statgraphics® centurion

Dynamic Data Visualization

Gain New Insights from Interacting with Your Data

Dr. Neil W. Polhemus, CTO, Statpoint Technologies, Inc.

Data Visualization

• The communication of information clearly and effectively through graphical means.

 Graphs can often provide insights into complex data sets by communicating the key aspects in a more intuitive way than can numerical tables.



Dynamic Data Visualization

- Adds animation or interaction to the graphs.
- Reveals additional aspects of the data not easily seen in static displays.



Example #1: Demographic Dataset

 Demographic and economic data for 27 countries between 1961 and 2010.

	E:\western hemisphere.sgd													
	Country Code	Country	Year	Population	Pop. Density	Rural Population	Female Percentage	Age Dependency Ratio	Life Expectancy (Total)	Life Expectancy (Female)	Life Expectancy (Male)			
				total	people per sq. km of land area	<pre>% of total population</pre>	<pre>% of total population</pre>	<pre>% of working-age population</pre>	years at birth	years at birth	years at birth			
1	ARG	Argentina	1961	20961000	7.66	25.84	49.28	57.02	65.3	68.32	62.42			
2	ARG	Argentina	1962	21297317	7.78	25.28	49.35	57.1	65.39	68.49	62.44			
3	ARG	Argentina	1963	21633126	7.9	24.72	49.41	57.12	65.47	68.64	62.45			
4	ARG	Argentina	1964	21966478	8.03	24.16	49.48	57.09	65.54	68.77	62.46			
5	ARG	Argentina	1965	22296628	8.15	23.6	49.54	57.03	65.63	68.91	62.5			
6	ARG	Argentina	1966	22622012	8.27	23.1	49.61	56.95	65.74	69.06	62.58			
7	ARG	Argentina	1967	22944941	8.38	22.6	49.68	56.86	65.89	69.24	62.7			
8	ARG	Argentina	1968	23273148	8.5	22.1	49.74	56.77	66.07	69.44	62.86			
9	ARG	Argentina	1969	23616971	8.63	21.6	49.8	56.71	66.29	69.68	63.07			
10	ARG	Argentina	1970	23983358	8.76	21.1	49.85	56.71	66.55	69.95	63.31			
11	ARG	Argentina	1971	24376109	8.91	20.68	49.89	56.74	66.83	70.24	63.58			
12	ARG	Argentina	1972	24791983	9.06	20.26	49.93	56.81	67.12	70.54	63.87			
13	ARG	Argentina	1973	2522223	9.22	19.84	49.96	57	67.42	70.85	64.16			
14	ARG	Argentina	1974	25654154	9.37	19.42	50.02	57.35	67.71	71.15	64.44			
15	ARG	Argentina	1975	26078731	9.53	19	50.09	57.9	68	71.44	64.73			
16	ARG	Argentina	1976	26492716	9.68	18.62	50.2	58.68	68.29	71.74	65.01 💌			
14. €. ►	N western hemispher	e B C									•			



Tasks

- Display the data in a meaningful way.
- Look for patterns and relationships.

Build statistical models.

Make predictions.



Static Time Sequence Plot





1-D Visualizer Statlet





Displaying Subsets with Color





Static 2-Variable Plot





Adding Variable to 1D Visualizer





2-D Visualizer Statlet





Adding 2 More Variables





3-D Visualizer





Multivariate Visualizers





Profile Plots





Chernoff Faces





Statistical Modeling

	Análisis Multivariado 🛛 🕹	
Country Code Country Year Population Pop. Density Rural Population Female Percentage Age Dependency Ratio Life Expectancy (Total) Life Expectancy (Female) Life Expectancy (Male) Female-Male	Datos: Population Pop. Density Rural Population Female Percentage Age Dependency Ratio Life Expectancy (Total) Female-Male Fertility Rate Infant Mortality Rate Trade	
Fertility Rate Infant Mortality Rate Trade GDP per Capita Central Government Debt Consumer Price Inflation Real Interest Rate Unemployment (Total) Unemployment (female)	GDP per Capita	5 (dag
Ordenar nombres de column Aceptar Cancela	a vear=2009 Borrar Transformar Ayuda	



