

PLT MrLib: Graphical Libraries Manual

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372

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Thanks

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1. MrLib

The MrLib collection consists of several libraries, each of which provides a set of procedures and syntax.

To use a MrLib library, either at the top-level or within a module, import it with

```
(require (lib "libname" "mrlib"))
```

For example, to use the **graph.ss** library:

```
(require (lib "graph.ss" "mrlib"))
```

The MrLib collection provides the following libraries:

- **aligned-pasteboard.ss** – pasteboards that manage the geometry of their snips
- **bitmap-label.ss** – builds button labels from bitmaps
- **cache-image-snip.ss** – the core of the drscheme image teachpack
- **fancy-value-port.ss** – allows ports to show syntax and numbers interactively
- **graph.ss** – shows graphs in a pasteboard
- **include-bitmap.ss** – inlines bitmaps into source text for stand-alone executables
- **name-message.ss** – a control for showing a path in a pop-down menu
- **plot.ss** – library for plotting values to a dc
- **path-dialog.ss** – a platform-independent file/directory dialog
- **syntax-browser.ss** – library for browsing the structure of syntax objects
- **text-string-style-desc.ss** – normalizes snips and styles into sexps

2. aligned-pasteboard.ss: Aligned Pasteboard

To load: `(require (lib "aligned-pasteboard.ss" "mrlib"))`

The aligned-pasteboard library provides classes derived from `pasteboard%` with geometry management that mirrors that of `vertical-panel%` and `horizontal-panel%`.

- `aligned-editor-canvas%`
- `aligned-editor-snip%`
- `aligned-pasteboard<%>`
- `aligned-pasteboard-parent<%>`
- `horizontal-pasteboard%`
- `stretchable-snip<%>`
- `vertical-pasteboard%`

2.1 aligned-editor-canvas%

Superclass: `editor-canvas%`

Calls the `realign` method when resized.

```
- (new aligned-editor-canvas% (parent _) [(editor _)] [(style _)] [(scrolls-per-page
_)] [(label _)] [(wheel-step _)] [(line-count _)] [(horizontal-inset _)] [(vertical-inset
_)] [(enabled _)] [(vert-margin _)] [(horiz-margin _)] [(min-width _)] [(min-height
_)] [(stretchable-width _)] [(stretchable-height _)]) => aligned-editor-canvas%
object
  parent: frame%, dialog%, panel%, or pane% object
  editor = #f: text% or pasteboard% object or #f
  style = null: list of symbols in '(no-border control-border combo no-hscroll
no-vscroll hide-hscroll hide-vscroll auto-vscroll
auto-hscroll resize-corner deleted transparent)
  scrolls-per-page = 100: exact integer in [1, 10000]
  label = #f: string (up to 200 characters) or #f
  wheel-step = 3: exact integer in [1, 10000] or #f
  line-count = #f: exact integer in [1, 1000] or #f
  horizontal-inset = 5: exact integer in [0, 1000]
  vertical-inset = 5: exact integer in [0, 1000]
  enabled = #t: boolean
  vert-margin = 0: exact integer in [0, 1000]
  horiz-margin = 0: exact integer in [0, 1000]
```

min-width = graphical minimum width : exact integer in [0, 10000]
min-height = graphical minimum height : exact integer in [0, 10000]
stretchable-width = #t : boolean
stretchable-height = #t : boolean

If a canvas is initialized with #f for *editor*, install an editor later with `set-editor`.

The *style* list can contain the following flags:

- 'no-border — omits a border around the canvas
- 'control-border — gives the canvas a border that is like a `text-field%` control
- 'combo — gives the canvas a combo button that is like a `combo-field%` control; this style is intended for use with 'control-border, 'hide-hscroll, and 'hide-vscroll
- 'no-hscroll — disallows horizontal scrolling and hides the horizontal scrollbar
- 'no-vscroll — disallows vertical scrolling and hides the vertical scrollbar
- 'hide-hscroll — allows horizontal scrolling, but hides the horizontal scrollbar
- 'hide-vscroll — allows vertical scrolling, but hides the vertical scrollbar
- 'auto-hscroll — automatically hides the horizontal scrollbar when unneeded (unless 'no-hscroll or 'hide-hscroll is specified)
- 'auto-vscroll — automatically hides the vertical scrollbar when unneeded (unless 'no-vscroll or 'hide-vscroll is specified)
- 'resize-corner — leaves room for a resize control at the canvas's bottom right when only one scrollbar is visible
- 'deleted — creates the canvas as initially hidden and without affecting *parent*'s geometry; the canvas can be made active later by calling *parent*'s `add-child` method
- 'transparent — the canvas is “erased” before an update using it's parent window's background

While vertical scrolling of text editors is based on lines, horizontal scrolling and pasteboard vertical scrolling is based on a fixed number of steps per horizontal page. The *scrolls-per-page* argument sets this value.

