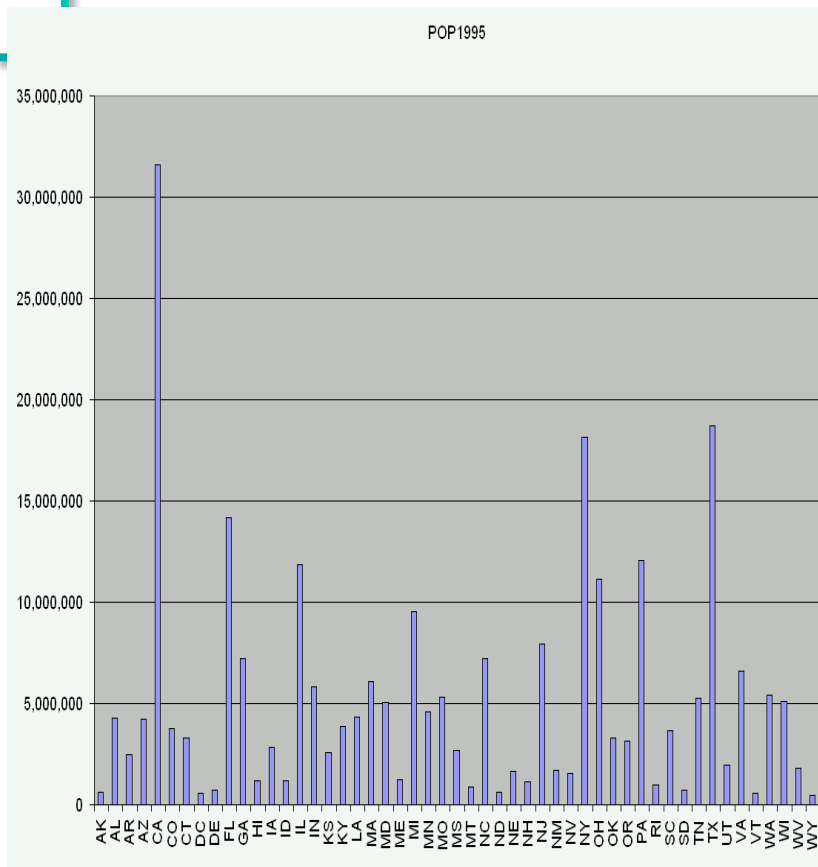


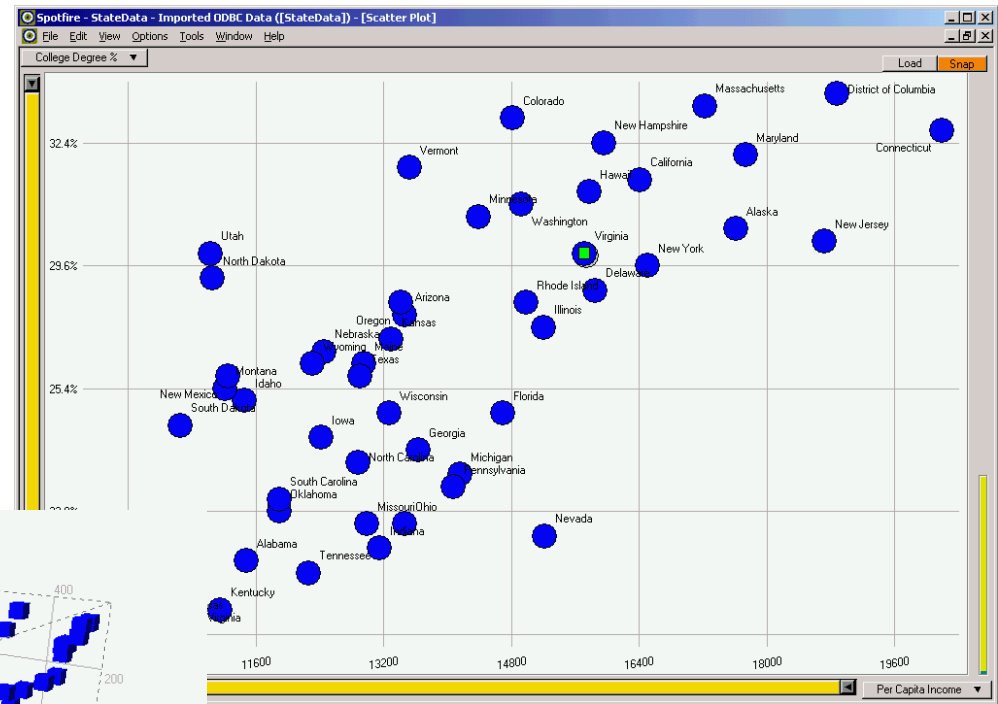
Visualização de Dados Multidimensionais

- Caracterização de dados multidimensionais
- Técnicas selecionadas

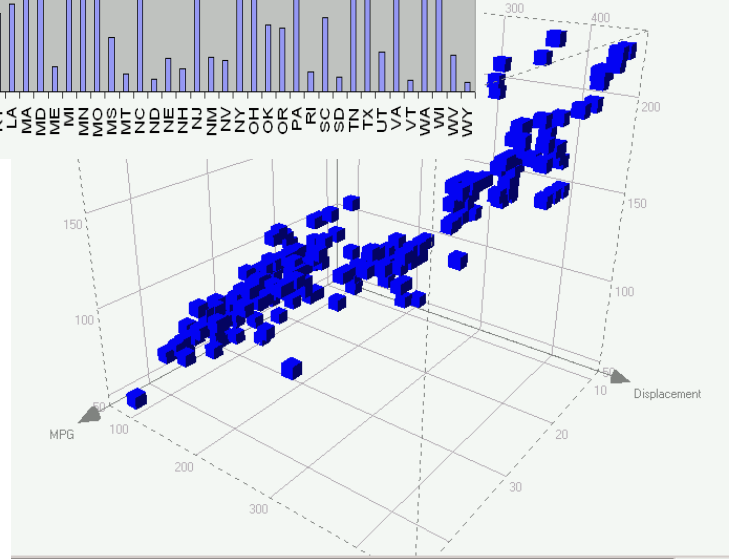
- Dados univariados



- Dados bivariados

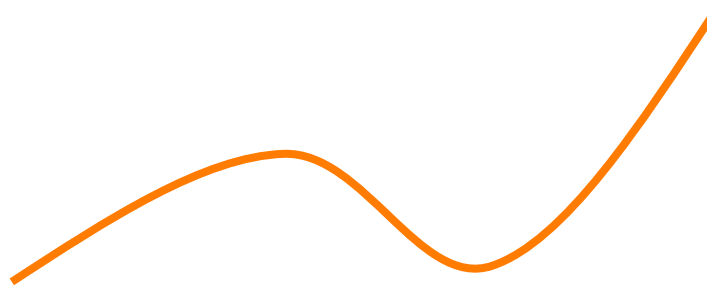


Dados trivariados



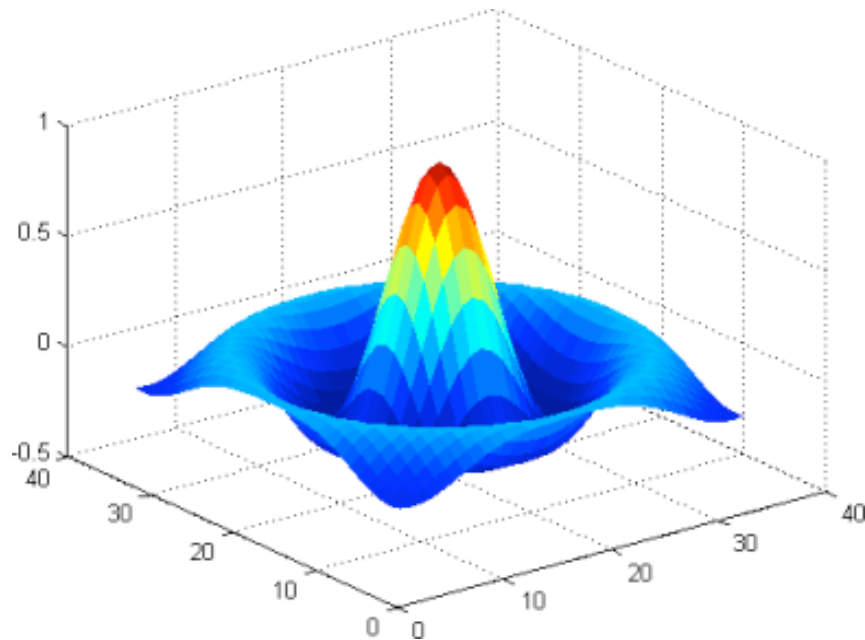
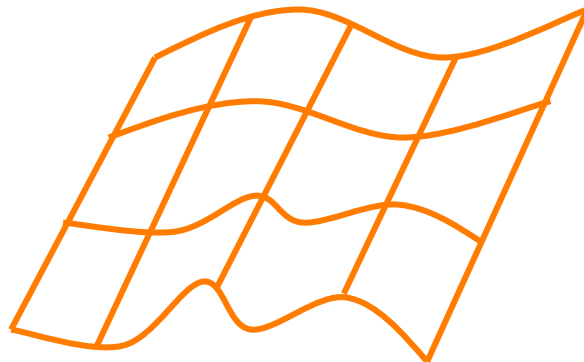
I-D: Fácil

- $b = f(a)$
- $a \rightarrow x$
- $b \rightarrow y$



2-D: Fácil

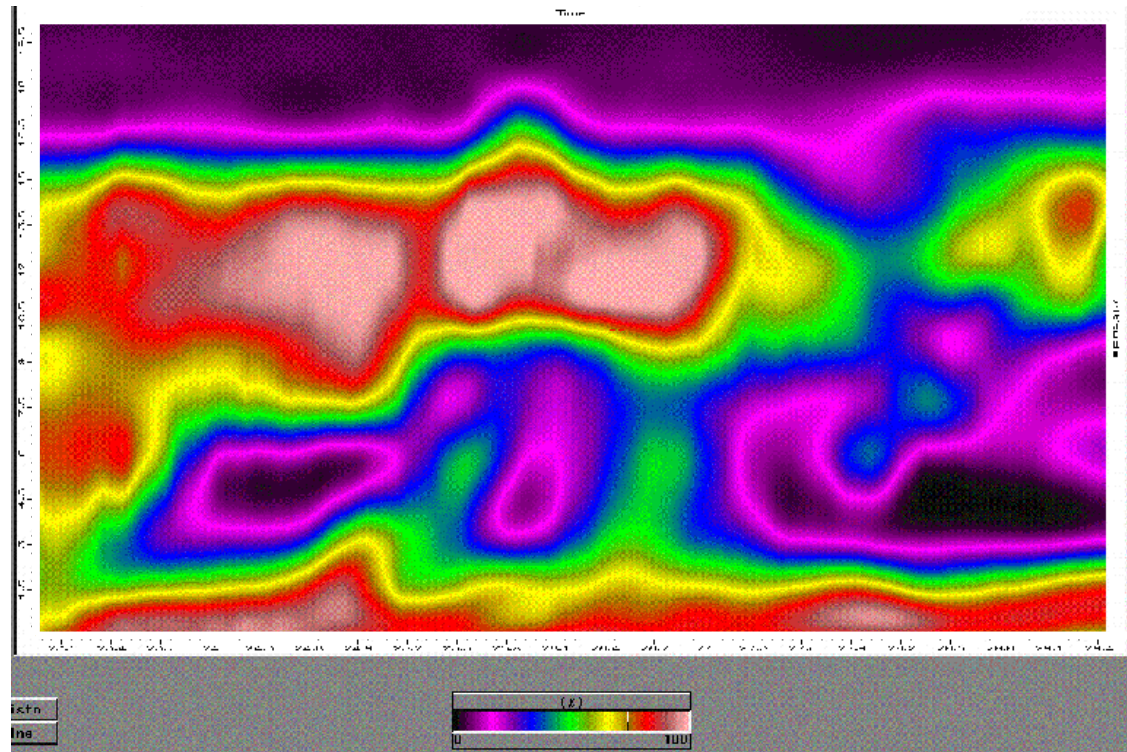
- $c = f(a, b)$
- Campo de altitude:
 - $a \rightarrow x$
 - $b \rightarrow y$
 - $c \rightarrow z$



2-D: Fácil

- $c = f(a, b)$
- Mapa de temperatura
 - $a \rightarrow x$
 - $b \rightarrow y$
 - $c \rightarrow \text{cor}$

b

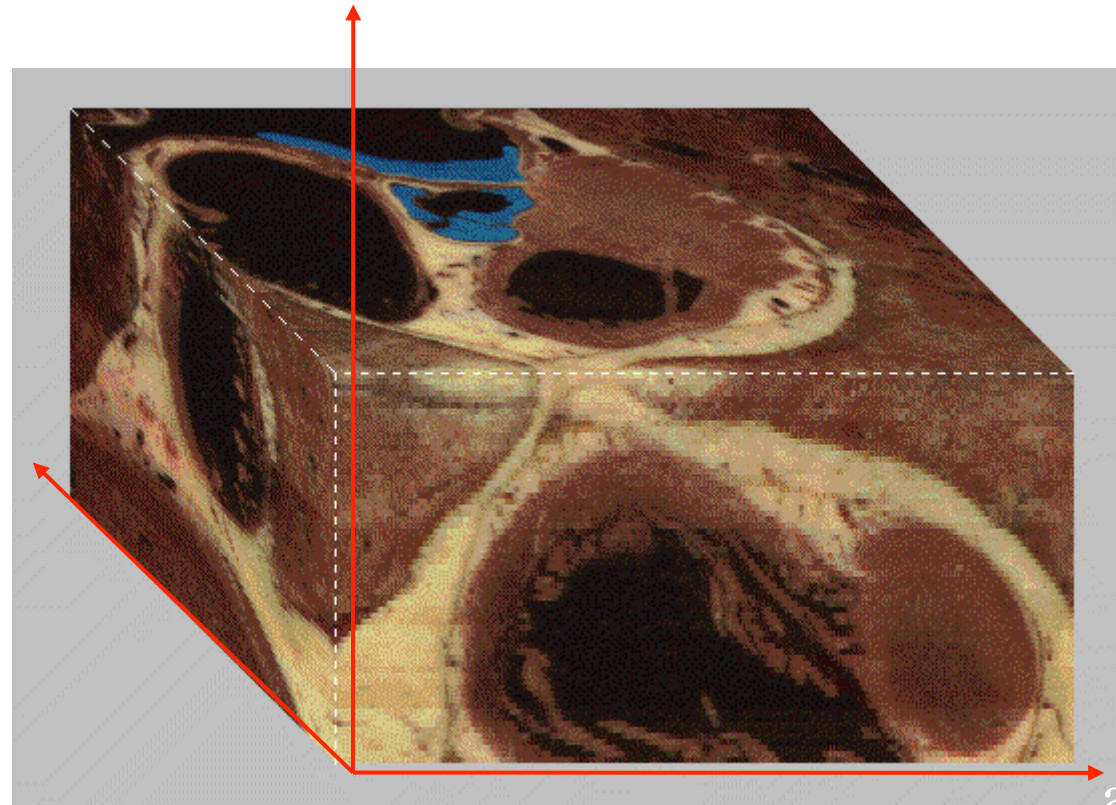


a

c

3-D: Difícil

- $d = f(a, b, c)$
- Volume de cores:
 - $a \rightarrow x$
 - $b \rightarrow y$
 - $c \rightarrow z$
 - $d \rightarrow \text{color}$



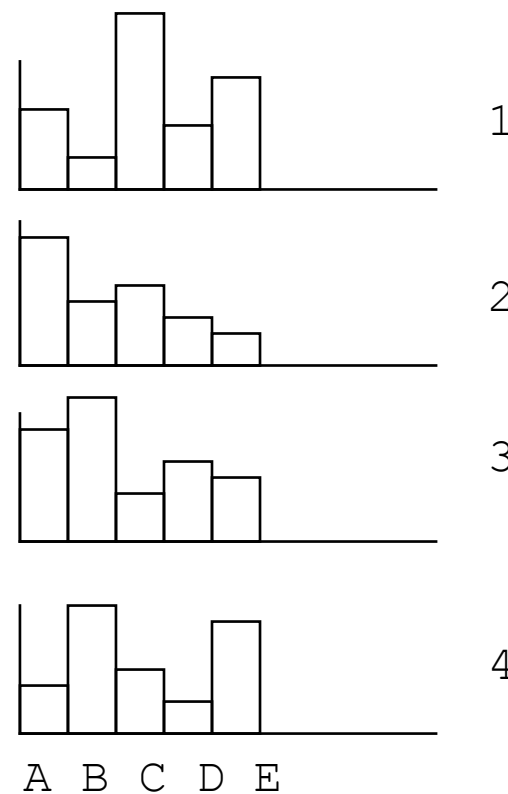
$\geq 4D$: Muito difícil

- $y = f(x_1, x_2, x_3, x_4, \dots, x_n)$
- Espaço 5D??
- Exemplos de abordagens:
 - Eixos hierárquicos (Mihalisin)
 - Coordenadas aninhadas (Worlds within Worlds)

Dados multivariados

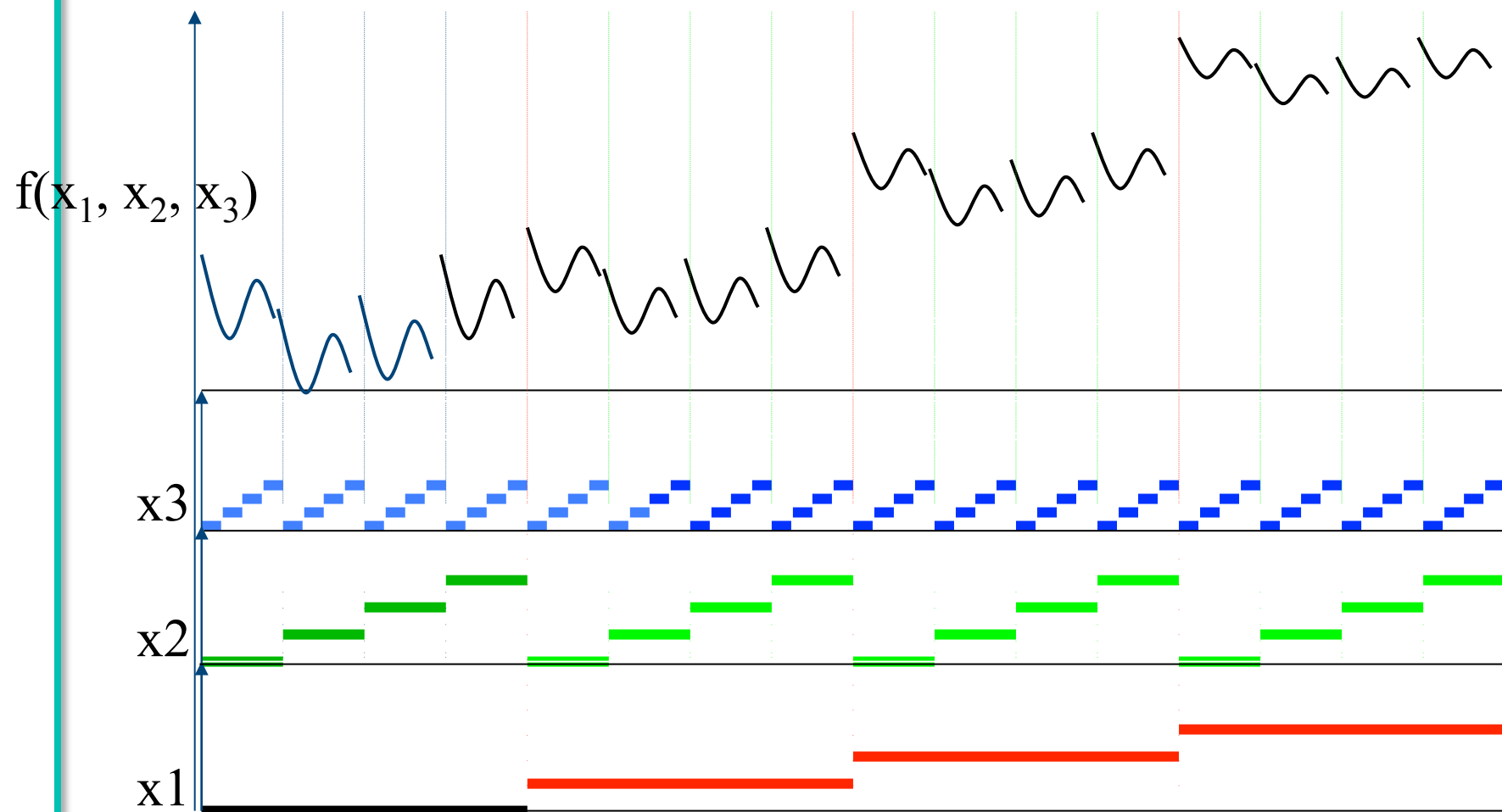
- Utilizar multiples gráficos univariados

	A	B	C	D	E
1	4	1	8	3	5
2	6	3	4	2	1
3	5	7	2	4	3
4	2	6	3	1	5



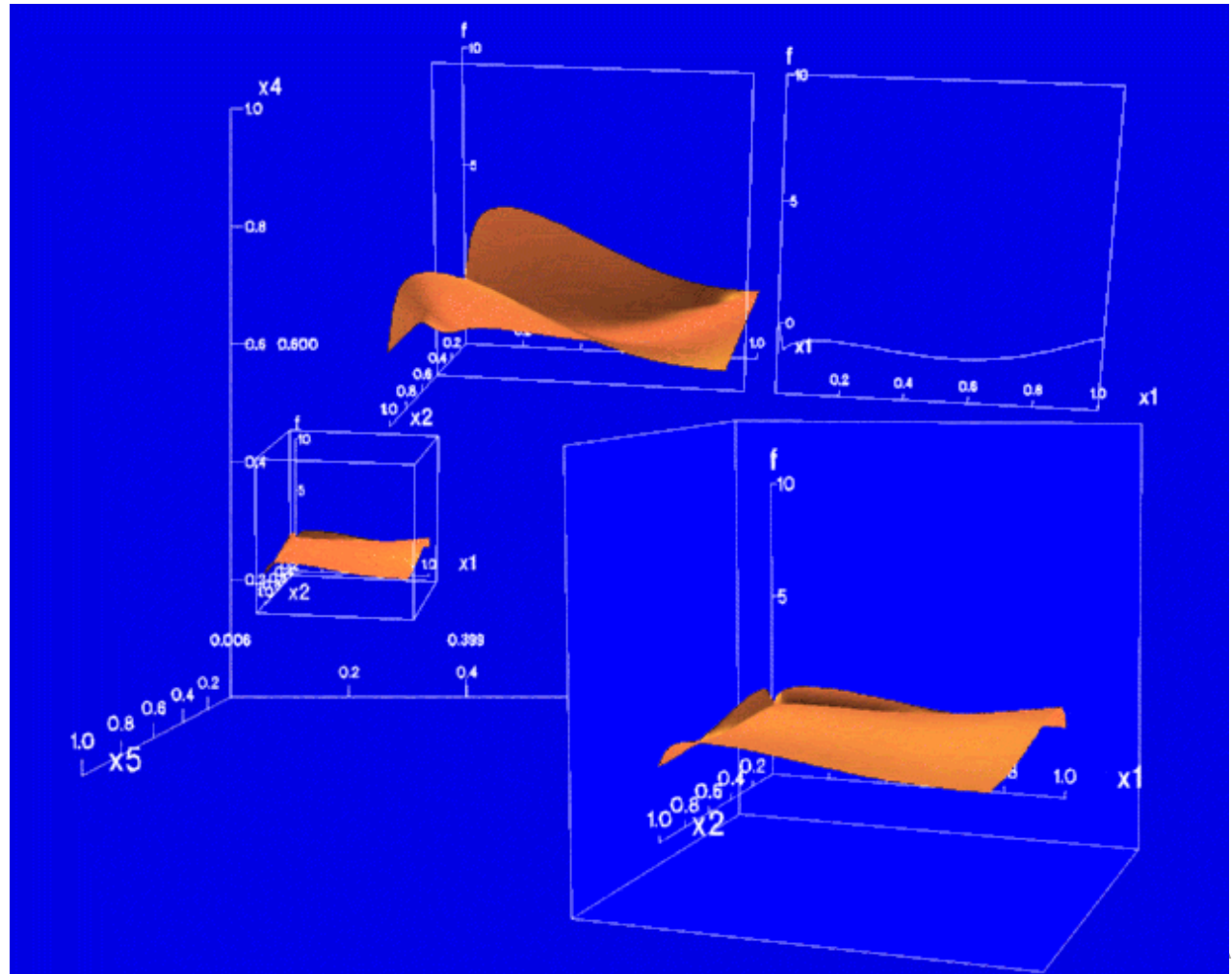
Eixos hierárquicos

- Visão 1D de uma função 3D (Mihalisin *et al.*)



Sistemas de coordenadas aninhados

- Feiner & Beshers. Worlds within worlds: metaphors for exploring n-dimensional virtual worlds. UIST 90, pp. 76-83.



