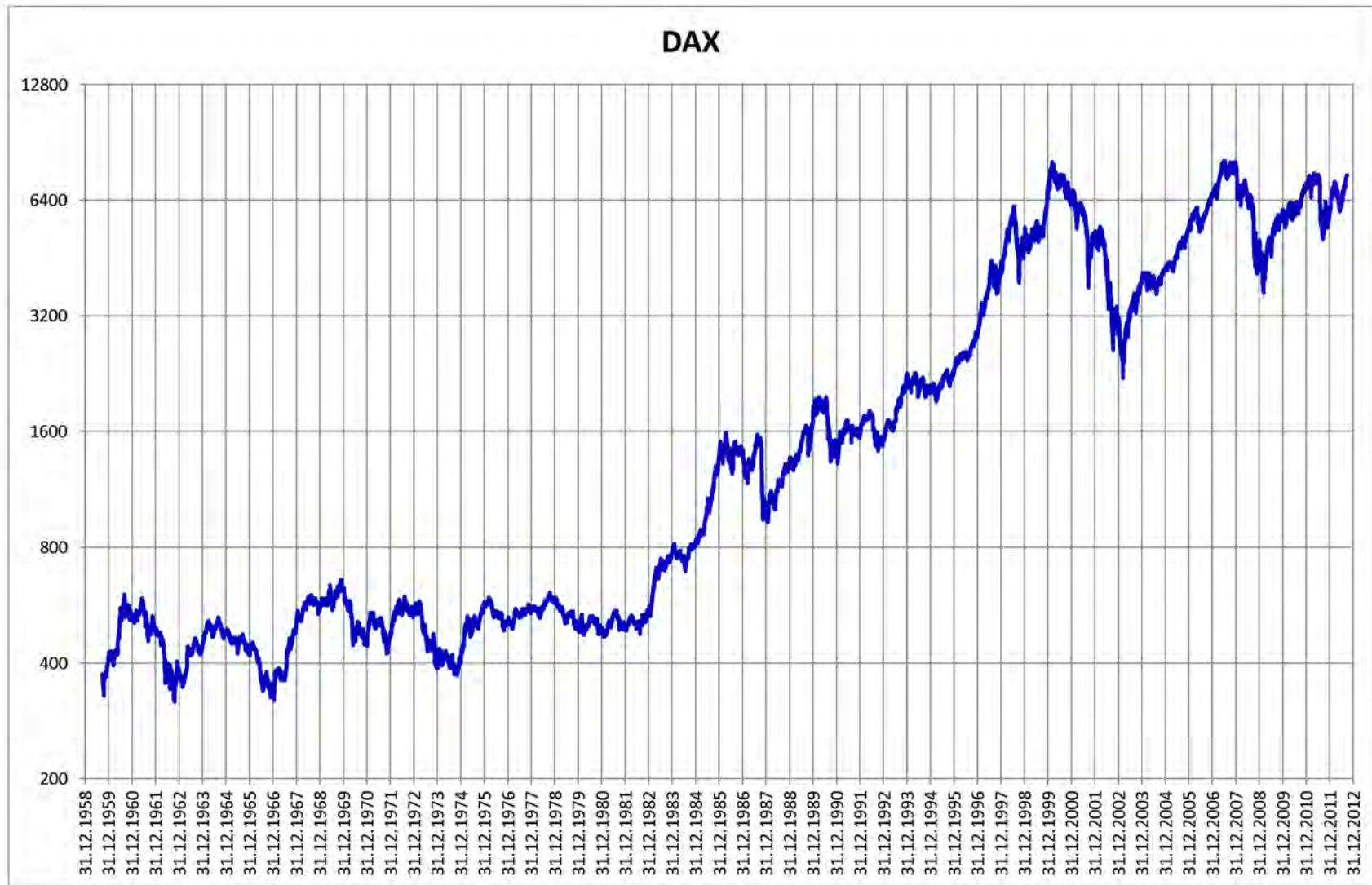


Kuchendiagramm (Piechart)

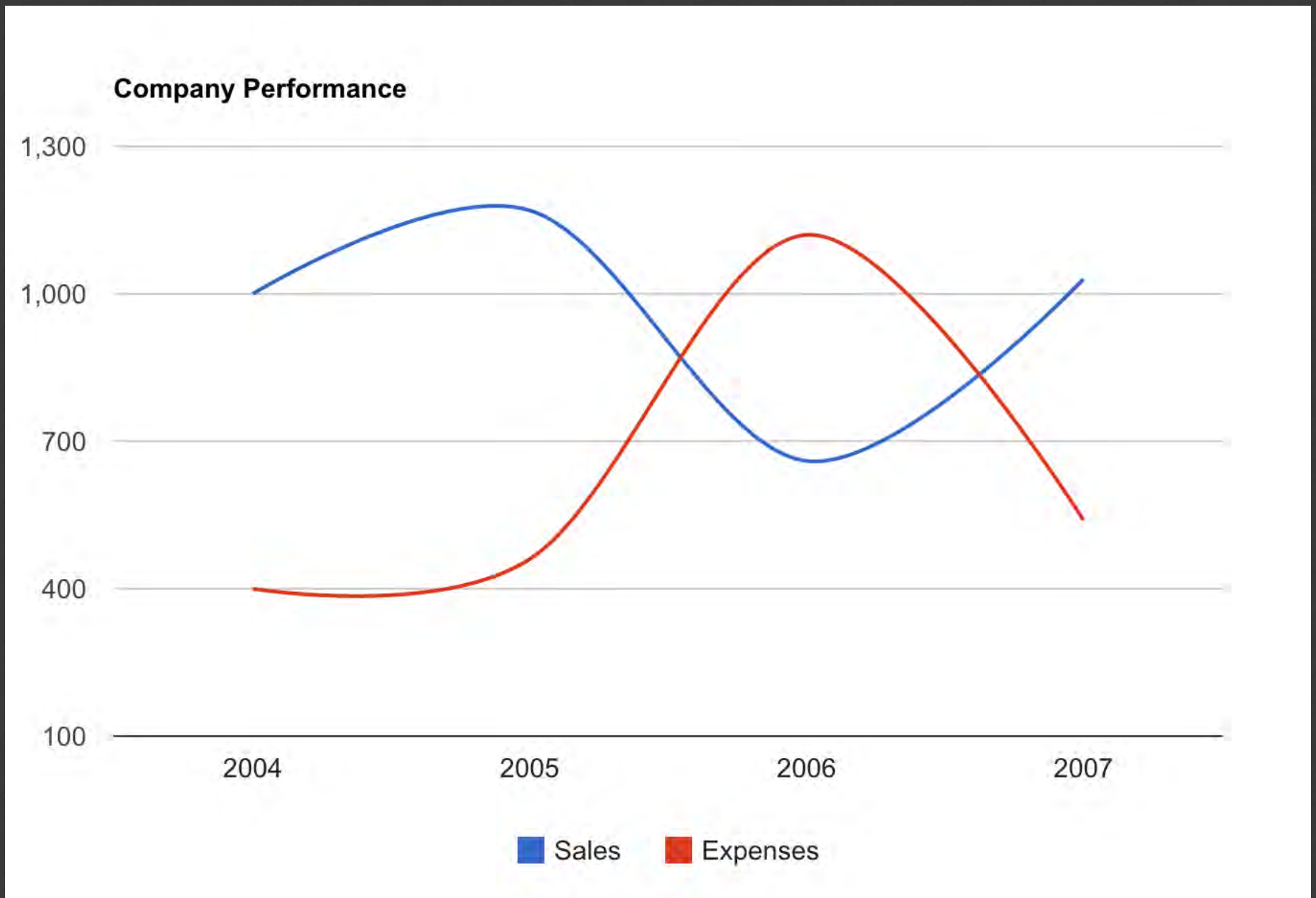
http://upload.wikimedia.org/wikipedia/commons/d/db/English_dialects1997.svg

Kuchendiagramme:

- **Vergleiche sind schwierig!**
- **Sehr viel Kritik**
- **Brauchbar, falls man einen Teil mit dem Ganzen vergleichen möchte**



Liniendiagramm (Linechart)

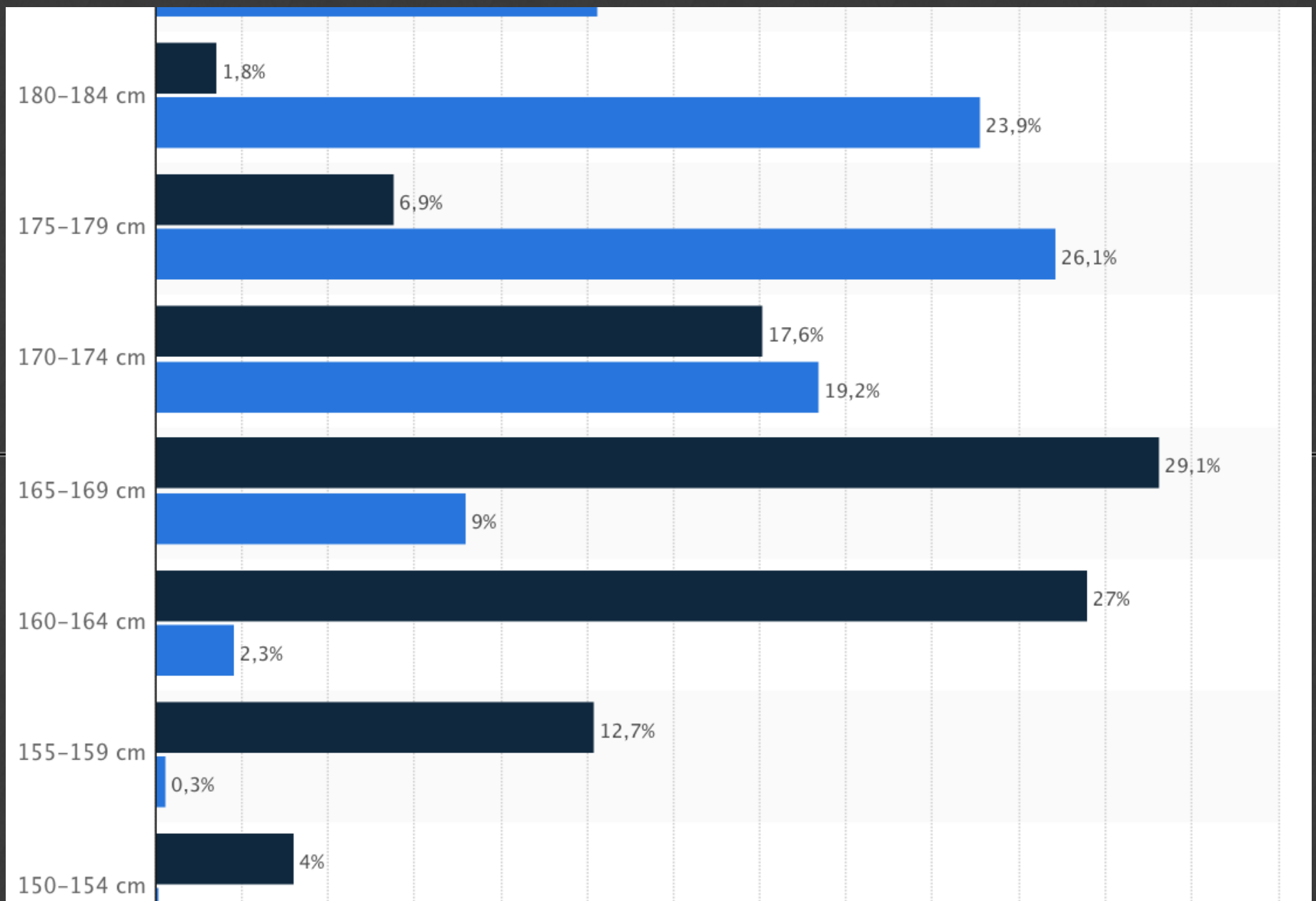


Gekrümmtes Liniendiagramm (Linechart)

<https://developers.google.com/chart/interactive/docs/gallery/linechart>

Liniendiagramme:

- Gut geeignet für zeitbasierte, kontinuierliche Daten
- Nicht verwenden, wenn keine Zusammenhang zwischen Werten besteht
- Linien können Eindruck von Werten verzerren



Histogramm (histogram)

Histogramme:

- Spezielle Form des Balkendiagramms, mit Stärken und Schwächen
- Hauptunterschied: Werte auf der Nicht-Balken-Achse sind mind. ordinal!

Siedlungsstrukturelle Raumtypen

Entwicklung auf den Gebietsstand nach der Gebietsreform in den neuen Bundesländern

Jahr: 1996

Graphie: M. Dörrbecker

Quelle: Bundesamt für Bauwesen und Raumordnung:
INKAR – Indikatoren und Karten zur Raum-
entwicklung. Bonn 1998

**Differenzierte
siedlungsstrukturelle
Regionstypen**

Agglomerationsräume

Verdichtete Räume

Ländliche Räume

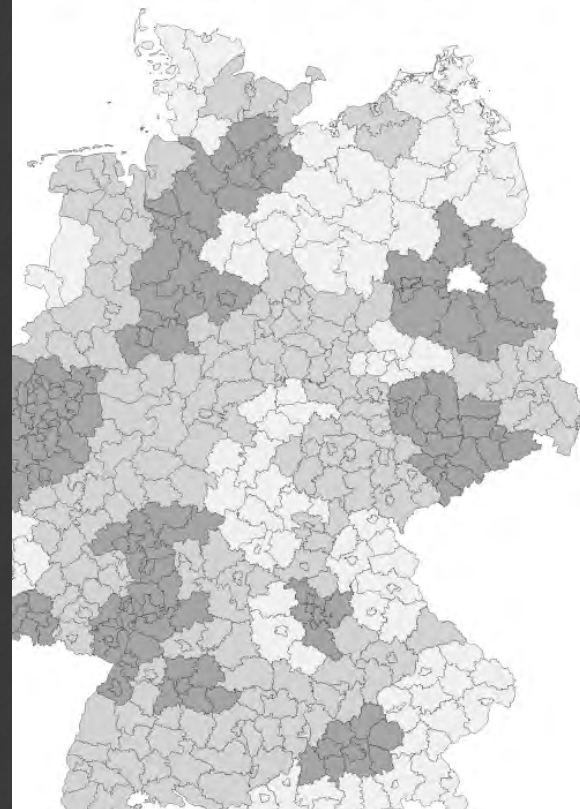
Kernstädte

Hochverdichtete
Kreise

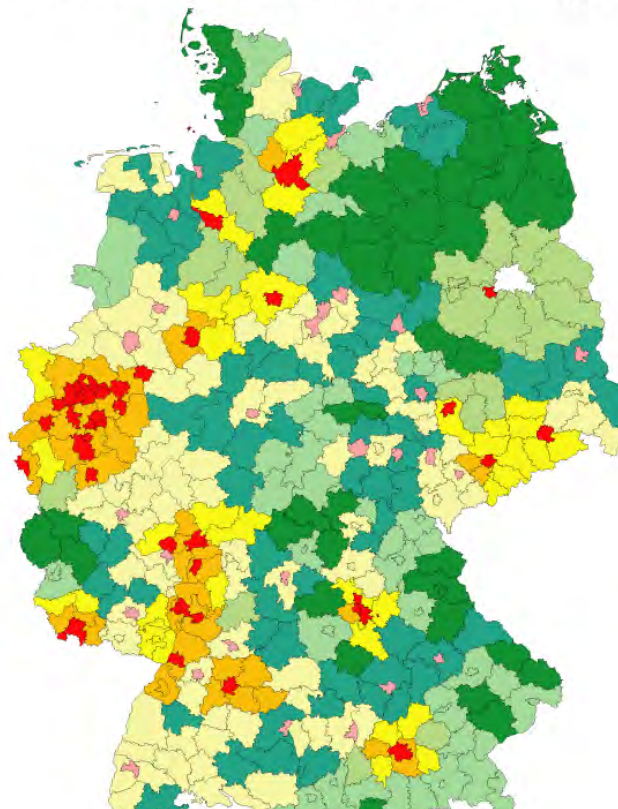
Verdichtete
Kreise

Ländliche Kreise
höherer
Dichte geringe
Dichte

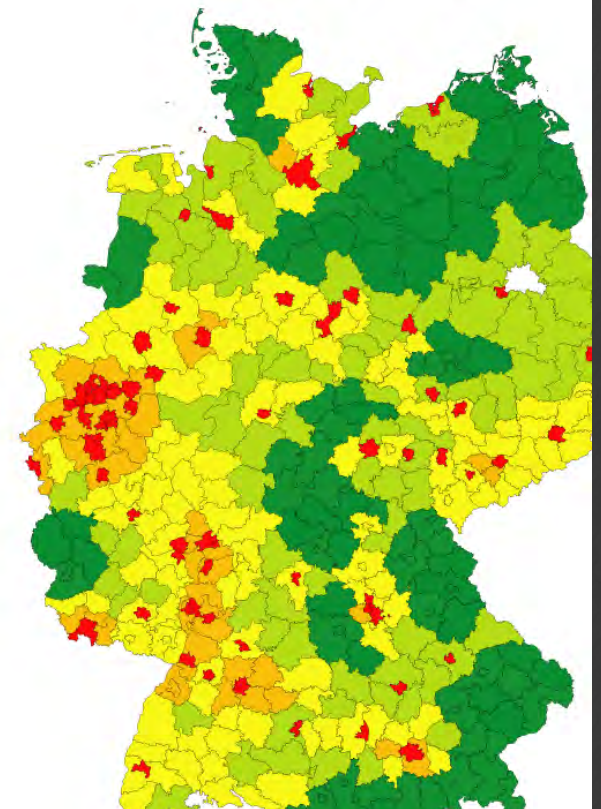
Differenzierte siedlungsstrukturelle Regionstypen