If provided, the *wheel-step* argument is passed on to the `wheel-step` method. The default wheel step can be overridden globally though the '|MrEd:wheelStep| preference; see “Preferences” (§ in *PLT MrEd: Graphical Toolbox Manual*).

If *line-count* is not #f, it is passed on to the `set-line-count` method.

If *horizontal-inset* is not 5, it is passed on to the `horizontal-inset` method. Similarly, if *vertical-inset* is not 5, it is passed on to the `vertical-inset` method.

For information about the *enabled* argument, see `window<%>`. For information about the *horiz-margin* and *vert-margin* arguments, see `subarea<%>`. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see `area<%>`.

2.2 aligned-editor-snip%

Superclass: `editor-snip%`

Calls the `realign` method when resized.

```
- (new aligned-editor-snip% [(editor -)] [(with-border? -)] [(left-margin -)]
  [(top-margin -)] [(right-margin -)] [(bottom-margin -)] [(left-inset -)] [(top-inset
  -)] [(right-inset -)] [(bottom-inset -)] [(min-width -)] [(max-width -)] [(min-height
  -)] [(max-height -)]) => aligned-editor-snip% object
  editor = #f : text% object or #f
  with-border? = #t : boolean
  left-margin = 5 : exact non-negative integer
  top-margin = 5 : exact non-negative integer
  right-margin = 5 : exact non-negative integer
```

```

bottom-margin = 5 : exact non-negative integer
left-inset = 1 : exact non-negative integer
top-inset = 1 : exact non-negative integer
right-inset = 1 : exact non-negative integer
bottom-inset = 1 : exact non-negative integer
min-width = 'none : non-negative real number or 'none
max-width = 'none : non-negative real number or 'none
min-height = 'none : non-negative real number or 'none
max-height = 'none : non-negative real number or 'none

```

If *editor* is non-#f, then it will be used as the editor contained by the snip. See also [set-editor](#).

If *with-border?* is not #f, then a border will be drawn around the snip. The editor display will be inset in the snip area by the amounts specified in the *-margin* arguments. The border will be drawn with an inset specified by the *-inset* arguments.

See [get-inset](#) and [get-margin](#) for information about the inset and margin arguments.

2.3 aligned-pasteboard<%>

`get-aligned-min-height`

The minimum height an aligned-pasteboard can be and still fit the heights of all of its children.

```
- (send an-aligned-pasteboard get-aligned-min-height) => number
```

`get-aligned-min-width`

The minimum width an aligned-pasteboard can be and still fit the widths of all of its children.

```
- (send an-aligned-pasteboard get-aligned-min-width) => number
```

`realign`

```
- (send an-aligned-pasteboard realign width height) => void
  width: nonnegative
  height: nonnegative
```

Realigns the children inside the [aligned-pasteboard<%>](#) to the given width and height.

```
- (send an-aligned-pasteboard realign) => void
```

Realigns the children inside the aligned-pasteboard; the previously allotted width and height.

`set-aligned-min-sizes`

Calculates the minimum width and height of the of the pasteboard based on children's min-sizes and stores it for later retrieval via the getters.

```
- (send an-aligned-pasteboard set-aligned-min-sizes) => number
```

2.4 aligned-pasteboard-parent<%>

This interface must be implemented by any class whose editor is an [aligned-pasteboard<%>](#).

set-aligned-min-sizes

- (send *an-aligned-pasteboard-parent* set-aligned-min-sizes) ⇒ void

2.5 horizontal-pasteboard%

Superclass: *pasteboard%*

Implements: *aligned-pasteboard<%>*

- (new horizontal-pasteboard%) ⇒ *horizontal-pasteboard%* object

The editor will not be displayed until it is attached to an *editor-canvas%* object or some other *display*.

A new *keymap%* object is created for the new editor. See also *get-keymap* and *set-keymap*.

A new *style-list%* object is created for the new editor. See also *get-style-list* and *set-style-list*.

after-delete

Called after a snip is deleted from the editor (and after the *display* is refreshed; use *on-delete* and *begin-edit-sequence* to avoid extra refreshes when *after-delete* modifies the editor).

See also *can-delete?* and *on-edit-sequence*.

No internals locks are set when this method is called.

- (send *an-horizontal-pasteboard* after-delete *snip*) ⇒ void
snip: *snip%* object

after-insert

Called after a snip is inserted into the editor (and after the *display* is refreshed; use *on-insert* and *begin-edit-sequence* to avoid extra refreshes when *after-insert* modifies the editor).

See also *can-insert?* and *on-edit-sequence*.

No internals locks are set when this method is called.

- (send *an-horizontal-pasteboard* after-insert *snip* before *x* *y*) ⇒ void
snip: *snip%* object
before: *snip%* object or #f
x: real number
y: real number

after-reorder

Called before a snip is moved in the pasteboard's front-to-back snip order (and after the *display* is refreshed; use *on-reorder* and *begin-edit-sequence* to avoid extra refreshes when *after-reorder* modifies the editor).