Worlds Within Worlds

- Visualização de funções reais 5D

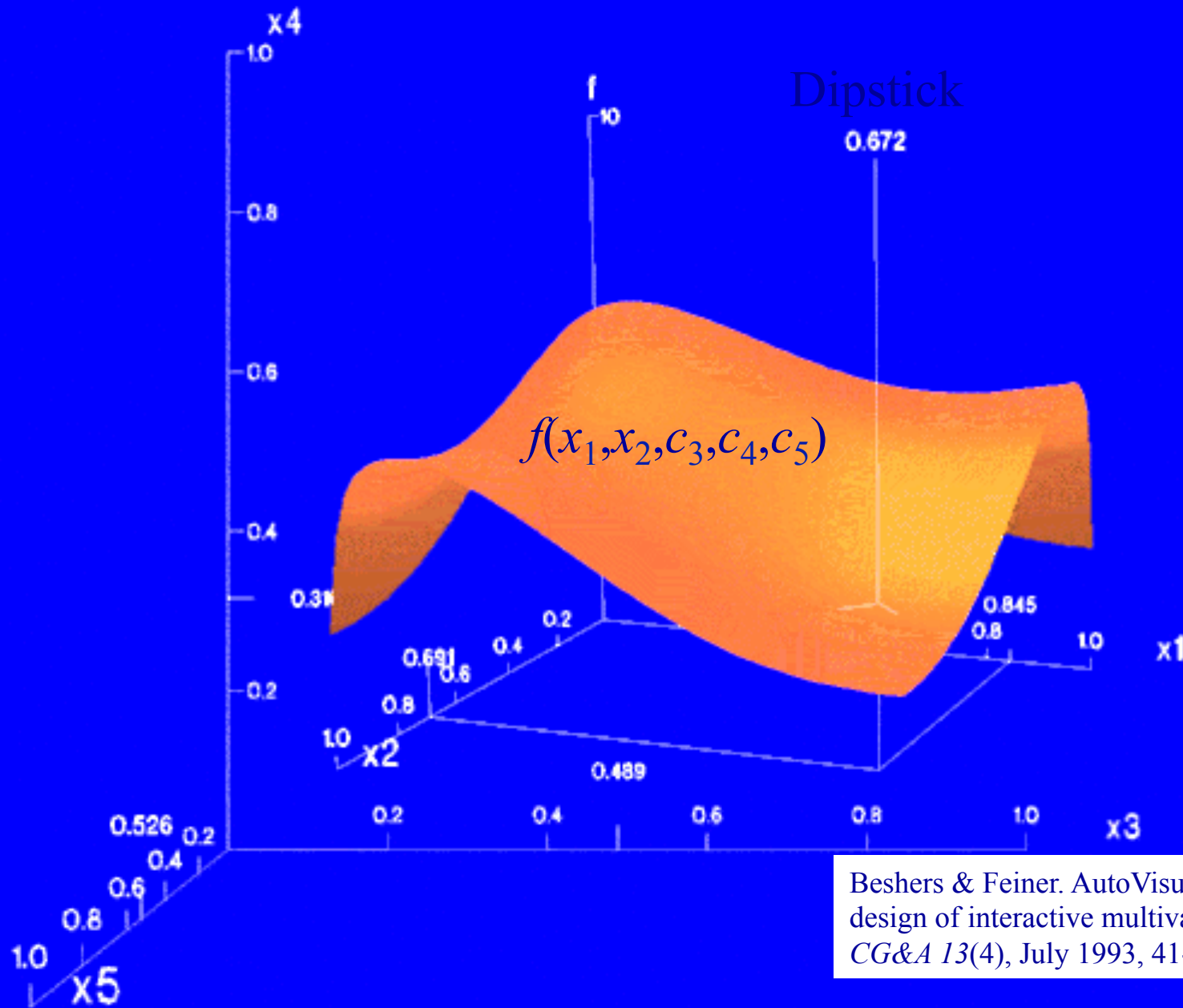
$$f(x_1, x_2, x_3, x_4, x_5)$$

- Em pontos discretos

$$x_3 = c_3, x_4 = c_4, x_5 = c_5$$

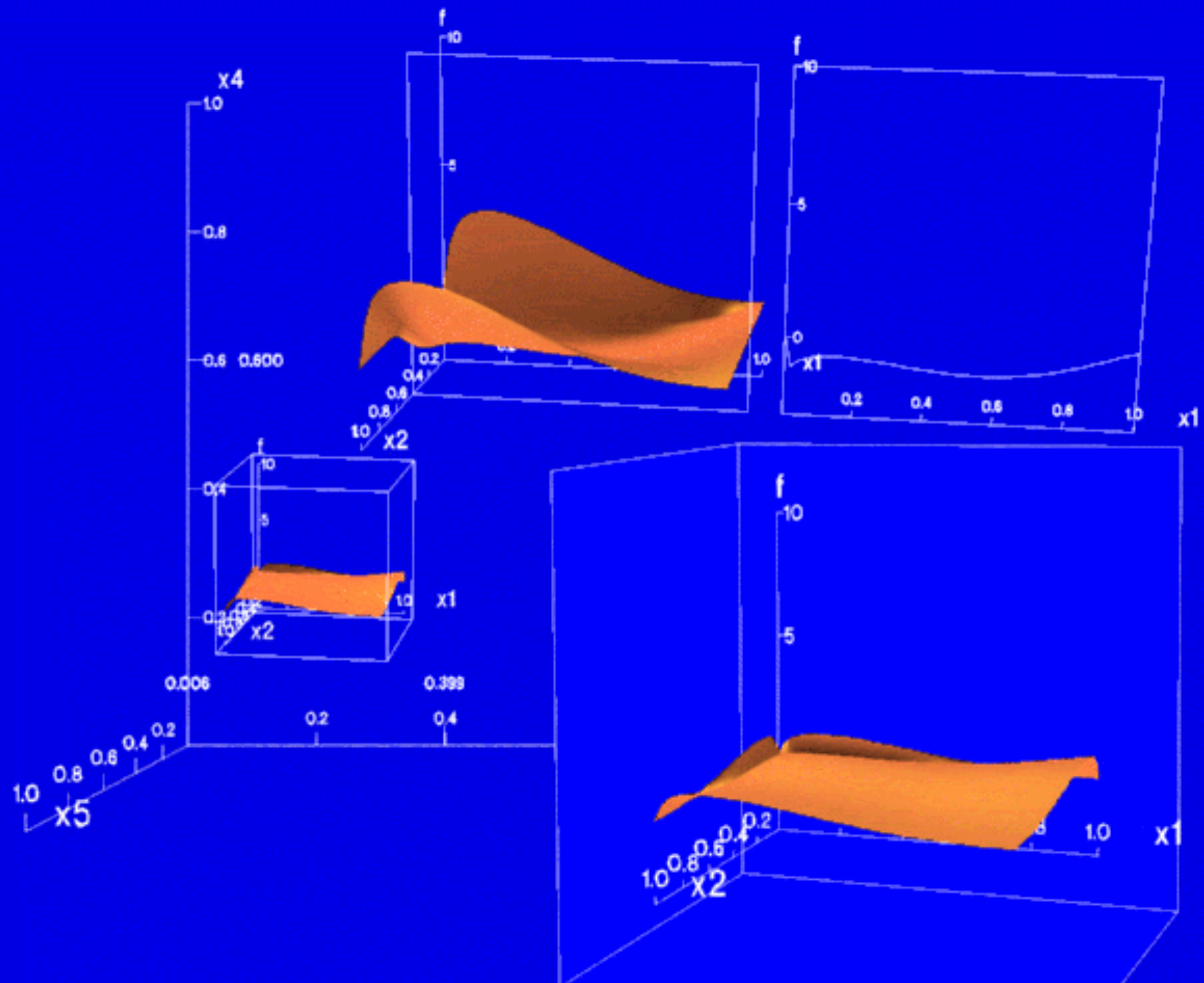
– Plota a função

$$f(x_1, x_2, c_3, c_4, c_5)$$

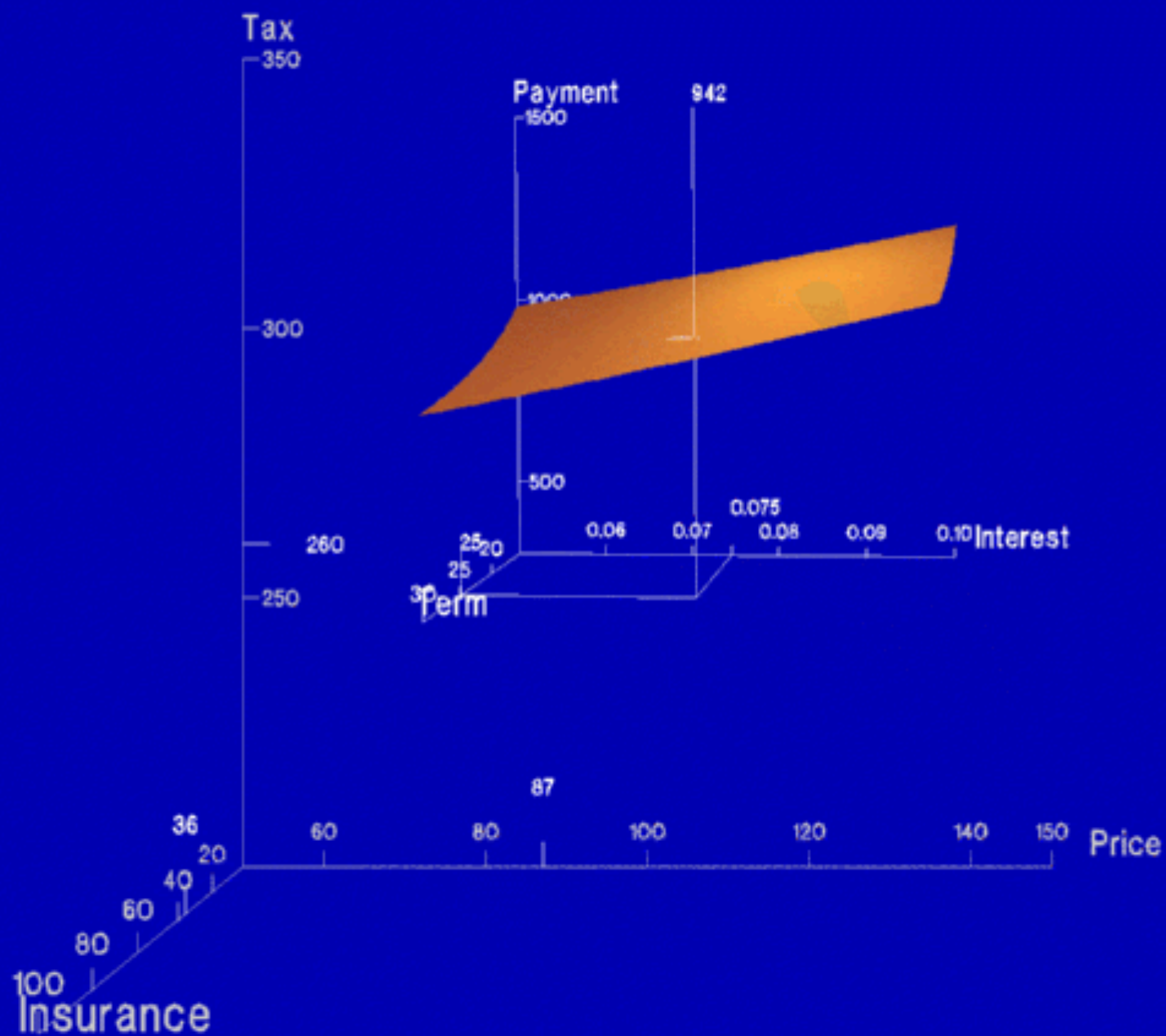


Beshers & Feiner. AutoVisual: Rule-based design of interactive multivariate visualizations. *CG&A* 13(4), July 1993, 41-49.

<http://monet.cs.columbia.edu/projects/AutoVisual/AutoVisual.html>



Constants: Down=10.0



Caracterização

- Dados multivariados, multidimensionais
- Cada entidade é caracterizada por um conjunto de $n > 3$ atributos
- Como representar essas dimensões?

Microsoft Excel - film.txt

	A	B	C	D	E	F	G	H	I	J
1	Year	Length	Title	Subject	Actor	Actress	Director	Popularity	Awards	*Image
2	integer	integer	string	string	string	string	string	integer	string	string
3	1990	125	Wild at Heart	Drama	Cage, Nicolas	Dern, Laura	Lynch, David	6	No	NicholasCage.gif
4	1961	120	Goodbye Again	Drama	Perkins, Anthor	Bergman, Ingrid	Litvak, Anatole	6	No	NicholasCage.gif
5	1990	135	Hunt for Red Oct	Drama	Connery, Sean		McTiernan, J.	8	No	NicholasCage.gif
6	1984	108	Terminator, The	Action	Schwarzenegge	Hamilton, Linda	Cameron, J.	17	No	T2.gif
7	1991	136	Terminator 2	Action	Schwarzenegge	Hamilton, Linda	Cameron, J.	8	No	T2.gif
8	1993	65	John Cleese on H	Comedy	Cleese, John	Booth, Connie		62	No	NicholasCage.gif
9	1987	103	Au Revoir les Enf	Drama	Manesse, Gas	Racette, Francis	Malle, Louis	35	No	NicholasCage.gif
10	1983	128	The Ballad of Nar	Drama		Missing	Imamura, Shoh	15	No	NicholasCage.gif
11	1990	138	Cyrano De Berger	Drama	Depardieu, Ger	Brochet, Anne	Rappeneau, Je	86	No	NicholasCage.gif
12	1990	107	Green Card	Comedy	Depardieu, Ger	MacDowell, And	Weir, Peter	25	No	NicholasCage.gif
13	1987	118	Hope & Glory	War	Hayman, David	Miles, Sarah	Boorman, John	3	No	NicholasCage.gif
14	1982	122	Missing	Drama	Lemmon, Jack	Spacek, Sissy	Costa-Gavras,	30	No	NicholasCage.gif
15	1986	125	The Mission	Drama	Niro, Robert De	Lunghi, Cherie	Joffe, Roland	20	No	NicholasCage.gif
16	1987	101	My Life As a Dog	Comedy	Glanzelius, Anton		Hallstrom, Lass	21	No	NicholasCage.gif
17	1984	150	Paris, Texas	Drama	Stanton, Harry	Kinski, Nastass	Wim Wenders	27	No	NicholasCage.gif
18	1984	106	Romancing the S	Action	Douglas, Micha	Turner, Kathleer	Silvestri, Rober	83	No	NicholasCage.gif
19	1982	120	The State of Thing	Drama		Isabelle Weinga	Wenders, Wim	40	No	NicholasCage.gif
20	1986	98	Summer	Comedy	Gauthier, Vince	Riviere, Marie	Rohmer, Eric	11	No	NicholasCage.gif
21	1955	108	Smiles of a Sumr	Comedy	Bjornstrand, Gu	Jacobsson, Ulla	Bergman, Ingm	58	No	Bergman.gif
22	1987	98	Under the Sun of	Drama	Depardieu, Ger	Bonnaire, Sandi	Pialat, Maurice	45	No	NicholasCage.gif
23	1985	105	Vagabond	Drama	Meril, Macha	Bonnaire, Sandi	Varda, Agnes	49	No	NicholasCage.gif
24	1988	115	Working Girl	Comedy	Ford, Harrison	Griffith, Melanie	Nichols, Mike	25	No	NicholasCage.gif
25	1984	106	A Year of the Qui	Drama	Wilson, Scott	Komorowska, M	Zanussi, Krzys	78	No	NicholasCage.gif
26	1983	134	Yentl	Music	Patinkin, Mand	Streisand, Barb	Streisand, Barb	46	No	NicholasCage.gif
27	1982	111	Yol	Drama	Akan, Tarik		Guney, Yilmaz	53	No	NicholasCage.gif
28	1992	102	The Addams Fam	Comedy	Julia, Raul	Huston, Anjelica	Sonnenfeld, B.	8	No	NicholasCage.gif
29	1992	88	Adventures in Din	Action	Katz, Omri	Hoffman, Shawr	Thompson, Bre	19	No	NicholasCage.gif
30	1992	95	Alan & Naomi	Drama	Haas, Lukas	Aquino, Vanessa	Vanwagenen, S	3	No	NicholasCage.gif

Dados multidimensionais

- Cada atributo corresponde a uma dimensão
 - n -D indica que temos n atributos associados a cada elemento ou entidade
 - Número pequeno de atributos facilita a representação
 - facilita o mapeamento
-

	A	B	C	D	E	F	G	H	I	J	K
1	Year	Length	Title	Subject	Actor	Actress	Director	Popularity	Awards	*Image	
2	integer	integer	string	string	string	string	string	integer	string	string	
3	1990	125	Wild at Heart	Drama	Cage, Nicolas	Dern, Laura	Lynch, David	6	No	NicholasCage.gif	
4	1961	120	Goodbye Again	Drama	Perkins, Anthor	Bergman, Ingrid	Litvak, Anatole	6	No	NicholasCage.gif	
5	1990	135	Hunt for Red Octo	Drama	Connery, Sean		McTiernan, J.	8	No	NicholasCage.gif	
6	1984	108	Terminator, The	Action	Schwarzenegge	Hamilton, Linda	Cameron, J.	17	No	T2.gif	
7	1991	136	Terminator 2	Action	Schwarzenegge	Hamilton, Linda	Cameron, J.	8	No	T2.gif	
8	1993	65	John Cleese on H	Comedy	Cleese, John	Booth, Connie		62	No	NicholasCage.gif	
9	1987	103	Au Revoir les Enf	Drama	Manesse, Gasc	Racette, Francis	Malle, Louis	35	No	NicholasCage.gif	
10	1983	128	The Ballad of Nar	Drama		Missing	Imamura, Shoh	15	No	NicholasCage.gif	
11	1990	138	Cyrano De Berger	Drama	Depardieu, Ger	Brochet, Anne	Rappeneau, Je	86	No	NicholasCage.gif	
12	1990	107	Green Card	Comedy	Depardieu, Ger	MacDowell, And	Weir, Peter	25	No	NicholasCage.gif	
13	1987	118	Hope & Glory	War	Hayman, David	Miles, Sarah	Boorman, John	3	No	NicholasCage.gif	
14	1982	122	Missing	Drama	Lemmon, Jack	Spacek, Sissy	Costa-Gavras,	30	No	NicholasCage.gif	
15	1986	125	The Mission	Drama	Niro, Robert De	Lunghi, Cherie	Joffe, Roland	20	No	NicholasCage.gif	
16	1987	101	My Life As a Dog	Comedy	Glanziels, Anton		Hallstrom, Lasse	21	No	NicholasCage.gif	
17	1984	150	Paris, Texas	Drama	Stanton, Harry I	Kinski, Nastass	Wim Wenders	27	No	NicholasCage.gif	
18	1984	106	Romancing the S	Action	Douglas, Micha	Turner, Kathlee	Silvestri, Rober	83	No	NicholasCage.gif	
19	1982	120	The State of Thin	Drama		Isabelle Weinga	Wenders, Wim	40	No	NicholasCage.gif	
20	1986	98	Summer	Comedy	Gauthier, Vince	Rviere, Marie	Rohmer, Eric	11	No	NicholasCage.gif	
21	1955	108	Smiles of a Sumr	Comedy	Bjornstrand, Gu	Jacobsson, Ulla	Bergman, Ingm	58	No	Bergman.gif	
22	1987	98	Under the Sun of	Drama	Depardieu, Ger	Bonnaire, Sandi	Pialat, Maurice	45	No	NicholasCage.gif	
23	1985	105	Vagabond	Drama	Meril, Macha	Bonnaire, Sandi	Varda, Agnes	49	No	NicholasCage.gif	
24	1988	115	Working Girl	Comedy	Ford, Harrison	Griffith, Melanie	Nichols, Mike	25	No	NicholasCage.gif	
25	1984	106	A Year of the Qui	Drama	Wilson, Scott	Komorowska, M	Zanussi, Krzys	78	No	NicholasCage.gif	
26	1983	134	Yentl	Music	Patinkin, Mand	Streisand, Barb	Streisand, Bar	46	No	NicholasCage.gif	
27	1982	111	Yol	Drama	Akan, Tarik		Guney, Yilmaz	53	No	NicholasCage.gif	
28	1992	102	The Addams Fam	Comedy	Julia, Raul	Huston, Anjelic	Sonnenfeld, B.	8	No	NicholasCage.gif	
29	1992	88	Adventures in Din	Action	Katz, Omri	Hoffman, Shawr	Thompson, Bre	19	No	NicholasCage.gif	
30	1992	95	Alan & Naomi	Drama	Haas, Lukas	Aquino, Vanessa	Vanwagenen, S	3	No	NicholasCage.gif	

Table Lens

The image shows a 'Table Lens' visualization. It features a table with five columns: 'League', 'Players', 'Home ...', 'At Bats', and 'Hits'. The table is divided into two main sections: 'National' and 'American'. The 'National' section lists Dale Murphy, Eric Davis, and Darryl Strawberry. The 'American' section lists Jesse Barfield, Dave Kingman, and Gary Gaetti. Each row has three horizontal bars representing the values in the 'Home ...', 'At Bats', and 'Hits' columns. The bars are blue and their lengths correspond to the numerical values. A red rectangular box highlights the 'American' section of the table.