Kombination der differenzierten siedlungsstrukturellen
Regionstypen und der siedlungsstrukturellen Kreistypen



Siedlungsstrukturelle Kreistypen

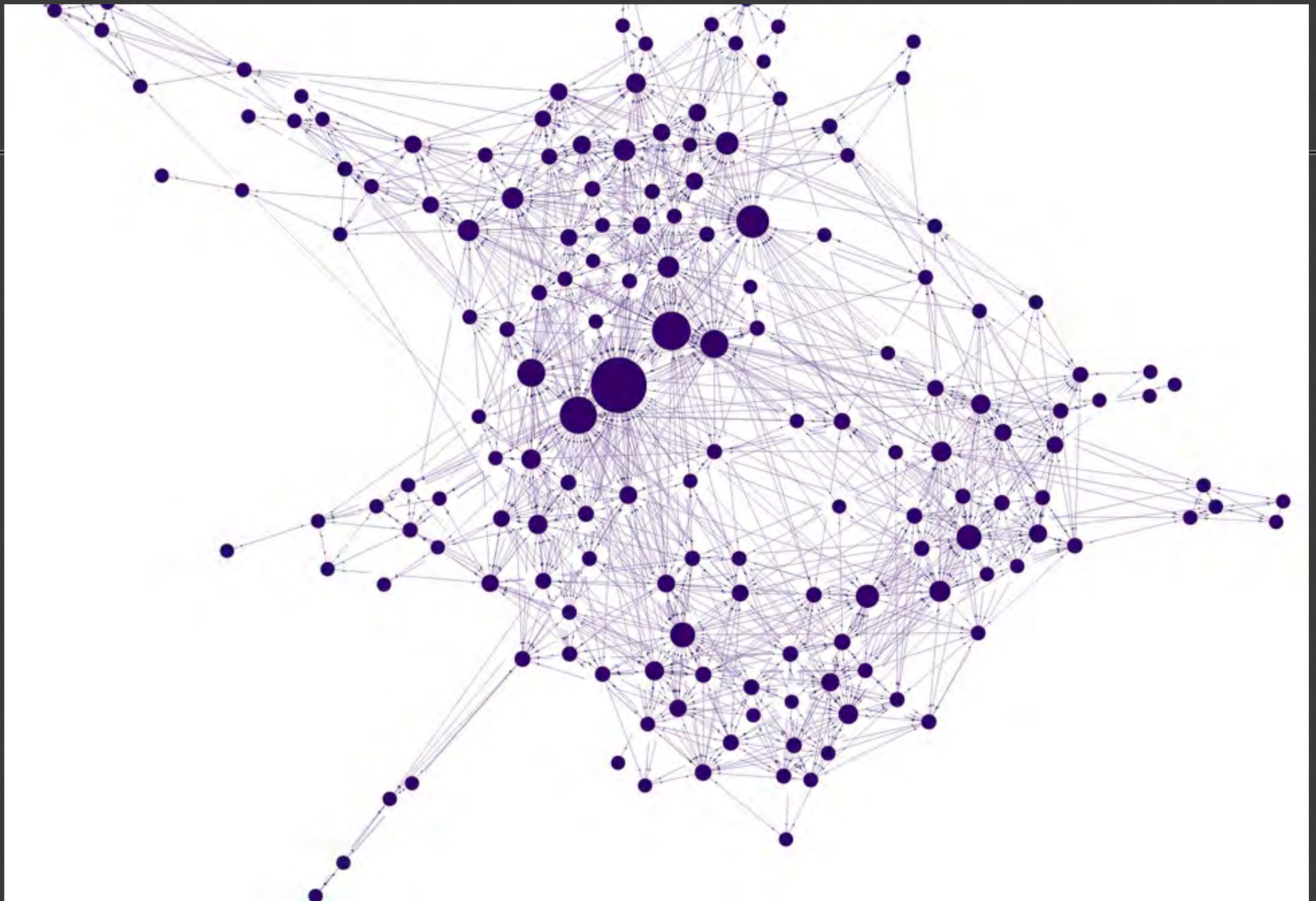


Choroplethenkarte (Choropleth Map)

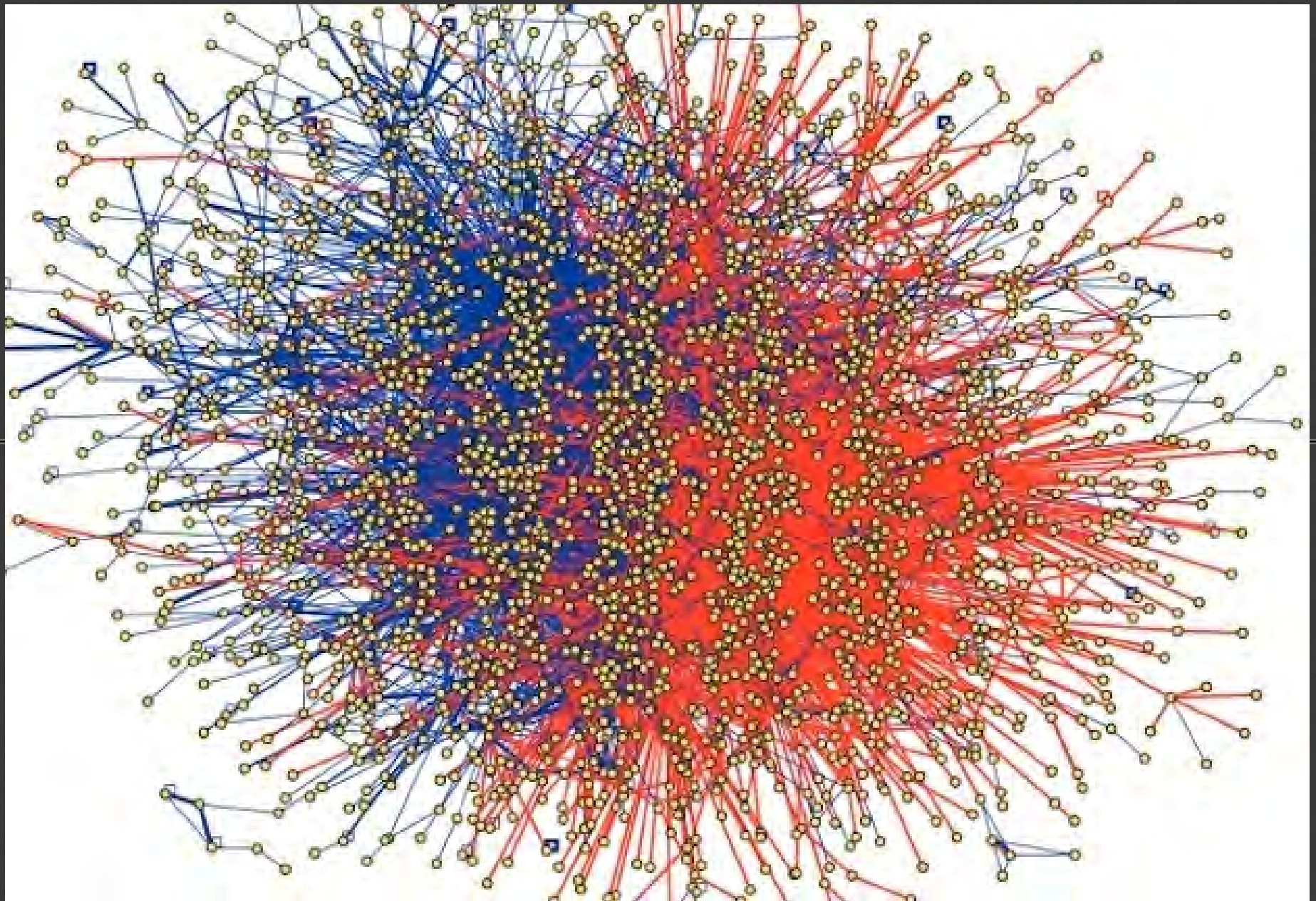
<http://commons.wikimedia.org/wiki/File:SiedlungsstrukturelleRaumtypen1996.png>

Choroplethenkarte:

- Schneller Überblick über geographische Verteilung
- Eingeschränkt bzgl. Anzahl der Kategorien



Node-Link Diagram



Node-Link Diagram - "Knäuel" (Hairball)

http://www.wired.com/wp-content/uploads/images_blogs/wiredscience/2013/11/bad_hairball.jpg

Node-Link-Diagram:

- Gut geeignet für Netzwerke
- Layout ist schwierig
- Hat die Angewohnheit, zu einem "Knäuel" zu degenerieren

Interaktion



Direct Manipulation

http://en.wikipedia.org/wiki/Ben_Shneiderman#/media/File:Ben_Shneiderman_at_UNCC.jpg

Eight Golden Rules of Interface Design: (Shneiderman)

- 1 Strive for consistency.
- 2 Enable frequent users to use shortcuts.
- 3 Offer informative feedback.
- 4 Design dialog to yield closure.
- 5 Offer simple error handling.
- 6 Permit easy reversal of actions.
- 7 Support internal locus of control.
- 8 Reduce short-term memory load.

Direct Manipulation (1983):

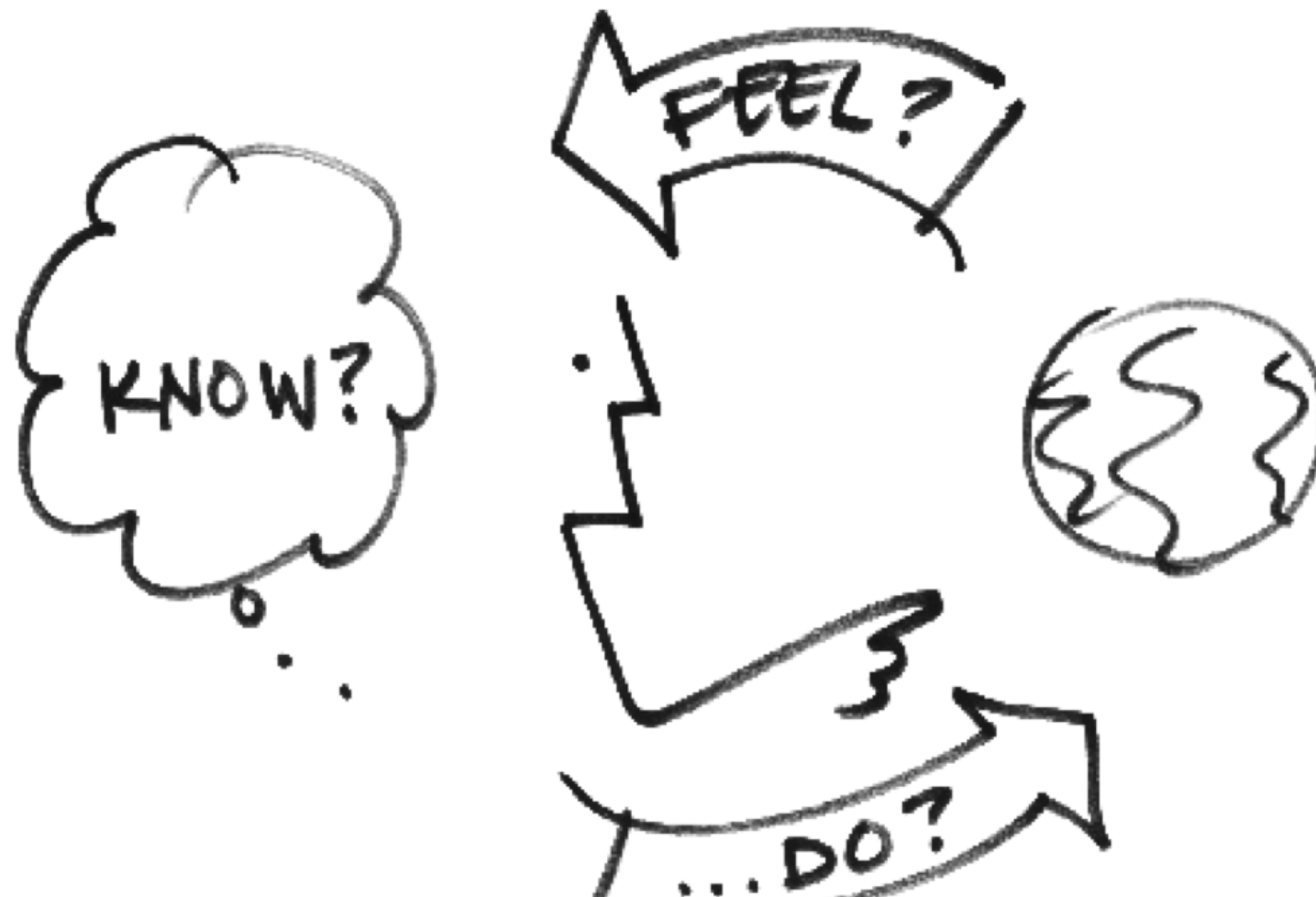
Zusammengefasst: Virtuelle Objekte verhalten sich wie reale Objekte und lassen sich ebenso manipulieren.

