GLUI
A GLUT-Based User Interface Library

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Contents

1 Introduction

1.1 Overview

GLUI is a GLUT-based C++ user interface library which provides controls such as buttons, checkboxes, radio buttons, and spinners to OpenGL applications. It is window-system independent, relying on GLUT to handle all system-dependent issues, such as window and mouse management. Features of the GLUI User Interface Library include:

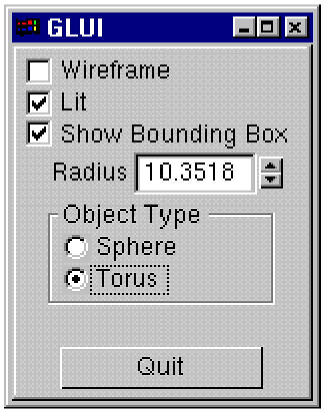
- Complete integration with GLUT toolkit
- Simple creation of a new user interface window with a single line of code
- Support for multiple user interface windows
- Standard user interface controls such as:
  - Buttons
  - Checkboxes for boolean variables
  - Radio Buttons for mutually-exclusive options
  - Editable text boxes for inputting text, integers, and floating-point values
  - Spinners for interactively manipulating integer and floating-point values
  - Static text fields
  - Panels for grouping sets of controls
  - Separator lines to help visually organize groups of controls
- Controls can generate callbacks when their values change
- Variables can be linked to controls and automatically updated when the value of the control changes (*live variables*)
- Controls can be automatically synchronized to reflect changes in live variables
- Controls can trigger GLUT redisplay events when their values change
- Layout and sizing of controls is automatic
- User can cycle through controls using Tab key

1.2 Background

The OpenGL Utility Toolkit (GLUT) is a popular user interface library for OpenGL applications. It provides a simple interface for handling windows, a mouse, keyboard, and other input devices. It has facilities for nested pop-up menus, and includes utility functions for bitmap and stroke fonts, as well as for drawing primitive graphics objects like spheres, tori, and teapots. Its greatest attraction is its *window system independence*, which (coupled with OpenGL's own window system independence) provides a very attractive environment for developing cross-platform graphics applications.

Many applications can be built using only the standard GLUT input methods - the keyboard, mouse, and pop-up menus. However, as the number of features and options increases, these methods tend to be greatly overworked. It is not uncommon to find glut applications where almost every key on the keyboard is assigned to some function, and where the pop-up menus are large and cumbersome.

The GLUI User Interface Library addresses this problem by providing standard user interface elements such as buttons and checkboxes. The GLUI library is written entirely over GLUT, and contains *no system-dependent code*. A GLUI program will therefore behave the same on SGIs, Windows machines, Macs, or any other system to which GLUT has been ported. Furthermore, GLUI has been designed for programming simplicity, allowing user interface elements to be added with one line of code each.



Sample GLUI window

2 Overview

GLUI is intended to be a simple yet powerful user interface library. This section describes in more detail its main features, including a flexible API, easy and full integration with GLUT, live variables, and callbacks.

2.1 Simple Programming Interface

GLUI has been designed for maximum programming simplicity. New GLUI windows and new controls within them can be created with a single line of code each. GLUI automatically sizes controls and places them within their windows. The programmer does not need to explicitly give X, Y, width, and height parameters for each control - an otherwise cumbersome task.

GLUI provides default values for many parameters in the API. This way, one does not need to place `NULL` or dummy values in the argument list when some feature are not needed. As an example, there are several ways to create a checkbox:

```
GLUI *glui;
  ...
glui->add_checkbox("Click me");
```

Adds a simple checkbox with the name "Click me"

```
glui->add_checkbox("Click me", &state );
```

The variable `state` will now be automatically update to reflect the state of the checkbox (see *live variables* below).

```
glui->add_checkbox( "Click me", &state, 17, callback_fn );
```

Now we have a live variable, *plus* a callback function will be invoked (and passed the value '17') whenever the checkbox changes state.

Note how a default size and position for the checkbox was never specified - GLUI automatically lays out controls in their window.