See also [can-reorder?](#) and [on-edit-sequence](#).

No internals locks are set when this method is called.

```
- (send an-horizontal-pasteboard after-reorder snip to-snip before?) ⇒ void
  snip: snip% object
  to-snip: snip% object
  before?: boolean
```

resized

Called (indirectly) by snips within the editor: it forces a recalculation of the display information in which the specified snip has changed its size.

```
- (send an-horizontal-pasteboard resized snip redraw-now?) ⇒ void
  snip: snip% object
  redraw-now?: boolean
```

2.6 stretchable-snip<%>

This interface must be implemented by any snip class whose objects will be stretchable when inserted into an [aligned-pasteboard<%>](#).

get-aligned-min-height

The minimum height that the snip can be resized to

```
- (send a-stretchable-snip get-aligned-min-height) ⇒ number
```

get-aligned-min-width

The minimum width that the snip can be resized to.

```
- (send a-stretchable-snip get-aligned-min-width) ⇒ number
```

stretchable-height

Whether or not the snip can be stretched in the Y dimension

```
- (send a-stretchable-snip stretchable-height) ⇒ boolean
```

stretchable-width

Whether or not the snip can be stretched in the X dimension

```
- (send a-stretchable-snip stretchable-width) ⇒ boolean
```

2.7 vertical-pasteboard%

Superclass: `pasteboard%`

Implements: `aligned-pasteboard<%>`

- `(new vertical-pasteboard%) ⇒ vertical-pasteboard% object`

The editor will not be displayed until it is attached to an `editor-canvas%` object or some other `display`.

A new `keymap%` object is created for the new editor. See also `get-keymap` and `set-keymap`.

A new `style-list%` object is created for the new editor. See also `get-style-list` and `set-style-list`.

`after-delete`

Called after a snip is deleted from the editor (and after the `display` is refreshed; use `on-delete` and `begin-edit-sequence` to avoid extra refreshes when `after-delete` modifies the editor).

See also `can-delete?` and `on-edit-sequence`.

No internals locks are set when this method is called.

- `(send a-vertical-pasteboard after-delete snip) ⇒ void`
`snip: snip% object`

`after-insert`

Called after a snip is inserted into the editor (and after the `display` is refreshed; use `on-insert` and `begin-edit-sequence` to avoid extra refreshes when `after-insert` modifies the editor).

See also `can-insert?` and `on-edit-sequence`.

No internals locks are set when this method is called.

- `(send a-vertical-pasteboard after-insert snip before x y) ⇒ void`
`snip: snip% object`
`before: snip% object or #f`
`x: real number`
`y: real number`

`after-reorder`

Called before a snip is moved in the pasteboard's front-to-back snip order (and after the `display` is refreshed; use `on-reorder` and `begin-edit-sequence` to avoid extra refreshes when `after-reorder` modifies the editor).

See also `can-reorder?` and `on-edit-sequence`.

No internals locks are set when this method is called.

- `(send a-vertical-pasteboard after-reorder snip to-snip before?) ⇒ void`
`snip: snip% object`

```
to-snip: snip% object  
before?: boolean
```

resized

Called (indirectly) by snips within the editor: it forces a recalculation of the display information in which the specified snip has changed its size.

```
- (send a-vertical-pasteboard resized snip redraw-now?) ⇒ void  
  snip: snip% object  
  redraw-now?: boolean
```

3. `bitmap-label.ss`: Bitmap Labels

To load: `(require (lib "bitmap-label.ss" "mrlib"))`

`(make-bitmap-label string bitmap-or-path [font])` PROCEDURE

Constructs a bitmap label suitable for use a button that contains the image named by *bitmap-or-path* followed by the text in *string*.

`(bitmap-label-maker string bitmap-or-path)` PROCEDURE

OBSOLETE. Use `make-bitmap-label` instead.

This function takes a string and `bitmap%` (or filename) and returns a function that takes a container and generates a bitmap. The container determines the font that is used for the bitmap label. The result is a bitmap (with a mask) that is suitable for use as a `button%` label.

4. cache-image-snip.ss: Cache-image Snip

To load: `(require (lib "cache-image-snip.ss" "mrlib"))`

This library is the core data structure for the image.ss teachpack. Images in the image.ss library are instances of the `cache-image-snip%` class.

The library also defines a new type, `argb`, that represents a bitmap, but with alpha values. It has a maker, two selectors, and a predicate.

- `cache-image-snip%`
- **Functions**

4.1 cache-image-snip%

Superclass: `snip%`

- `(make-object cache-image-snip%)` ⇒ `cache-image-snip%` object
Creates a plain snip of length 1 with the "Basic" style of the-style-list.