[Example Source on GitHub](#)

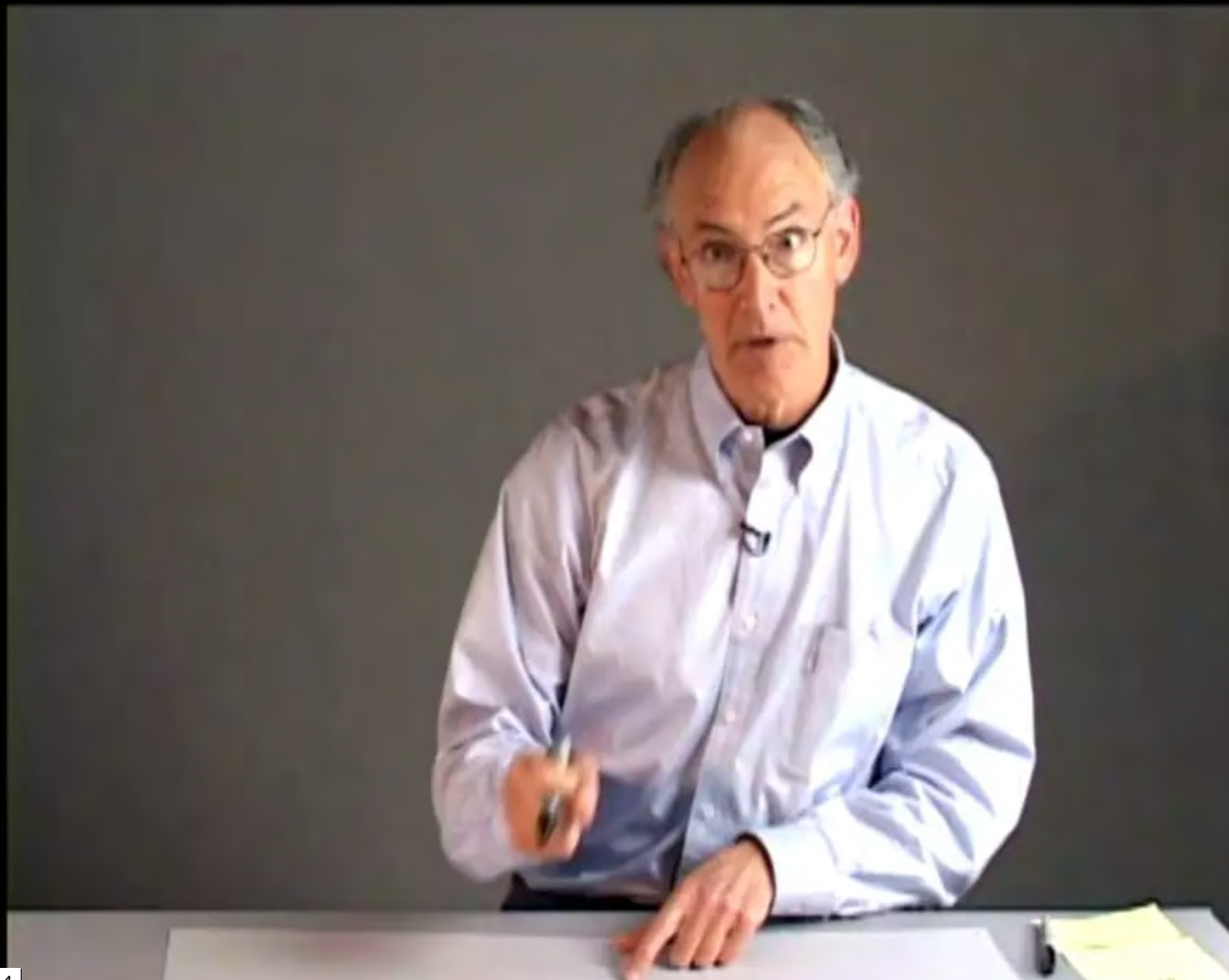


Bekanntestes Beispiel: Drag and drop

<http://marcojakob.github.io/dart-dnd/basic/web/>



Interaction Design



02:44



vimeo

Bill Verplank: Interaction Design

<https://player.vimeo.com/video/83683447?title=0&byline=0>

Card, Mackinlay, Shneiderman (1999)

"Information Visualization: The use of computer-generated, interactive, visual representations of data to amplify cognition."

Infovis-Mantra:

"Overview first, zoom and filter, details-on-demand"

Ben Shneiderman (1996)

Word Frequency Comparison Between the Bible and the Quran

654
OCCURRENCES
IN **572**
VERSES
31102
TOTAL VERSES

2.8%

OLD TESTAMENT

NEW TESTAMENT

1.8%

0.96%

Details-On-Demand

<http://www.pitchinteractive.com/bibleQuran>

The New York TimesThe New York Times

[The Upshot](#) | Where We Came From and Where We Went, State by State

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- [More](#)

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dominikus.baur

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0

Settings

Close search

search sponsored by

Search NYTimes.com

Clear this text input

Go

<http://nyti.ms/1mLu4bq>



1. 1.

[Grow and Give](#)

[Can Washington's Gift Economy in Marijuana Work?](#)



2.

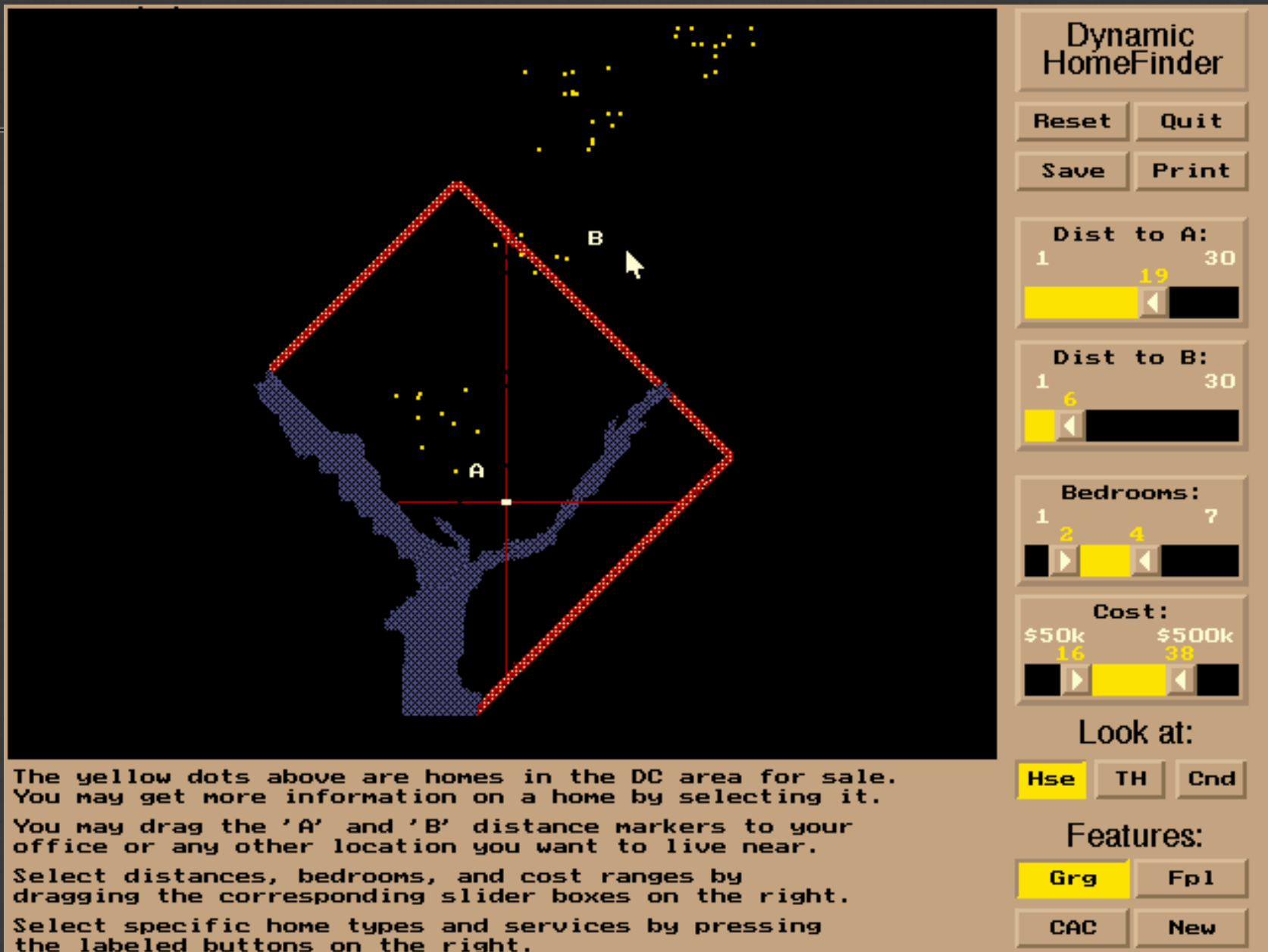
[Economic View](#)

Highlighting

http://www.nytimes.com/interactive/2014/08/13/upshot/where-people-in-each-state-were-born.html?_r=0

Dynamic Queries

Slider und Filter statt komplexer Datenbankabfragen.



Williamson, Shneiderman: HomeFinder (1992)

<http://www.sapdesignguild.org/goodies/controls/HomeFinder.htm>

Immobilienmarkt Süddeutsche.de

Immobilien finden

Immobilien anbieten

Service

login ▶

Immer aktuell - Neue Angebote per E-Mail erhalten:

Suche speichern

Wo? (Region)

Ich suche in...



Deutschland

+ zur Regionenauswahl

Was? (Freitext)

Ich suche nach...



Objektart

☒ Wohnung

☐ Haus

☐ Gewerbeobjekt

+ mehr

Miete (€)

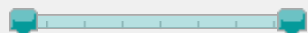
☐ Miete inkl. NK

☐ provisionsfrei



bis 1.600

Wohnfläche (m²)



bis

Zimmer



Wohnung in Deutschland mieten [1.729 Treffer]

Liste

Galerie

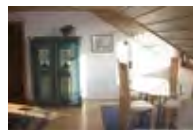
Karte

Sortierung:

Standard

Markierte Angebote:

merken



Große, möblierte 2-Zi.-DG-Whg. in ZFH mit...

22 90m², 2 Zimmer, Baujahr 1981

Dachterrassen- / DG-Wohnung, Kelheim (Lkr.), Rohr (Niederbayern)

550,00 €

zzgl. NK



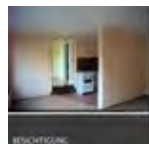
!==Für Singles==!

22 41m², 2 Zimmer, Baujahr 1936

Wohnung allgemein, Karlsruhe (Stadt)

500,00 €

zzgl. NK



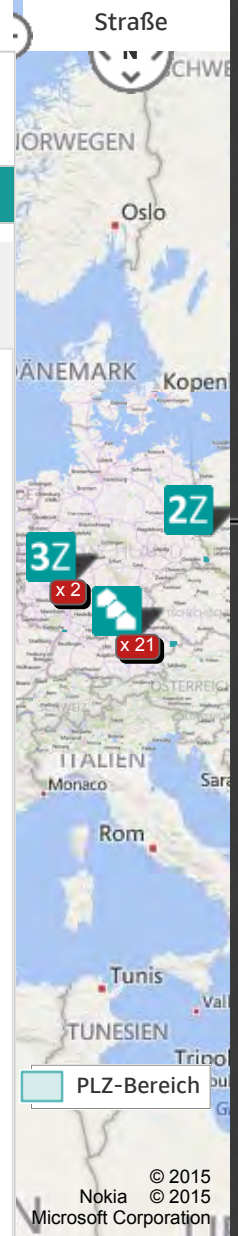
*ruhig gelegene Wohnung in Mitten der Sta...

22 61m², 2.5 Zimmer, Baujahr 1920

Wohnung allgemein, Görlitz (Lkr.)

279,00 €

zzgl. NK

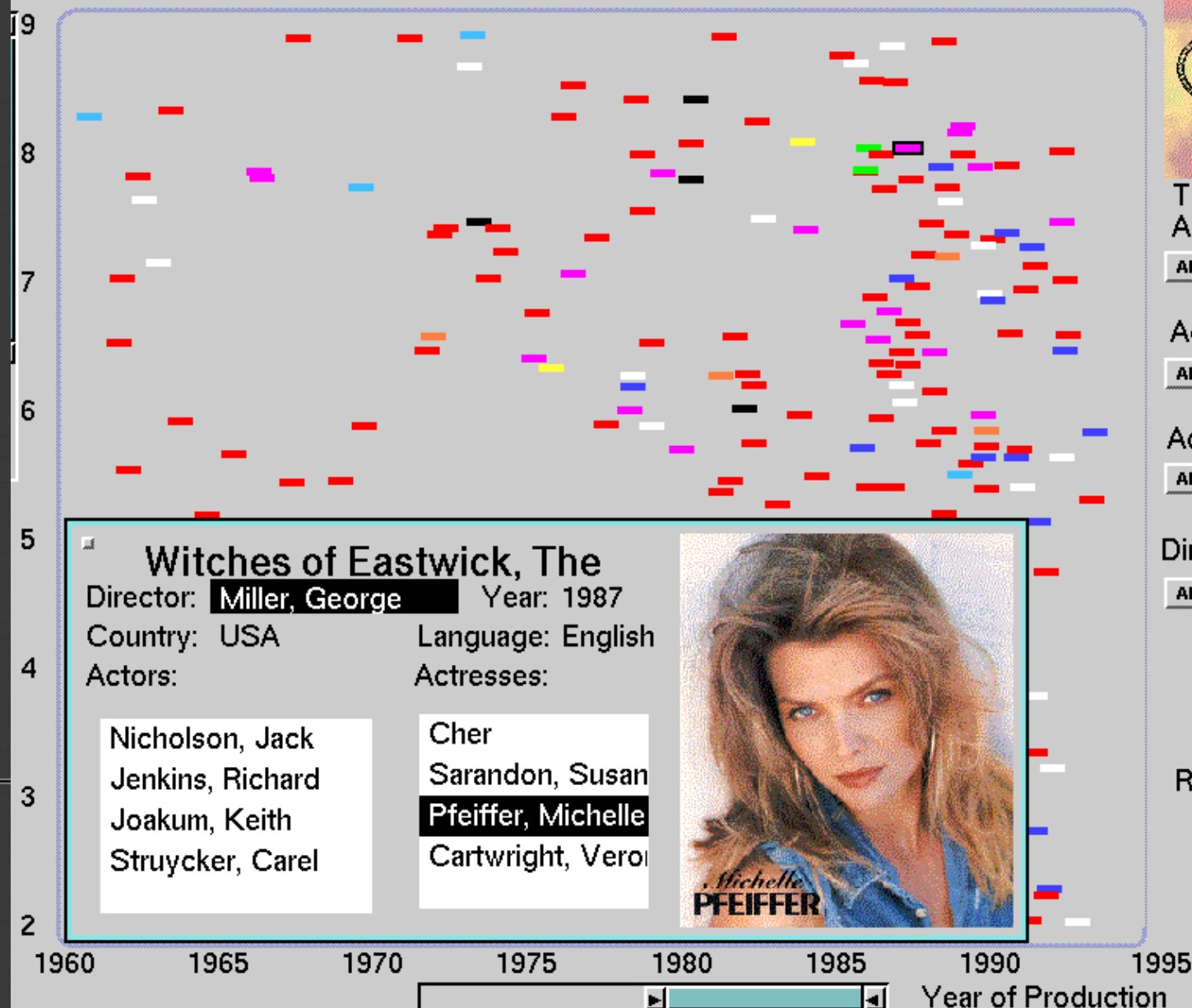


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Microsoft Corporation

ANZEIGE

http://immobilienmarkt.sueddeutsche.de/index.php?liste/home#&atype=a&ptype=M&cat=1&pTo=1.600®=DEU00000000001&offset=0&sort=default

popularity



Title :
ALL

ALL

AB C D F G H L M N P R S T W Z

Actor : ALL

ALL

AB C D F G H J K L M P R S T W Z

Actress : Pfeiffer, Michelle

ALL

AB C D F G H K L M P R S T W Z

Director : Miller, George

ALL

AB C D F G H J K L M P R S T W Z

105 Length 231

0 450

Ratings ☐ G ☐ PG
☐ PG-13 ☒ R

Films Shown: 210



Copyright (C) 1993 HCIL

Shneiderman, Ahlberg: FilmFinder (1994)