League	Players	Home ...	At Bats	Hits
National	Dale Murphy	29	614	163
	Eric Davis	27	415	115
	Darryl Strawb...	27	475	123
American	Jesse Barfield	40	589	170
	Dave Kingman	35	561	118
	Gary Gaetti	34	596	171

Rao, R. and Card, S. **The table lens: merging graphical and symbolic representations in an interactive focus + context visualization for tabular information.** In *Proceedings of the SIGCHI conference on Human factors in computing systems: celebrating interdependence (CHI '94)*. ACM, New York, NY, USA, 318-322

<https://www.youtube.com/watch?v=ZDY9YCYv7z8>

Implementação fornecida por NComVA:

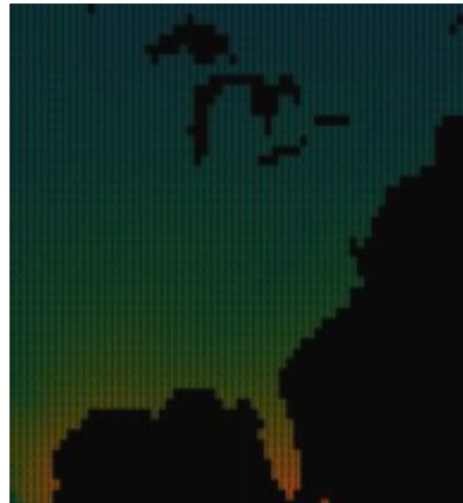
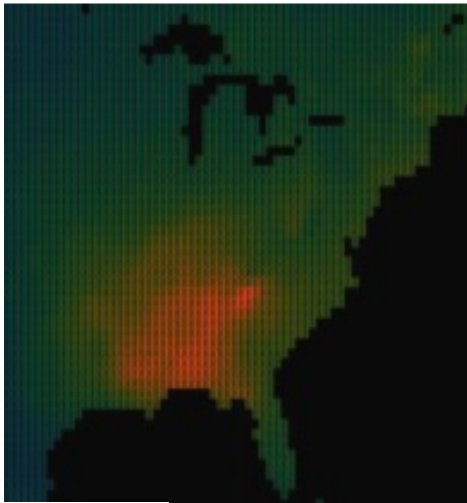
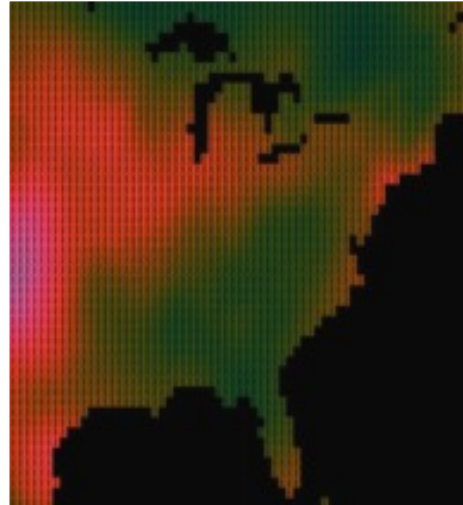
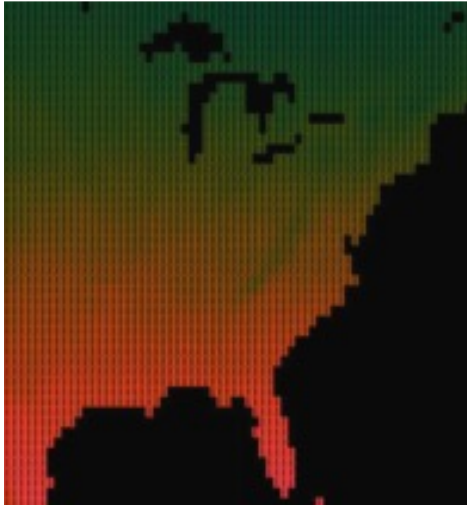
http://www.ncomva.se/guide/index.php?chapter=Visualizations§ion=Table%20Lens#_General

Especificação formal (Healey, 2001)

- Dataset $D = \{ e_1, \dots, e_n \}$ containing n elements e_i
- D represents m data attributes $A = \{ A_1, \dots, A_m \}$
- Each e_i encodes m attribute values $e_i = \{ a_{i,1}, \dots, a_{i,m} \}$
- Visual features $V = \{ V_1, \dots, V_m \}$ used to represent A
- Function $\phi_j: A_j \rightarrow V_j$ maps domain of A_j to range of displayable values in V_j
- *Data-feature mapping* $M(V, \Phi)$, a visual representation of D
- **Visualization:** Selection of M and viewers interpretation of images produced by M

Healey, C. G. "Formalizing Artistic Techniques and Scientific Visualization for Painted Renditions of Complex Information Spaces." In *Proceedings International Joint Conference on Artificial Intelligence 2001* (Seattle, Washington, 2001), pp. 371-376.

Separate Displays



Function $\Phi_j: A_j \rightarrow V_j$ maps domain of A_j to range of displayable values in V_j

$n = 42,224$ elements

$m = 4$

$A_1 = \text{temperature}$

$A_2 = \text{windspeed}$

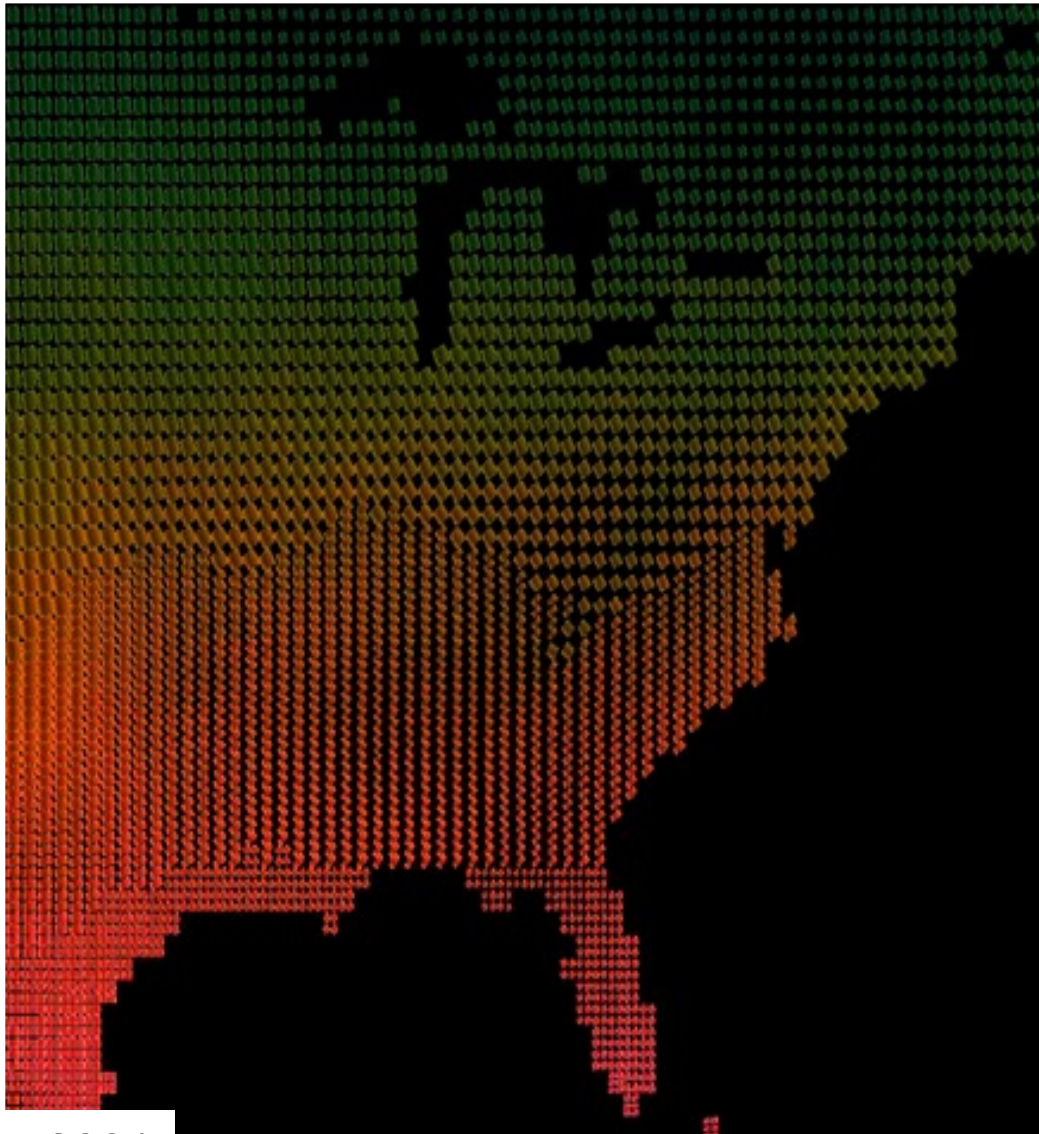
$A_3 = \text{precipitation}$

$A_4 = \text{pressure}$

$V = \text{colour}$

$\Phi = \text{dark blue ... bright pink}$

Integrated Display



Healey, 2001

Function $\Phi_j: A_j \rightarrow V_j$ maps domain of A_j to range of displayable values in V_j

$n = 42,224$ elements

$m = 4$

$A_1 = \text{temperature}$

$A_2 = \text{windspeed}$

$A_3 = \text{precipitation}$

$A_4 = \text{pressure}$

$V_1 = \text{colour}$

$V_2 = \text{size}$

$V_3 = \text{orientation}$

$V_4 = \text{density}$

$\Phi_1 = \text{dark blue} \dots \text{bright pink}$

$\Phi_2 = 0.25 \dots 1.15$

$\Phi_3 = 0^\circ \dots 90^\circ$

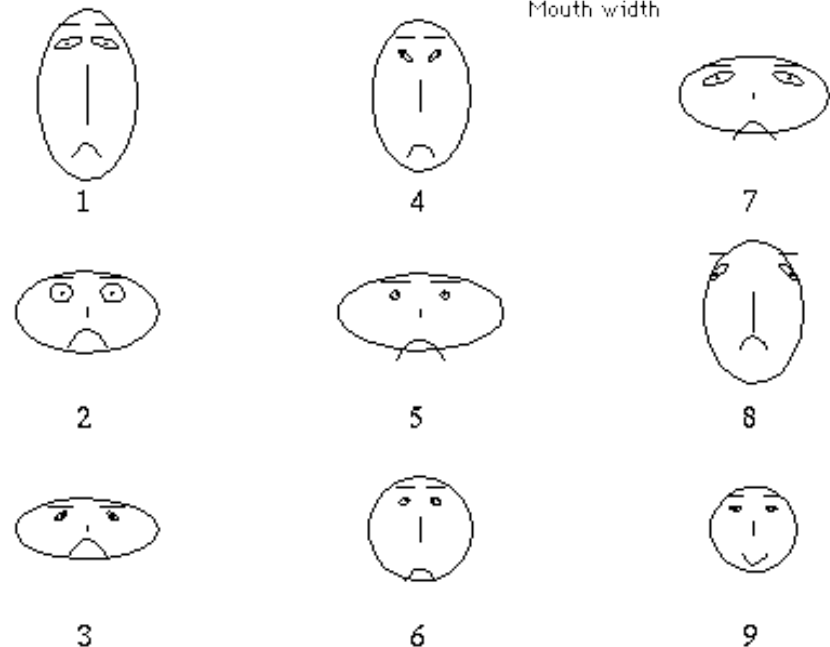
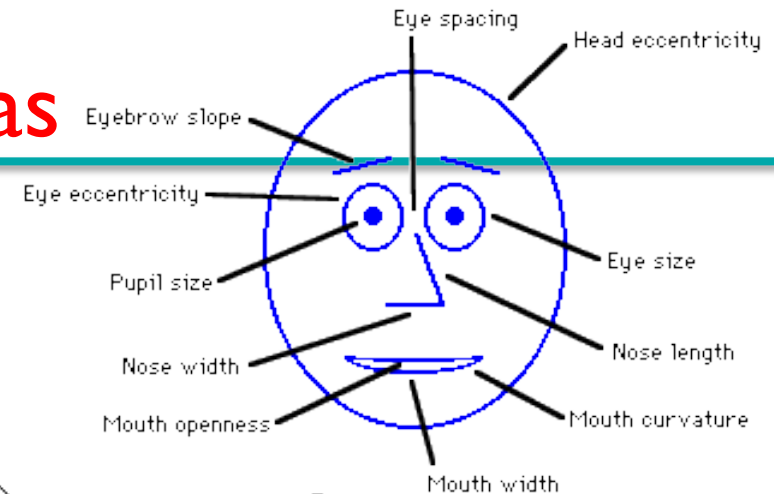
$\Phi_4 = 1 \times 1 \dots 3 \times 3$

Mapeamento

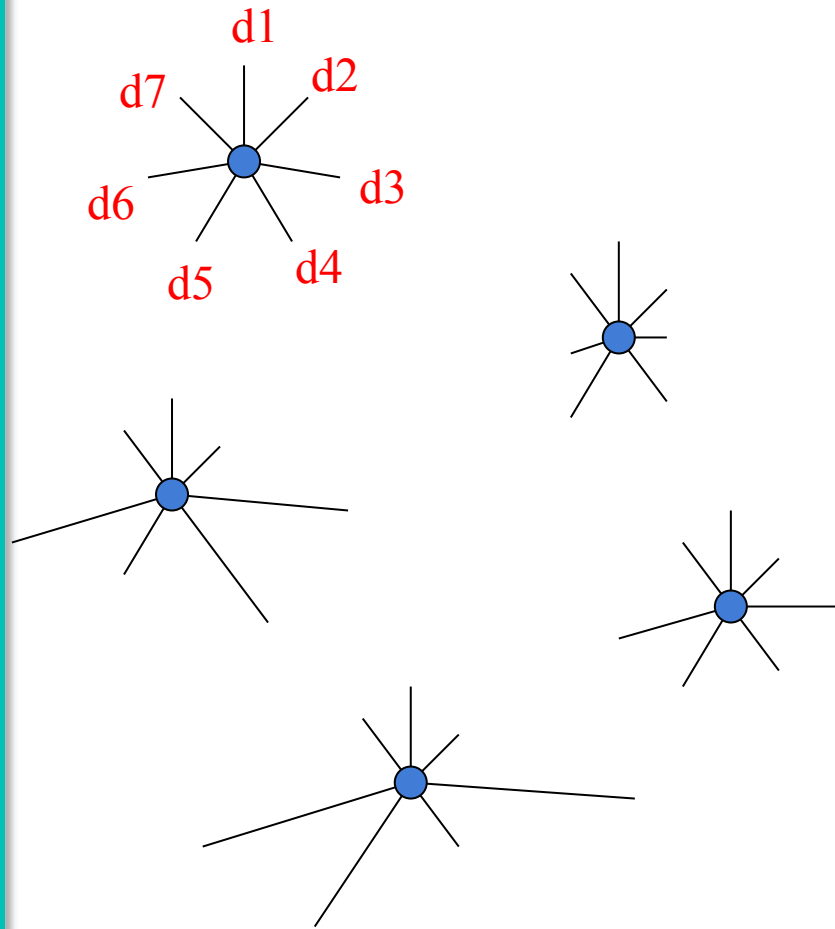
- Mapear o espaço nD para o espaço 2D da imagem
 - Projeção
- Abordagens diferentes (Keim, 1996)
 - Técnicas iconográficas
 - Baseadas em ícones e glifos
 - Técnicas orientadas a pixel
 - Mapeamento direto para pixels na imagem
 - Técnicas de projeção geométrica
 - Projeção para coordenadas num domínio espacial

Técnicas iconográficas

- Faces de Chernoff (1973)
- Parâmetros
 - Formato da cabeça
 - Espaço entre-olhos
 - Formato do olho
 - Tamanho do olho
 - Tamanho da pupila
 - Inclinação da sobrancelha
 - Tamanho do nariz
 - Posição da boca
 - Largura da boca
 - Abertura da boca

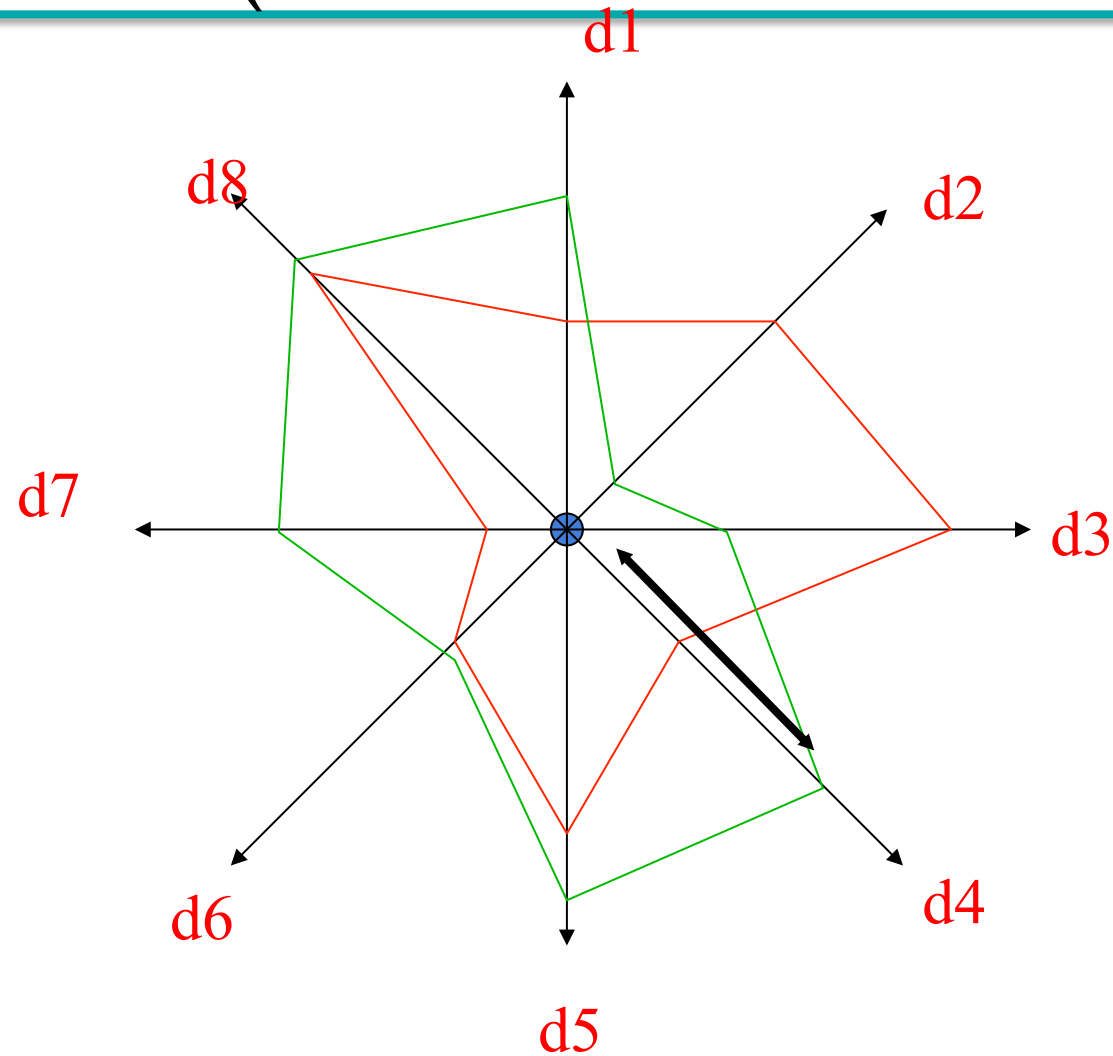


Estrelas (Star icons, sun rays)



- Comprimento dos segmentos corresponde aos valores das variáveis
- Distribuição radial, uniforme dos segmentos ao redor de um núcleo

Estrelas (Star Plots ou Radar Plots)