`get-argb`

- `(send a-cache-image-snip get-argb)` ⇒ `argb`
Returns a pixel array for this image, forcing it to be computed.

`get-argb-proc`

- `(send a-cache-image-snip get-argb-proc)` ⇒ `(argb number number .-i . void)`
Returns a procedure that fills in an `argb` with the contents of this image at the given offset

`get-argb/no-compute`

- `(send a-cache-image-snip get-argb/no-compute)` ⇒ `(union #f argb)`
Returns a pixel array for this image or `#f` if it has not been computed yet.

`get-bitmap`

- `(send a-cache-image-snip get-bitmap)` ⇒ `bitmap`
Builds (if not yet built) a bitmap corresponding to this snip and returns it.

get-dc-proc

- (send *a-cache-image-snip* get-dc-proc) ⇒ (union #f ((is-a?/c dc<*>) int[dx] int[dy] -i void))

Either returns false, or a procedure that draws the contents of this snip into a dc.

get-pinhole

- (send *a-cache-image-snip* get-pinhole) ⇒ (values number number)

returns the pinhole coordinates for this image, counting from the top-left of the image.

get-size

- (send *a-cache-image-snip* get-size) ⇒ (values number number)

returns the width and height for the image.

4.2 Functions

snip-class SNIPCLASS

This snipclass is used for saved cache image snips.

(make-argb (*vector of rational [between 0 & 255]*) *int*) CONSTRUCTOR

Constructs a new argb value. The vector has four entries for each pixel, an alpha, red, green, and blue value. The int specifies the width of the image; the height is the size of the vector, divided by 4, divided by the width.

(argb-vector *argb*) SELECTOR

Extracts the vector from an argb

(argb-width *argb*) SELECTOR

Extracts the width from an argb.

(argb? *any*) PREDICATE

Tests if its argument is an argb.

(overlay-bitmap *dx dy color-bitmap mask-bitmap*) PROCEDURE

Builds a new argb after overlaying color-bitmap (with masking based on mask-bitmap) onto argb at (dx, dy) from the top-left.

(build-bitmap *draw w h*) PROCEDURE

Builds a bitmap with width *w* and height *h*, using the procedure *draw*. The procedure should accept one argument, `dc< %>`, and return void.

(flatten-bitmap *bitmap*) PROCEDURE

Builds a new bitmap that flattens the original bitmap with its mask, producing a bitmap that has no mask, and looks the way that bitmap would draw (when drawn with the mask).

(argb->cache-image-snip *argb number number*) PROCEDURE

Builds a new `cache-image-snip%` based on the contents of argb, using the two numbers as the pinhole.

(argb->bitmap *argb*) PROCEDURE

Builds a bitmap that draws the same way as argb; the alpha pixels are put into the bitmap's get-loaded-mask bitmap.

5. interactive-value-port.ss: Interactive Value Port

To load: `(require (lib "interactive-value-port.ss" "mrlib"))`

`(set-interactive-display-handler port)`

PROCEDURE

Sets the port-display-handler for the given port so that when it encounters these values:

- exact, real, non-integral numbers
- syntax objects

it uses `write-special` to send snips to the port, instead of those values. Otherwise, it behaves like the default port-display-handler.

In order to show values embedded in lists and other compound object, it uses `pretty-print`.

`(set-interactive-write-handler port)`

PROCEDURE

Same as `set-interactive-display-handler`, except that it sets the port-print-handler.

`(set-interactive-print-handler port)`

PROCEDURE

Same as `set-interactive-display-handler`, except that it sets the port-display-handler.

6. gif.ss: GIF and Animated GIF Writing

To load: `(require (lib "gif.ss" "mrlib"))`

The **gif.ss** library provides functions for writing bitmap objects to GIF files.

`(write-gif bitmap filename)`

PROCEDURE

Writes the given *bitmap* to *filename* as a GIF image, where *bitmap* is either an instance of `bitmap%` or a thunk (to be called just once) that generates such an object. If the bitmap uses more than 256 colors, it is automatically quantized using a simple algorithm. If the bitmap has a mask bitmap, it is used to determine transparent pixels in the generated GIF image.

`(write-animated-gif bitmap-list delay filename [#:one-at-a-time? one-at-a-time?])`
PROCEDURE

Writes the bitmaps in *bitmap-list* to *filename* as an animated GIF. The *bitmap-list* list can contain a mixture of `bitmap%` objects and thunks (each called just once) that produce `bitmap%` objects. The *delay* argument is the amount of time in 1/100s of a second to wait between transitions.

If *one-at-a-time?* is `#f` (the default), then the content of all images is collected and quantized at once, to produce a single colortable; a drawback to this approach is that it uses more memory, and it allows less color variation among animation frames. Even when *one-at-a-time?* is false, the result of each thunk in *bitmap-list* is converted to a byte-string one at a time (which helps avoid bitmap-count limits under Windows).