<http://www.sapdesignguild.org/goodies/controls/FilmFinder.htm>

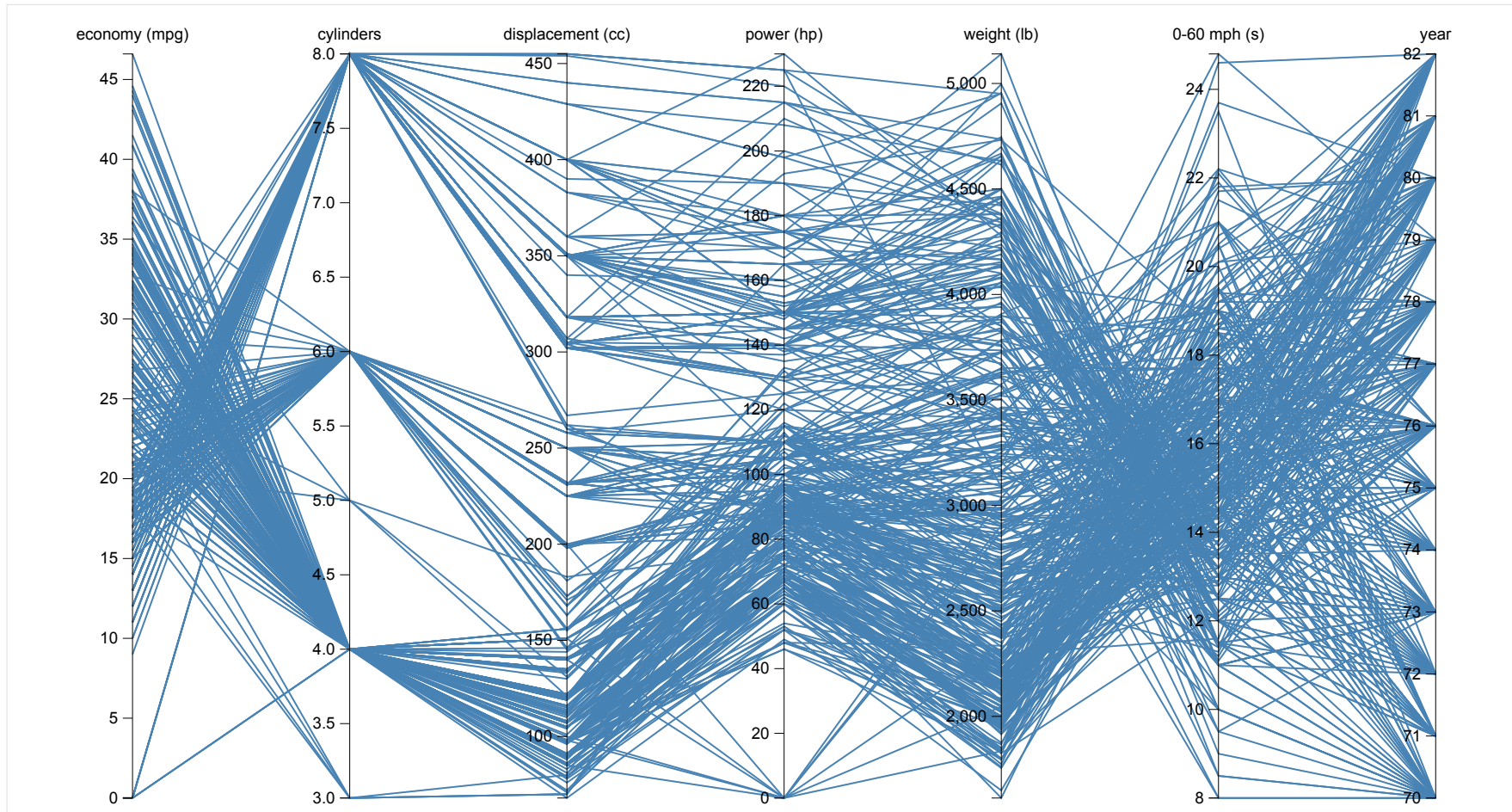
Brushing and Linking

Interaktive Verknüpfung mehrerer Ansichten

"Brushing": Highlighting eines Ausschnitts der Daten

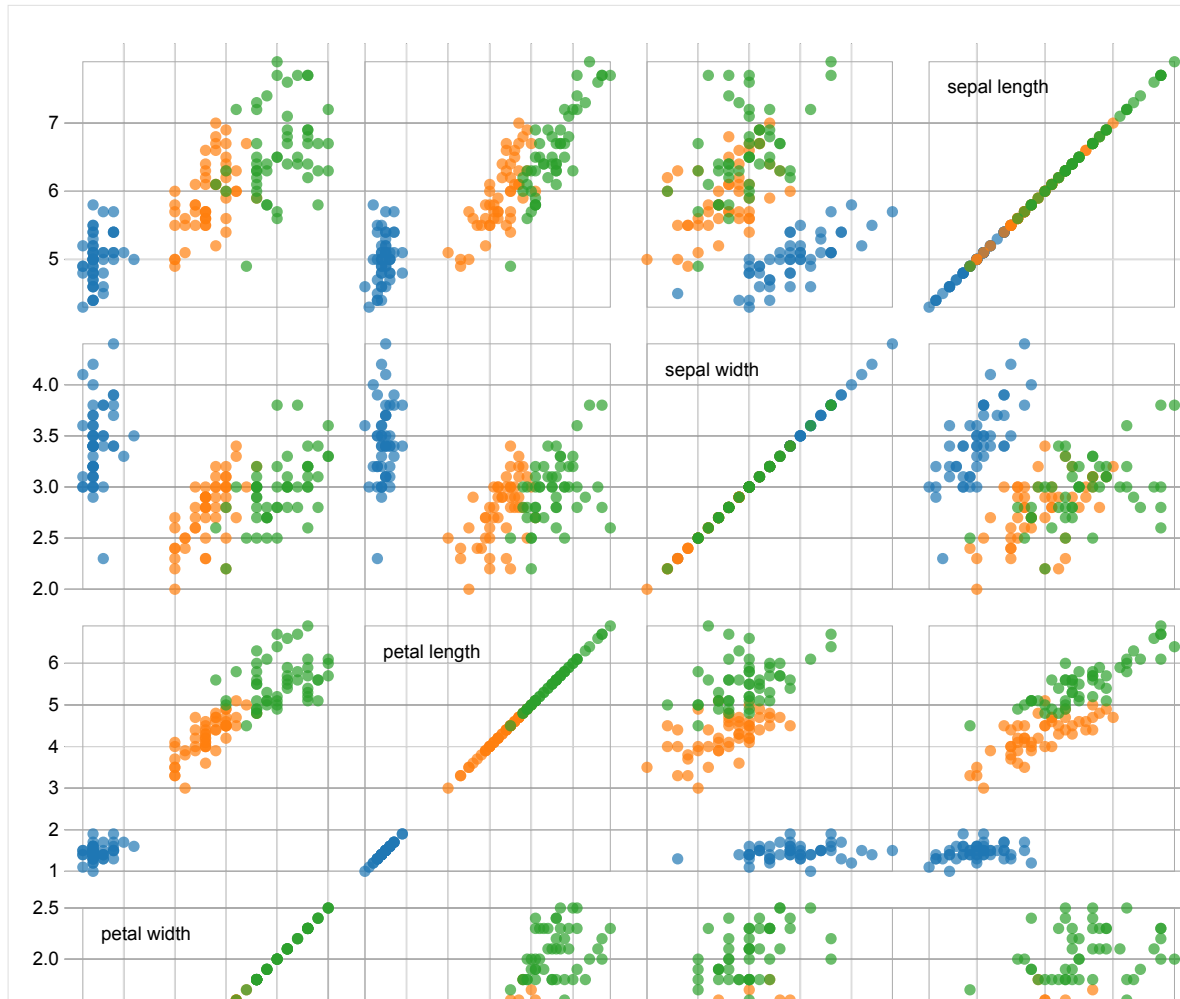
"Linking": Gleichzeitiges Hervorheben in anderen Ansichten

Parallel Coordinates



Brushing and Linking: Parallel Coordinates

Scatterplot Matrix Brushing



Brushing and Linking: Scatterplot Matrix

Nutrient Contents – Parallel Coordinates

Hide Ticks

Dark

Shadows

Opacity: 20%

An interactive visualization of the [USDA Nutrient Database](#). For information on parallel coordinates, read this [tutorial](#).

Per 100g of Food

Selected 1153 rows

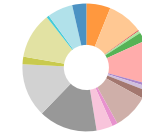
Keep

Remove

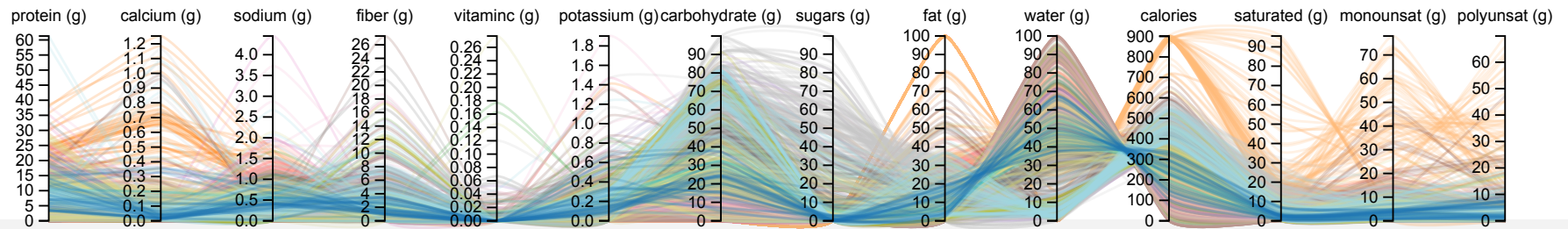
Export

Group Breakdown

Total Selected



- Dairy and Egg Products
- Fats and Oils
- Poultry Products
- Soups, Sauces, and Gravies
- Vegetables and Vegetable Products
- Sausages and Luncheon Meats
- Breakfast Cereals
- Fruits and Fruit Juices
- Nut and Seed Products
- Beverages
- Finfish and Shellfish Products
- Legumes and Legume Products
- Baked Products
- Sweets
- Cereal Grains and Pasta
- Fast Foods
- Meals, Entrees, and Sidedishes
- Snacks
- Restaurant Foods



name
group
protein (g)
calcium (g)
sodium (g)
fiber (g)
vitamin c (g)
potassium (g)
carbohydrate (g)
sugars (g)
fat (g)

Brushing and Linking: Mehrere Ansichten

<http://exposedata.com/parallel/>

Wozu Interaktion?

Unterstützung zum Lösen von Aufgaben!

Wozu visualisieren?

1. Aufzeichnen
2. Analysieren
3. Kommunizieren

128.54 ▲0.00 (0.00%)

Pre-market: 128.89 ▲0.35 (0.27%)

1 day

5 day

1 month

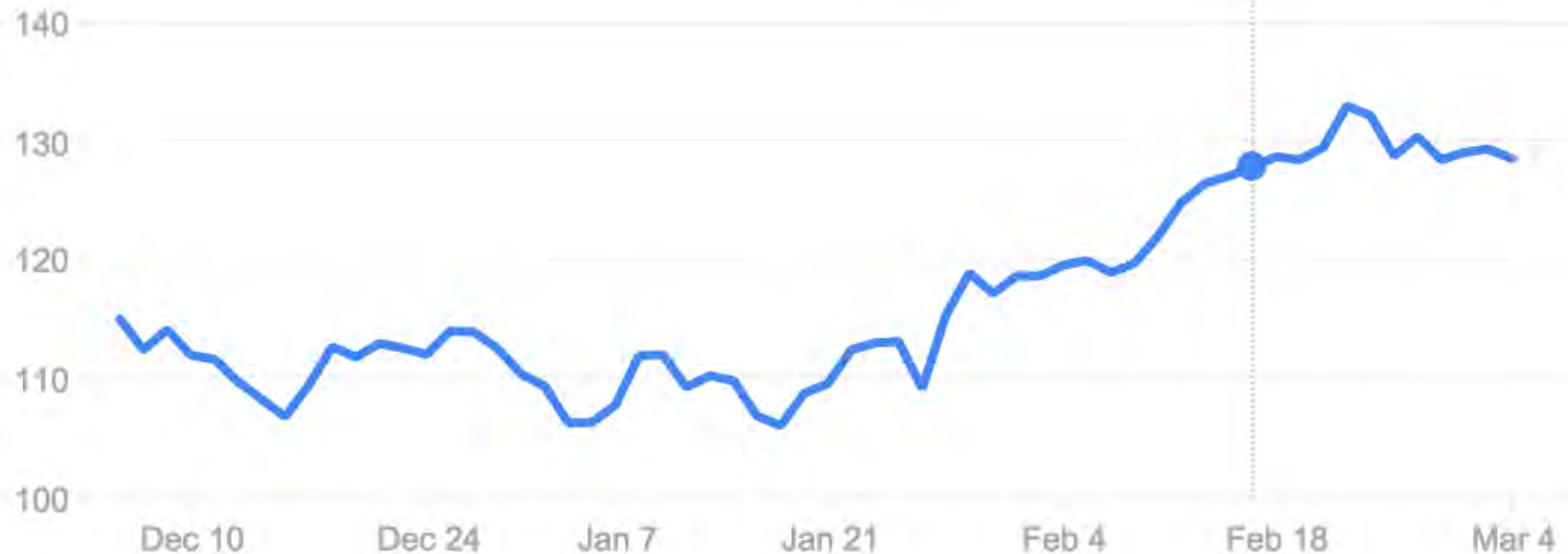
3 months

1 year

5 years

max

127.83 Feb 17, 2015



Open

-

Market cap

748.71B

High

-

P/E ratio (ttm)

17.32

Welche Fragen kann ich hiermit beantworten?

Analyseprozess:

Werte suchen

dann

Ablesen (ein Wert)

oder

Vergleichen (mehrere Werte)

oder

Zusammenfassen (viele Werte)

Was will ich finden?

Trends

Ausreißer

Bestimmte Muster (je nach Daten)

Attribute

1. Ein Attribut

Verteilung

Extremwerte

2. Viele Attribute

Korrelation

Ähnlichkeit

Viele Visualisierungsaufgaben lassen sich rein visuell lösen!
(durch simples Lesen)

[illegible]

Reebee Garofalo: Genealogy of Pop/Rock Music (1978)

Interaktion nutzt die Flexibilität des Computers um das Visuelle zu ergänzen.

Verfügbare Interaktionen hängen stark von der gewählten Visualisierungstechnik ab!