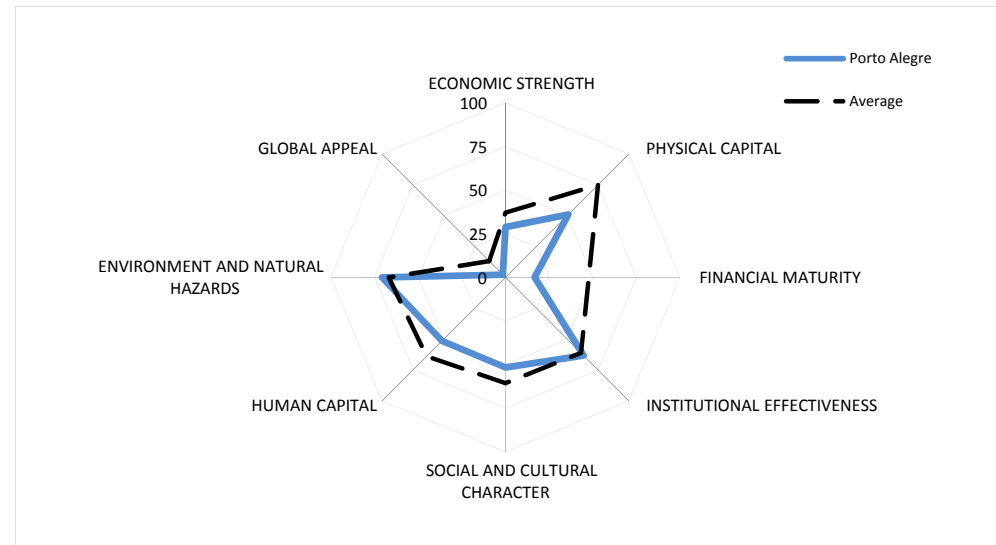


Star/radar plots

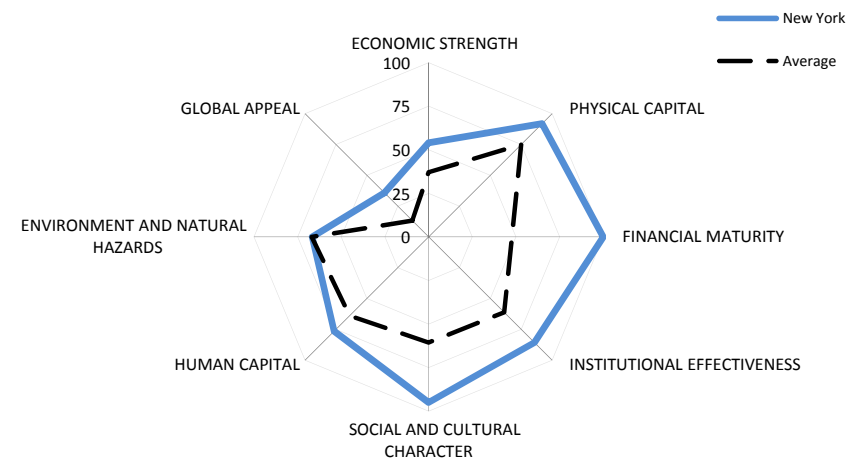
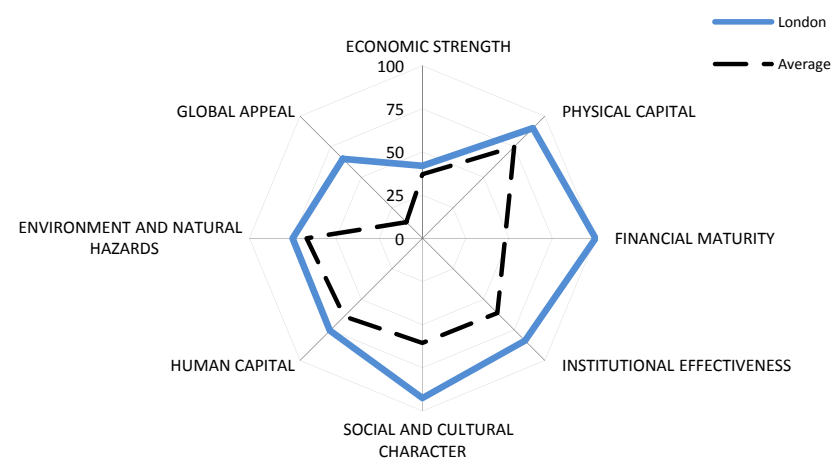
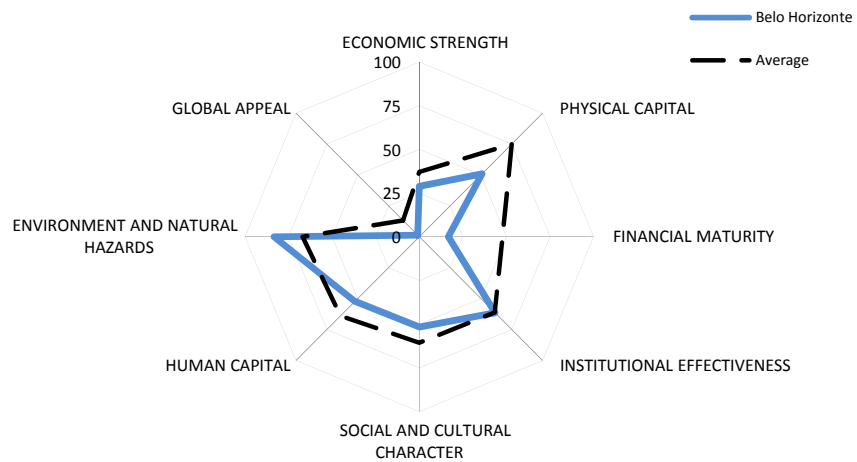
City Profile

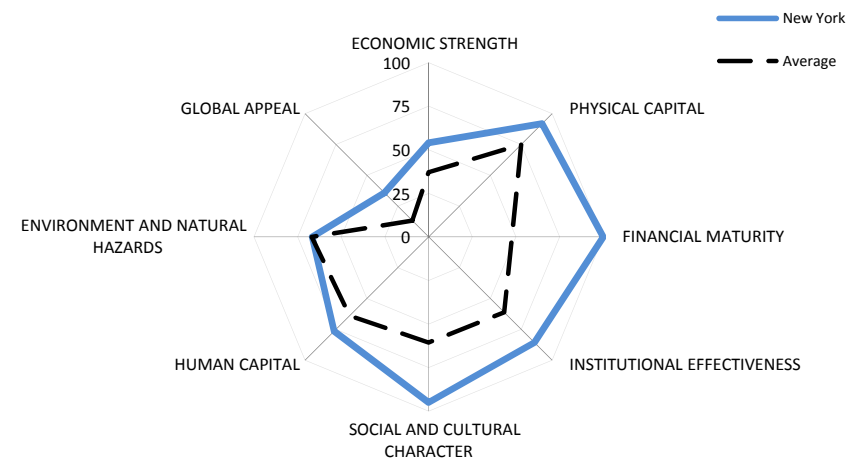
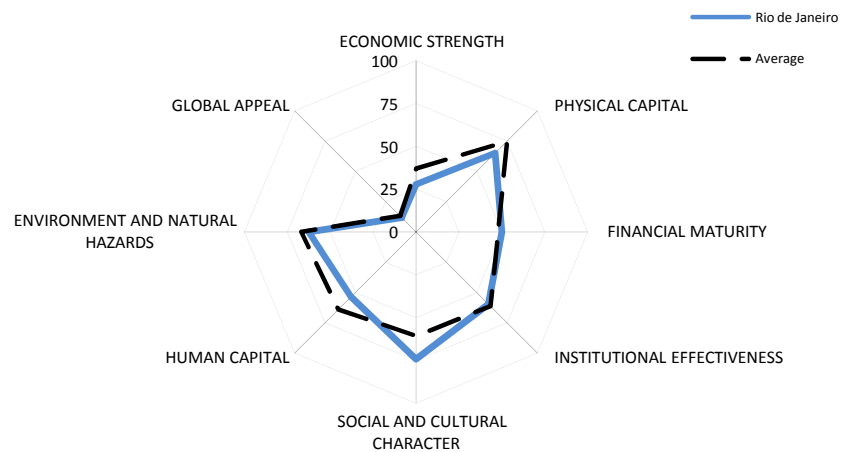
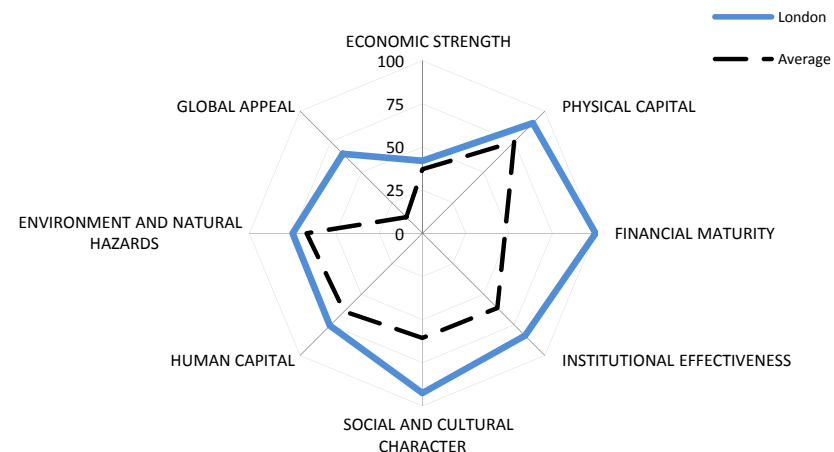
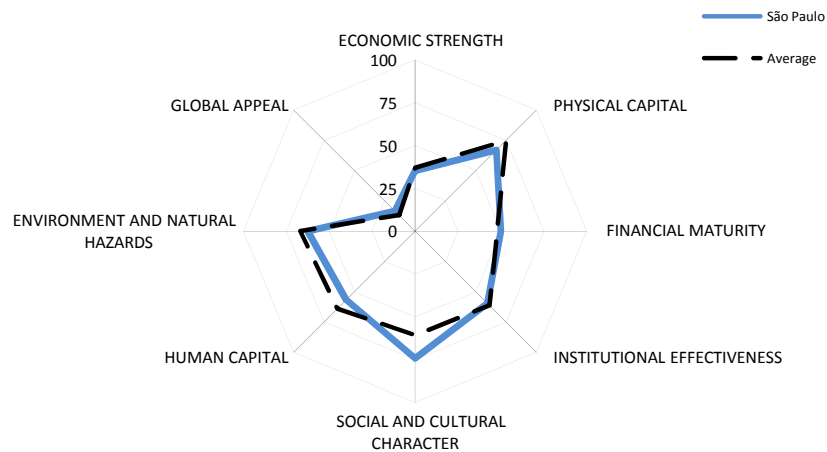
Porto Alegre

	Rank / 120	Score / 100	Average
OVERALL SCORE	103	39.0	49.9
ECONOMIC STRENGTH	109	28.9	37.1
PHYSICAL CAPITAL	=105	50.9	74.9
FINANCIAL MATURITY	=93	16.7	47.8
INSTITUTIONAL EFFECTIVENESS	61	63.2	61.2
SOCIAL AND CULTURAL CHARACTER	=76	51.7	60.6
HUMAN CAPITAL	110	51.4	63.9
ENVIRONMENT AND NATURAL HAZARDS	=43	70.8	66.9
GLOBAL APPEAL	100	2.2	13.2

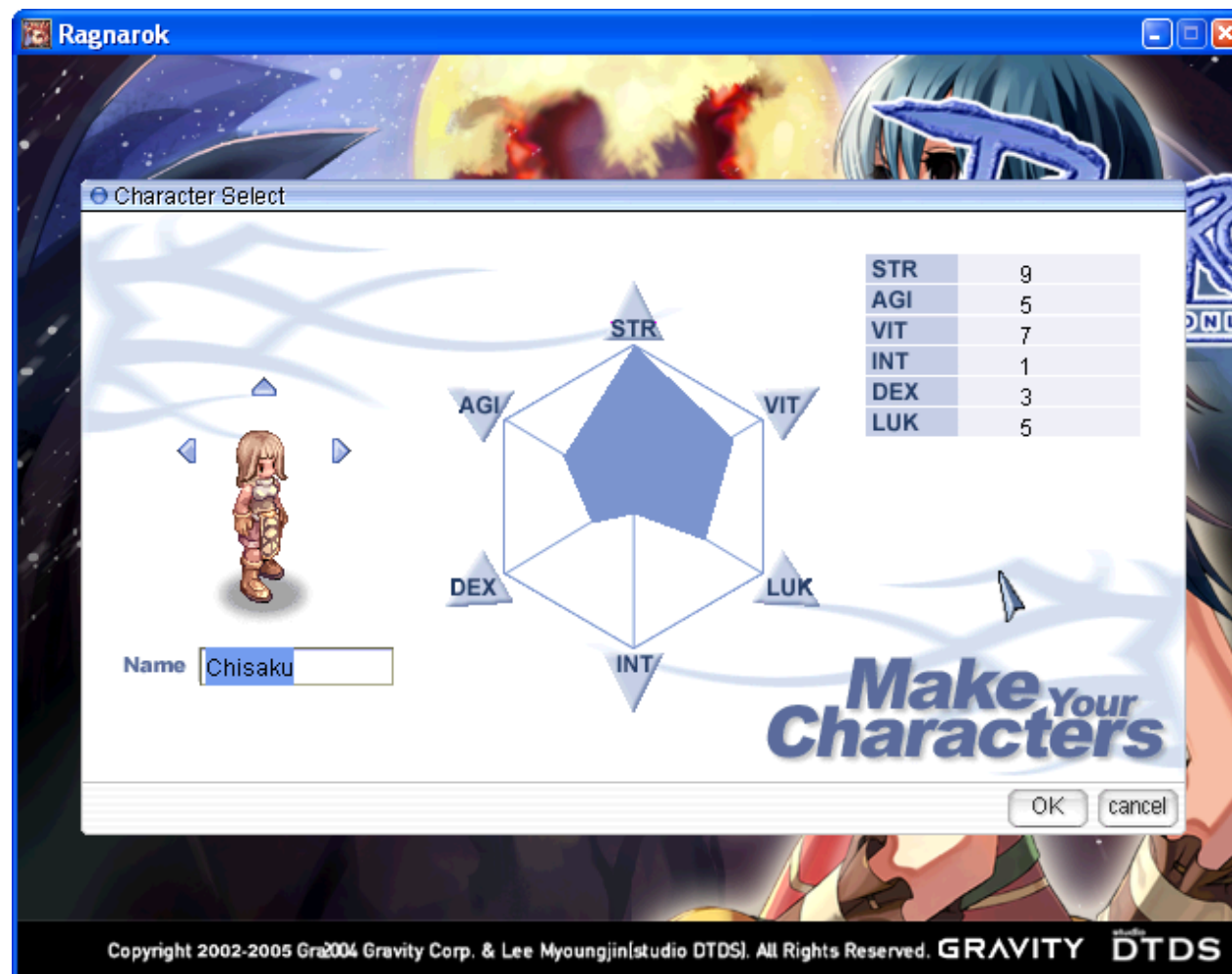


Fonte: The Economist Intelligence Unit Limited 2012 (jan 2012)

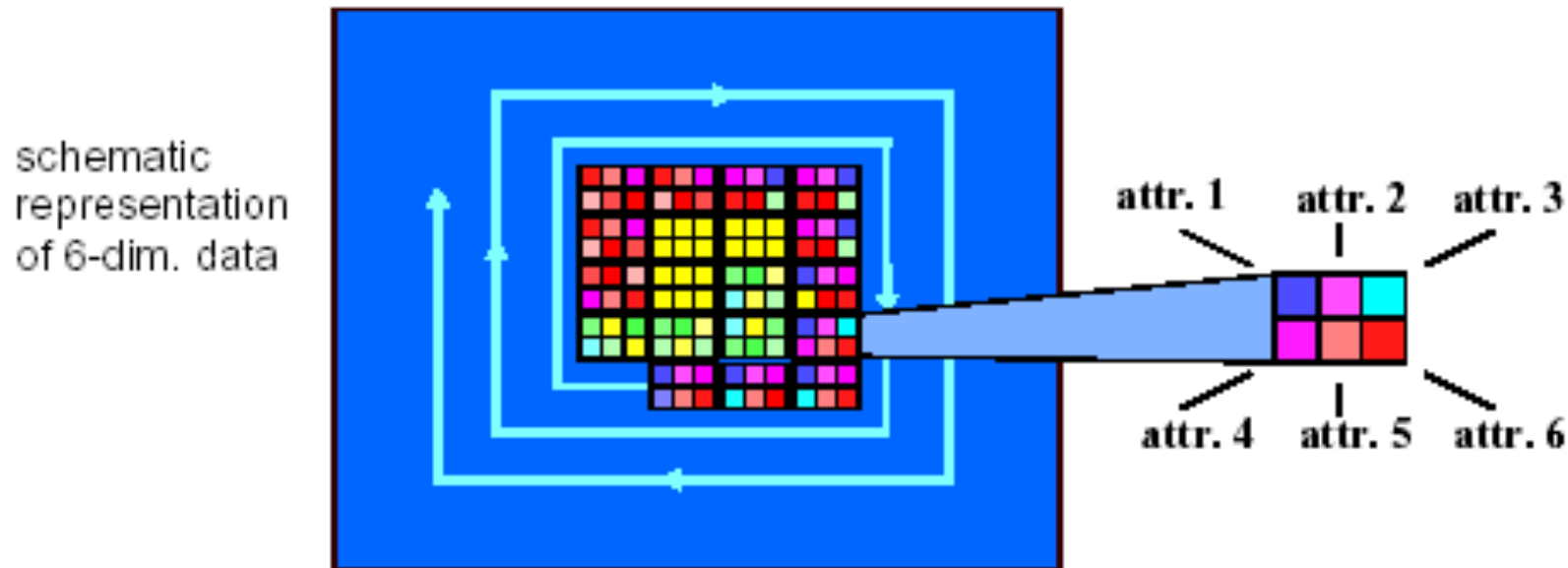




Star/radar plots

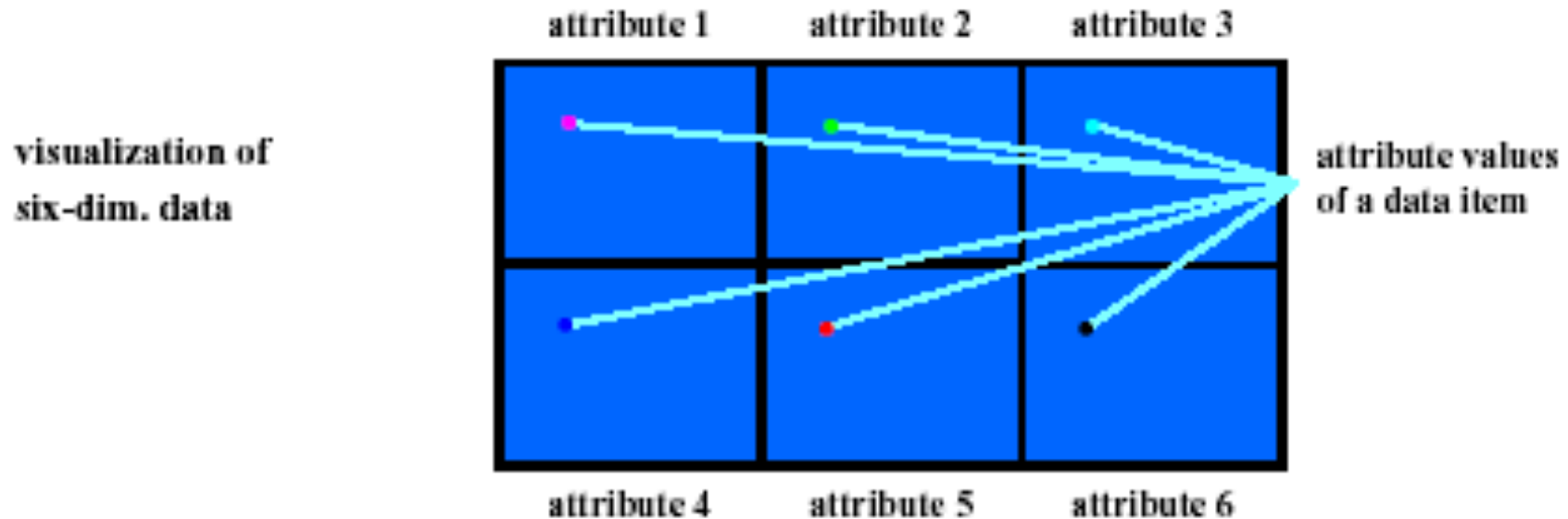


Ícones codificados por cor



- Ícones como arrays de células coloridas
- Cada célula representa um atributo
- Disposição dos ícones é dependente da consulta
- (Levkowitz, 1991) (Keim, 1994)

Técnicas orientadas a pixel



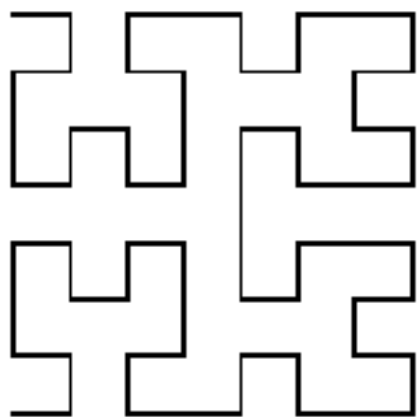
- Uma janela para cada atributo, com um elemento por pixel
- Cor correspondente ao valor do atributo

Técnicas orientadas a pixel

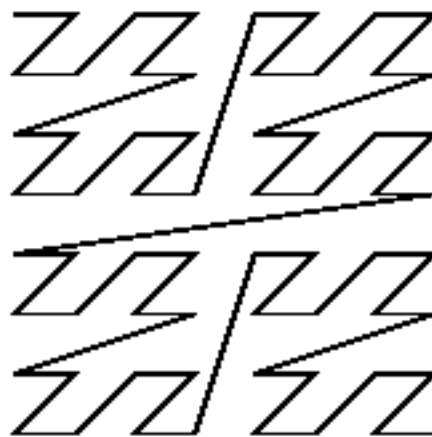
Categorias relativas à consulta sendo realizada

- Independentes da consulta
 - Técnicas de preenchimento em curvas
 - Técnicas de padrão recursivo
- Dependentes da consulta
 - Espiral
 - Orientada pelos eixos
 - Segmentos de círculo

