Creating Graphs with vfig and vplot

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Overview

There are two main VisionX utilities, **vplot** and **vfig**; either can be used in scripts. **vplot** is the older utility and is designed mainly for fast simple graphs and accepts inputs from pipes. **vfig** has more high-level functions, supports individual configuration files, and is, in general, recommended for the creation of most graphs. **vfig** can either be invoked with all parameters specified on the command line or by a configuration file. For publications a configuration file for each figure is recommended.

Together these utilities provide a unified framework for graph generation that will provides consistent high quality graphs for LaTeX, MS Powerpoint, MS Word, OpenOffice and VisionX Java Viewer. The graphs are created using the gnuplot graph engine.

This tutorial starts with examples of the different graph types and the corresponding vfig specifications and then provides additional details on vfig and vplot options.

Example 1. Simple x-y plot with labels

Command line invocation:

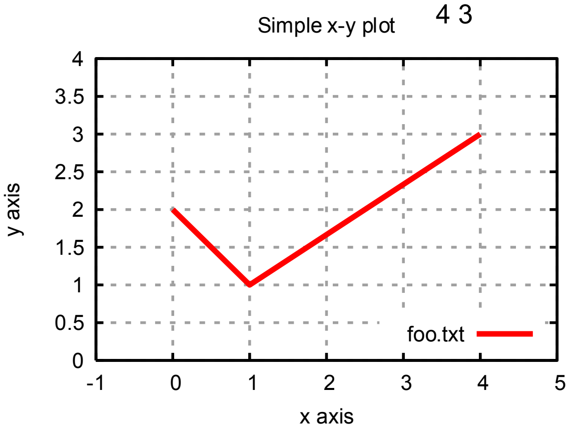
```
vfig d1=foo.txt l1="foo.txt" ct="Simple x-y plot" xl="x axis" yl="y axis” xmin=-1
xmax=5 ymin=0 ymax=4 lw=2 -a -g -l -p of="foo.cgm"
```

Input file foo.txt:

```
0 2
1 1
4 3
```

Configuration file foo.cfg:

```
<header>
d1=foo.txt
l1=foo.txt
ct="Simple x-y plot"
xl="x axis"
yl="y axis"
xmin=-1
xmax=5
ymin=0
ymax=4
lw=2
lp=4
options="-a -g –l -p"
of="foo.cgm"
<footer>
```



Example 2. Simple box plot

Command line invocation:

```
vfig d1=data.txt –a –b xmin=0 xmax=5 ymin=0 ymax=6 of=out.cgm –p
```

Configuration file foo.cfg:

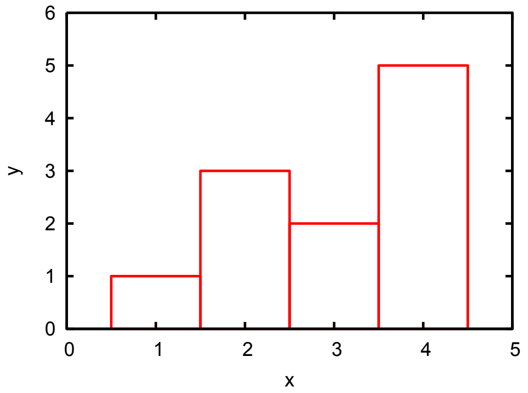
```
<header>

d1=data.txt
xmin=0
xmax=5
ymin=0
ymax=6
options="-a -b -p"
of=“out.cgm"

<footer>
```

Input file data.txt:

```
1    1
2    3
3    2
4    5
```



Example 3. FROC and ROC plots

Command line invocation:

```
vfig d1=froc1.txt xmax=1 -f -p of=froc.cgm
```

Input file froc.txt:

```
0.00 0.00
0.10 0.25
0.20 0.60
0.40 0.50
0.50 0.85
0.70 0.90
```

The convex hull of the operating points is computed automatically!

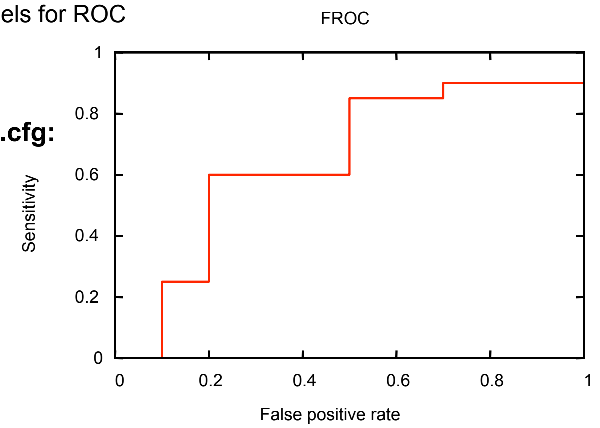
Use the ‘–r’ option to change labels for ROC