Case Study: OECD Regional Well-Being

OECD Regional Well-Being

Datenset:

- **362 OECD Regionen**

Country	Territorial level 2 (number of regions)
Australia	States/territories (8)
Austria	Bundesländer (9)
Belgium	Régions (3)
Canada	Provinces and territories (13)
Chile	Regions (15)
Czech Republic	Oblasti (8)
Denmark	Regioner (5)
Estonia	Region (1)
Finland	Suuralueet (5)
France	Régions (22)
Germany	Länder (16)
Greece	Groups of development regions (4)

OECD Regional Well-Being

• jeweils 9 "Well-Being" Aspekte

	Topics	Indicators
Material conditions	Income	♦ Household disposable income per capita (in real USD PPP)
	Jobs	♦ Employment rate (%) ♦ Unemployment rate (%)
	Housing	♦ Number of rooms per person (ratio)
Quality of life	Health	♦ Life expectancy at birth (years) ♦ Age adjusted mortality rate (per 1 000 people)
	Education	♦ Share of labour force with at least secondary education (%)
	Environment	♦ Estimated average exposure to air pollution in PM2.5 (µg/m³), based on satellite imagery data, 2012
	Safety	♦ Homicide rate (per 100 000 people)
	Civic engagement	♦ Voter turnout (%)
	Accessibility of services	♦ Share of households with broadband access (%)

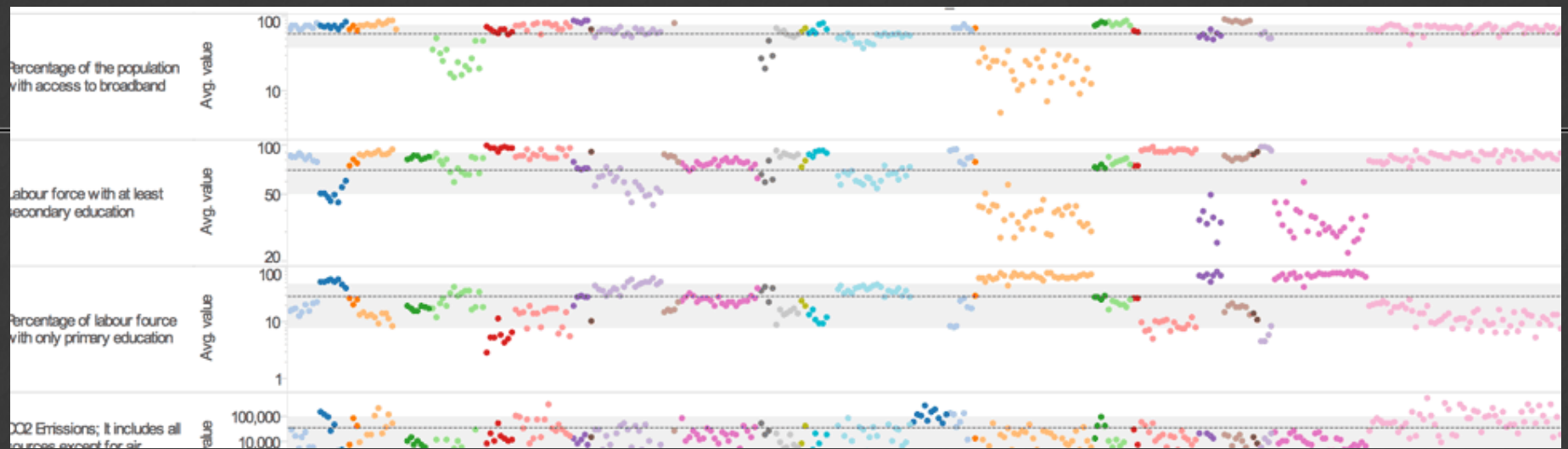
OECD Regional Well-Being

Datenset:

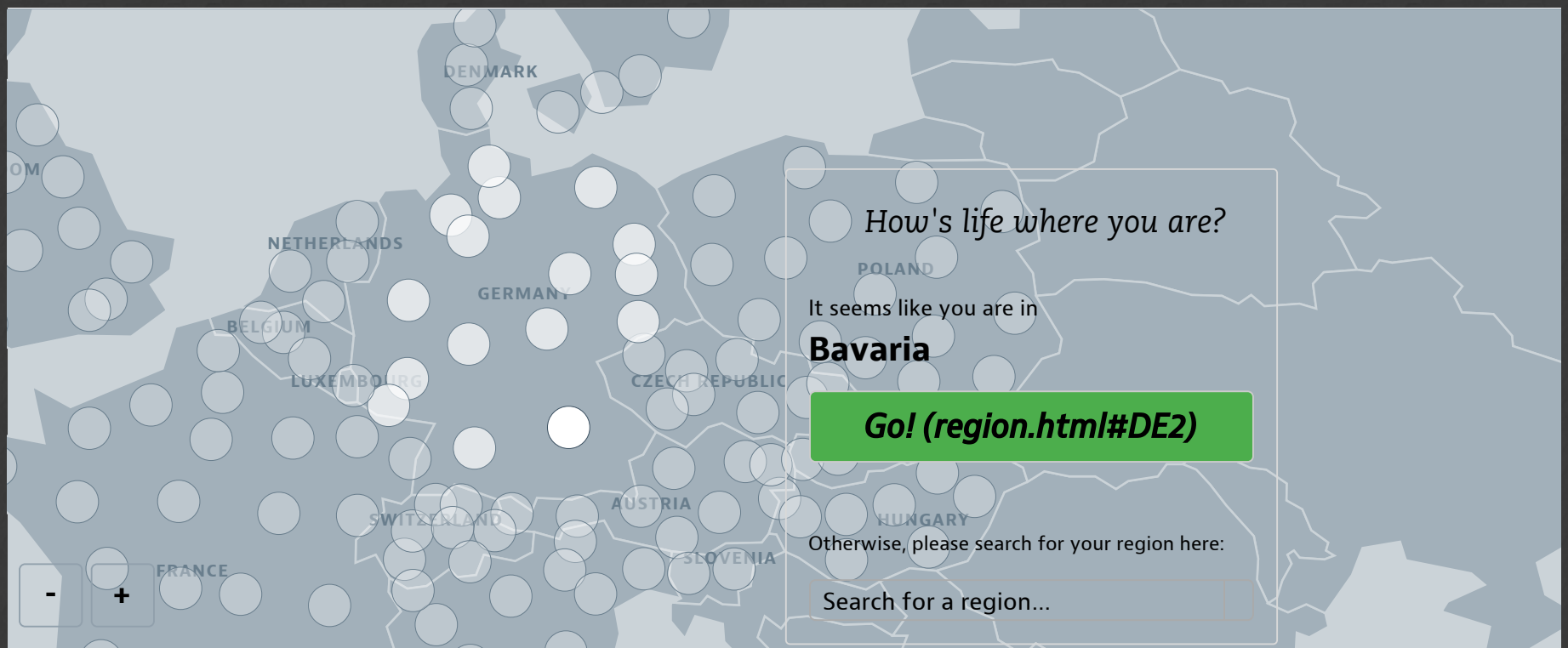
- **362 OECD Regionen**
- **jeweils 9 "Well-Being" Aspekte**

(Einkommen, Beruf, Wohnen, Gesundheit, Bildung, Umwelt, Sicherheit, Ziviles Engagement, Infrastruktur)

Aufgaben?



RWB: Data analysis



OECD Regional Well-Being: A Closer Measure of Life

How does your region perform when it comes to education, environment, safety and other topics important to your well-being? This interactive site allows you to measure well-being in your region and compare it with 362 other OECD regions based on nine topics central to the quality of our lives.

📄 User's guide to OECD regional well-being (<assets/downloads/Regional-Well-Being-User-Guide.pdf>)

🔗 Learn more about OECD Regional Well-Being (<http://www.oecd.org/regional/how-is-life-in-your->

Interaktionskat egorien

Interaktionskategorien

- **Daten/Ansicht bestimmen**
- **Ansicht verändern**
- **Dokumentation**

**Daten/Ansicht
bestimmen**

The New York Times

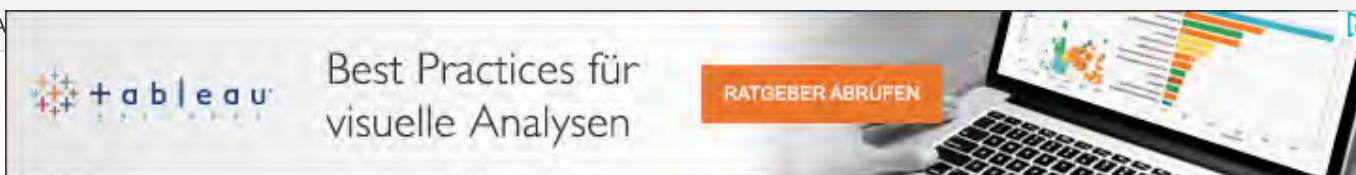
U.S.

Search All NYTimes.com

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WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION ARTS STYLE TRAVEL JOBS REAL ESTATE AUTOS

POLITICS EDUCATION



UPDATED August 31, 2011

TWITTER LINKEDIN SHARE

Flooding, Power Failures, Rainfall and Damage From Hurricane Irene

Hurricane Irene caused widespread flooding and power failures. More than 5.8 million customers lost electricity. [Related Article »](#)

SCROLL TO LOCATION:

New England

New York

New Jersey-Pennsylvania

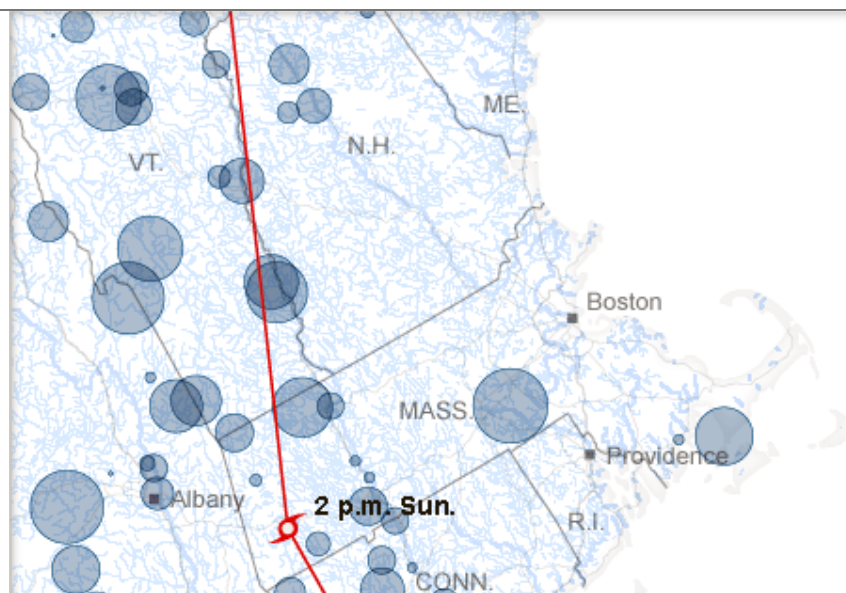
Maryland-Delaware-Washington

Virginia

North Carolina

CHANGE MAP TO SHOW:

- ☒ River gauges where buildings and roads have flooded. Circles represent the percentage above



New England Rivers flooded by heavy rainfall swept through many Vermont towns, washing away roads and forcing emergency evacuations. Several homes collapsed in flood waters along the Connecticut shore, where residents had been ordered to evacuate. Major flooding was also reported in New Hampshire and western Massachusetts. Boston shut down its public transit.

Daten/Ansicht bestimmen: (1) Visualisieren

<http://www.nytimes.com/interactive/2011/08/27/us/preparations-for-hurricane-irene-and-reports-of-damage.html>

RAW

(<http://raw.densitydesign.org>)

[FEATURES \(HTTP://RAW.DENSITYDESIGN.ORG/FEATURES/\)](http://raw.densitydesign.org/features/)

[HOW IT WORKS \(HTTP://RAW.DENSITYDESIGN.ORG/HOW-IT-WORKS/\)](http://raw.densitydesign.org/how-it-works/)

[FAQS \(HTTPS://GITHUB.COM/DENSITYDESIGN/RAW/WIKI/FAQS\)](https://github.com/densitydesign/raw/wiki/faqs)

[TEAM \(HTTP://RAW.DENSITYDESIGN.ORG/TEAM/\)](http://raw.densitydesign.org/team/)

[API REFERENCE \(HTTPS://GITHUB.COM/DENSITYDESIGN/RAW/WIKI/API-REFERENCE\)](https://github.com/densitydesign/raw/wiki/api-reference)

[GITHUB \(HTTPS://GITHUB.COM/DENSITYDESIGN/RAW/\)](https://github.com/densitydesign/raw/)

RAW

The missing link between
spreadsheets and vector graphics.

USE IT NOW!

([HTTP://APP.RAW.DENSITYDESIGN.ORG/#/](http://app.raw.densitydesign.org/#/))

FORK ME ON GITHUB

([HTTPS://GITHUB.COM/DENSITYDESIGN/RAW/](https://github.com/densitydesign/raw/))

Daten/Ansicht bestimmen: (1) Visualisieren

<http://raw.densitydesign.org/>

Daten/Ansicht bestimmen: (2) Daten filtern

<https://www.google.com/hotelfinder/#search;l=New+York+City,+NY;d=2015-03-27;n=4;usd=1;si=8fb02437;av=r>

The New York Times

N.Y. / Region

Search All NYTimes.com

Go

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION ARTS STYLE TRAVEL JOBS REAL ESTATE AUTOS

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AdChoices

Published: June 17, 2011

How Many Households Are Like Yours?

Explore different types of American households and see how they have changed over time. [Related Article »](#)

Single
male
Single
female
Married
couple
Male/female
unmarried partners
Male
unmarried partners
Female
unmarried partners



Daten/Ansicht bestimmen: (2) Daten filtern

<http://www.nytimes.com/interactive/2011/06/19/nyregion/how-many-households-are-like-yours.html>

Daten/Ansicht bestimmen: (3) Sortieren

<http://kungfu.herokuapp.com/index.html>

Major Canadian City Crime Stats 1998-2011

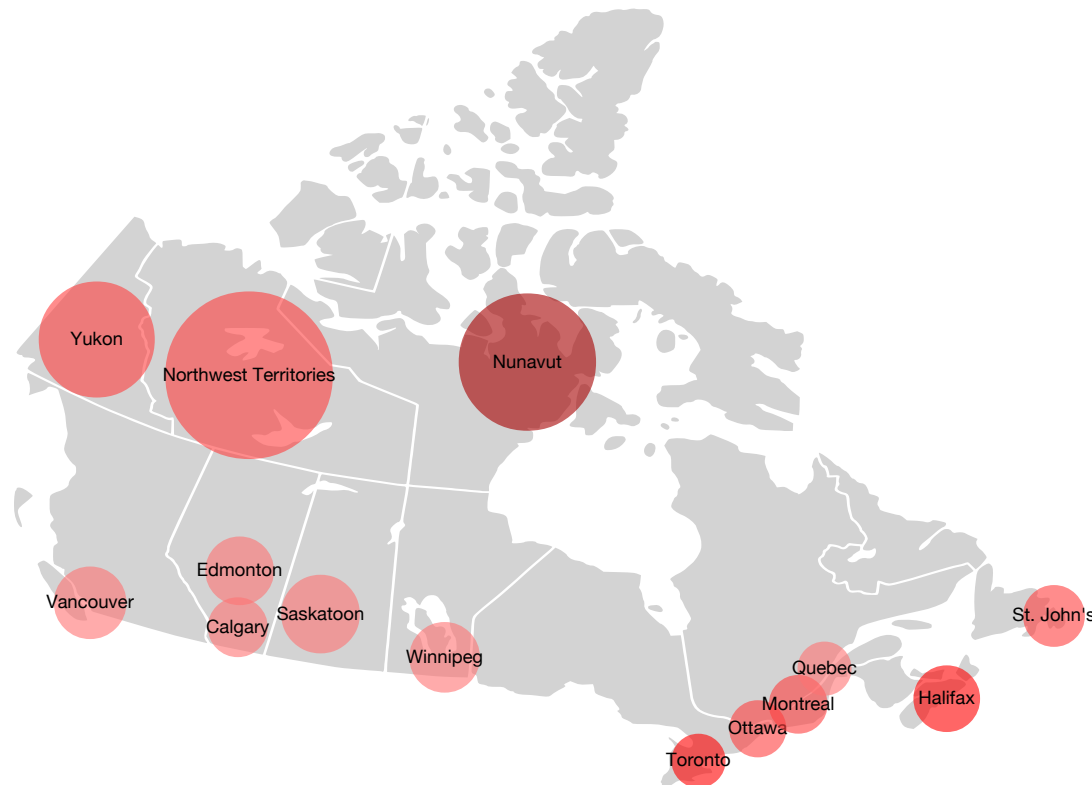
Fork me on GitHub

This is a [dc.js](#) example demonstrating crime rate differences among major Canadian cities. This visualization reveals overall crime rate, including violent and non-violent crime, have been in decline among most of the major cities in Canada. This particular example utilizes a bubble overlay chart with a custom svg map to generate flexible geographic data visualization combined with other dc.js charts.

