Zoom Modes

Zoom Modes for Cartesian plots:

For 2.0, there should be very minor changes from 1.4, except that the separate X zoom and Y zoom modes will be eliminated. They will still be accessible via the keyboard modifiers.

Zoom modes are determined separately for the X and Y axis. This document will describe the Y axis behavior. The X axis behavior is analogous.

Some modes set the zoom based on plot's contents. All curve type objects (curves, images) have an 'ignoreAutoScale' property. If this is set, the curve is not used in the calculation.

Modes are:

- **Auto:** The limits of the plot go from the minimum Y value of any active curve object (curve or image) in the plot to the maximum Y value of any active curve object in the plot. If there are no active curves, or if min==max, then the range will be from -0.1 to 0.1. If the plot is in log mode, the lower extend of the plot will be the minimum Y value larger than zero.

- **AutoBorder:** Auto mode, plus a 2.5% border on top and bottom.

- **Expression:** The limits are given by scalar equations (which would normally be two constants). A mouse zoom sets this mode.

- **Spike Insensitive:** Auto mode, but with an algorithm to reject spikes. The algorithm is TBD, but needs to be very fast.

- **Mean Centered:** The range is given by an expression, but the center of the plot is the mean of all active curves in the plot.

Changing zoom:
Keyboard and RMB: When in *Zoom Mode* (rather than *Layout Mode*) the following rmb options, with corresponding keyboard accelerators change the zoom:

M: *Maximum:* X axis zoom to Auto, Y axis zoom to AutoBorder.
S: *Spike Insensitive*: X axis zoom to Auto, Y axis zoom to SpikeInsensitive.
A: *Mean Centered*: X azis zoom to Auto, Y axis zoom to Mean Centered
ctrl-M: *X Zoom Maximum*: X axis zoom to auto, Y zoom not changed.
shift-right: *X Zoom Out*: X axis zoom changed to fixed and increased:

```
new_xmin = xmin - (xmax - xmin)*0.25;
new_xmax = xmax + (xmax – xmin)*0.25;
```

shift-left: *X Zoom In*: X axis zoom changed to fixed and decreased:

```
new_xmin = xmin + (xmax - xmin)*0.1666666;
new_xmax = xmax - (xmax – xmin)*0.1666666;
```

N: *Normalize X axis to Y axis:* Given the current plot aspect ratio, change the X axis range to

have the same units per mm as the Y axis range. Particularly useful for images.

shift-M: *Y Zoom Maximum*. Y axis zoom to auto, X zoom not changed.

shift-L: *Local Y zoom maximum*: When zoomed in in X, auto zoom Y, only counting points within the current X range. (eg, curve goes from x=0 to 100, but we are zoomed in to x = 30 to 40. Adjust Y zoom to include all points with x values between 30 and 40.

shift-Up: *Y Zoom Out*: Y axis zoom increased. If the Y zoom mode is not *Mean Centered*, change to *Fixed* (*expression*).

```
new_ymin = ymin - (ymax - ymin)*0.25;
new_ymax = ymax + (ymax - ymin)*0.25;
```

shift-Down: *Y Zoom In*: Y axis zoom decreased. If the Y zoom mode is not *Mean Centered*, change to *Fixed* (*expression*).

```
new_ymin = ymin + (ymax - ymin)*0.1666666;
new_ymax = ymax - (ymax – ymin)*0.1666666;
```

shift-N: *Normalize Y axis to X axis:* Given the current plot aspect ratio, change the Y axis range to have the same units per mm as the X axis range. Particularly useful for images.

L: *Y Log mode*: toggle log Y axis

G: *X Log mode*: toggle log X axis

Tied Zoom:

- Plots can have their zooms tied to other plots.
- Zooms are Tied by a selection box in the top right of each plot. The zooms of all plots with the selection box checked are tied at the next change. All others are not.
- When the zoom or zoom mode of any Tied plot is changed, all other tied zoom plots change their zoom or zoom mode to match. If the change explicitly only changes one axis (eg, *X-Zoom Out*) only the mode of that axis will be changed. So:
  - if the mode of the current plot is changed to *fixed (expression) x = -10 to 10, y = -1 to 1*, all plots tied to it are changed to *fixed (expression) x = -10 to 10, y = -1 to 1*.
  - If the mode of the current plot is changed to *Maximum*, then all plots tied to it are changed to *Maximum*. In this case, the zoom of the plots will probably be different.
  - If the mode of the current plot is changed to *Mean Centered, dY=20*, then all plots tied to it will be changed to *Mean Centered, dY=20*. This is particularly useful for multiple plots with very different offsets, but similar variations.
  - If the Y zoom range is changed with the mouse, all tied plots will have their Y zoom ranges changed to match, but the X zoom ranges will not be changed.
- When in zoom mode, there will be a tool bar icon to tie or un-tie all plots. If most plots are tied, clicking the icon will un-tie them all. If most the plots are untied, clicking the icon will tie them all.