If *one-at-a-time?* is true, then the bitmaps are quantized and written to the file one at a time; that is, for each thunk in *bitmap-list*, its result is written and discarded before another thunk is called. A drawback to this approach is that a separate colortable is written for each frame in the animation, which can make the resulting file large.

7. graph.ss: Graph

To load: `(require (lib "graph.ss" "mrlib"))`

The **graph.ss** library provides a graph drawing toolkit, built out of MrEd's `pasteboard%`s.

- `graph-pasteboard<%>`
- `graph-pasteboard-mixin%`
- `graph-snip<%>`
- `graph-snip-mixin%`
- **Graph Functions**

7.1 graph-pasteboard<%>

`get-arrowhead-params`

- `(send a-graph-pasteboard get-arrowhead-params) ⇒ (values number number number)`

Returns the current settings for the arrowhead's drawing.

`on-mouse-over-snips`

- `(send a-graph-pasteboard on-mouse-over-snips a-los) ⇒ void`
`a-los: (listof (is-a?/c snip%))`

This method is called when the mouse passes over any snips in the editor. It is only called when the list of snips under the editor changes (ie, if the mouse moves, but remains over the same list of snips, the method is not called). Also, this method is called with the empty list if the mouse leaves the pasteboard.

`set-arrowhead-params`

- `(send a-graph-pasteboard set-arrowhead-params angle-width short-side long-size)`
`⇒ void`
`angle-width: number`
`short-side: number`
`long-size: number`

Sets drawing parameters for the arrowhead. The first is the angle of the arrowhead's point, in radians. The second is the length of the outside line of the arrowhead and the last is the distance from the arrowhead's point to the place where the arrowhead comes together.

set-draw-arrow-heads?

```
- (send a-graph-pasteboard set-draw-arrow-heads? draw-arrow-heads?) => void
  draw-arrow-heads?: boolean
```

Sets a boolean controlling whether or not arrow heads are drawn on the edges between nodes.

(Does not affect self-links, only links between two different nodes.)

7.2 graph-pasteboard-mixin

Domain: (class->interface **pasteboard%**)

Implements: **graph-pasteboard<%>**

This mixin overrides many methods to draw lines between **graph-snip<%>** that it contains.

```
- init args:
```

The editor will not be displayed until it is attached to an **editor-canvas%** object or some other **display**.

A new **keymap%** object is created for the new editor. See also **get-keymap** and **set-keymap**.

A new **style-list%** object is created for the new editor. See also **get-style-list** and **set-style-list**.

7.3 graph-snip<%>

add-child

```
- (send a-graph-snip add-child child) => void
  child: (is-a?/c graph-snip<%>)
```

Adds a child of this snip. Instead of calling this method, consider using the add-links function provided from this library.

add-parent

Adds a parent of this snip. Instead of calling this method, consider using add-links function provided from this library.

```
- (send a-graph-snip add-parent parent) => void
  parent: (is-a?/c graph-snip<%>)
```

```
- (send a-graph-snip add-parent parent mouse-over-pen mouse-off-pen mouse-over-brush
  mouse-off-brush) => void
  parent: (is-a?/c graph-snip<%>)
  mouse-over-pen: (or/c false/c (is-a?/c pen%))
  mouse-off-pen: (or/c false/c (is-a?/c pen%))
  mouse-over-brush: (or/c false/c (is-a?/c brush%))
  mouse-off-brush: (or/c false/c (is-a?/c brush%))
```

get-children

```
- (send a-graph-snip get-children) ⇒ (listof snip%)
```

returns a list of snips that implement **graph-snip<%>**. Each of these snips will have a line drawn from it, pointing at this snip.

get-parents

```
- (send a-graph-snip get-parents) ⇒ (listof graph-snip<%>)
```

Returns a list of snips that implement **graph-snip<%>**. Each of these snips will have a line drawn to it, starting from this snip.

remove-child

```
- (send a-graph-snip remove-child child) ⇒ void
  child: (is-a?/c graph-snip<%>)
```

Removes a child snip from this snip. Be sure to remove this snip as a parent from the argument, too.

remove-parent

```
- (send a-graph-snip remove-parent parent) ⇒ void
  parent: (is-a?/c graph-snip<%>)
```

removes a parent snip from this snip. Be sure to remove this snip as a child from the argument, too.

7.4 graph-snip-mixin

Domain: (class->interface **snip%**)

Implements: **graph-snip<%>**

```
- init args:
```

Creates a plain snip of length 1 with the "Basic" style of the-style-list.