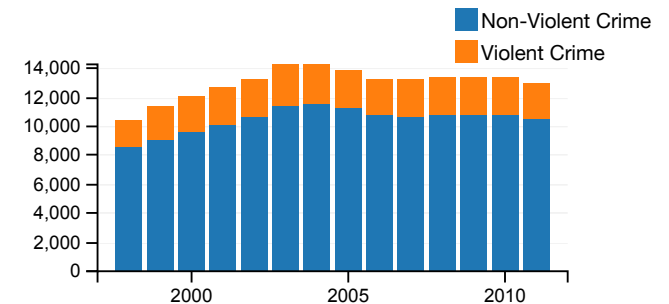
Public data source [Open Data Canada](#).

Crime Rate by City

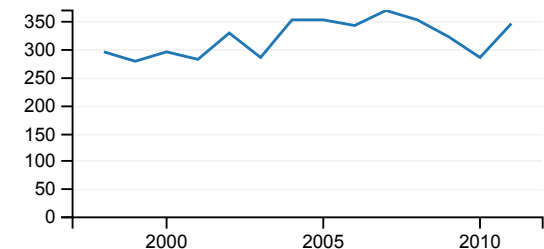
radius total crime rate per 100k population
color violent/non-violent crime ratio



Crime Per 100K Population by Year



Homicide Incidents by Year

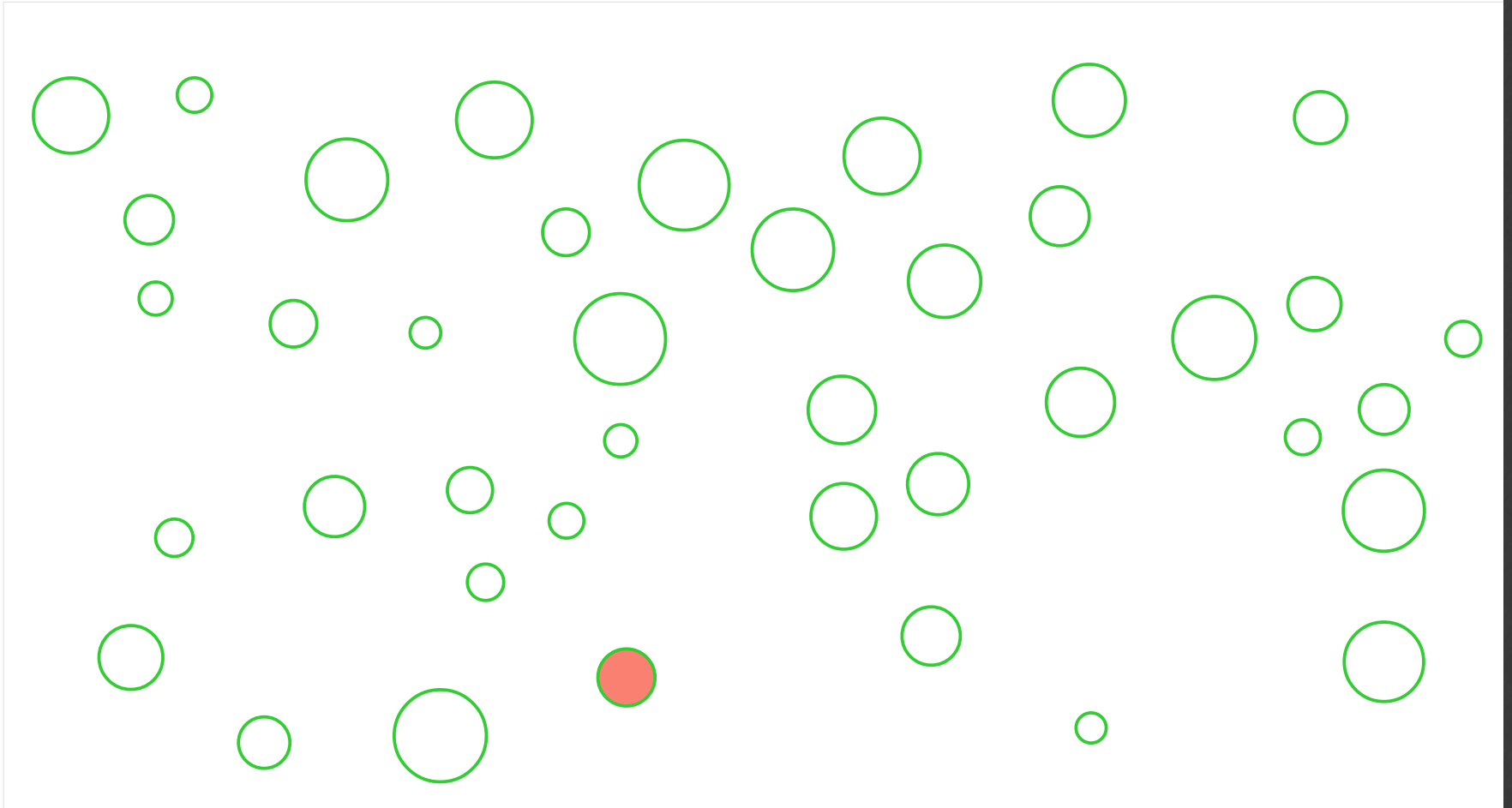


Daten/Ansicht bestimmen: (4) Werte ableiten

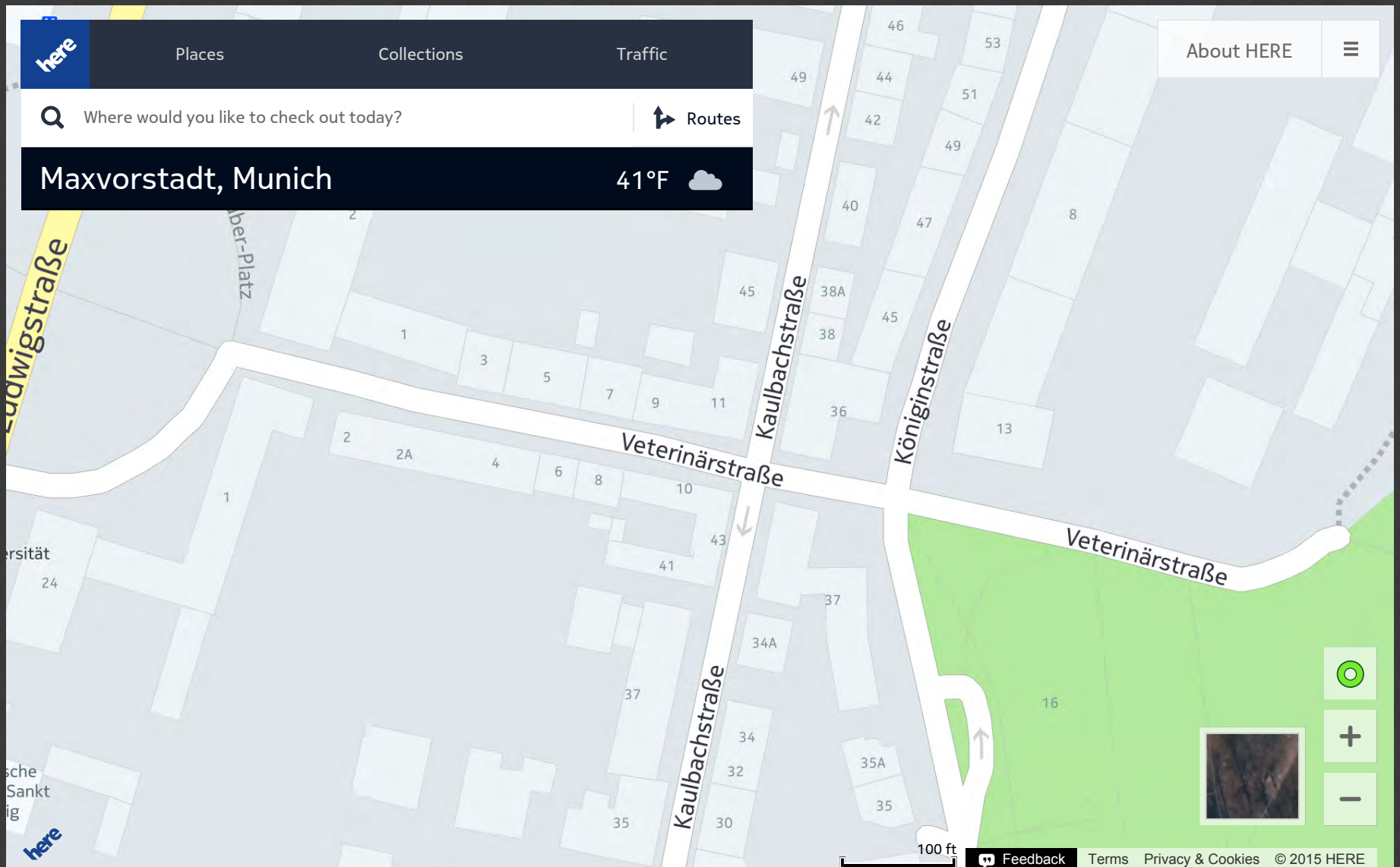
<http://dc-js.github.io/dc.js/crime/index.html>

**Ansicht
verändern**

Bubble Cursor



Ansicht verändern: (1) Auswählen



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Ansicht verändern: (2) Navigation

<https://www.here.com/>

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Barbara Zighetti		Dan Park			 Lesley
		David Longmuir			 Lisa A
Carlos Hernandez		Denise Smith			 Lisa M

1 minute, 8 seconds

Semantic Zoom

[//channel9.msdn.com/Blogs/One-Dev-Minute/Semantic-zoom-C-and-XAML/player](http://channel9.msdn.com/Blogs/One-Dev-Minute/Semantic-zoom-C-and-XAML/player)

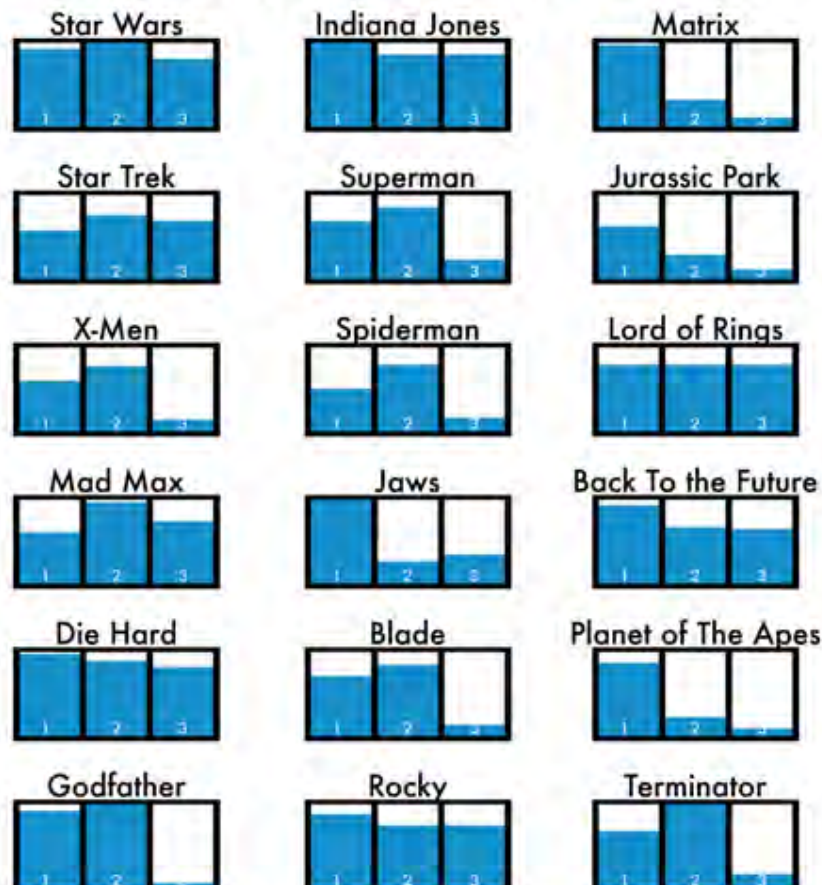


Focus + Context

<https://www.youtube.com/embed/yKe2ahApaz4>

DAN METH

THE TRILOGY METER



Ansicht verändern: (3) Koordinieren

<http://danmeth.com/post/77471620/my-trilogy-meter-1-in-a-series-of-pop-cultural>

The New York Times

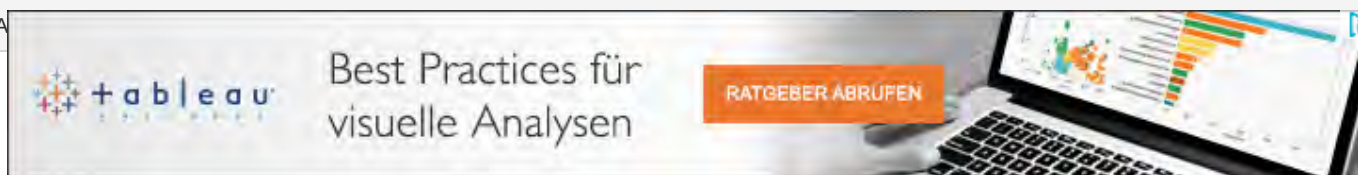
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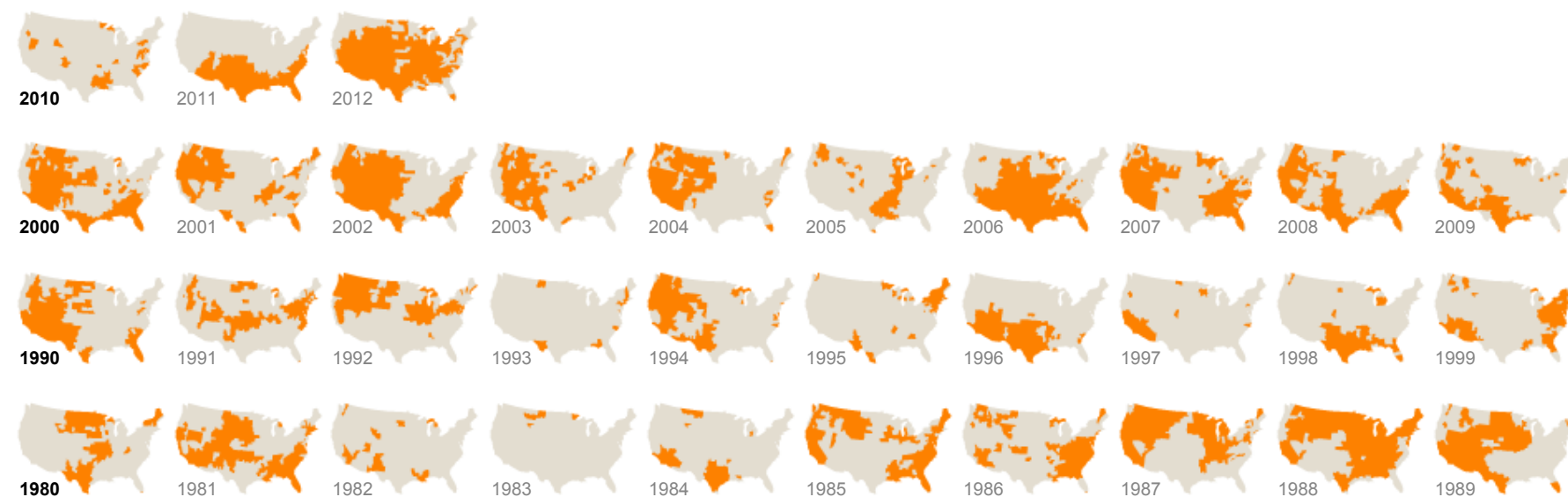