Preenchimento em curvas

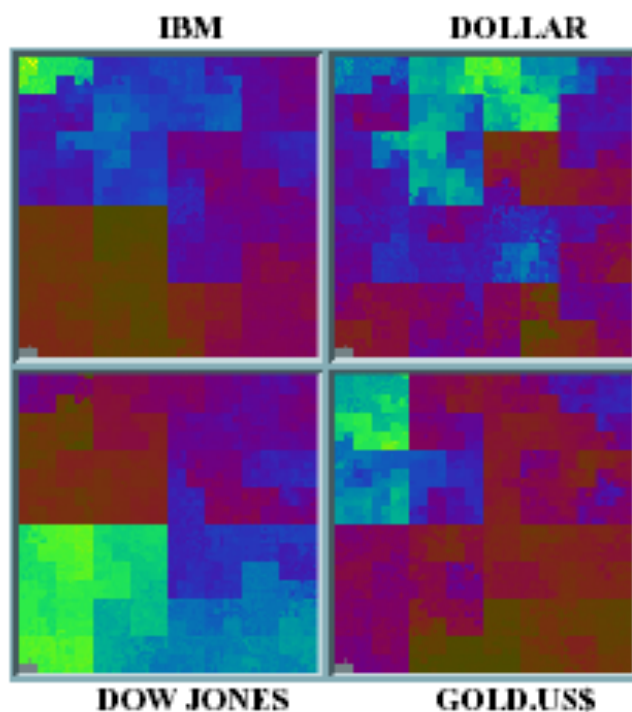


Peano-Hilbert

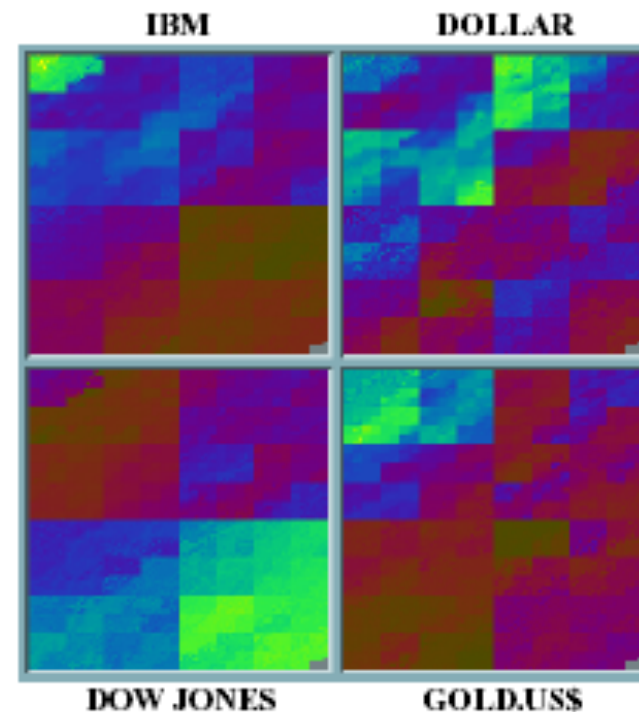


Morton (Z-Curve)

Séries de dados
temporais

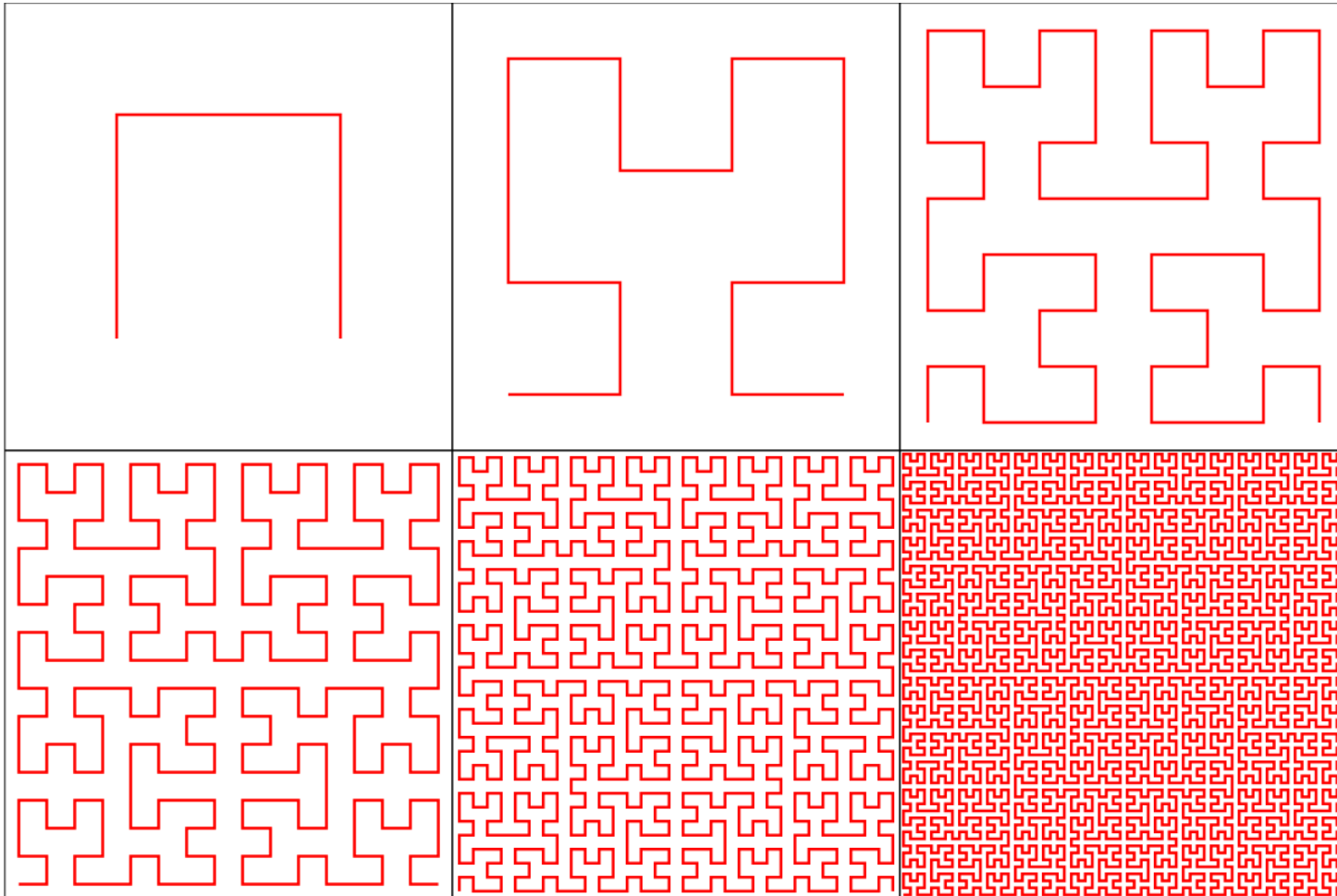


Peano-Hilbert

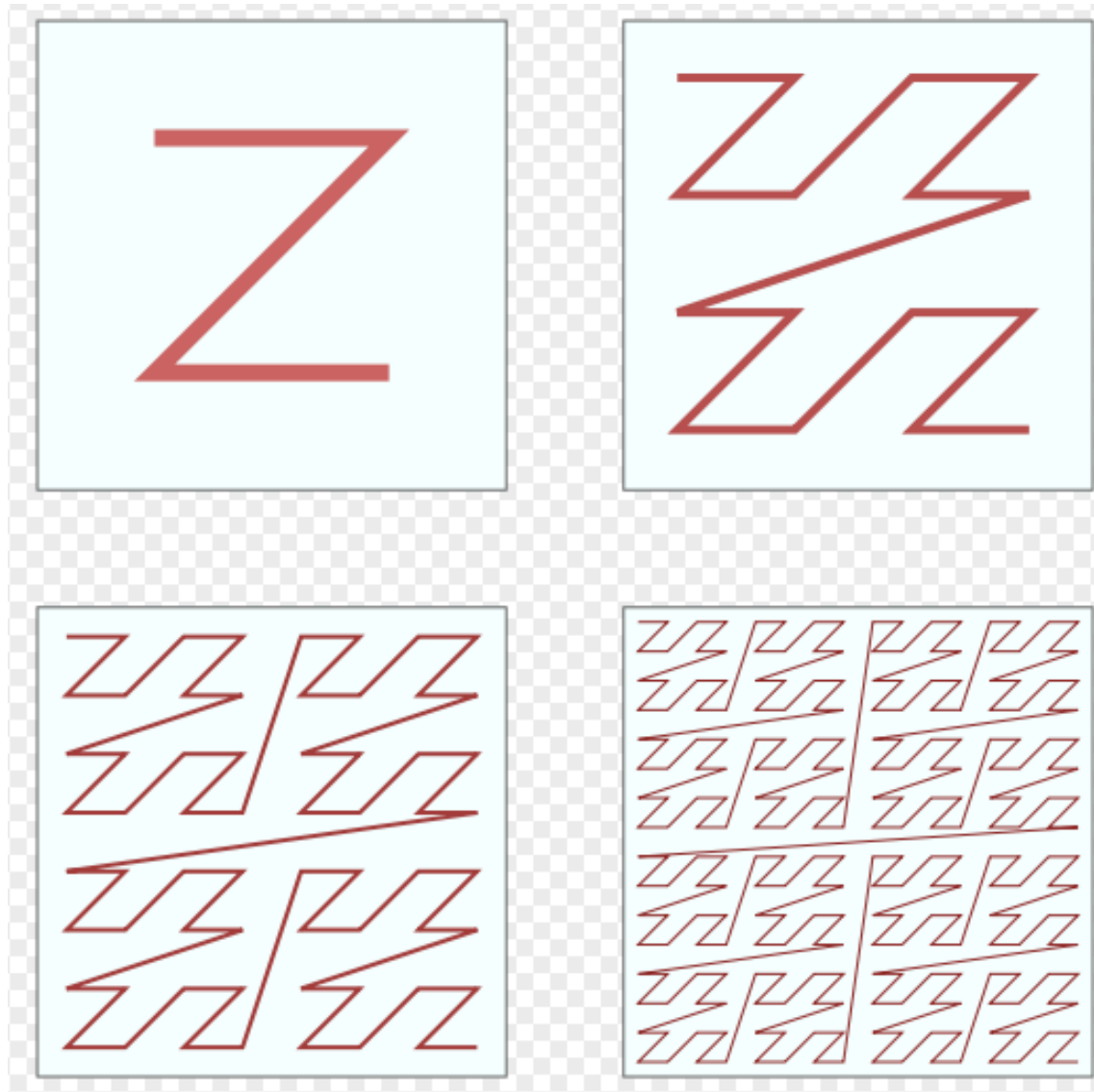


Morton (Z-Curve)

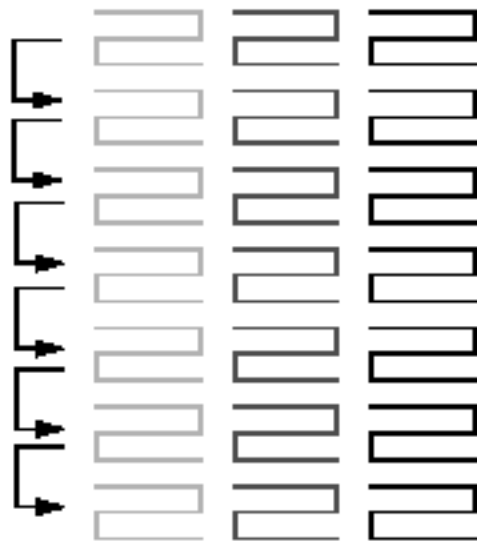
Peano-Hilbert curve (6 iterations)



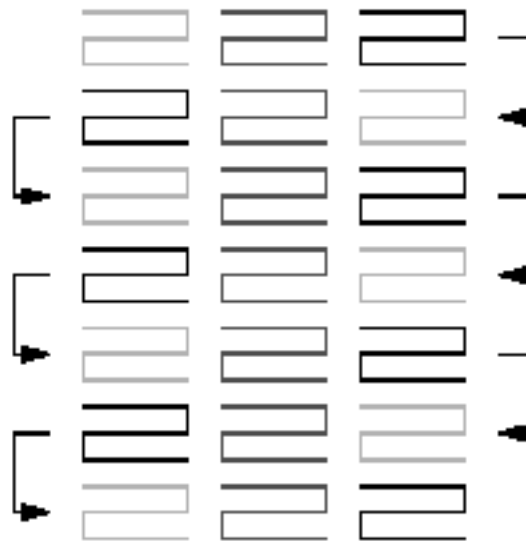
Morton (Z) Curve (4 iterations)



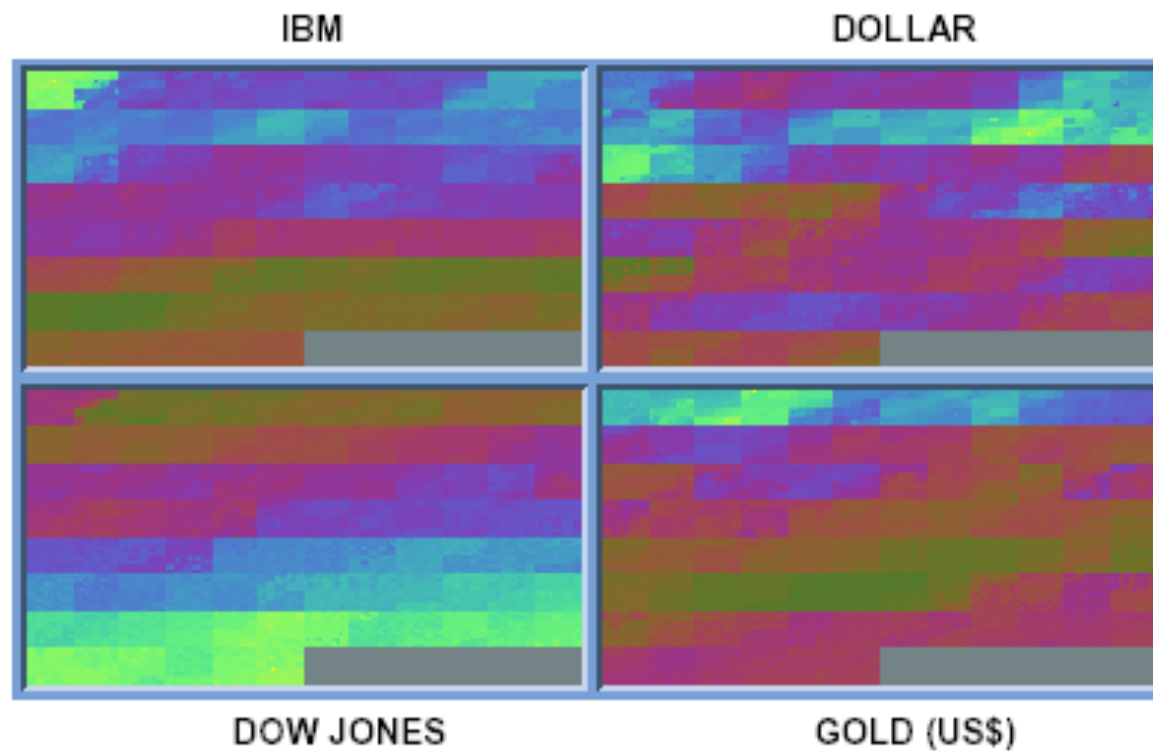
Padrões recursivos



line-by-line loop



back-and-forth loop



time series of
financial data

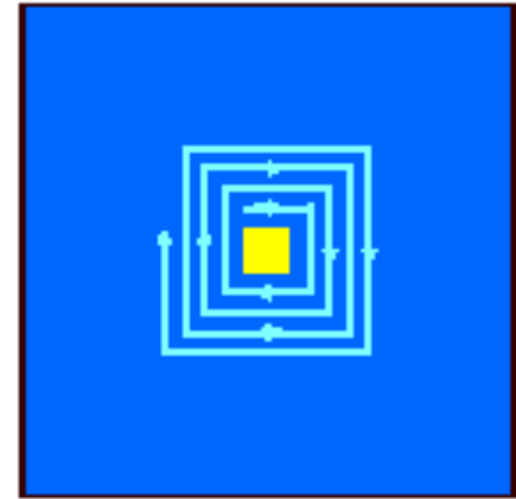
Técnicas dependentes da consulta

- Preenchimento baseado na distância entre as tuplas retornadas e uma tupla de consulta (chave de busca)
 - Tupla = $(a_1, a_2, a_3, \dots, a_n)$
 - Chave de busca = $(q_1, q_2, q_3, \dots, q_n)$
 - Distância tupla-chave = $(d_1, d_2, d_3, \dots, d_n)$
 - Mapear as distâncias para cores
 - Cada valor de distância (de um elemento) é mapeado para um pixel, numa janela diferente
 - Cada janela mostra um atributo

VisDB

Keim, 1994

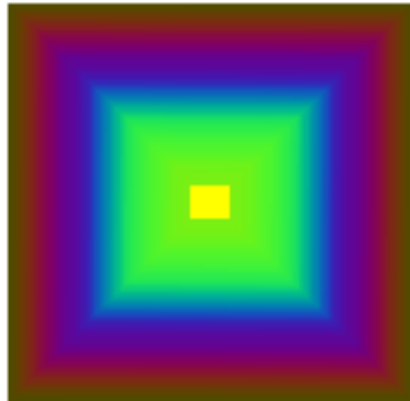
Espiral



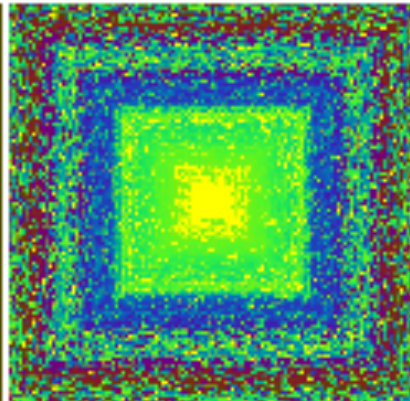
arrangement in spiral form
according to the overall distance

result of a
complex query

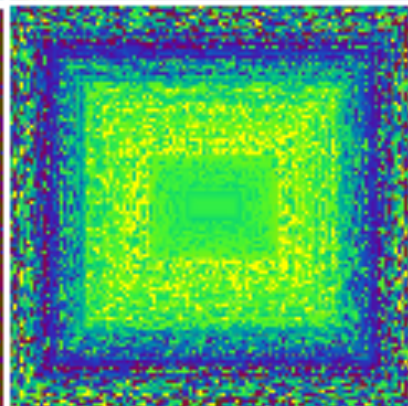
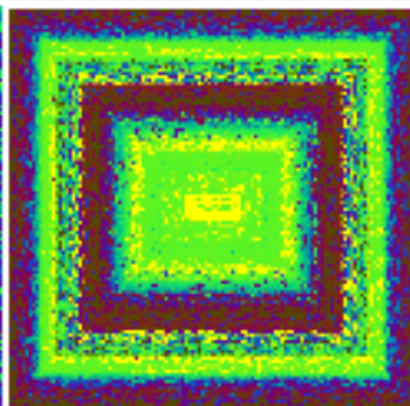
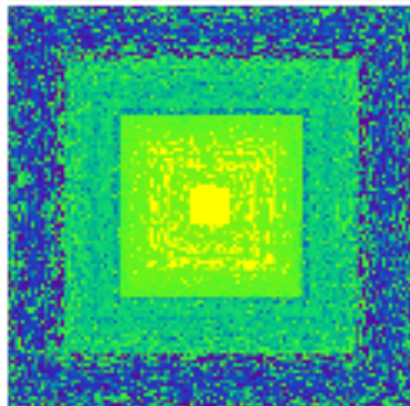
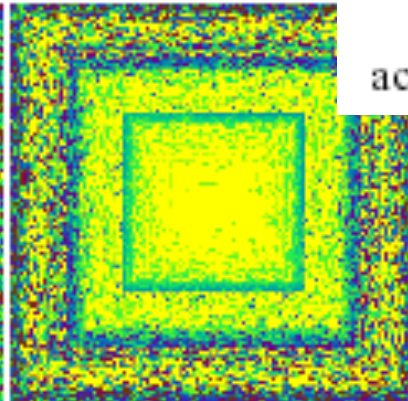
d1