7.5 Graph Functions

```
(add-links graph-snip<%> graph-snip<%>) PROCEDURE
```

```
(add-links
graph-snip<%>
graph-snip<%>
(union false? (is-a?/c pen%))
(union false? (is-a?/c pen%))
(union false? (is-a?/c brush%))
(union false? (is-a?/c brush%))) PROCEDURE
```

```
(add-links
graph-snip<%>
graph-snip<%>
(union false? (is-a?/c pen%))
(union false? (is-a?/c pen%))
(union false? (is-a?/c brush%))
(union false? (is-a?/c brush%))
(union false? string)) PROCEDURE
```

```
(add-links
graph-snip<%>
graph-snip<%>
(union false? (is-a?/c pen%))
(union false? (is-a?/c pen%))
(union false? (is-a?/c brush%))
(union false? (is-a?/c brush%))
number
number) PROCEDURE
```

```
(add-links
graph-snip<%>
graph-snip<%>
(union false? (is-a?/c pen%))
(union false? (is-a?/c pen%))
(union false? (is-a?/c brush%))
(union false? (is-a?/c brush%))
number
number
(union false? string)) PROCEDURE
```

The `add-links` function connects a parent snip to a child snip in the same pasteboard.

When called with two arguments, connects the snips using a blue/purple color scheme for the links. The first snip is the parent and the second snip is the child.

When called with six arguments, uses the two pens and brushes for the color scheme. The first pen and the first brush are used when the mouse cursor is over the snip (or a child or parent) and the second pen and brush are used when the mouse cursor is not over the snip. The brush is used to draw inside the arrow head and the pen is used to draw the border of the arrowhead and the line connecting the two snips.

When called with a final string argument, the string is used as a label on the edge.

When called with two final number arguments, they are dx and dy offsets for the head and the tail of the arrow, first dx and then dy.

When called with two numbers and a string as the final three arguments, the numbers and strings behave as they do separately.

```
(add-links/text-colors
graph-snip<%>
graph-snip<%>
(union false? (is-a?/c pen%))
(union false? (is-a?/c pen%))
(union false? (is-a?/c brush%))
(union false? (is-a?/c brush%))
(union false? (is-a?/c color%))
(union false? (is-a?/c color%))
number
number
```

```
(union false? string))
```

PROCEDURE

Behaves like *add-links*, except that seventh and eighth arguments specify colors for the text on the label (the arguments preceding and following are treated like the last case of *add-links*).

8. include-bitmap.ss: Include Bitmap

To load: `(require (lib "include-bitmap.ss" "mrlib"))`

The **include-bitmap.ss** library provides a `include-bitmap` form that takes a filename containing a bitmap and “inlines” the bitmap into the program. The advantage of inlining the bitmap is that a stand-alone executable can be created that contains the bitmap and does not refer to the original image file.

`(include-bitmap file-spec [type-expr])` SYNTAX

The *file-spec* is the same as for MzLib’s `include` form: a path string, a `build-path` form, or a `lib` form. The *type-expr* should produce `'unknown`, `'unknown/mask`, etc., and the default is `'unknown/mask`.

`(include-bitmap/relative-to source file-spec [type-expr])` SYNTAX

Analogous to `include-at/relative-to`, though only a source is needed (no context).

9. name-message.ss: Name Message

To load: `(require (lib "name-message.ss" "mrlib"))`

- `name-message%`
- `Name-Message Functions`

9.1 name-message%

Superclass: `canvas%`

A `name-message%` control displays a filename that the user can click to show the filename's path and select one of the enclosing directories. Override the `on-choose-directory` method to handle the user's selection.

```
- (new name-message% (parent _) [(style _)] [(paint-callback _)] [(label _)] [(gl-config
_)]) [(enabled _)] [(vert-margin _)] [(horiz-margin _)] [(min-width _)] [(min-height
_)]) [(stretchable-width _)] [(stretchable-height _)]) => name-message% object
parent: frame%, dialog%, panel%, or pane% object
style=null: list of symbols in '(border control-border combo vscroll hscroll
resize-corner gl deleted no-autoclear transparent no-focus)
paint-callback=void: procedure of two arguments: a canvas% object and a dc<%> object
label=#f: string (up to 200 characters) or #f
gl-config=#f: gl-config% object or #f
enabled=#t: boolean
vert-margin=0: exact integer in [0, 1000]
horiz-margin=0: exact integer in [0, 1000]
min-width=graphical minimum width: exact integer in [0, 10000]
min-height=graphical minimum height: exact integer in [0, 10000]
stretchable-width=#t: boolean
stretchable-height=#t: boolean
```

The `style` argument indicates one or more of the following styles:

- 'border — gives the canvas a thin border
- 'control-border — gives the canvas a border that is like a `text-field%` control
- 'combo — gives the canvas a combo button that is like a `combo-field%` control; this style is intended for use with 'control-border and not with 'hscroll or 'vscroll
- 'hscroll — enables horizontal scrolling (initially visible but inactive)
- 'vscroll — enables vertical scrolling (initially visible but inactive)
- 'resize-corner — leaves room for a resize control at the canvas's bottom right when only one scrollbar is visible
- 'gl — *obsolete* (every canvas is an OpenGL context where supported)
- 'deleted — creates the canvas as initially hidden and without affecting `parent`'s geometry; the canvas can be made active later by calling `parent`'s `add-child` method
- 'no-autoclear — prevents automatic erasing of the canvas before calls to `on-paint`