Published: July 19, 2012

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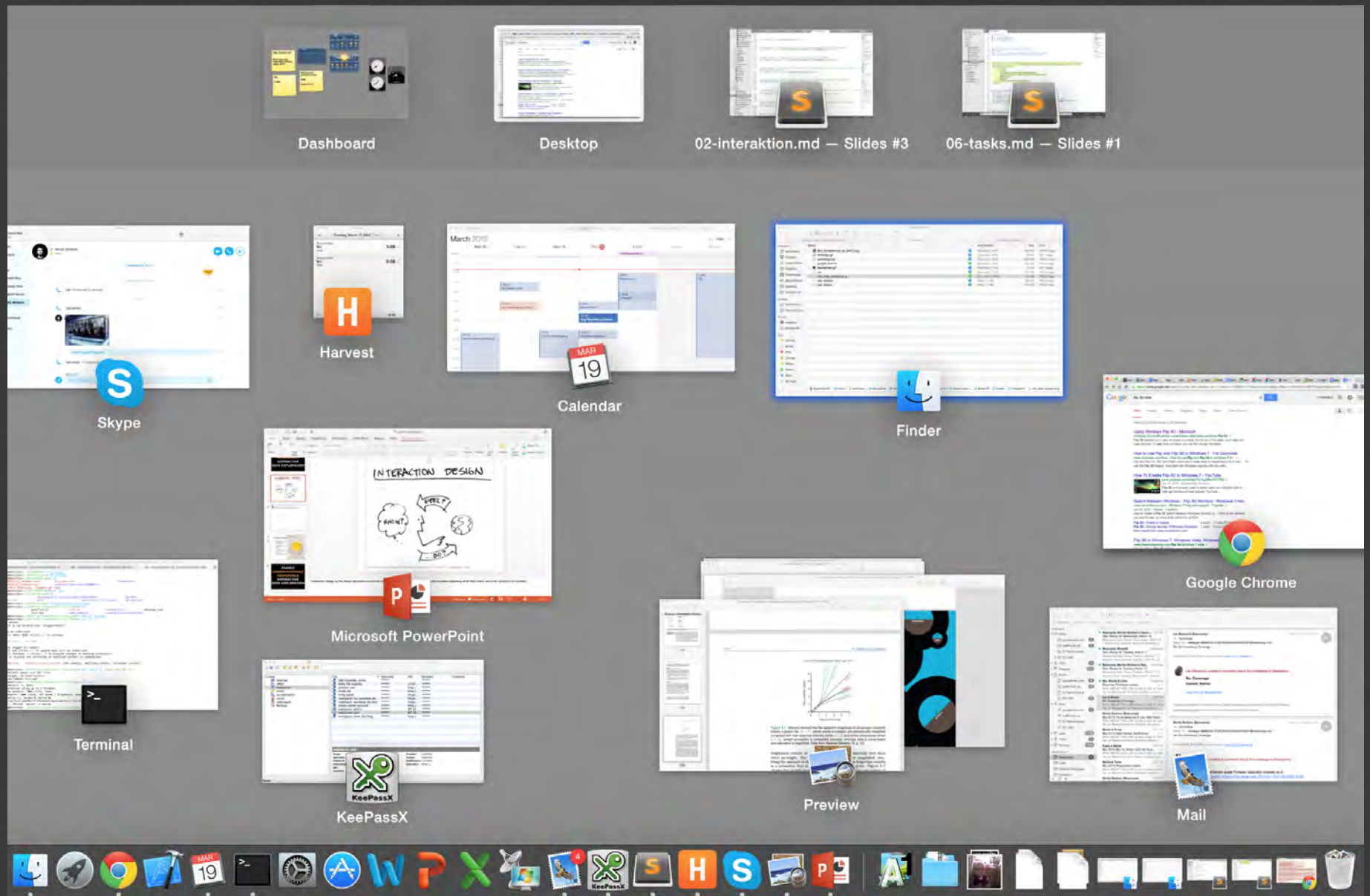
Drought's Footprint

More than half of the country was under moderate to extreme drought in June, the largest area of the contiguous United States affected by such dryness in nearly 60 years. Nearly 1,300 counties across 29 states have been declared federal disaster areas. Areas under moderate to extreme drought in June of each year are shown in orange below. [Related Article »](#)



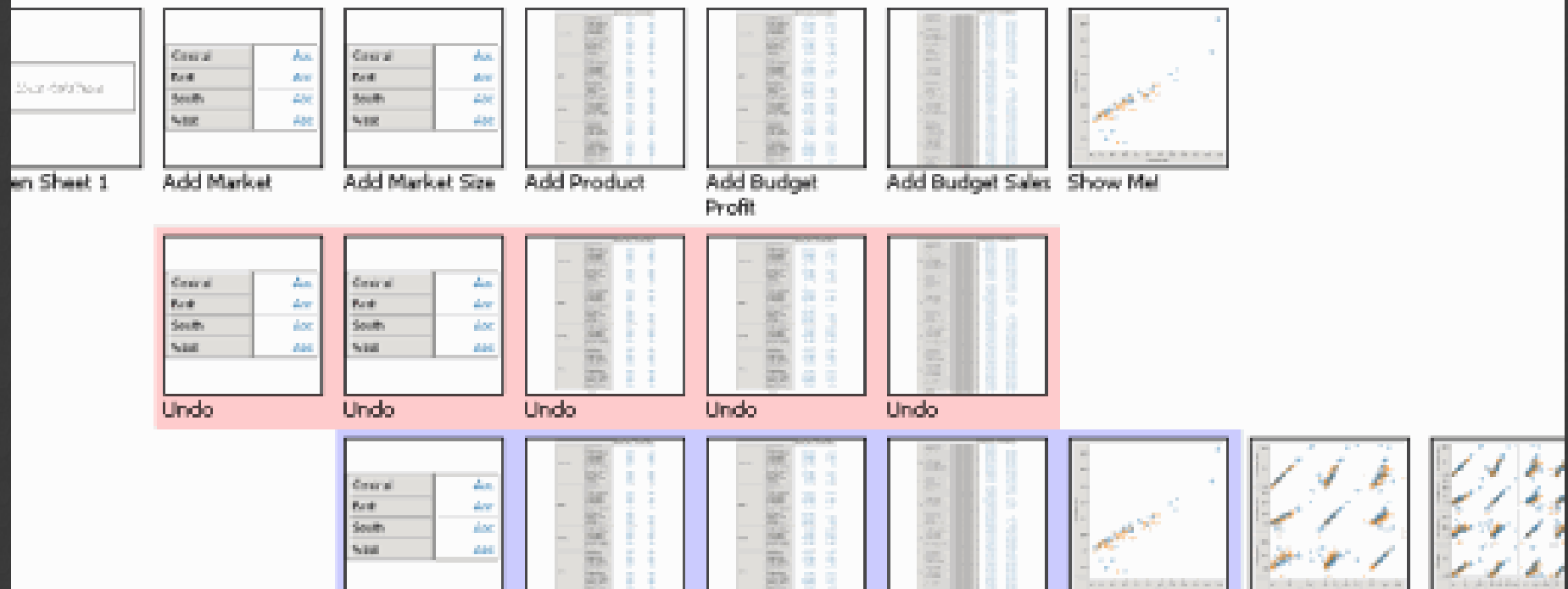
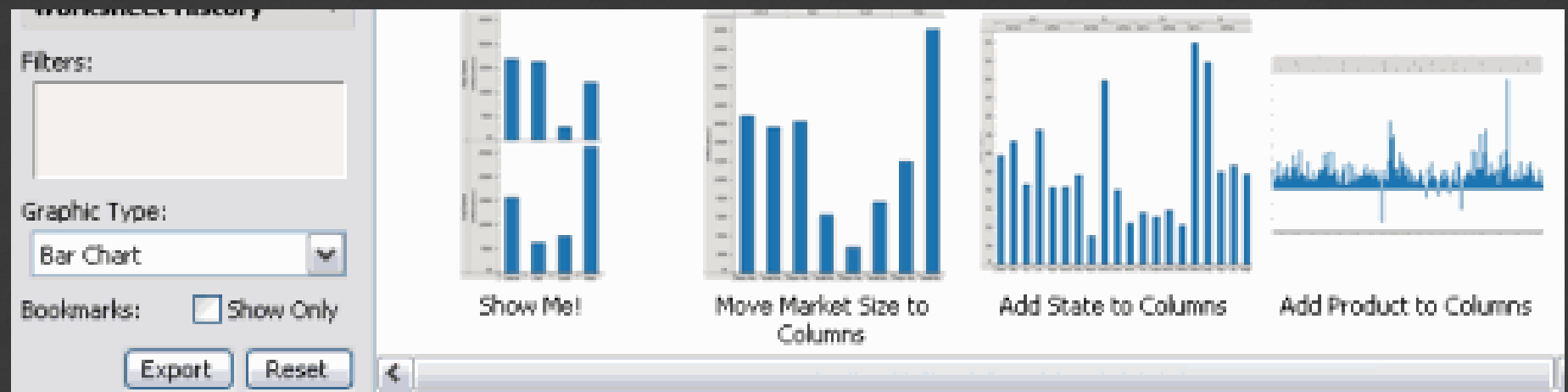
Small multiples

<http://www.nytimes.com/interactive/2012/07/20/us/drought-footprint.html>



Ansicht verändern: (4) Organisieren

Dokumentation



Dokumentation: (1) Analysen aufzeichnen

<http://vis.stanford.edu/papers/graphical-histories>



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Dokumentation: (2) Notizen

<http://kb.tableau.com/articles/knowledgebase/Annotations>



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GOOGLE MAPS



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AND

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Dokumentation: (3) Ansichten teilen

<http://v.isits.in>

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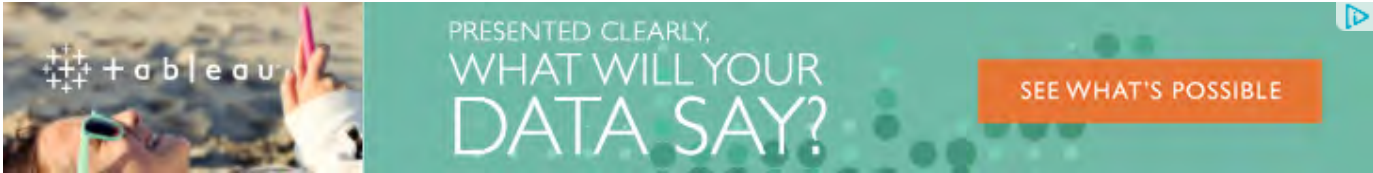
The 111th Congress

Video

The Latest Political News

Opinion

[Editorials](#)[Columns](#)



Published: February 2, 2010

Budget Forecasts, Compared With Reality

Just two years ago, surpluses were predicted by 2012. How accurate have past White House budget forecasts been?

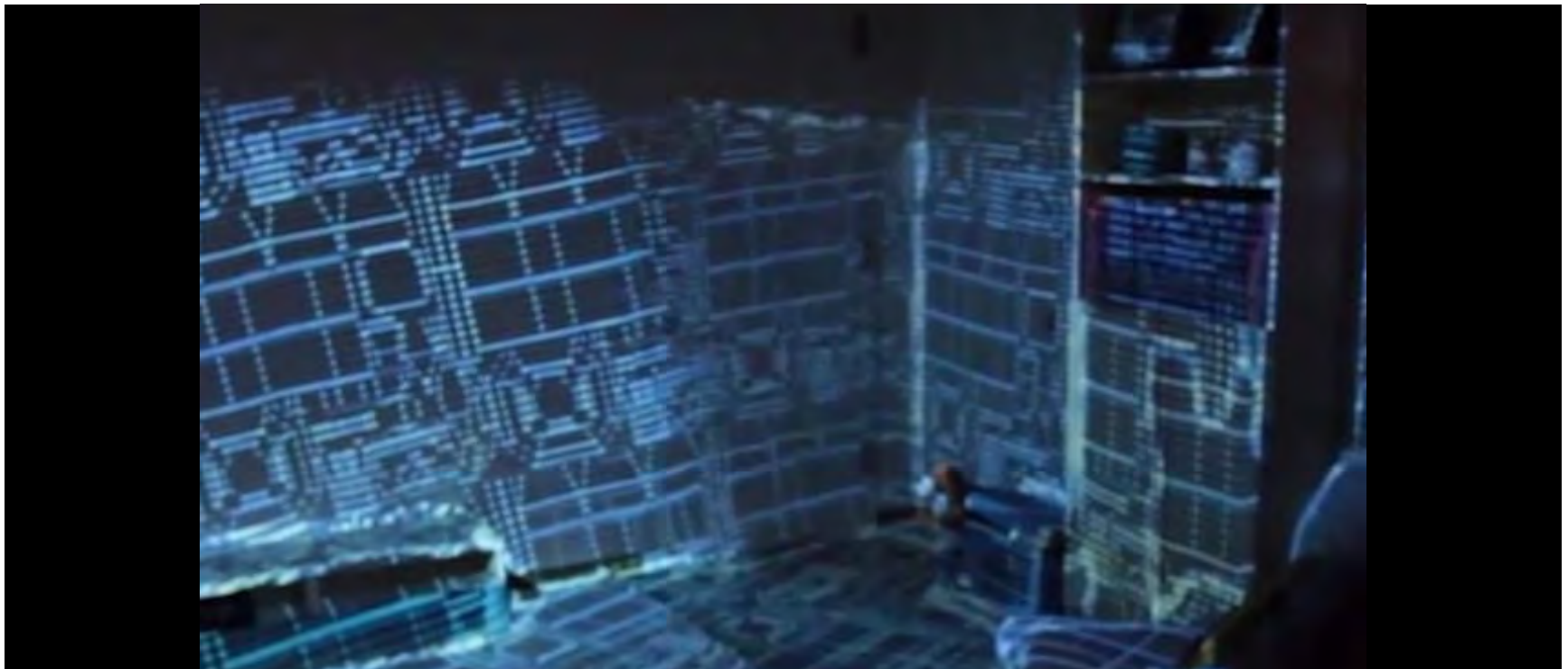
Dokumentation: (4) Führung
<http://www.nytimes.com/interactive/2010/02/02/us/politics/20100201-budget-porcupine-graphic.html>

Und jetzt?

- Explorationshilfe
- Checkliste
- Inspiration für neue Interaktionen



RoomAlive: Magical Experiences Enabled by Scalable, Adaptive Projector-Camera Units



Natural Interaction

<http://research.microsoft.com/apps/video/default.aspx?id=230402>

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Fluid Interaction

<http://www.prologue.com/projects/iron-man-2/groups/process-3/galleries/desktop-monitors>

Touch Interaktion



Baur, Lee, Carpendale: TouchWave (2012)

<https://www.youtube.com/embed/tZ1EJoY8HCk>



04:51

HD vimeo

Sadana, Stasko: Interactive Scatterplots (2014)

<https://player.vimeo.com/video/97798460?title=0&byline=0>

Processing 2: Interaktion

Mausvariablen:

mouseX // aktuelle Mausposition
mouseY

pmouseX // vorherige Mausposition
pmouseY

mousePressed // Maustaste gedrückt?