2.2 Full Integration with GLUT

GLUI is built on top of - and meant to fully interact with - the GLUT toolkit. Existing GLUT applications therefore need very little change in order to use the user interface library (these changes are outlined in Section 2.5 below). Once integrated, the presence of a user interface will be mostly transparent to the GLUT application.

2.3 Live Variables

GLUI can associate *live variables* with most types of controls. These are regular C variables that are automatically updated whenever the user interacts with a GLUI control. For example, a checkbox may have an associated integer variable, to be automatically toggled between one and zero whenever the user checks or unchecks the control. A editable text control may maintain an entire character array as a live variable, such that anything the user types into the text box is automatically copied into the application's character array. This eliminates the need for the programmer to explicitly query each control's state to determine their current value or contents. In addition, a GLUI window can send a *GLUT redisplay message* to another window (i.e., a main graphics window) whenever a value in the interface is changed. This will cause that other window to redraw, automatically using the new values of any live variables. For example, a GLUI window can have a spinner to manipulate the radius of an on-screen object. When the user changes the spinner's value, a live variable (say, `float radius`) is automatically updated, and the main graphics window is sent a redisplay message. The graphics window then redraws itself, using the current (that is, the updated) value of `radius` - unaware that it was changed since the last frame. Live variables help make the GLUI interface transparent to the rest of the application.

Live variables are automatically updated by GLUI whenever the user interacts with a control, but what happens if the user directly changes the value of variable? For example, what if the application changes the radius with a line such as:

```
radius = radius * .05;                    // Updates variable, but not control
```

instead of going through the GLUI API:

```
radius_control->set_float_val( radius * .05 );    // Updates control also
```

Clearly, the first method will leave the variable and the on-screen control out-of-sync. To remedy this, one can *synchronize live variables*. This procedure will check the current value of all live variables in a GLUI window, and compare them with the controls' current values. If a pair does not match (that is, the user changed a live variable without telling GLUI), then the control is automatically updated to reflect the variable. Thus, one can make a series of changes to variables in memory, and then use the single function call `sync_live()` to synchronize the user interface:

```
radius   = radius * .05;           // Make changes to a group of variables that
aperture = aperture + .1;          // are linked to controls
num_segments++;

glui->sync_live();                 // Update user interface to reflect these changes
```

If a pointer to a live variable is passed to a control creation function (e.g., `add_checkbox()`), then the current value of that variable will be used as the initial value for the control. Thus, remember to always properly initialize live variables (including strings), before passing them to a control creation function.

2.4 Callbacks

GLUI can also generate callbacks whenever the value of a control changes. Upon creation of a new control, one specifies a function to use as a callback, as well as an integer ID to pass to that function when the control's value changes. A single function can handle callbacks for multiple controls by using a `switch` statement to interpret the incoming ID value within the callback.

2.5 Usage

Integrating GLUI with a new or existing GLUT application is very straightforward. The steps are:

1. Add the GLUI library to the link line (e.g., glui32.lib for Windows). The proper order in which to add libraries is: GLUI, GLUT, GLU, OpenGL.

2. #include the file "glui.h" in all sources that will use the GLUI library.

3. Create your regular GLUT windows and popup menus as usual. Make sure to store the window id of your main graphics window, so GLUI windows can later send it redisplay events:

   ```
   int window_id = glutCreateWindow( "Main gfx window" );
   ```

4. Register your GLUT callbacks as usual (*except the Idle callback, discussed below*).

5. Register your GLUT idle callback (if any) with `GLUI_Master` (a global object which is already declared), to enable GLUI windows to take advantage of idle events without interfering with your application's idle events. If you do not have an idle callback, pass in NULL.

   ```
   GLUI_Master.set_glutIdleFunc( myGlutIdle );
   ```
   or
   ```
   GLUI_Master.set_glutIdleFunc( NULL );
   ```

6. In your idle callback, explicitly set the current GLUT window before rendering or posting a redisplay event. Otherwise the redisplay may accidently be sent to a GLUI window.

   ```
   void myGlutIdle( void ) {
     glutSetWindow(main_window);
     glutPostRedisplay();
   }
   ```

7. Create a new GLUI window using

   ```
   GLUI *glui = GLUI_Master.create_glui( "name", flags, x, y );
   ```

   Note that `flags`, `x`, and `y` are optional arguments. If they are not specified, default values will be used. GLUI provides default values for arguments whenever possible.