- 'transparent — the canvas is automatically “erased” before an update using its parent window’s background; the result is undefined if this flag is combined with 'no-autoclear
- 'no-focus — prevents the canvas from accepting the keyboard focus when the canvas is clicked, or when the `focus` method is called

The 'hscroll and 'vscroll styles create a canvas with an initially inactive scrollbar. The scrollbars are activated with either `init-manual-scrollbars` or `init-auto-scrollbars`, and they can be hidden and re-shown with `show-scrollbars`.

The `paint-callback` argument is called by the default `on-paint` method, using the canvas and the DC returned by `get-dc` as the argument.

The `label` argument names the canvas for `get-label`, but it is not displayed with the canvas.

The `gl-config` argument determines properties of an OpenGL context for this canvas, as obtained through the canvas’s drawing context. See also `get-dc` and `get-gl-context in dc<%>`.

For information about the `enabled` argument, see `window<%>`. For information about the `horiz-margin` and `vert-margin` arguments, see `subarea<%>`. For information about the `min-width`, `min-height`, `stretchable-width`, and `stretchable-height` arguments, see `area<%>`.

on-choose-directory

- (send *a-name-message* on-choose-directory *dir*) ⇒ void
dir: path

Called when one of the popup menu items is chosen. The argument is a represents the selected directory.

on-event

Called when the canvas receives a mouse event. See also “Mouse and Keyboard Events” (§ in *PLT MrEd: Graphical Toolbox Manual*), noting in particular that certain mouse events can get dropped.

- (send *a-name-message* on-event *event*) ⇒ void
event: `mouse-event%` object

Handles the click by popping up a menu or message.

on-paint

Called when the canvas is exposed or resized so that the image in the canvas can be repainted.

When `on-paint` is called in response to a system expose event and only a portion of the canvas is newly exposed, any drawing operations performed by `on-paint` are clipped to the newly-exposed region; however, the clipping region as reported by `get-clipping-region` does not change.

- (send *a-name-message* on-paint) ⇒ void

Draws the control’s current message.

set-hidden?

Calling this method with #f causes the name message to become invisible and to stop responding to mouse movements.

Calling it with #t restores its visibility and makes it respond to mouse movements again.

- (send *a-name-message* set-hidden?) ⇒ void

set-message

Sets the label for the control.

- (send *a-name-message* set-message *file-name?* *msg*) ⇒ void
file-name? : boolean
msg : path string

If *file-name?* is #t, *msg* is treated like a pathname, and a click on the name-message control creates a popup menu to open a get-file dialog.

If *file-name?* is #f, *msg* is treated as a label string. Clicking on the name-message control pops up a dialog saying that there is no file name until the file is saved.

9.2 Name-Message Functions

(*calc-button-min-sizes* *dc string*) PROCEDURE

Calculates the minimum width and height of a button label (when drawn with *draw-frame-button-label*). Returns two values: the width and height.

(*draw-frame-button-label* *dc string width height inverted?*) PROCEDURE

Draws a button label like the one for the (*define ...*) and filename buttons in the top-left corner of the DrScheme frame. Use this function to draw similar buttons.

The basic idea is to create a canvas object whose *on-paint* method is overridden to call this function. The *dc* argument should be canvas's drawing context, and *string* should be the string to display on the button. The *width* and *height* arguments should be the width and height of the button, and *inverted?* should be *#t* when the button is pressed.

See *calc-button-min-sizes* for help calculating the min sizes of the button.

10. path-dialog.ss: File/Directory Dialog

To load: `(require (lib "path-dialog.ss" "mrlib"))`

- `path-dialog%`

10.1 path-dialog%

Superclass: `dialog%`

The `path-dialog%` class implements a platform-independent file/directory dialog. The dialog is the same as the dialog under X for MrEd's `get-file`, `put-file`, `get-directory`, and `get-file-list` procedures, but considerable extra functionality is available through the class.

```
- (new path-dialog% [(label _)] [(message _)] [(parent _)] [(directory _)] [(filename
_) ] [(put? _)] [(dir? _)] [(existing? _)] [(new? _)] [(multi? _)] [(can-mkdir?
_) ] [(filters _)] [(show-file? _)] [(show-dir? _)] [(ok? _)] [(guard _)]) =>
path-dialog% object
  label = #f : string (up to 200 characters) or #f
  message = #f : string (up to 200 characters) or #f
  parent = #f : frame% or dialog% object or #f
  directory = #f : path or #f
  filename = #f : path or #f
  put? = #f : boolean
  dir? = #f : boolean
  existing? = (not put?) : boolean
  new? = #f : boolean
  multi? = #f : boolean
  can-mkdir? = put? : boolean
  filters = #t : list of (list filter-name filter-glob), #f, or #t
  show-file? = #f : path-to-boolean procedure or #f
  show-dir? = #f : path-to-boolean procedure or #f
  ok? = #f : path-to-boolean procedure or #f
  guard = #f : procedure or #f
```

The `label` argument is the dialog's title string. If `label` is `#f`, the default is based on other field values.