Configuration file froc.cfg:

```
<header>

d1=froc1.txt
xmax=1
options="-f -p"
of="froc.cgm"

<footer>
```



Example 4. Contour plot

Input image girl.vx:

Command line invocation:

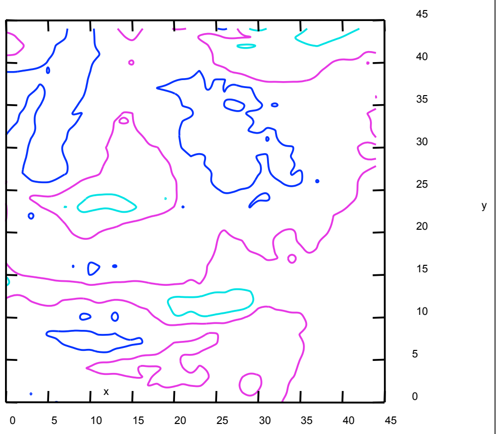
```
vfig d1=girl.vx -c -p of=girl.cgm
```

Configuration file cont.cfg:

```
<header>

d1="g1“
options="-c -p"
of="g1.cgm"

<footer>
```



Example 5. Multiple graphs

Input file foo.txt:

```
0 2
1 1
4 3
```

Input file bar.txt:

```
0 0
1 2
2 2
3 0
```

If not specified, displayed data ranges are computed automatically!

Command line invocation:

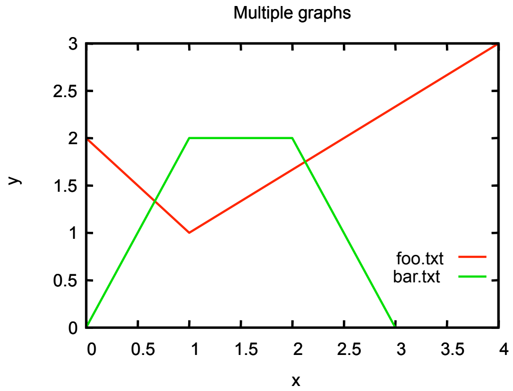
```
vfig d1=foo.txt d2=bar.txt l1="foo.txt" l2="bar.txt" ct="Multiple graphs" -a -l -p
of=mult.gcm
```

Configuration file mult.cfg:

```
<header>

d1="foo.txt"
d2="bar.txt"
l1="foo.txt"
l2="bar.txt“
options="-a -l -p"
of="mult.cgm“

<footer>
```



Example 6. Bar Chart

Command line

```
vfig d1=data.txt –x –br l1=benign l2=malignant ct=“Size Dist” xl=“Size (mm)” –p
    of=out.cgm
```

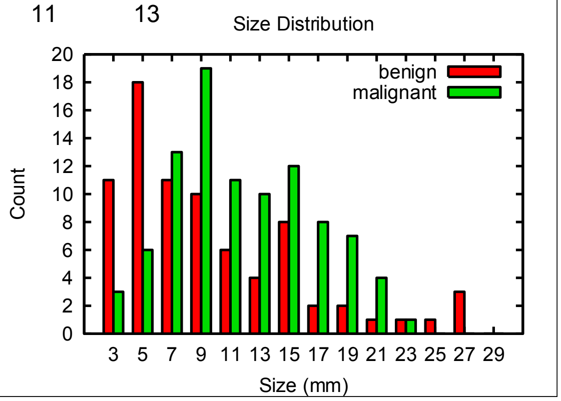
Input file

Size	benign	malignant
3	11	3
5	18	6
7	11	13
…		

Config file

```
<header>
d1=data.txt
l1=“benign”
l2=“malignant”
ct=“Size Distribution”
xl=“Size(mm)”
options=“-x -br –p”
of=“out.cgm”
<footer>
```

NOTE: all data in one input file, specified by d1= only!