d2



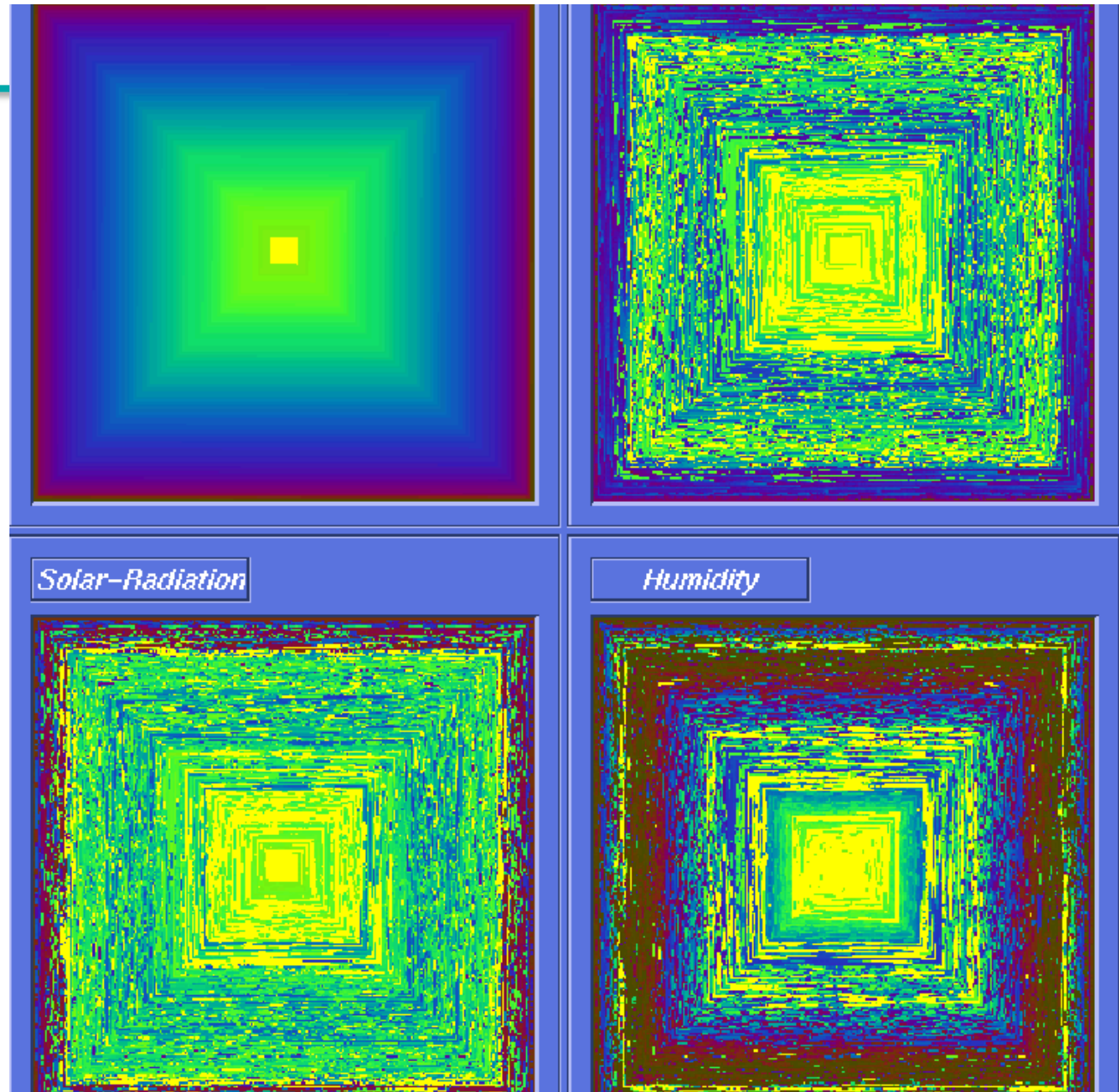
d3



VisDB

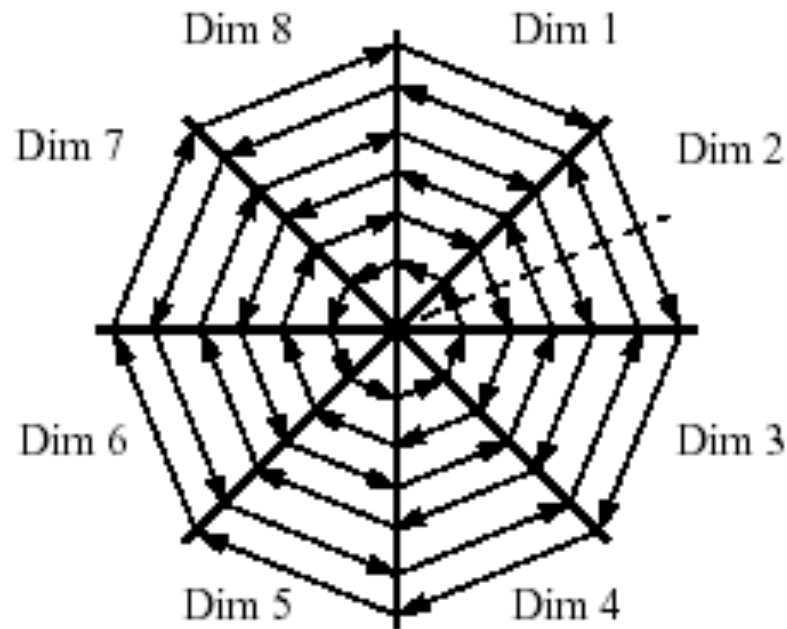
Keim, 1994

Espiral

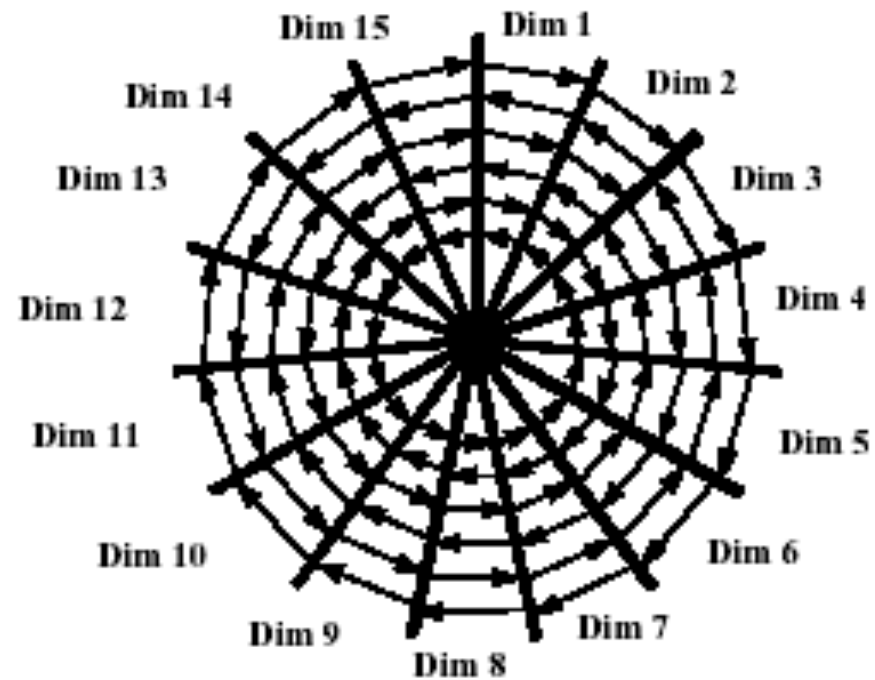


Segmentos de círculo

Arrangement of Attributes on the Segments of a Circle

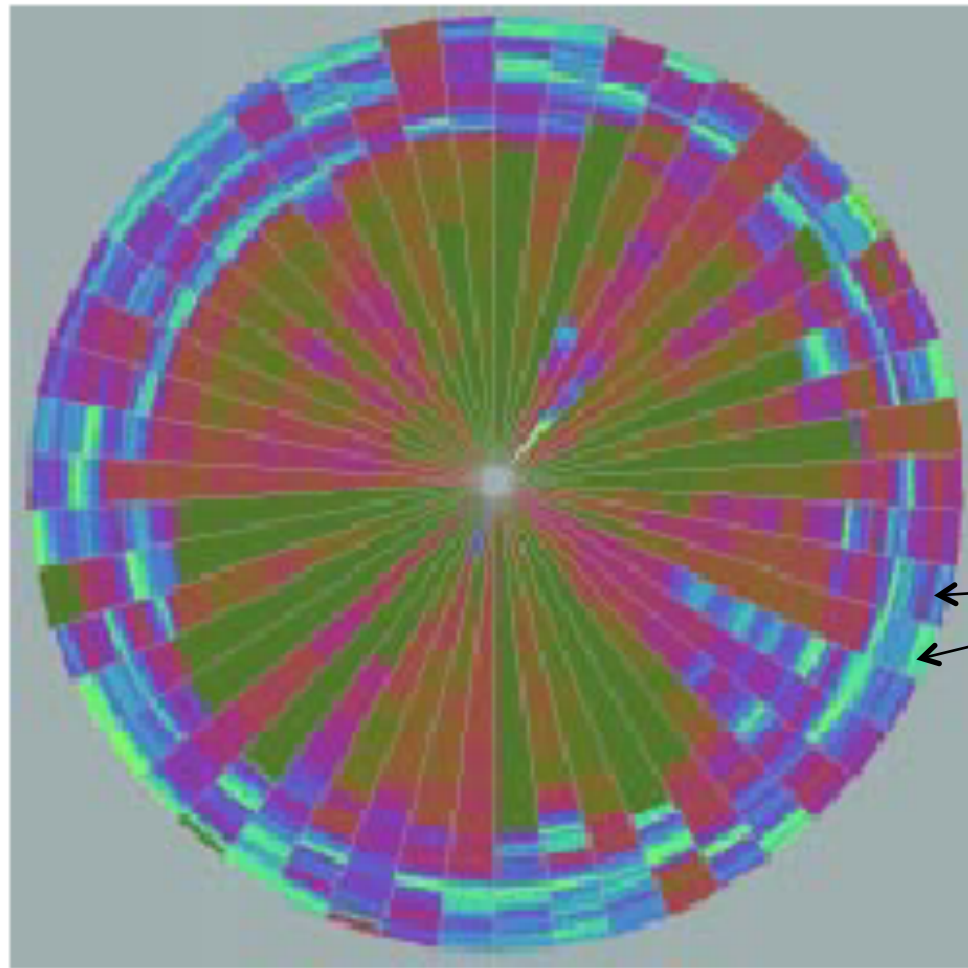


Arrangement of 8-dim. Data



Arrangement of 15-dim. Data

Segmentos de círculo

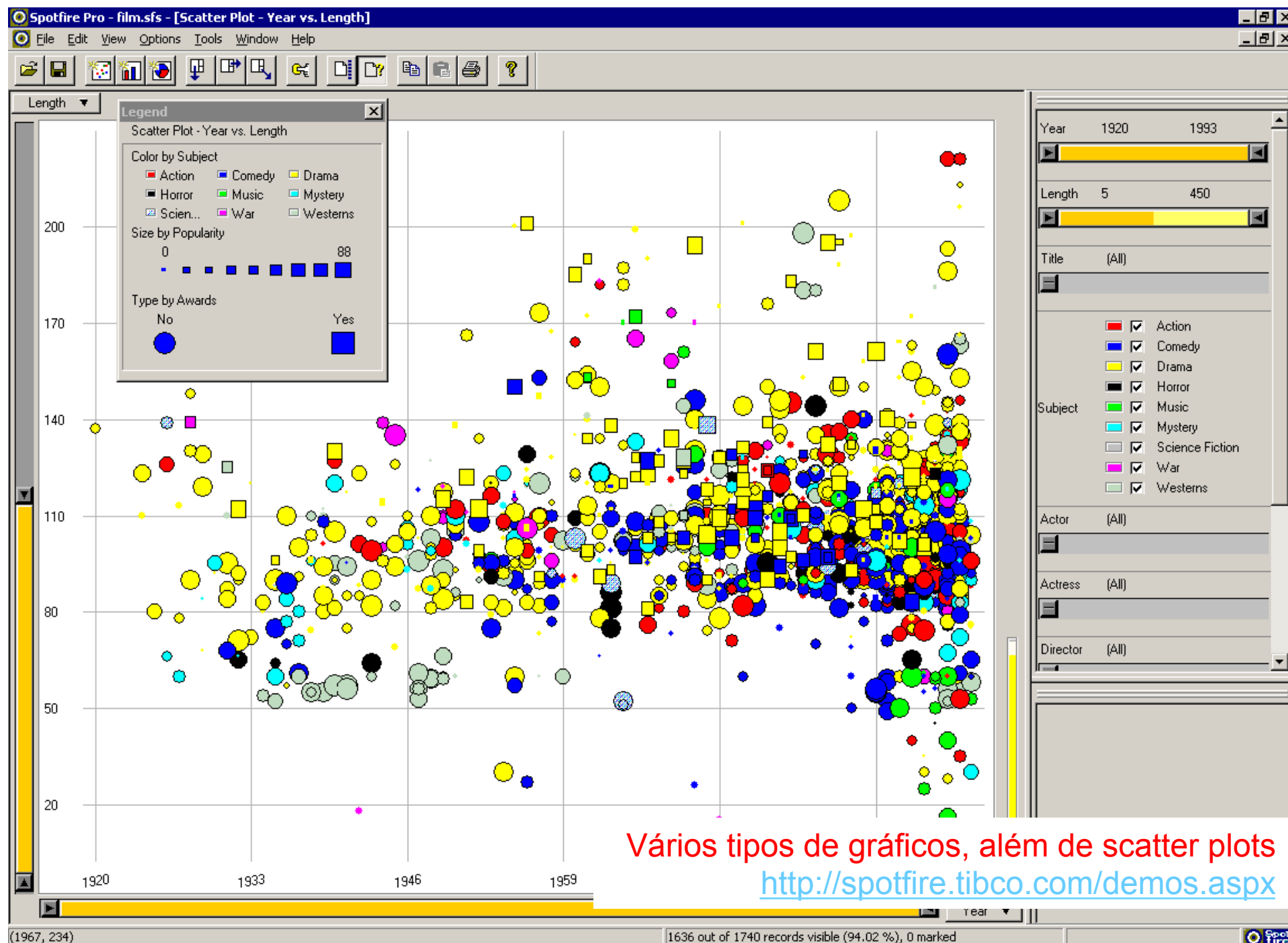


time series of
50 stocks of
the Frankfurt
Stock Index

ativos financeiros;
temporalidade nos
círculos
concêntricos

Técnicas de projeção geométricas

- Os dados são mapeados para representações visuais, através de algum tipo de projeção geométrica
 - Gráficos 2D tradicionais
 - Matriz de scatter plots
 - Coordenadas paralelas
 - Coordenadas radiais
 - Projeções multidimensionais

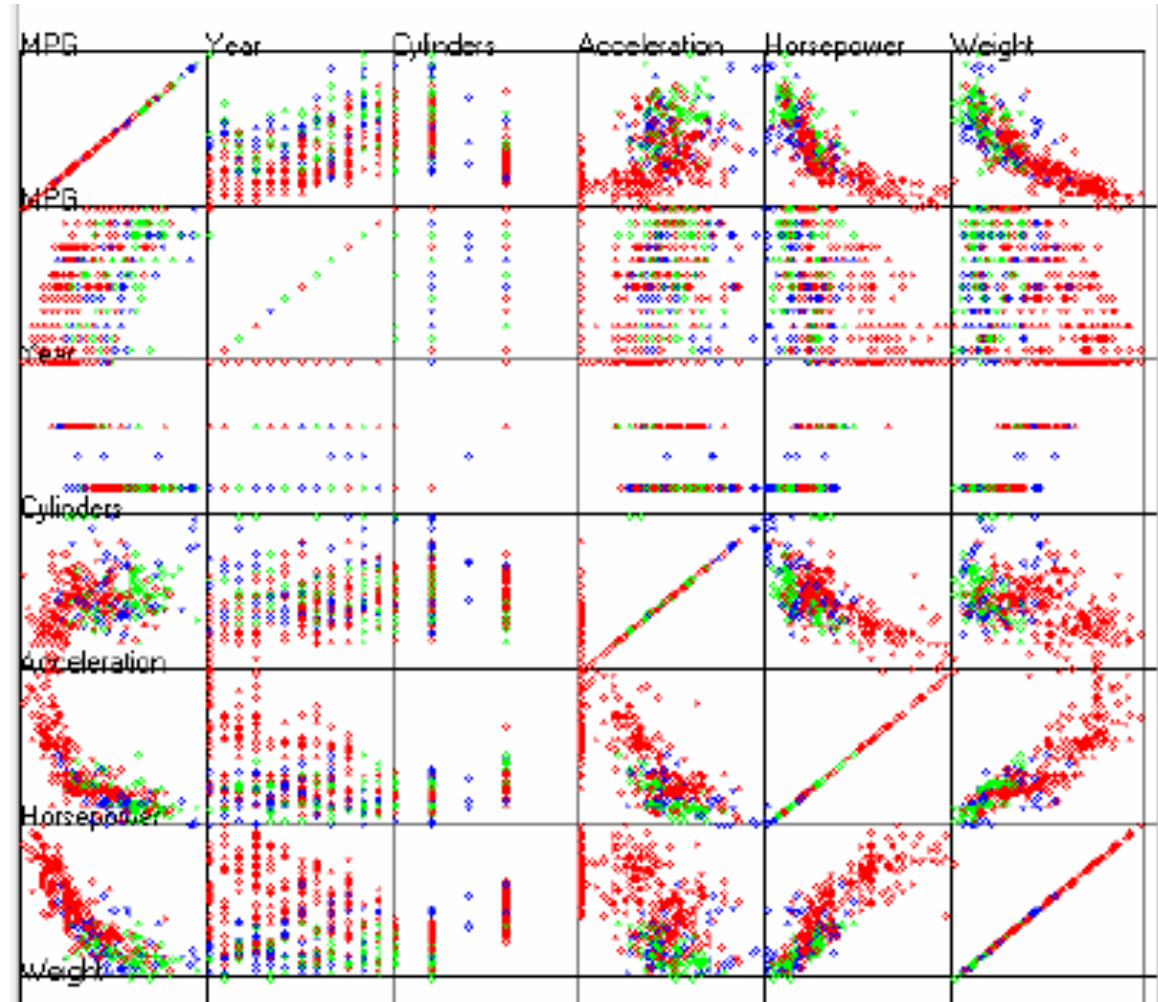


Vários tipos de gráficos, além de scatter plots

<http://spotfire.tibco.com/demos.aspx>

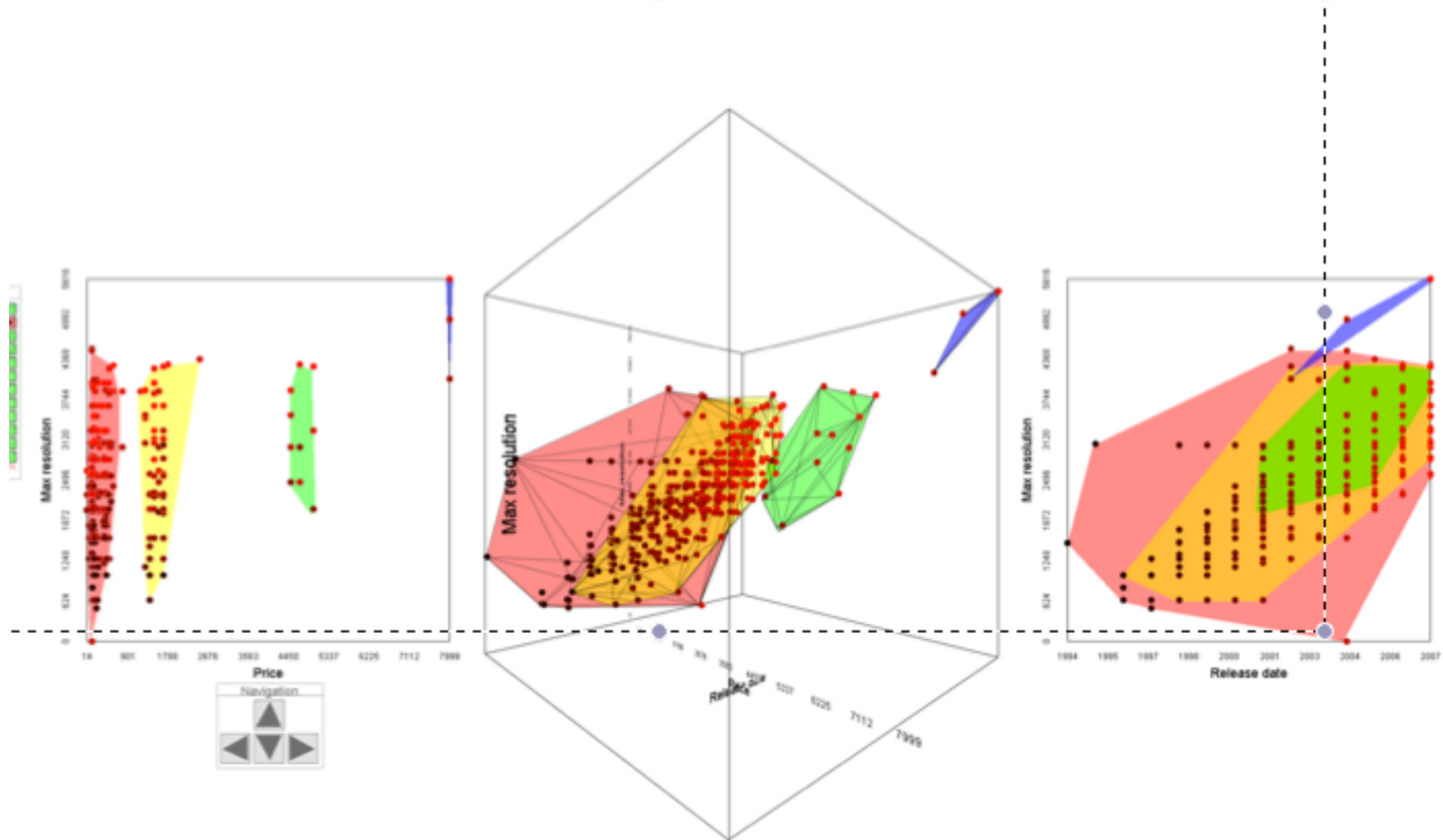
Matriz de gráficos tipo *scatterplot*

- Simples de obter
- Todos os pares de gráficos possíveis
- Relacionam um atributo a cada um dos outros



<https://mbostock.github.io/d3/talk/20111116/iris-splom.html>

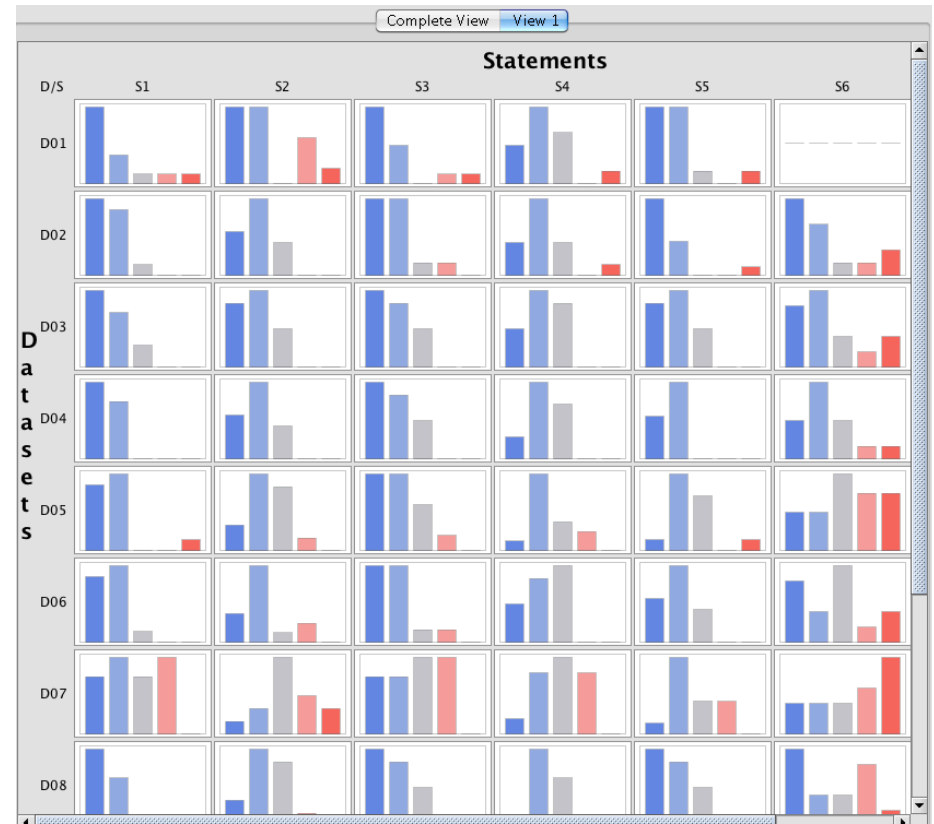
ScatterDice (Elmqvist et al., 2008)