Simple Beispiel:

```
void setup(){  
    size(600,600);  
    background(255);  
}
```

```
void draw(){  
    line(width/2, height/2, mouseX, mouseY);  
}
```


Gedrückte Maus:

```
void setup(){  
    size(600,600);  
    background(255);  
}  
  
void draw(){  
    if(mousePressed)  
        line(width/2, height/2, mouseX, mouseY);  
}
```

Kleines Zeichenprogramm:

```
void setup(){  
    size(600,600);  
    background(255);  
}  
  
void draw(){  
    if(mousePressed)  
        line(mouseX, mouseY, mouseX, mouseY);  
}
```

Funktionen

```
// Funktionen führen kleine Stücke Code aus.  
void iAmAFunction(){  
    println("Funktion aufgerufen!");  
}
```

Funktionen II

```
// Sie können auch Parameter haben:  
void plusEins(int zahl){  
    println(zahl + 1);  
}
```

Funktionen III

```
// Und Rückgabewerte:  
// (void: kein Rückgabewert)  
float multiply(float z1, float z2){  
    return z1 * z2;  
}
```

Mausfunktionen:

```
void mouseClicked(){ // Maus wurde geklickt  
}
```

```
void mousePressed(){ // Maustaste gedrückt  
}
```

```
void mouseReleased(){ // Maustaste losgelassen  
}
```

```
void mouseMoved(){ // Maus wurde bewegt  
}
```

```
void mouseDragged(){  
    // Maustaste gedrückt  
    // + Maus bewegt  
}
```


Buttons (1)

```
float boxSize = 60;  
float boxX = 200;  
float boxY = 200;  
boolean active = false;
```

```
void setup(){  
  size(600,600);  
  background(255);  
  noStroke();  
}  
...
```

Buttons (2)

```
void draw(){
    if(active)
        fill(128,0,0);
    else
        fill(128);

    rect(boxX, boxY, boxSize, boxSize);
}

void mouseClicked(){
    if(mouseX >= boxX && mouseY >= boxY &&
        mouseX <= boxX+boxSize && mouseY <= boxY+boxSize)
        active = !active;
}
```

Ziehbarer Button (1)

```
float boxSize = 60;
float boxX = 200;
float boxY = 200;
boolean dragging = false;
float offsetX = 0;
float offsetY = 0;

void setup(){
    size(600,600);
    background(255);
    noStroke();
}
...
```

Ziehbarer Button (2)

```
...  
void draw(){  
    background(255);  
    if(dragging)  
        fill(228);  
    else  
        fill(128);  
    rect(boxX, boxY, boxSize, boxSize);  
}  
  
void mouseDragged(){  
    if(dragging){  
        boxX = mouseX-offsetX;  
        boxY = mouseY-offsetY;  
    }  
}  
...
```

Ziehbarer Button (3)

```
...  
void mousePressed(){  
    if(mouseX >= boxX && mouseY >= boxY &&  
        mouseX <= boxX+boxSize && mouseY <= boxY+boxSize){  
        dragging = true;  
        offsetX = mouseX-boxX;  
        offsetY = mouseY-boxY;  
    }  
}  
  
void mouseReleased(){  
    dragging = false;  
}
```

Farbräume:

```
colorMode(RGB)    // Red Green Blue
colorMode(HSB)    // Hue Saturation Brightness

colorMode(HSB, 360, 100, 100)
    // Umstellen auf HSB und Angabe
    // entsprechender Grenzen
```


Malprogramm mit Palette (1)

```
void setup(){  
    size(600,600);  
    background(255);  
  
    colorMode(HSB, 360, 100, 100);  
    for(int i = 0; i < 18; i++){  
        fill(i*20,100,100);  
        rect(0,i*20,20,20);  
    }  
}  
...
```

Malprogramm mit Palette (2)

```
...  
void draw(){  
    if(mousePressed)  
        line(pmouseX, pmouseY, mouseX, mouseY);  
}  
  
void mouseClicked(){  
    if(mouseX <= 20 && mouseX >= 0  
        && mouseY <= (17*20)){  
        stroke(mouseY,100,100);  
    }  
}
```

Abstände

```
dist(x1, y1, x2, y2)  
    // Abstand zwischen (x1, y1)  
    // und (x2, y2)
```

Tooltips (1)

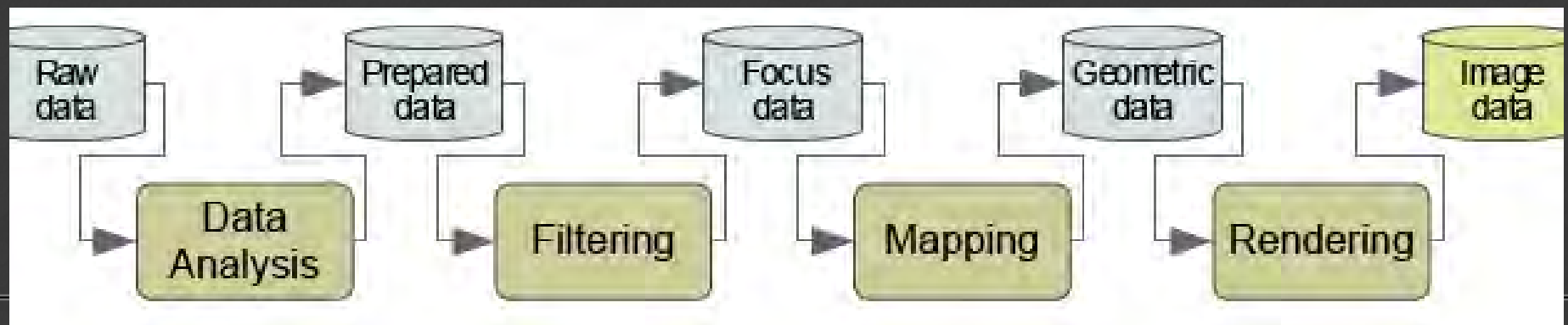
```
...  
void draw(){  
    background(64);  
    stroke(255);  
    fill(255);  
  
    int tooltip = -1;  
    for(int i = 0; i < data.length; i++){  
        float[] coords = myScale(data[i][0], data[i][1]);  
        float area = basicArea * bubbleData[i];  
        float r = sqrt(area/2*PI);  
        ellipse(coords[0], coords[1], r, r);  
  
        if(dist(coords[0], coords[1], mouseX, mouseY) < r){  
            tooltip = i;  
        }  
    }  
    ...
```

Tooltips (2)

```
...
// tooltip?
if(tooltip != -1){
    fill(255);

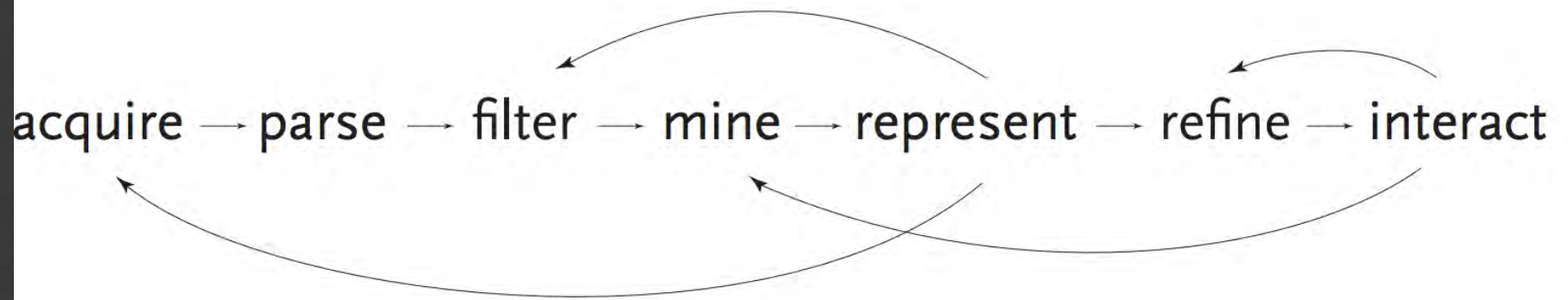
    rect(mouseX, mouseY, 100,60);
    fill(0);
    text("Data:\n" +
        "x: " + data[tooltip][0] +
        "\ny: " + data[tooltip][1] +
        "\nz: " + bubbleData[tooltip],
        mouseX+10, mouseY+10);
}
...
}
```

Prozess und Kritik



Card, Mackinlay, Shneiderman: Infovis Pipeline (1999)

http://www.infovis-wiki.net/index.php?title=Visualization_Pipeline



Ben Fry: Process (2004)

<http://benfry.com/phd/dissertation-110323c.pdf>

characterizing the problems of real-world users

abstracting into operations on data types

designing visual encoding and interaction techniques

creating algorithms to execute techniques efficiently

Tamara Munzner: Nested Model

<http://www.cs.ubc.ca/labs/imager/tr/2009/NestedModel/>

Kritik

Methode aus dem Design:

Was funktioniert?

Was nicht?

Was könnte besser sein?

Speziell für Visualisierung:

Aufgaben des Lesers?

Erfüllt die Enkodierung diese?

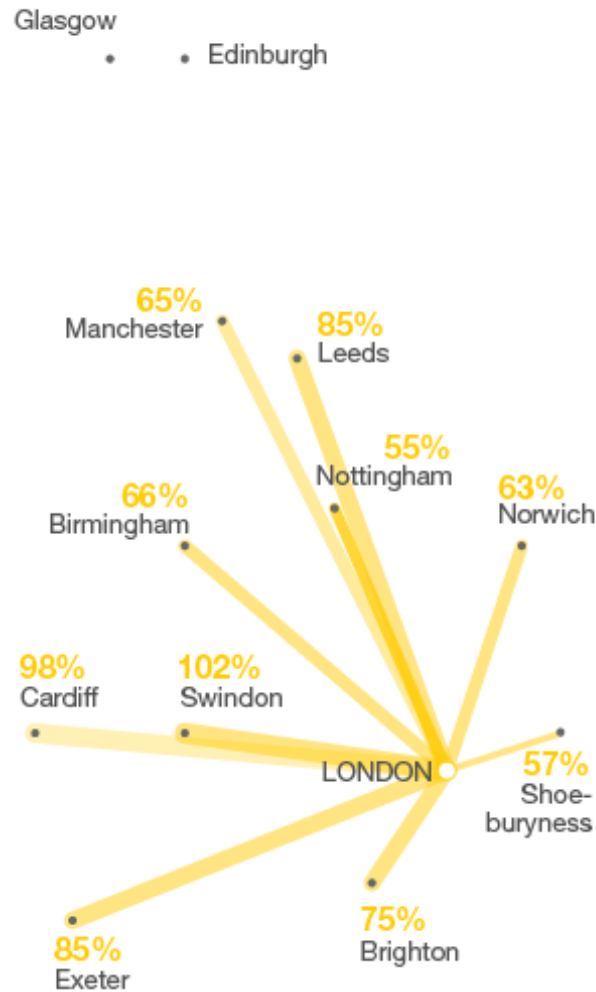
Passt die Informationsarchitektur?

Funktioniert die Interaktion?

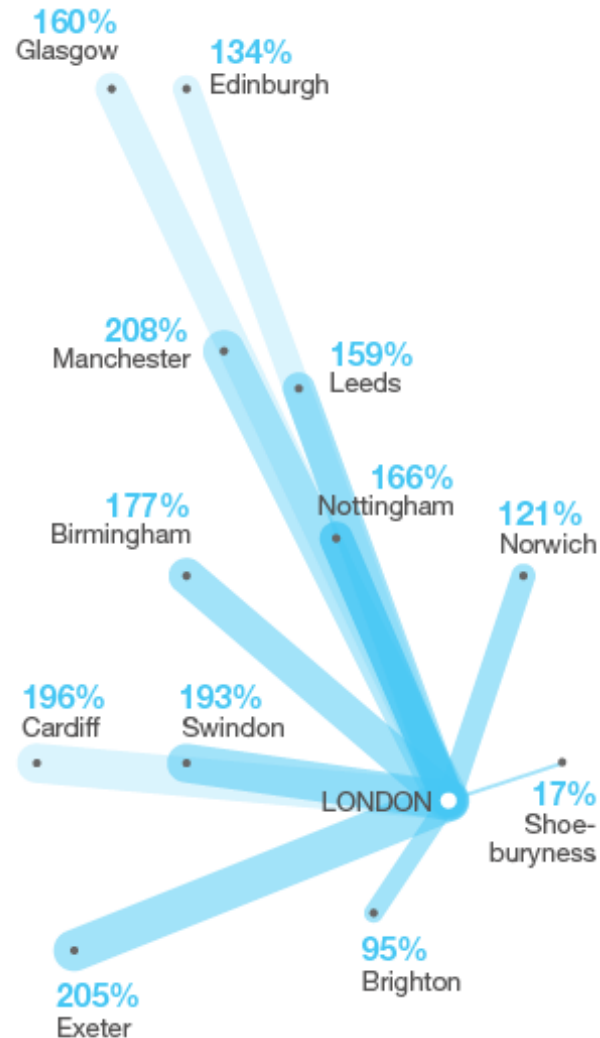
Comparison of increase in fares since 1995

Thicker lines show greater increase in fare

Season ticket



Single ticket



— This line equates to inflation since 1995. A line thinner than this would mean a reduction in price in real terms.

Source: Barry Doe, rail analyst

BBC: Train Fares (2013)

<http://www.bbc.com/news/magazine-21056703>

Fixing the British Rails — oh well, it's just a chart about them.

« Previous | Next »

Author: Xaquín G.V.
 February 5, 2013
 Data-driven graphics,
 School of Visual Arts
 No Comments

Last Tuesday was the first class of Information Design of the new semester. A full house, literally no more chairs in the classroom — one of the students had to sit on a teeny tiny plastic chair.

I wanted to do the same experiment we did last semester, a favorite of John Grimwade's that I use whenever I talk to his class: [fix the NYTimes smart elevators](#). But this [@junkcharts](#) post about a BBC graphic offered a better conversation starter.

Comparison of increase in fares since 1995

Thicker lines show greater increase in fare

Season ticket

Glasgow

• • Edinburgh

Single ticket

160%
Glasgow

134%
Edinburgh

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What's popular

Said it on twitter

Reading this
<http://t.co/zOuKvAWd>
 @nickhilton story I see that

Fare chart - redesigns

<http://www.xocas.com/blog/en/fixing-the-british-rails-oh-well-its-just-a-chart-about-them/>

Wiederholung

Grundlegende Visualisierungstechniken

Was ist Interaktion?

Processing II - Interaktion

Prozess und Kritik

Für's nächste Mal (1):

Ladet euch die Hausaufgabenvorlage von der Vorlesungs-Homepage herunter.

Diese Vorlage lädt eine CSV-Datei und legt sie in einer Processing-Table ab.

Lest euch die Dokumentation zu Processing-Tables durch. Findet heraus, wie die Daten aufgebaut sind (println() hilft).

Für's nächste Mal (2):

Das Beispiel zeichnet zwei Scatterplots mit unterschiedlichen Datenattributen.
Implementiert Brushing+Linking für diese Ansichten.

Bonus: Baut noch eine dritte Ansicht (z.B. ein Balkendiagramm) und bindet diese auch in die Brushing+Linking Funktionalität ein.

Infos: <http://do.minik.us/teaching/dvuv/15>

Moodle: <https://www.moodle.ufg.at/moodle/course/view.php?id=172>