Example 7. Box-Whiskers

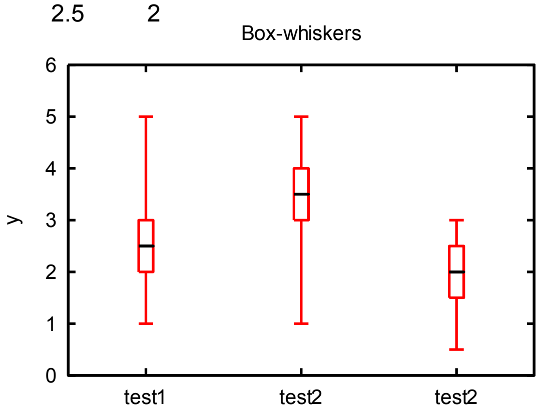
Command line

```
vfig d1=data.txt –x –bw ct="Box-whiskers" f=16 ymin=0 ymax=6 –p  of=out.cgm
```

Input file

label	1q	min	max	3q	mean
test1	2	1	5	3	2.5
test2	3	1	5	4	3.5
test2	1.5	0.5	3	2.5	2

NOTE: all data in one input file, specified in d1 only!

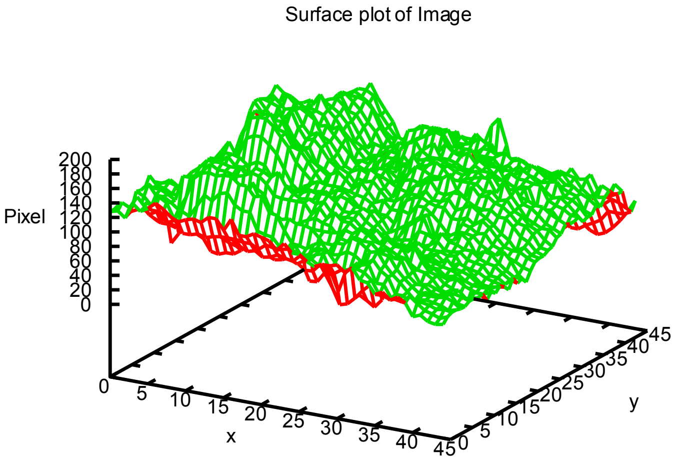


Example 8. Surface Plot

Command line

```
vfig d1=girl.vx ct="Surface plot of Image" f=16 –p of=surface.cgm
```

Input image girl.vx:



Example 9. Error Bars

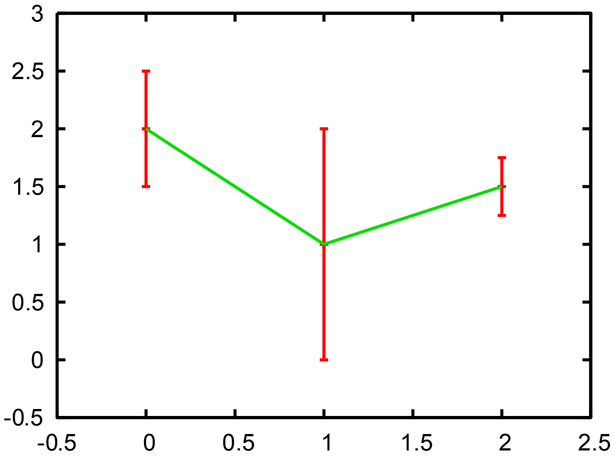
Command line

```
vfig d1=data.txt –x –eb of=out.cgm –p xmin=-0.5 xmax=2.5 ymin=-0.5 ymax=3
```

Input file (1D vector)

2	1	1.5
0.5	1	0.25

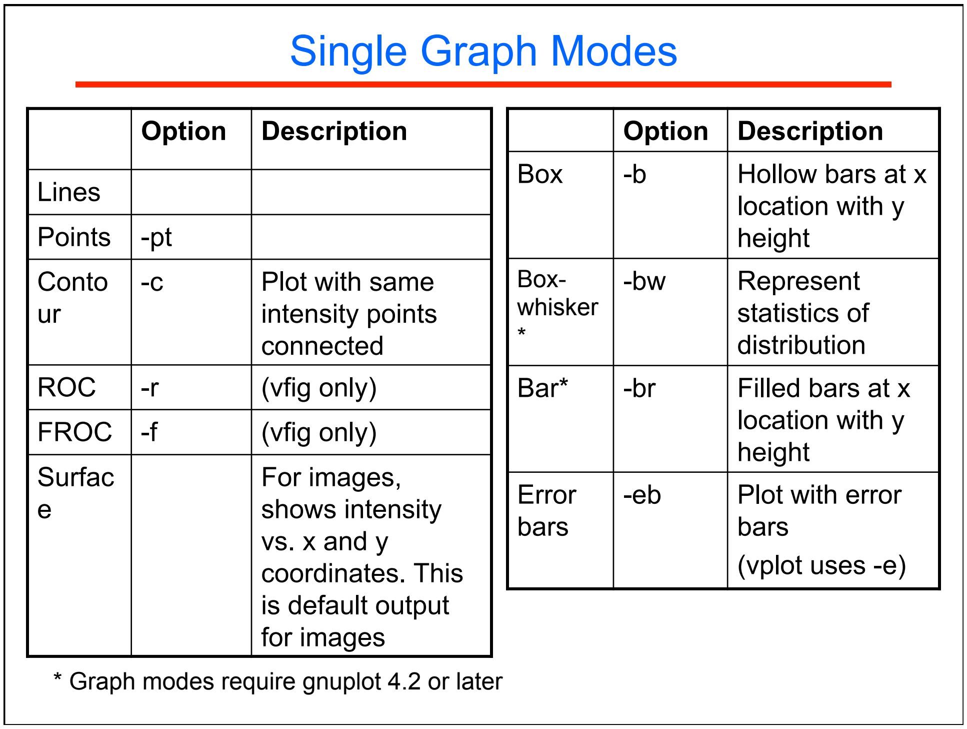
(The first line is the data the second line is the error bar values)