<https://engineering.purdue.edu/~elm/projects/scatterdice.html>

Matriz de gráficos (small multiples)

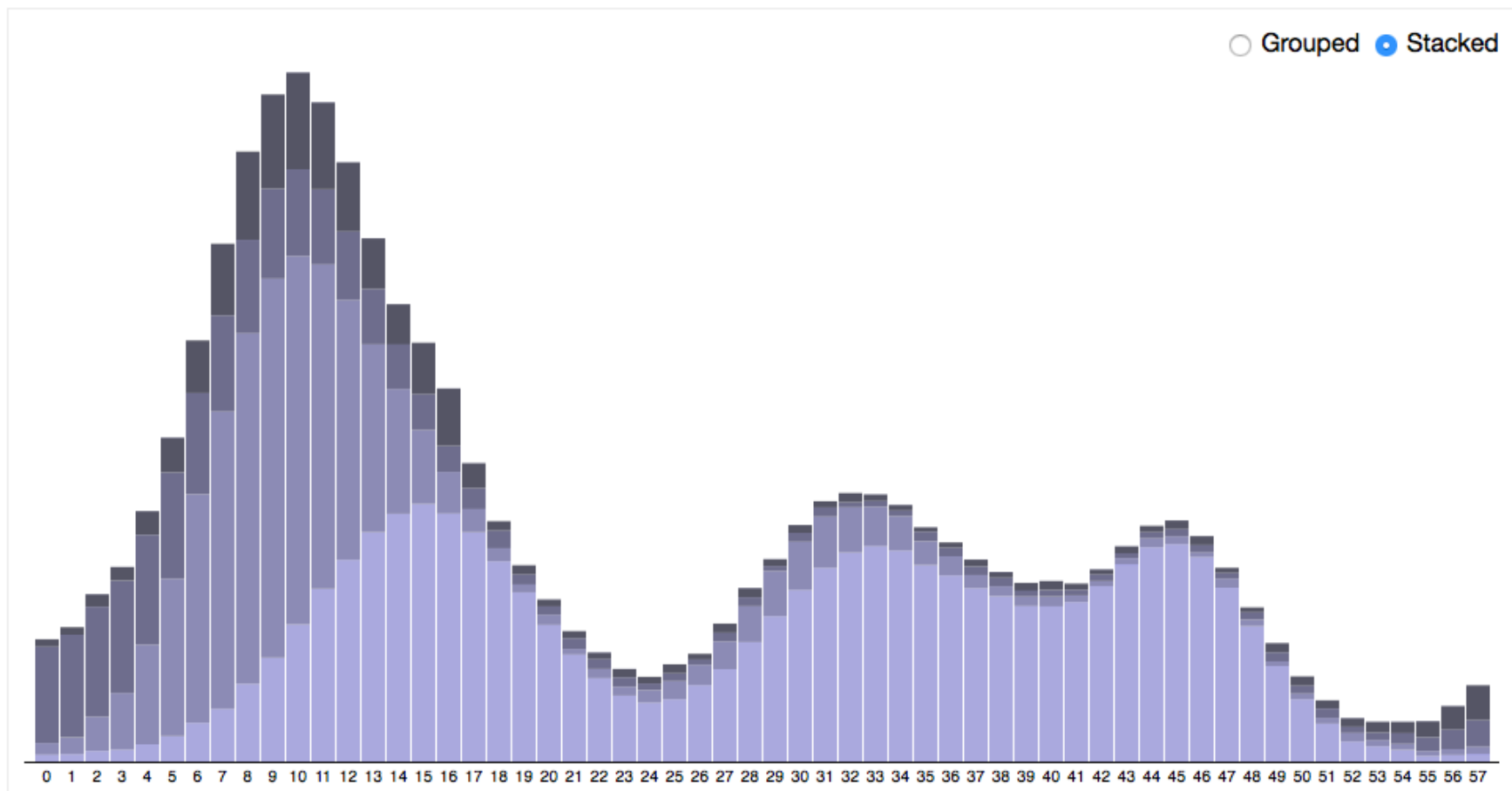
- Stacked bar chart
- Bar chart



Petrillo, Fabio et al. **Interactive Analysis of Likert Scale Data using a Multichart Visualization Tool**. In: 10th Brazilian Symposium on Human Factors in Computing Systems and the 5th Latin American Conference on Human-Computer Interaction (IHC+CLIH 2011). Porto de Galinhas, Recife, PE, 2011. p. 358-365.

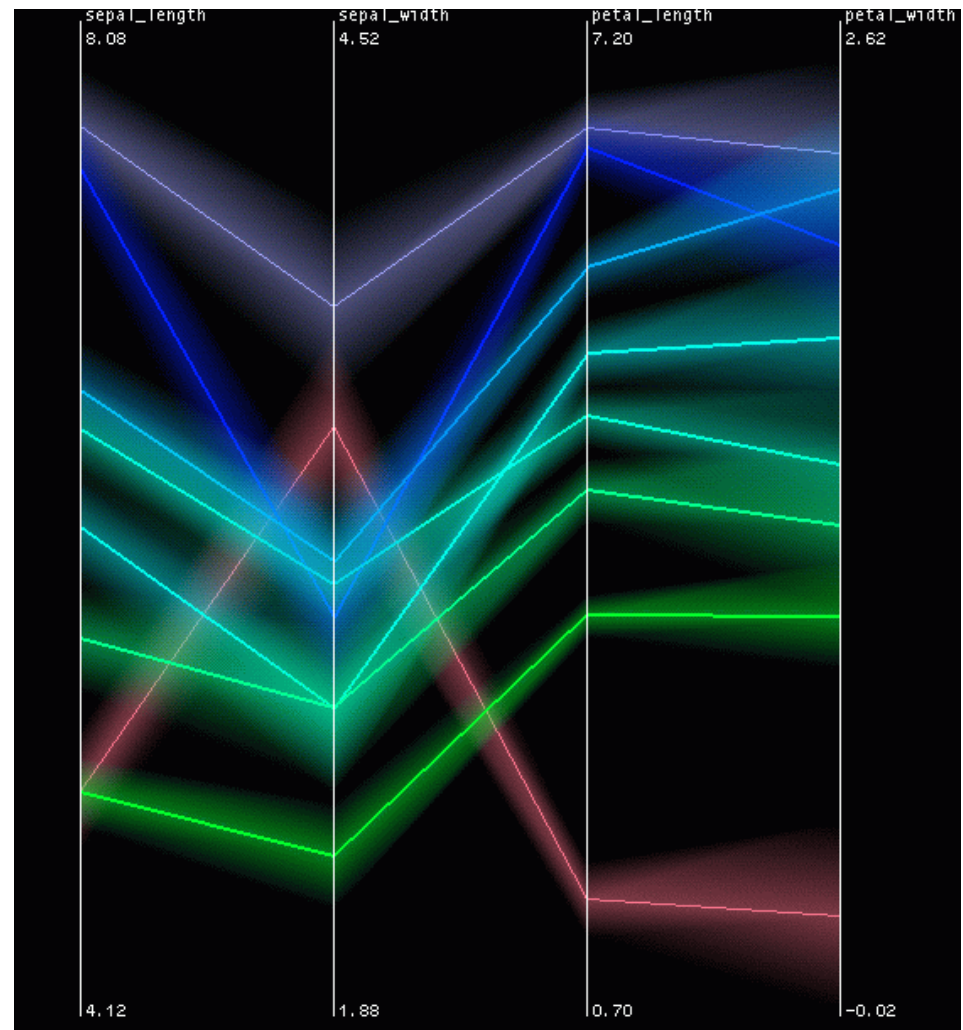
Stacked x grouped bar charts

<http://bl.ocks.org/mbostock/3943967>



Coordenadas paralelas

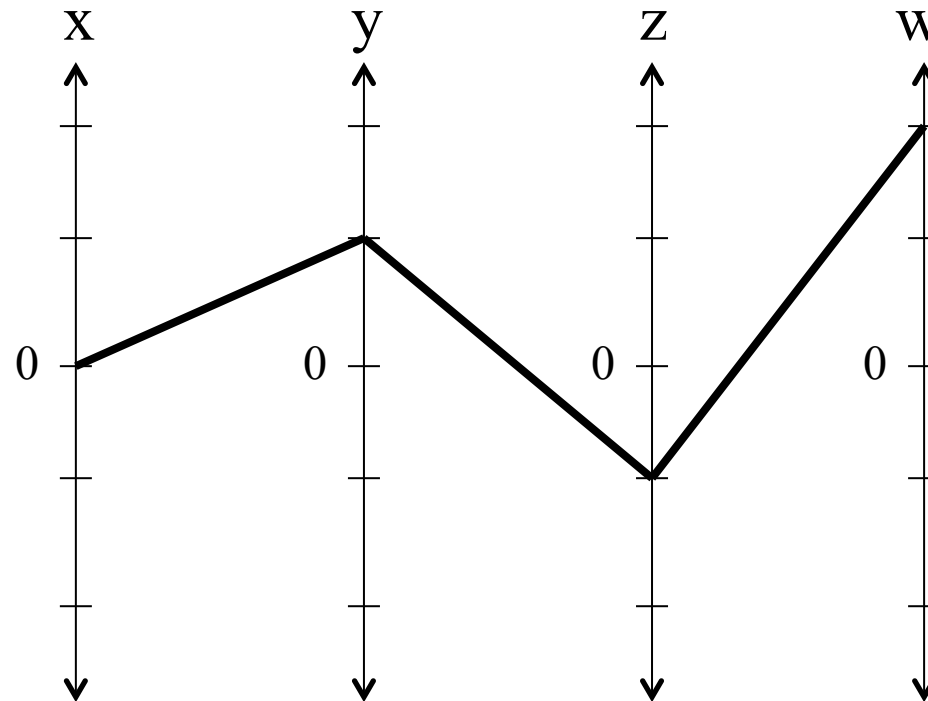
- Alfred Inselberg, 1985, 1990
- Cada atributo é representado por um eixo vertical
- Cada elemento no conjunto de dados corresponde a uma linha conectando os valores dos atributos nos diferentes eixos



Coordenadas paralelas

$(0, 1, -1, 2)$

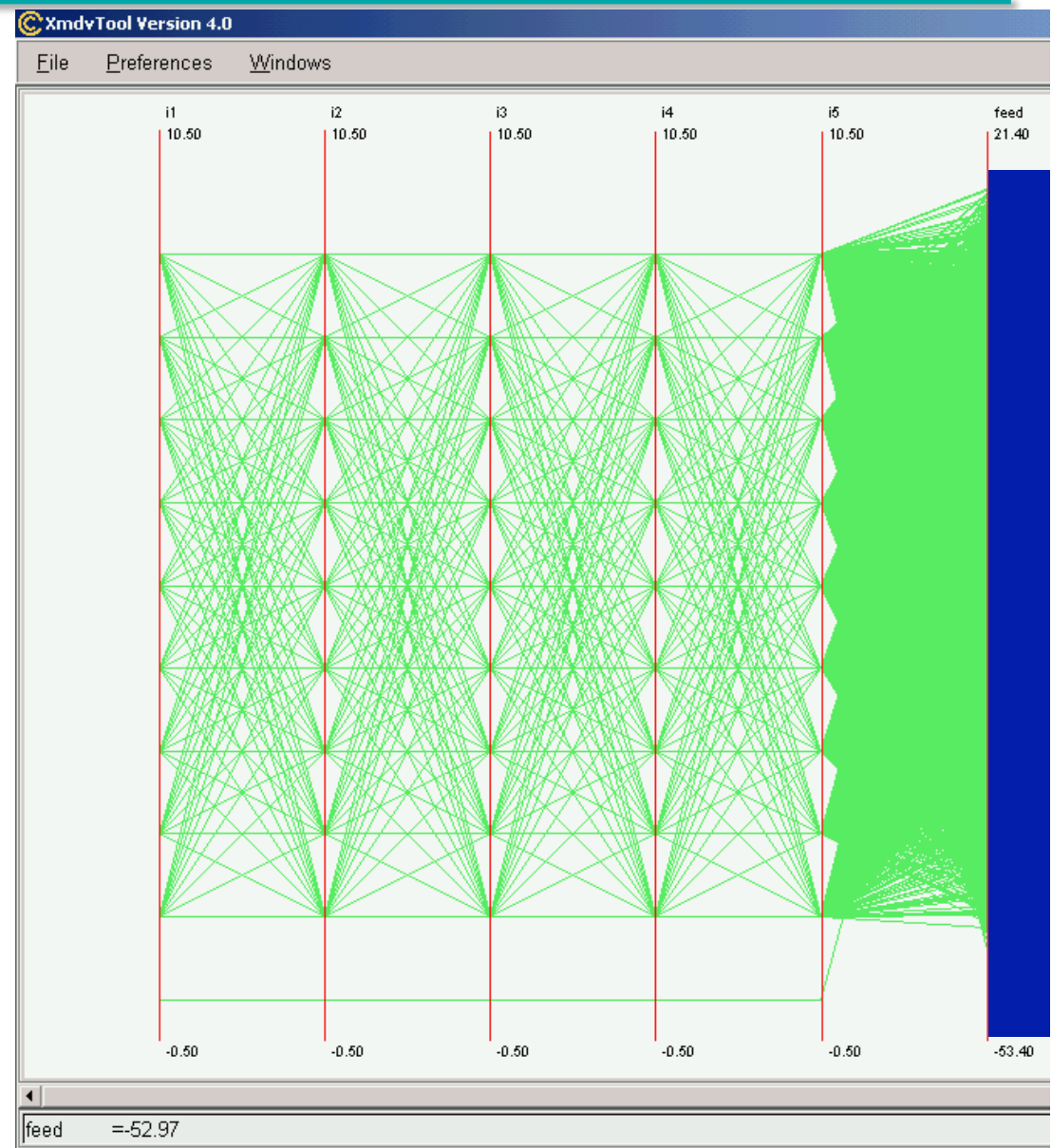
- Pontos a considerar:
 - Ordem dos eixos
 - Escala de cada eixo

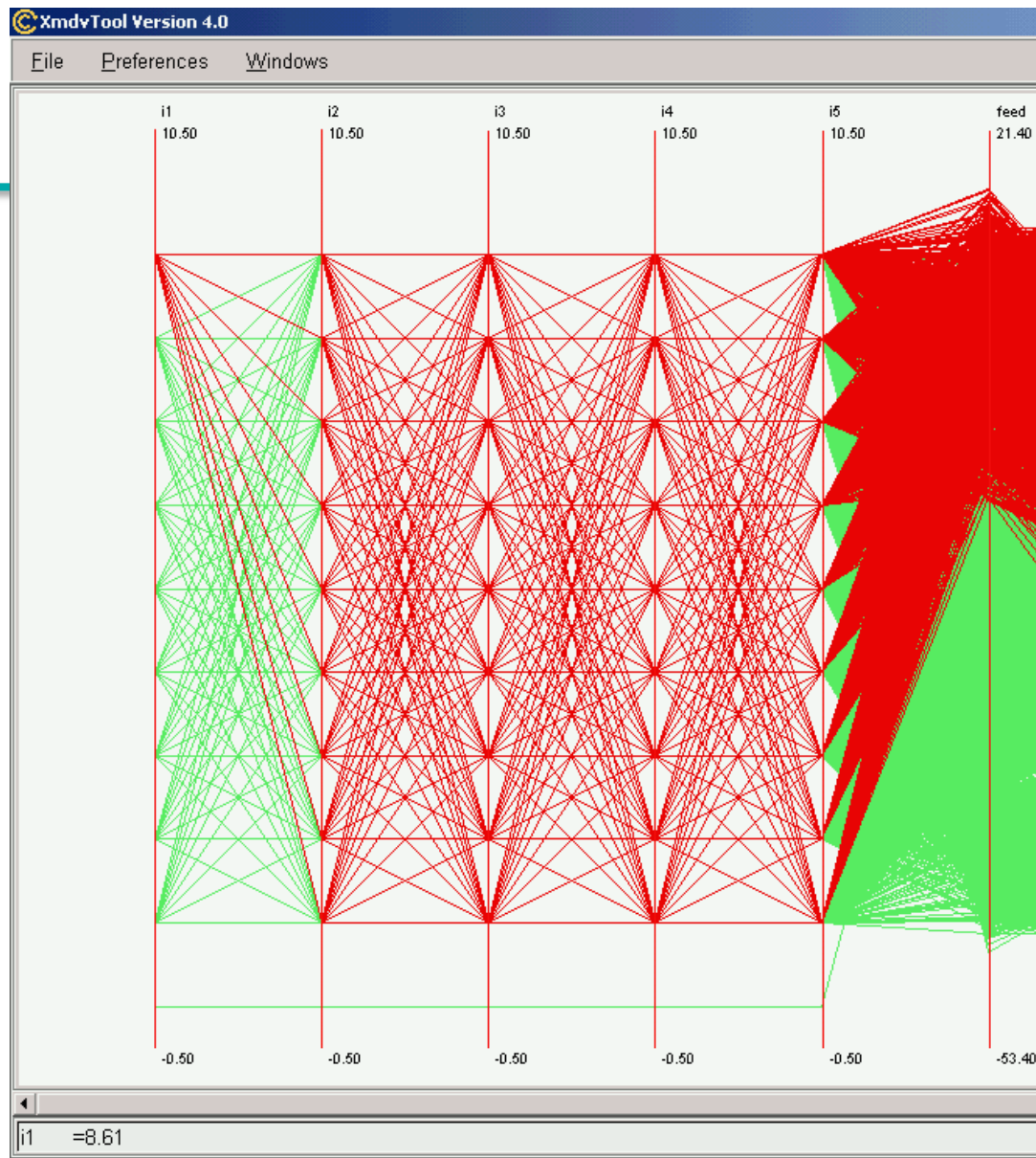


<http://eagereyes.org/techniques/parallel-coordinates>
<http://exposedata.com/parallel/>

Coordenadas paralelas

- Densidade elevada para múltiplos atributos, grandes conjuntos de dados
- Exemplo:
 - Função 5D amostrada fixando as variáveis independentes



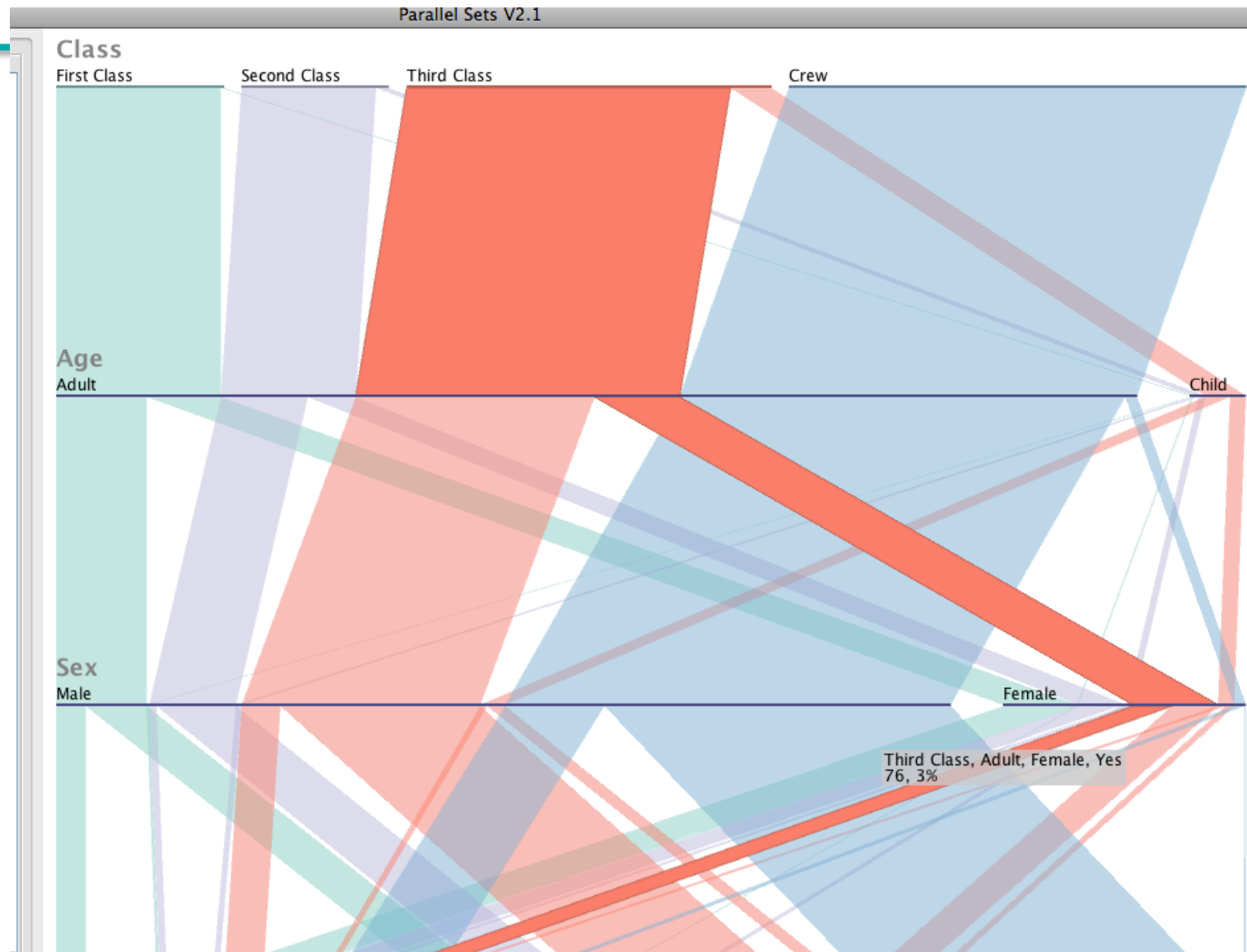


<http://www.xdat.org/>

Implementação com o Protovis: <http://mbostock.github.com/protovis/ex/cars.html>

Na D3: <https://mbostock.github.io/d3/talk/20111116/iris-parallel.html>

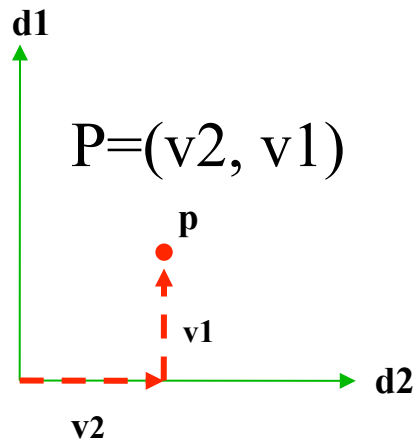
Parallel Sets: dados categóricos



<http://eagereyes.org/parallel-sets>

Star coordinates (Kandogan, 2001)