8. Add controls to the GLUI window. For example, we can add a checkbox and a quit button with:

   ```
   glui->add_checkbox( "Lighting", &lighting );
   glui->add_button( "Quit", QUIT_ID, callback_func );
   ```

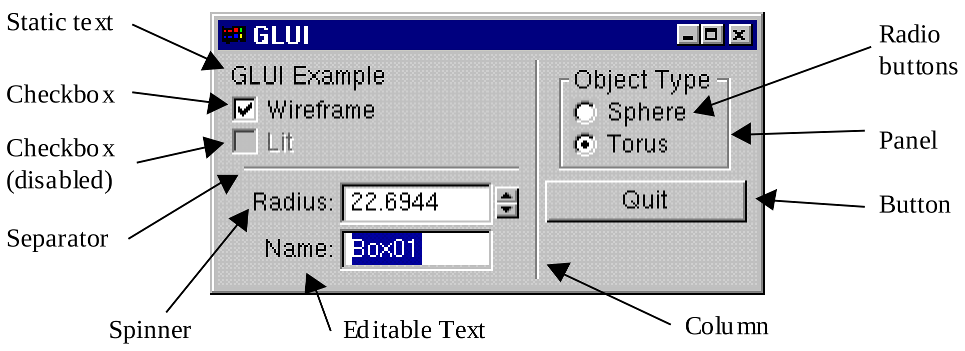
9. Let each GLUI window you've created know where its main graphics window is:

   ```
   glui->set_main_gfx_window( window_id );
   ```

10. Invoke the standard GLUT main event loop, just as in any GLUT application:

    ```
    glutMainLoop();
    ```

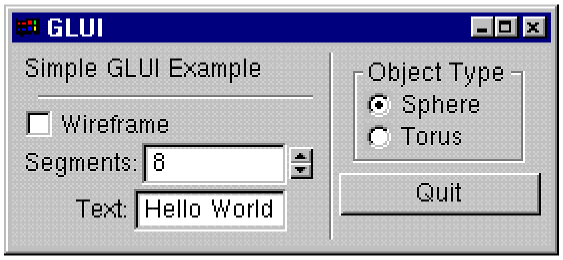
2.6 List of Controls



Control type	**Class name**	**Used for...**	**Set/Get values**	**Live var?**	**Callback?**
Panel	`GLUI_Panel`	grouping controls into boxes	-	-	N
Column	`GLUI_Column`	grouping controls into columns	-	-	N
Button	`GLUI_Button`	invoking user actions	-	-	Y
Checkbox	`GLUI_Checkbox`	handling booleans	`get_int_val` `set_int_val`	**`int`**	Y
Radio Group, Radio Button	`GLUI_RadioGroup,` `GLUI_RadioButton`	handling mutually-exclusive options	`get_int_val` `set_int_val`	**`int`**	Y
Static Text	`GLUI_StaticText`	plain text labels	`set_text`	-	N
Editable Text	`GLUI_EditText`	text that can be edited - and optionally interpreted as integers or floats. Upper and lower bounds can be placed on integers and floats	`get_int_val` `set_int_val`	**`int`**	Y
			`get_float_val` `set_float_val`	**`float`**	
			`get_text` `set_text`	**`text`**	
Spinner	`GLUI_Spinner`	interactively manipulating numeric values. Supports single clicks, click-hold, and click-drag. Upper and lower bounds can be specified	`get_int_val` `set_int_val`	**`int`**	Y
			`get_float_val` `set_float_val`	**`float`**	
Separator	`GLUI_Separator`	separating controls with simple horizontal lines	-	-	N