Input File Formats

File format	Possible plot modes
Tab-separated text file(x, y points)	xy plots, ROC/ FROC, box, histogram
Comma/tab-separated text file (Excel et al)	Box-whisker, bar chart, error bars (format depends on plot type)
VisionX text table	Same as above
Image (2D)	Histogram, 2D contour, surface

File format	Possible plot modes
VisionX 1D vector	xy plots, box, histogram (element num = x val)
VisionX 2D vector	xy plots, box, histogram, contour (x, y)
VisionX 3D vector	Surface, 3D line
VisionX multi-1D-vector	In addition to normal plot types… Error bars

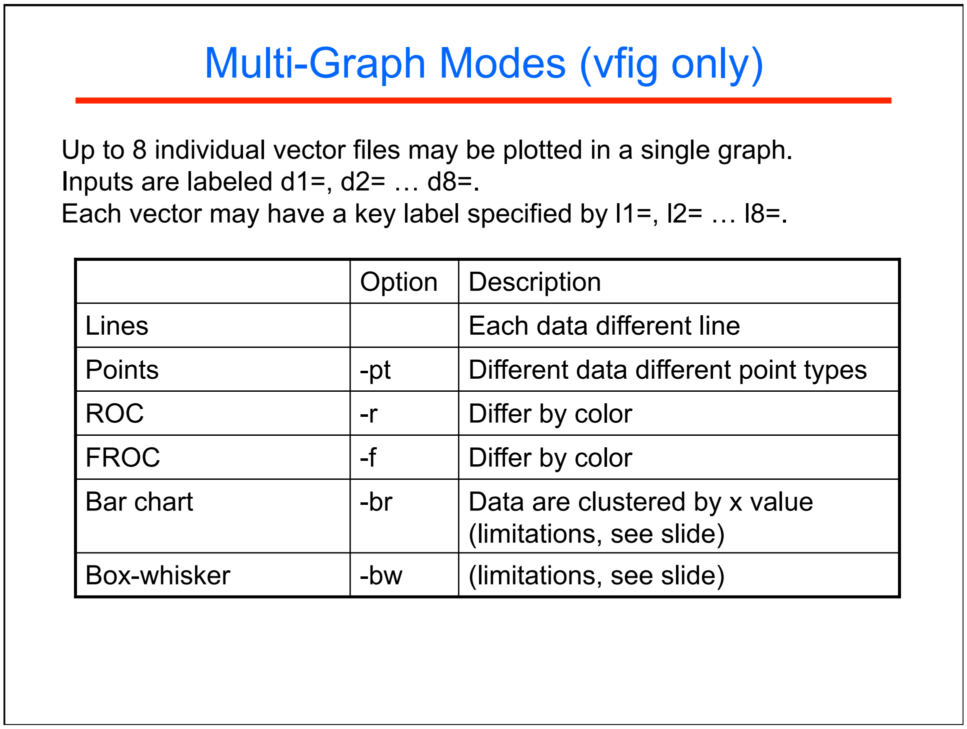


Single Graph Modes

	Option	Description
Lines		
Points	-pt	
Contour	-c	Plot with same intensity points connected
ROC	-r	(vfig only)
FROC	-f	(vfig only)
Surface		For images, shows intensity vs. x and y coordinates. This is default output for images

	Option	Description
Box	-b	Hollow bars at x location with y height
Box-whisker *	-bw	Represent statistics of distribution
Bar*	-br	Filled bars at x location with y height
Error bars	-eb	Plot with error bars (vplot uses -e)

* Graph modes require gnuplot 4.2 or later



Multi-Graph Modes (vfig only)

Up to 8 individual vector files may be plotted in a single graph.
Inputs are labeled d1=, d2= … d8=.
Each vector may have a key label specified by l1=, l2= … l8=.