Cartesianas

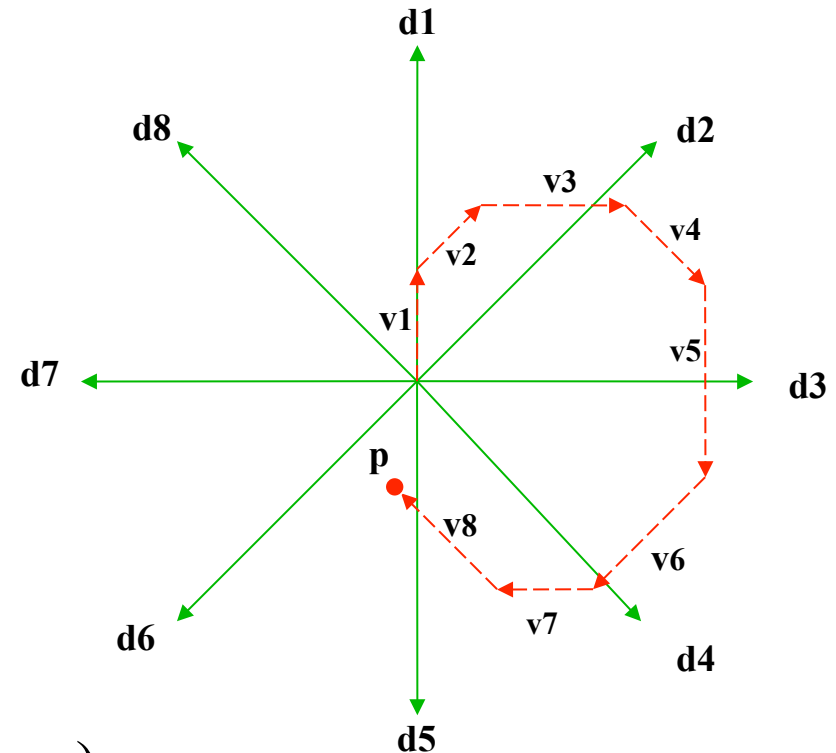


Mapeamento:

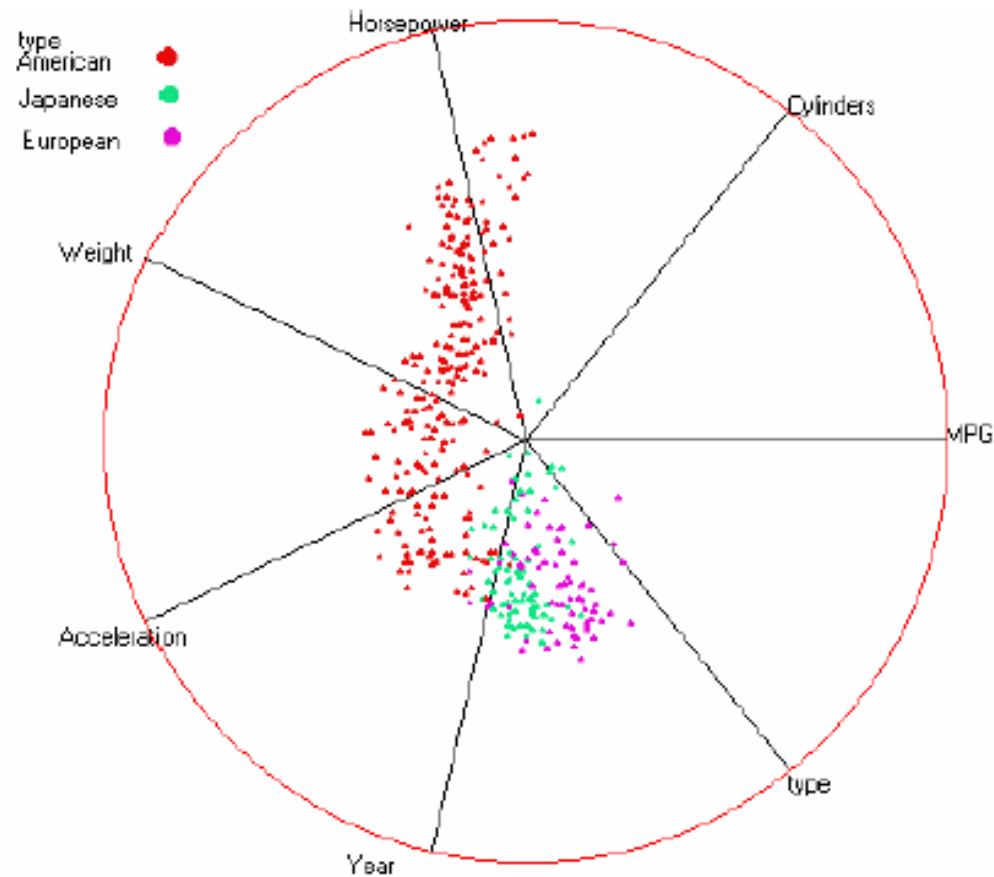
- itens \rightarrow pontos
- Σ vetores de atributos $\rightarrow (x,y)$

Star coordinates

$$P=(v1,v2,v3,v4,v5,v6,v7,v8)$$



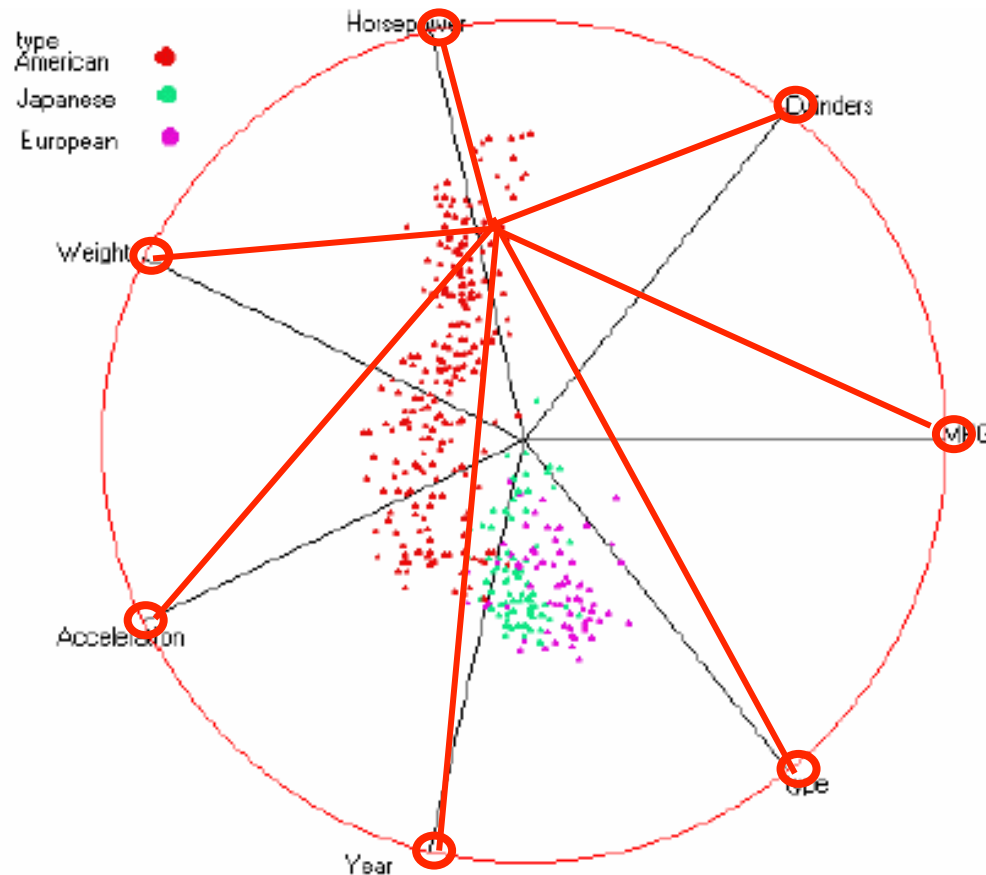
Coordenadas radiais: RadViz



Cada elemento é representado por um ponto no espaço do círculo.

Hoffman, P., Grinstein, G., Marx, K., Grosse, I., Stanley, E. **DNA visual and analytic data mining**. In Visualization'97. pp. 437-441

Coordenadas radiais: RadViz



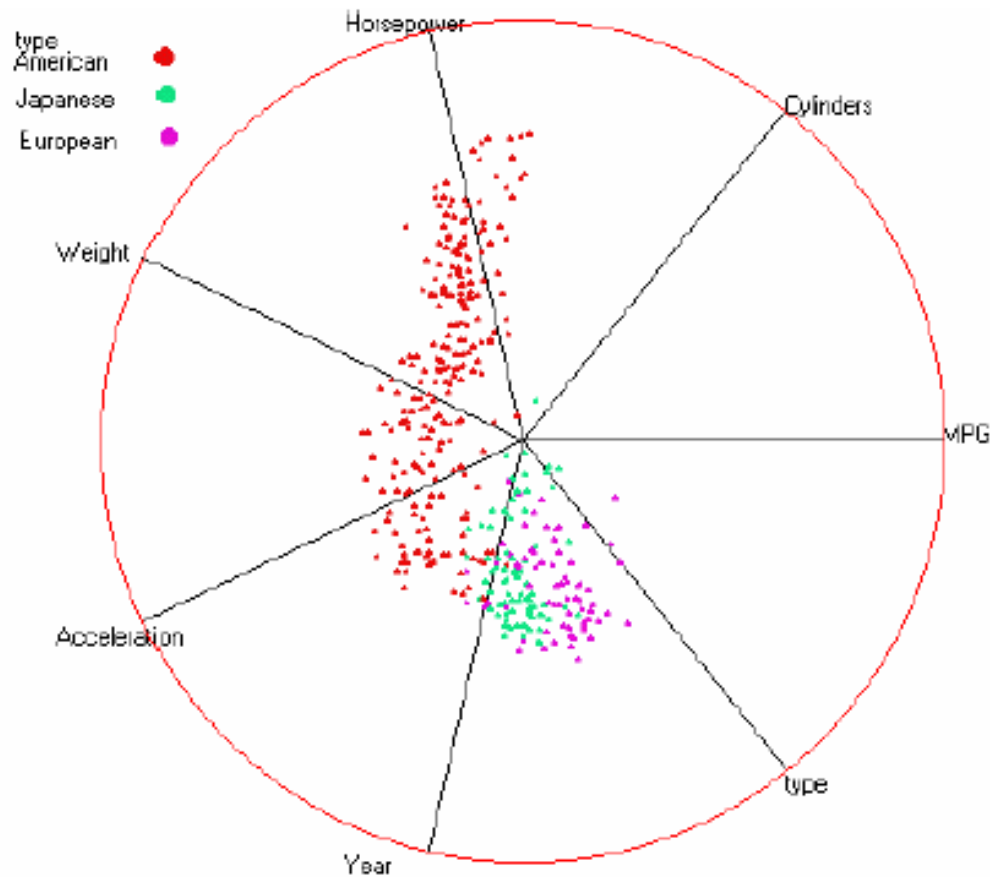
Cada elemento é representado por um ponto no espaço do círculo.

A posição de um ponto depende da posição das dimensões ao redor do círculo:

- Âncoras dimensionais
- Molas conectam cada ponto às “âncoras dimensionais”

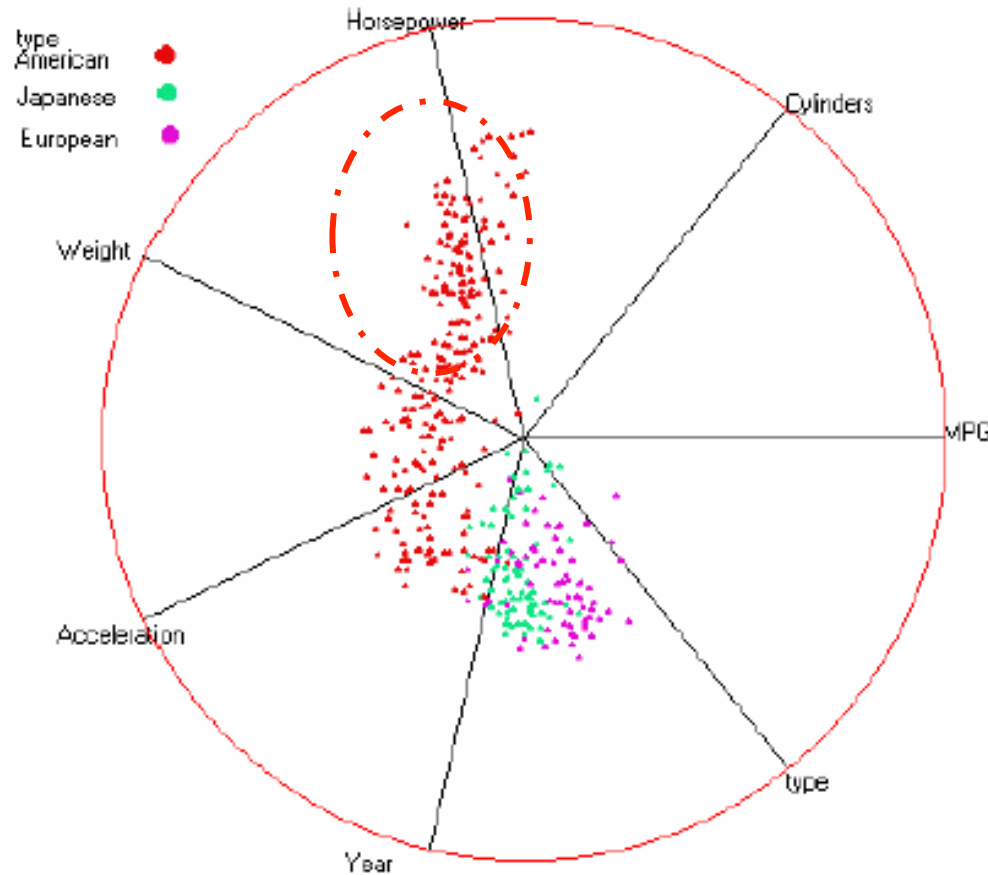
Hoffman, P., Grinstein, G., Marx, K., Grosse, I., Stanley, E. **DNA visual and analytic data mining**. In Visualization'97. pp. 437-441

Radviz



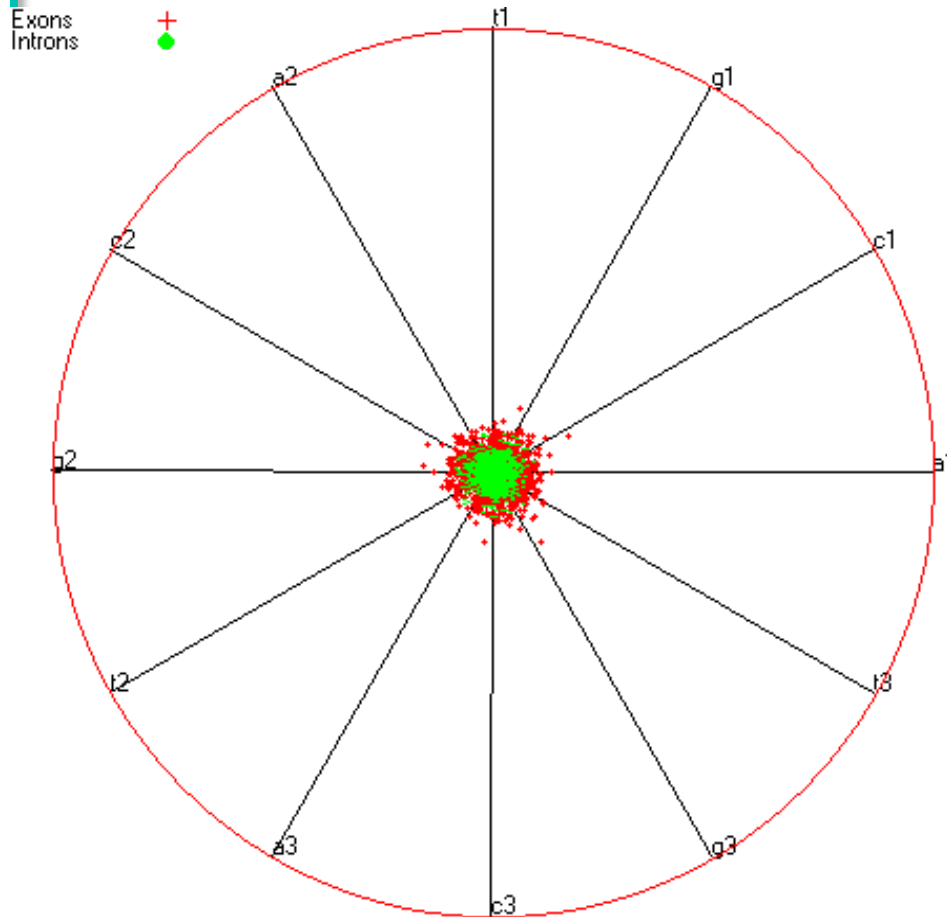
- Constantes das molas são dadas pelos valores das coordenadas
 - Os valores são previamente normalizados, localmente

Radviz



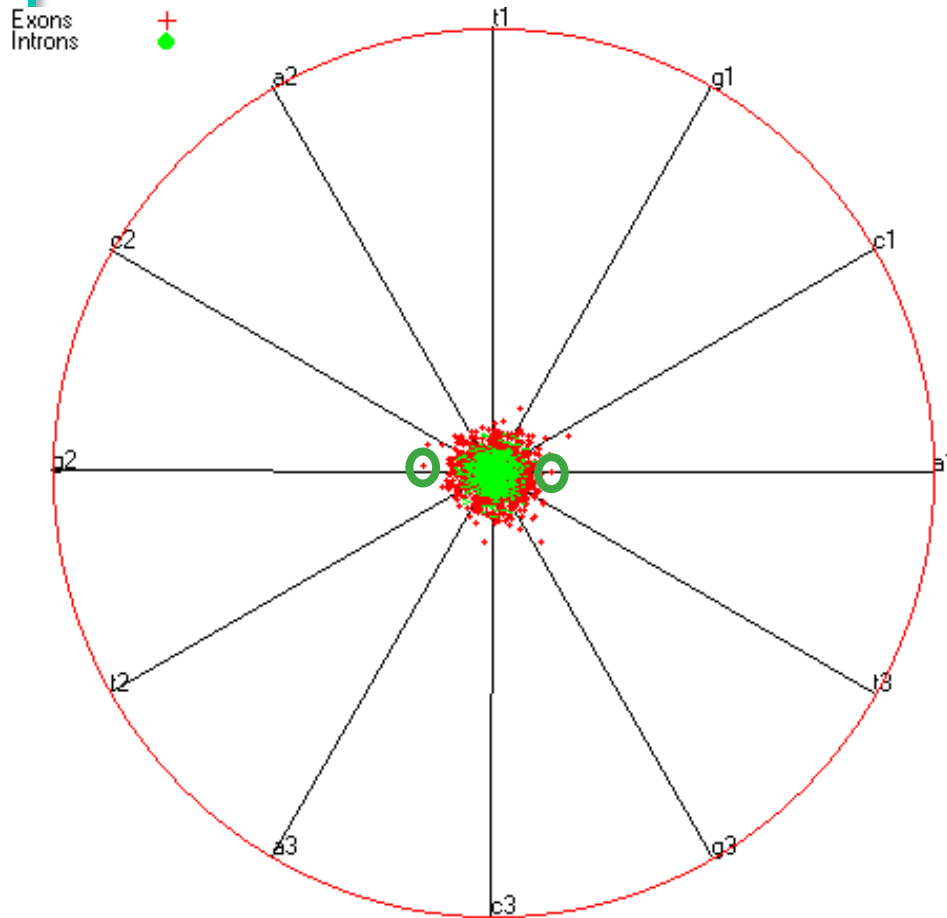
- Valores maiores dos atributos (ou dimensões) atraem o ponto projetado para regiões próximas aos eixos associados a esses atributos.

Radviz



- Pontos com valores de atributos aproximadamente iguais são posicionados próximos ao centro do círculo

Radviz



- Pontos com valores similares associados a dimensões em eixos opostos ficam, também, próximos ao centro.

Radviz

- Cálculo simples:
 - Para todas as dimensões $x_{i,j}$ de um dado elemento de dado x_j
 - $fx = x_{i,j} * x\grave{a}ncora_i$
 - $fy = x_{i,j} * y\grave{a}ncora_i$
 - $soma += x_{i,j}$
 - Ponto $(x_j, y_j) = (fx / soma, fy/soma)$
 - Transformar segundo a escala e reposicionar **ponto** de acordo com tamanho e posição do círculo
- Uma implementação encontrada na web ...
 - <http://www.cs.middlebury.edu/~bwbrown/cs465/radviz/implementation.html>

Técnicas iconográficas X projeções