3 Example

```
#include <GL/glut.h>
#include "glui.h"

void myGlutInit();
void myGlutKeyboard(unsigned char Key, int x, int y)
void myGlutMenu( int value )
void myGlutIdle( void )
void myGlutMouse(int button, int button_state, int x, int y )
void myGlutMotion(int x, int y )
void myGlutReshape( int x, int y )
void myGlutDisplay( void );
void control_cb( int ID );

        . . .

void main(int argc, char* argv[])
{
  int   main_window;

  /**  Initialize GLUT and create window - This  **/
  /**  is all regular GLUT code so far           **/

  glutInitDisplayMode( GLUT_RGB | GLUT_DOUBLE | GLUT_DEPTH );
  glutInitWindowPosition( 50, 50 );
  glutInitWindowSize( 300, 300 );

  main_window = glutCreateWindow( "GLUI test app" );
  glutKeyboardFunc( myGlutKeyboard );
  glutDisplayFunc( myGlutDisplay );
  glutReshapeFunc( myGlutReshape );
  glutMotionFunc( myGlutMotion );
  glutMouseFunc( myGlutMouse );
  myGlutInit();

  /** Now create a GLUI user interface window and add controls **/

  GLUI *glui = GLUI_Master.create_glui( "GLUI", 0 );
  glui->add_statictext( "Simple GLUI Example" );
  glui->add_separator();
  glui->add_checkbox( "Wireframe", &wireframe, 1, control_cb );
  GLUI_Spinner *segment_spinner =
    glui->add_spinner( "Segments:",GLUI_SPINNER_INT, &segments );
  segment_spinner->set_int_limits( 3, 60, GLUI_LIMIT_WRAP );
  GLUI_EditText *edittext =
     glui->add_edittext( "Text:", GLUI_EDITTEXT_TEXT, text );

  glui->add_column(true);       /**  Begin new column - 'true' indicates   **/
                                /**  a vertical bar should be drawn        **/

  GLUI_Panel *obj_panel = glui->add_panel( "Object Type" );
  GLUI_RadioGroup *group1 =
     glui->add_radiogroup_to_panel(obj_panel,&obj,3,control_cb);
  glui->add_radiobutton_to_group( group1, "Sphere" );
  glui->add_radiobutton_to_group( group1, "Torus" );
  glui->add_button( "Quit", 0,(GLUI_Update_CB)exit );

  /** Tell GLUI window which other window to recognize as the main gfx window **/
  glui->set_main_gfx_window( main_window );

  /** Register the Idle callback with GLUI (instead of with GLUT)     **/
  GLUI_Master.set_glutIdleFunc( myGlutIdle );

  /** Now call the regular GLUT main loop **/
  glutMainLoop();
}
```



Wireframe
Segments: 8
Text: Hello World
[✓ Sphere] Torus

4 API

The GLUI library consists of 3 main classes: `GLUI_Master_Object`, `GLUI`, and `GLUI_Control`. There is a single global `GLUI_Master_Object` object, named `GLUI_Master`. *All GLUI window creation must be done through this object.* This lets the GLUI library track all the windows with a single global object. The `GLUI_Master` is also used to set the GLUT Idle function, and to retrieve the current version of GLUI.

4.1 Windows

This section describes the functions related to window creation and manipulation. The functions listed here belong to two classes: `GLUI_Master_Object` and `GLUI`. Keep in mind that any member function of the `GLUI_Master_Object` class should be invoked from the global object, named `GLUI_Master`, while any function of the `GLUI` class should be invoked via a `GLUI` pointer returned from `GLUI_Master.create_glui()`. For example:

```
float version     = GLUI_Master.get_version();
GLUI *glui_window = GLUI_Master.create_glui( "GLUI" );
glui_window->add_StaticText( "Hello World!" );
```

4.1.1 Initialization

get_version

Returns the current GLUI version.

Usage

```
float   GLUI_Master_Object::get_version( void );
```

Returns: Current GLUI version

create_glui

Creates a new user interface window

Usage

```
GLUI  *GLUI_Master_Object::create_glui( char *name, int flags=0,
                                        int x=-1, int y=-1 );
```

`name`	- Name of new GLUI window
`flags`	- Initialization flags. No flags are defined in the current version.
`x,y`	- Initial location of window. Note that no initial size can be specified, because GLUI automatically resizes windows to fit all controls.