	Option	Description
Lines		Each data different line
Points	-pt	Different data different point types
ROC	-r	Differ by color
FROC	-f	Differ by color
Bar chart	-br	Data are clustered by x value (limitations, see slide)
Box-whisker	-bw	(limitations, see slide)

Target Specification

Target	vfig	vplot
Interactive*		
MS PowerPoint	-p (.cgm)	-gcm
MS Word	-e (.emf)	-emf
OpenOffice	-e (.emf)	-emf
LaTeX	-t (.ps)	-ps
Web / HTML	-w (.png)	-png
VisionX	-j (.vx)	No option required

* For interactive mode the ‘of=’ parameter is not be specified.

vfig invocations

1. Using command line parameters :

vfig [dN=<dataN>] [lN=<labelN>] [of=<output[pf=<vplot>] [ct=<title>] [xl=<x_label>][yl=<y_label>[zl=<z_label>] [xmin=<x_min>][ymin=<y_min>] [xmax=<x_max>][ymax=<y_max>][f=<font_size>][lw=<line_width>] [sp=<spacing>] [lp=<legnd_pos>][-g][-l] [-f][-r][-bw][-br][-eb][-a][-b][-c][-h] [-logx][-logy][-p][-t][-w][-e][-j]

2. Using a `<config>` file :

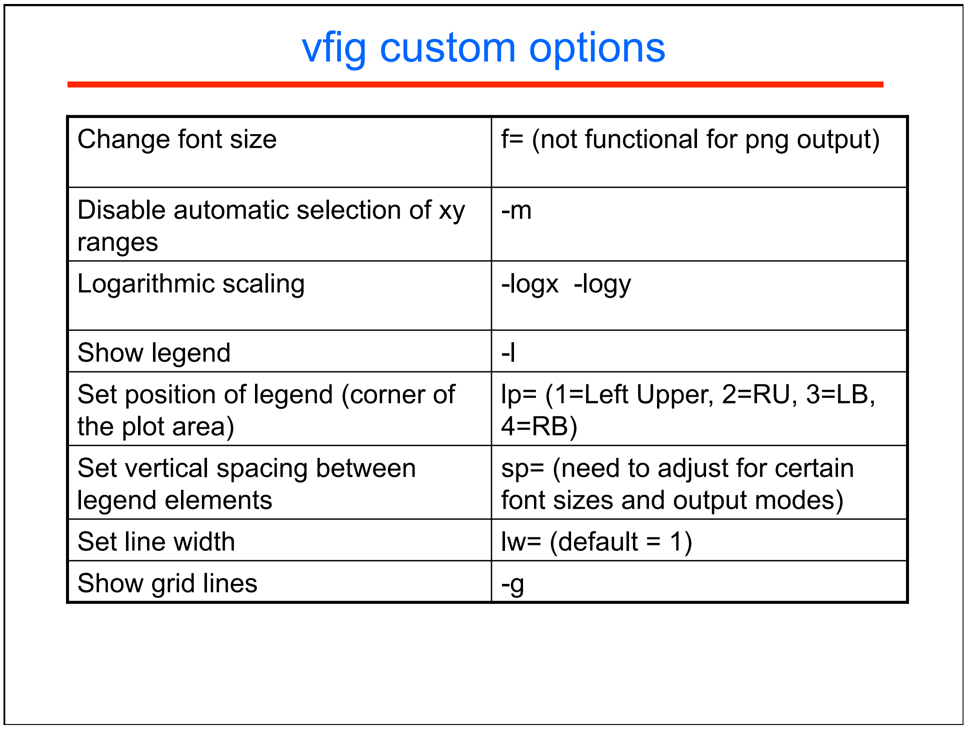
```
vfig if=<config>
```

Important: if the command line has both `<config>` and other parameters, `<config>` file parameters are overridden!

3. Running standalone `<xconfig>` file:

```
<xconfig>
```

Here the `<xconfig>` file must be executable and have necessary footer and header. Use “`vfig.tpl`” as a template for making an `<xconfig>` file.



vfig custom options

Change font size	f= (not functional for png output)
Disable automatic selection of xy ranges	-m
Logarithmic scaling	-logx -logy
Show legend	-l
Set position of legend (corner of the plot area)	lp= (1=Left Upper, 2=RU, 3=LB, 4=RB)
Set vertical spacing between legend elements	sp= (need to adjust for certain font sizes and output modes)
Set line width	lw= (default = 1)
Show grid lines	-g