Correlation Plot

Análisis Multivariado

Correlaciones Pearson Producto-Momento														
-1.0											1.0			
	_													
Fertility Rate	1.00	0.86	0.91	0.49	-0.18	-0.01	0.01	-0.19	-0.09	-0.24	-0.26	-0.52	-0.47	-0.86
Infant Mortality Rate	0.86	1.00	0.69	0.50	-0.21	0.03	-0.02	-0.07	-0.12	-0.09	-0.21	-0.45	-0.44	-0.97
Age Dependency Ratio	0.91	0.69	1.00	0.53	-0.02	-0.01	0.03	-0.11	-0.16	-0.16	-0.30	-0.43	-0.52	-0.73
Rural Population	0.49	0.50	0.53	1.00	0.43	-0.06	-0.05	0.41	-0.14	0.03	-0.37	-0.38	-0.35	-0.56
Trade	-0.18	-0.21	-0.02	0.43	1.00	-0.09	-0.05	0.32	0.04	0.05	-0.40	-0.10	-0.15	0.12
Consumer Price Inflation	-0.01	0.03	-0.01	-0.06	-0.09	1.00	-0.32	-0.05	0.02	0.01	0.03	0.01	-0.04	-0.03
Real Interest Rate	0.01	-0.02	0.03	-0.05	-0.05	-0.32	1.00	-0.02	-0.12	0.03	0.01	0.06	-0.05	0.02
Pop. Density	-0.19	-0.07	-0.11	0.41	0.32	-0.05	-0.02	1.00	-0.19	0.51	-0.18	0.07	0.02	0.09
Gross Domestic Savings	-0.09	-0.12	-0.16	-0.14	0.04	0.02	-0.12	-0.19	1.00	-0.11	0.08	0.01	0.20	0.13
Female Percentage	-0.24	-0.09	-0.16	0.03	0.05	0.01	0.03	0.51	-0.11	1.00	0.18	0.39	0.27	0.09
Population	-0.26	-0.21	-0.30	-0.37	-0.40	0.03	0.01	-0.18	0.08	0.18	1.00	0.23	0.68	0.24
Female-Male	-0.52	-0.45	-0.43	-0.38	-0.10	0.01	0.06	0.07	0.01	0.39	0.23	1.00	0.24	0.43
GDP per Capita	-0.47	-0.44	-0.52	-0.35	-0.15	-0.04	-0.05	0.02	0.20	0.27	0.68	0.24	1.00	0.48
Life Expectancy (Total)	-0.86	-0.97	-0.73	-0.56	0.12	-0.03	0.02	0.09	0.13	0.09	0.24	0.43	0.48	1.00
	Fertility Rate	Infant Mortality Rate	Age Dependency Ratio	Rural Population	Trade	Consumer Price Inflation	Real Interest Rate	Pop. Density	Gross Domestic Savings	Female Percentage	Population	Female-Male	GDP per Capita	Life Expectancy (Total)



Correlation Plot

Análisis Multivariado															
Correlaciones Pearson Producto-Momento X = no es significante a 5% -1.0															
Fertility Rate		0.86	0.91	0.49	-0.18	х	х	-0.19	-0.09	-0.24	-0.26	-0.52	-0.47	-0.86	
Infant Mortality Rate	0.86		0.69	0.50	-0.21	х	х	-0.07	-0.12	-0.09	-0.21	-0.45	-0.44	-0.97	
Age Dependency Ratio	0.91	0.69		0.53	х	х	х	-0.11	-0.16	-0.16	-0.30	-0.43	-0.52	-0.73	
Rural Population	0.49	0.50	0.53		0.43	-0.06	х	0.41	-0.14	х	-0.37	-0.38	-0.35	-0.56	
Trade	-0.18	-0.21	х	0.43		-0.09	х	0.32	х	х	-0.40	-0.10	-0.15	0.12	
Consumer Price Inflation	х	х	Х	-0.06	-0.09		-0.32	Х	х	х	х	Х	х	х	
Real Interest Rate	х	х	х	х	х	-0.32		х	-0.12	х	х	х	х	х	
Pop. Density	-0.19	-0.07	-0.11	0.41	0.32	х	х		-0.19	0.51	-0.18	0.07	Х	0.09	
Gross Domestic Savings	-0.09	-0.12	-0.16	-0.14	Х	Х	-0.12	-0.19		-0.11	0.08	х	0.20	0.13	
Female Percentage	-0.24	-0.09	-0.16	х	х	Х	х	0.51	-0.11		0.18	0.39	0.27	0.09	
Population	-0.26	-0.21	-0.30	-0.37	-0.40	X	X	-0.18	0.08	0.18		0.23	0.68	0.24	
Female-Male	-0.52	-0.45	-0.43	-0.38	-0.10	X	X	0.07	X	0.39	0.23		0.24	0.43	-
GDP per Capita	-0.47	-0.44	-0.52	-0.35	-0.15	X	X	X	0.20	0.27	0.68	0.24	0.40	0.48	4
Life Expectancy (lotal)	-0.86	-0.97	-0.73	-0.56	0.12	×	×	0.09	0.13	0.09	0.24	0.43	0.48 m	_	J
	Fertility Rate	Infant Mortality Rate	Age Dependency Ratic	Rural Population	Trade	Consumer Price Inflation	Real Interest Rate	Pop. Density	Gross Domestic Saving	Female Percentage	Population	Female-Male	GDP per Capits	Life Expectancy (Total	