Returns: Pointer to a new GLUI window

set_glutIdleFunc

Registers a standard GLUT Idle callback `f` with GLUI. GLUI registers its own Idle callback with GLUT, but calls this user function `f` after each idle event. Thus every idle event is received by the callback `f`, but only after GLUI has done its own idle processing. This is mostly transparent to the GLUT application: simply register the idle callback with this function rather than the standard GLUT function `glutIdleFunc()`, and the GLUT application will work as usual. The only caveat is that under the GLUT specification, the current window is undefined in an idle callback. Therefore, your application will need to explicitly set the current window before rendering or posting any GLUT redisplay events:

```
int main_window;

void myGlutIdle( void )
{
   /* ... */

  if ( glutGetWindow() != main_window )
     glutSetWindow(main_window);

   glutPostRedisplay();
}
```

This ensures that the redisplay message is properly sent to the graphics window rather than to a GLUI window.

Usage

```
void   GLUI_Master_Object::set_glutIdleFunc(void (*f)(void));
```

`f` - GLUT Idle event callback function

set_main_gfx_window

Tells a GLUI window which other (standard GLUT) window to consider the main graphics window. When a control in the GLUI window changes value, a redisplay request will be sent to this main graphics window.

Usage

```
void    GLUI::set_main_gfx_window( int window_id );
```

`window_id` - ID of main graphics window. Obtained as the result of `glutCreateWindow()`, or with `glutGetWindow()` immediately after the main graphics window is created.

4.1.2 Window management

get_glut_window_id

Returns the standard GLUT window ID of a GLUI window.

Usage

```
int      GLUI::get_glut_window_id( void );
```

Returns: GLUT window ID of the GLUI window

enable, disable

Enables or disables (grays out) a GLUI window. No controls are active when a GLUI window is disabled.

Usage

```
void     GLUI::enable( void );
void     GLUI::disable( void );
```

sync_live

Synchronizes all live variables associated with a GLUI window. That is, it reads the current value of the live variables, and sets the associated controls to reflect these variables. More information on live variables and synchronization, see Section 2.3 above.

Usage

```
void    GLUI::sync_live( void );
```

4.2 Controls

All controls are derived from the base class `GLUI_Control`. As such, they all are created and operated similarly. Section 4.2.1 lists functions that are shared by some or all controls, while the rest of Section 0 lists the specific functions used to create or manage each type of control.

There are two functions to create each type of control. One will be named `add_control()` (where `control` is replaced by the name of the specific control), while the other follows the form `add_control_to_panel()`. The second form nests the control within a panel, while the first form places the control at the top level of the window. Panels are used to group related controls togethers, and panels can be nested within other panels.

Many controls accept *live variables* (Section 2.3) and/or callbacks (Section 2.4). To use live variables (application variables that are automatically updated by the GLUI library), simply pass a pointer to the variable (int, float, or character string) to the `add_control` function as the control is created. To use callbacks, pass in both an integer ID and a callback function. The callback function will be called - with the ID as its single parameter - whenever the control value changes. Multiple controls can share a callback function, which should then use the ID to determine which control invoked it.

Within a callback or at any other time, the current value of a control can be retrieved with one of the functions `get_int_val()`, `get_float_val()`, or `get_text()`, depending on the type of control. For example, a checkbox stores integer values only, while an editable text box may stores a float, an integer, or plain text, depending on what type of text box it is. The values of controls can be set using one of `set_int_val()`, `set_float_val()`, `set_text()`. The documentation for each specific control below list which of these functions it supports.

4.2.1 Common Functions

set_name

Sets the label on a button, checkbox, etc.

Usage

```
void  GLUI_Control::set_name( char *name );

name  - New label for control
```

set_w, set_h

Sets new minimum width/height for a control. `set_w()` is especially useful to increase the size of the editable text area in an editable text control or spinner.

Usage

```
void  GLUI_Control::set_w( int new_size );
void  GLUI_Control::set_h( int new_size );
```

`new_size` - New minimum width or height for control

get, set

Gets or sets the value of a control. Refer to the individual control descriptions below to see which values can be read and set for each control.