Mouse Zoom:

- When the UI is in Zoom mode (rather than Layout Mode) the mouse is used to change the zoom.

- **Left button drag:** draws a rubber-band selection box. At the end of the drag, the plot's zoom is changed to fixed, showing only the selected region.

- **Shift-Left-button drag:** Zooms only in Y. X is left unchanged. The rubber band selection box extends all the way across the plot to indicate this.

- **CTRL-Left-button drag**: Zooms only in X. Y is left unchanged. The rubber band selection box extends from the top to the bottom of the plot to indicate this.

- **Shift key:** a horizontal line the width of the plot, through the cursor indicates that shift is pressed, and that a drag will zoom only in Y. (observe similar behavior in kst 1.x)

- **CTRL key:** a vertical line the height of the plot, through the cursor, indicates that ctrl is pressed, and that a drag will zoom only in Y. (observe similar behavior in kst 1.x)

Mouse position feedback and *Data Snap Mode*:

The coordinates of the mouse in plot coordinates are shown on the status bar. In the case of an overlay, the coordinates in the first plot is used. There will be a **DataSnapMode** toggle on the toolbar which will cause the coordinates of the point nearest to the mouse to be displayed instead. The point will be indicated by a red and black dot. If the mouse is over an image, in data mode, the value of pixel under the mouse will also be shown. NOTE: *DataSnapMode* for curves with lots of points can be computationally intensive: optimizations are required here. A future doc will describe the precise behavior, and suggest optimizations.

Precision: With linear axis (not log) the coordinates will be given with 6 significant figures, or as $\log_{10}((Max + Min)/(Max - Min))+3$ significant figures, whichever is more. This precision is calculated separately for X, Y and Image Z. The coordinates will be printed with C's %g format (fixed or floating, whichever is shorter, given the precision).

Zoom history:

- Each plot will keep a zoom history.
- On each zoom mode change, except for a zoom history pop, the complete X & Y zoom state (eg, *AUTO*, or *EXPRESSION: X = -10 to 10, Y = -4 to 17*) will be pushed onto the zoom history.
- The ***Middle Button*** or ***R*** will pop to the previous zoom mode.
- If the zoom of a tied plot is popped, all plots tied to the plot will change to the zoom mode of the plot whose zoom history was popped. Their zooms are not popped; rather the new zoom is pushed into the zoom history.

Zoom Mode Icons:

The following toolbar icons will appear when in zoom mode (replacing the layout mode icons). These icons all appeared in 1.x.

- **Data Snap Mode:** Toggle button whose behavior is described above.
- **Tie Zooms:** A push button whose behavior is described above

Data manipulation icons: which also appear only in Zoom Mode.

- **Read from end:** Push Button. Change all data source derived primitives (ie, Rvectors) to *Read from end* mode using the current requested frame span.
- **Pause**: Toggle Button: pause all updates.
- **Advance:** Push button: advance all RVectors by their current requested frame span and change to *Fixed Frame Range* mode. If this would cause data to be read past the end of the file, place into *read from end mode.*
- **Back:** Push Button: Shift all Rvectors back by their current requested frame span and change to

Fixed Frame Range mode. If this would cause data to be read past the beginning of the file, set the requested first frame to 0.

- **Change Data Range:** Push button: Bring up the *change data range* dialog.
- **Change Data File:** Push button: bring up the *change data file* dialog.

Zoom modes with shared Axis:

- If an axis is shared, then the range of that axis will be the same for all plots that share the axis.
- The shared axis has all of the same modes as an unshared axis, and they behave the same way as a shared axis, except that the ranges cover all plots in the group, not just the origin plot.
- If an axis is unshared, then the individual plot is responsible for its zooming – the shared box has no effect on it.