The `message` argument is a prompt message to show at the top of the dialog. If it is `#f`, no prompt line.

The `parent` argument is the parent frame or dialog, if any, for this dialog.

The `directory` argument specifies the dialog's initial directory. If it is `#f`, the initial directory is the last directory that was used by the user (or the current directory on first use).

The `filename` argument provides an initial filename text, if any.

If `put?` is true, the dialog operates in choose-file-to-write mode (and warn the user if choosing an existing name).

If *dir?* is true, the dialog operates in directory-choice mode.

If *existing?* is true, the user must choose an existing file.

If *new?* is true, the user must choose a non-existent path. Providing both *new?* and *existing?* as true triggers an exception.

If *multi?* is true, the dialog allows selection of multiple paths.

If *can-mkdir?* is true, the dialog includes a button for the user to create a new directory.

The *filters* argument is one of:

- (*list-of* (*list filter-name filter-glob*)) — a list of pattern names (e.g., “Scheme Files”) and glob patterns (e.g., “*.scm;*.ss”). Any list (including an empty list) enables a filter box for the user to enter glob patterns, and the given list of choices is available in a combo-box drop-down menu. Glob patterns are the usual Unix ones (see *glob->regex*), and a semicolon can be used to allow multiple patterns.
- #f — no patterns and no filter input box.
- #t — use a generic “All” filter, which is “*. *” on Windows and “*” on other platforms.

The *show-file?* predicate is used to filter file paths that are shown in the dialog. The predicate is applied to the file name as a string while the *current-directory* parameter is set. This predicate is intended to be a lightweight filter for choosing which names to display.

The *show-dir?* predicate is similar, but for directories instead of files.

The *ok?* predicate is used in a similar fashion to the *show-file?* and *show-dir?* predicate, but it is used to determine whether the OK button should be enabled when a file or directory is selected (so it need not be as lightweight as the other predicates).

The *guard* procedure is a generic verifier for the dialog’s final result, as produced by the *run* method. It receives the result that is about to be returned (which can be a list in a multi-selection dialog), and can return a different value (any value) instead. If it throws an exception, an error dialog is shown, and the dialog interaction continues (so it can be used to verify results without dismissing the dialog). This procedure can also raise *void*, in which case the dialog remains without an error message.

run

This method shows the dialog and returns the selected result. If a *guard* procedure is not supplied when the dialog is created, then the result is either a path or a list of paths (and the latter only when *schememulti?* is true when the dialog is created). If a *guard* procedure is supplied, its result determines the result of this method.

```
- (send a-path-dialog run) ⇒ value
```

11. plot.ss: Plot

To load: `(require (lib "plot.ss" "mrlib"))`

The **plot.ss** library provides a simple tool for plotting data values to a device context.

Two structures are provided: `data-set` and `plot-setup`.

A `data-set` value includes the following fields (which should be supplied on order to make-`data-set`):

- `points`: `(listof (is-a?/c point%))` — the data values to plot.
- `connected?`: `any?` — indicates whether the points are connected by a line.
- `pen`: `(is-a?/c pen%)` — the drawing pen for plotting points/lines.
- `min-x`: `number?`, `max-x`: `number?`, `min-y`: `number?`, and `max-y`: `number?` — the to plot the points, in drawing-context coordinates.

A `plot-setup` value includes the following fields (which should be supplied on order to plot-`setup`):

- `axis-label-font`: `(is-a?/c font%)` — the font for drawing axis labels.
- `axis-number-font`: `(is-a?/c font%)` — the font for drawing axis numbers.
- `axis-pen`: `(is-a?/c pen%)` — the pen for drawing the axes.
- `grid?`: `any?` — whether to draw a grid at axis markings.
- `grid-pen`: `(is-a?/c pen%)` the pen for drawing the grid (if any).
- `x-axis-marking`: `(listof number?)` — locations for marks on the x-axis.
- `y-axis-marking`: `(listof number?)` — locations for marks on the y-axis.
- `x-axis-label`: `string?` — the x-axis label.
- `y-axis-label`: `string?` — the y-axis label.

`(plot dc data-set-list plot-setup)`

PROCEDURE

Draws the data-sets in `data-set-list` into the given `dc`. Uses drawing-context coordinates in data-sets that will accommodate all of the data sets.

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