Curve-Fitting Statlet





Surface-Fitting Statlet

🔢 Aj	uste de Superfi	cies - Life Expectan	cy (Total) vs. Infant M	Nortality Rate y Ferti	lity Rate	
🔽 Agregar superficie de regresión I	Potencia X1: 1.0	•	▶ Potencia X2: 1.0	•	▶ Potencia Y: 1.0 ▲	
🗖 Agregar suavización LOWESS	Ventana: 60%	•	•	🗖 Agregar interacción	Opc. X Opc. Y Opc. X	&Y <u>R</u> einiciar
						<u> </u>
			Y=78.2398-0.19209 RMSE: 1.95296, R-	92*X1-0.629683*X2 Cuadrado: 93.65%		
 Life Expectancy (Total) 	88 78 68 58 48 38 0 30	60 90			8 Fertility Rate	



General Linear Models

Modelo	Lineales Generalizados		
Country Code	Variables Dependientes:		
Year Population Pop. Density	Life Expectancy (Total)	\$	
Female Percentage	Factores Categóricos:		
Age Dependency Ratio Life Expectancy (Total) Life Expectancy (Female) Life Expectancy (Male) Female-Male Fertility Rate Infant Mortality Rate		^	
Trade GDP per Capita			
Central Government Debt	Factores Cuantitativos:		
Consumer Price Inflation Real Interest Rate	Infant Mortality Pate		
Unemployment (Total) Unemployment (female) Unemployment (Male) Gross Domestic Savings	Fertility Rate Year		
		~	
	(Selección:)		
🗌 Ordenar nombres de columna			
Aceptar Cancelar	Borrar Transformar Avuda	1	



Response Surface





Response Surface Explorer

Expl	plorar superficie de respue	sta 🛛 🗶	
Ascendente Reset Infant Mortality Fertility Rate Year	Automático Extrapolar 58.4313 Jity J J J J J J J J J J J J J J J J J J J		



Time Series Forecasting

	Suavización Exponencial
Country Code Country Year Population Pop. Density Rural Population Female Percentage Age Dependency (Ratio Life Expectancy (Total) Life Expectancy (Total) Life Expectancy (Male) Female-Male Fertility Rate Infant Mortality Rate Trade	Datos: Life Expectancy (Total) (Indice Hora:) Year Selección:) Country Code="COL" Ilumna elar Borrar Transformar Ayuda
	statgraphics

Exponential Smoothing Statlet





Example #2 – Fish Populations

Fish counts in 13 locations between 1963 and 2003.

=			C:\DocDa	ta17\Gulf of Ma	ine.sgd				83
	year	Bay of Fundy	Browns Bank	Central Gulf of Maine	Central Gulf Continental of Maine Slope (Georges Bank	Georges Basin	
1	1963	0	4	92	14	23	70	7	1
2	1964	5	7	123	23	34	120	11	1
3	1965	7	8	107	23	33	118	10	1
4	1966	4	7	74	20	15	79	5	1
5	1967	2	2	31	4	8	49	4	5
6	1968	2	7	78	17	19	93	7	1
7	1969	3	7	108	24	33	155	15	2
8	1970	3	6	86	16	21	94	9	1
9	1971	1	7	80	22	27	127	9	1
10	1972	5	9	86	26	22	142	14	1
11	1973	2	6	78	19	17	98	11	8
12	1974	4	6	71	24	23	96	8	1
13	1975	2	7	85	19	12	95	6	1
14	1976	0	8	70	15	13	93	11	1
15	1977	2	8	117	18	15	159	8	2
16	1978	5	3	145	24	22	198	11	3
17	1979	3	7	145	12	17	222	9	4 🕶
	Gulf of Maine B	C D E F	G H I J K						



Standard Time Sequence Plot





Deviation Dashboard





Dynamic Control Chart





Example #3: Demographic Maps

I			C:\D	ocData17\censu	s2006.sgd			_	
	State	Area	Population	Population Density	Mean Elevation	Median Age	Percent Female	Per Capita Income	Crime 📤
		sq. mi.		per square mile	feet	years		U.S. dollars	violent per 100
1	Alabama	52419	4447100.00	87.6	500	35.8	51.7	18819	426.6
2	Alaska	663267	626932.00	1.1	1900	32.4	48.3	22660	634.5
3	Arizona	113998	5130632.00	45.2	4100	34.2	50.1	20275	504.1
4	Arkansas	53179	2673400.00	51.3	650	36	51.2	16904	499.1
5	California	158302	33871648.00	217.1	2900	33.3	50.2	22711	551.8
6	Colorado	104185	4301261.00	41.5	6800	34.3	49.6	24049	373.5
7	Connecticut	5543	3405565.00	702.9	500	37.4	51.6	28766	286.3
8	Delaware	2490	783600.00	401.1	60	36	51.4	23305	568.4
9	District of Col	68.3	572059.00		150	34.6	52.9	28659	1371.2
10	Florida	58560	15982378.00	296.4	100	38.7	51.2	21557	711.3
11	Georgia	58876	8186453.00	141.4	600	33.4	50.8	21154	455.5
12	Hawaii	6450	1211537.00	188.6	3030	36.2	49.8	21525	254.4
13	Idaho	83557	1293953.00	15.6	5000	33.2	49.9	17841	244.9
14	Illinois	56400	12419293.00	223.4	600	34.7	51	23104	542.9
15	Indiana	36291	6080485.00	169.5	700	35.2	51	20397	325.4
16	Iowa	56290	2926324.00	52.4	1100	36.6	50.9	19674	270.9
17	Kansas	82264	2688418.00	32.9	2000	35.2	50.6	20506	374.5
18	Kentucky	40409	4041769.00	101.7	750	35.9	51.1	18093	244.9
19	Louisiana	48523	4468976.00	102.6	100	34	51.6	16912	638.7
20	Maine	33215	1274923.00	41.3	600	38.6	51.3	19533	103.5
	census2006 B	C D E F	G (H (I (J (K	L M N O	PQRS				



Brushing Maps





Example #4: Time Series Maps

Ħ			С	:\Data\Colombi	a\crimerates.sgc	1				83
	State	Year	Population	Total Crime Rate	Violent Crime Rate	Murder	Forcible Rape	Robbery	Aggravated Assault	P1 📥
				per 100,000 population	total					
1	Alaska	1965	253000	2603.6	149.0	6.3	17.8	39.9	85.0	24
2	Alaska	1966	272000	2785.7	150.4	12.9	19.5	36.0	82.0	26
3	Alaska	1967	272000	2884.6	160.7	9.6	17.6	35.3	98.2	27
4	Alaska	1968	277000	3320.9	175.5	10.5	21.7	52.7	90.6	31
5	Alaska	1969	282000	3880.1	221.3	10.6	29.4	67.4	113.8	36
6	Alaska	1970	302173	3801.8	278.0	12.2	26.1	71.8	167.8	35
7	Alaska	1971	313000	4164.5	355.3	13.4	43.5	67.1	231.3	38
8	Alaska	1972	325000	4478.5	370.5	9.5	41.8	66.5	252.6	41
9	Alaska	1973	330000	4943.3	384.5	10.0	44.5	67.0	263.0	45
10	Alaska	1974	337000	5239.8	453.1	13.6	49.3	88.4	301.8	47
11	Alaska	1975	352000	6196.6	539.8	12.2	44.6	129.5	353.4	56
12	Alaska	1976	382000	6220.7	540.1	11.3	46.9	124.9	357.1	56
13	Alaska	1977	407000	5898.0	443.2	10.8	51.6	96.8	284.0	54
14	Alaska	1978	403000	6046.2	441.9	12.9	55.6	91.3	282.1	56
15	Alaska	1979	406000	6203.7	491.1	13.3	71.9	109.6	296.3	57
16	Alaska	1980	440142	5645.7	436.0	8.9	56.8	81.8	288.5	52
17	Alaska	1981	412000	6594.9	615.8	14.6	102.2	114.6	384.5	59
18	Alaska	1982	438000	6212.6	623.7	18.5	85.4	133.8	386.1	55
19	Alaska	1983	479000	6018.6	613.8	13.8	101.5	97.1	401.5	54 💌
	Crimerates B	C								



Time Series Map Visualizer