Usage

```
int    GLUI_Control::get_int_val( void );
```

Returns: Current integer value of control

```
float  GLUI_Control::get_float_val( void );
```

Returns: Current floating-point value of control

```
char  *GLUI_Control::get_text( void );
```

Returns: Pointer to string value of control. Do not modify this string directly - use `set_text()` instead.

```
void   GLUI_Control::set_int_val( int int_val );
void   GLUI_Control::set_float_val( float float_val );
void   GLUI_Control::set_text( char *text);
```

`int_val`	- New integer value for control
`float_val`	- New floating-point value for control
`text`	- New text for control. This is the editable text in an editable text box or a spinner, not the label on a button or checkbox - use `set_name()` for that instead.

disable, enable

Disables (grays out) or enables an individual control. A disabled control cannot be activated or used. Disabling a radio group disables all radio buttons within it, and disabling a panel disables all controls within it (including other panels). Enabling behaves similarly.

Usage

```
void   GLUI_Control::enable( void );
void   GLUI_Control::disable( void );
```

set_alignment

Sets the alignment of a control to left-aligned, right-aligned, or centered.

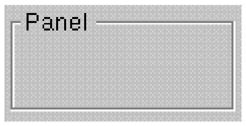
Usage

```
void   GLUI_Control::set_alignment( int align );
```

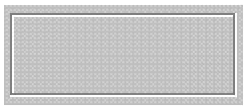
`align` - New alignment. May be one of `GLUI_ALIGN_CENTER`, `GLUI_ALIGN_RIGHT`, or `GLUI_ALIGN_LEFT`.

4.2.2 Panels

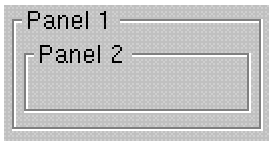
Panels are used to group controls together. An embossed rectangle is drawn around all controls contained within the panel. If the panel is given a name, it will be displayed in the upper-left of the rectangle. Panels may be nested.



Panel with name



Panel without name



Two nested panels

add_panel, add_panel_to_panel

Adds a new panel to a GLUI window, optionally nested within another panel.

Usage

```
GLUI_Panel   *GLUI::add_panel( char *name,
                               int type = GLUI_PANEL_EMBOSSED );

GLUI_Panel   *GLUI::add_panel_to_panel( GLUI_Panel *panel, char *name,
                                        int type = GLUI_PANEL_EMBOSSED  );
```

`name` - Label to display in the panel. If string is empty, no label is displayed

`type` - How to draw the panel. The options are:

`GLUI_PANEL_EMBOSSED`	- Draw the panel as a sunken box (default)
`GLUI_PANEL_RAISED`	- Draw as a raised box. Name is not displayed.
`GLUI_PANEL_NONE`	- Does not draw a box. Use this for organizing controls into groups without surrounding them with a box.

`panel` - Existing panel to nest new panel in

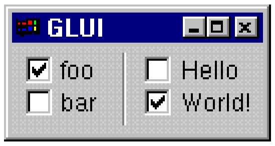
Returns: Pointer to a new panel control

4.2.3 Columns

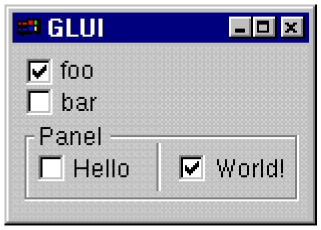
Controls can be grouped into vertical columns. The function `GLUI::add_column()` begins a new column, and all controls subsequently added will be placed in this new column (until another column is added). Columns can be added within panels, allowing arbitrary layouts to be created.

Examples:

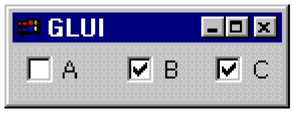
```
glui->add_checkbox("foo");
glui->add_checkbox("bar");
glui->add_column(true);
glui->add_checkbox("Hello");
glui->add_checkbox("World!");
```



```
glui->add_checkbox("foo");
glui->add_checkbox("bar");
GLUI_Panel *panel = glui->add_panel( "Panel" );
glui->add_checkbox_to_panel(panel, "Hello");
glui->add_column_to_panel(panel, true);
glui->add_checkbox_to_panel(panel, "World!");
```



```
glui->add_checkbox( "A" );
glui->add_column( false );
glui->add_checkbox( "B" );
glui->add_column( false );
glui->add_checkbox( "C" );
```



add_column, add_column_to_panel

Begins a new column in a GLUI window, optionally within a panel.

Usage

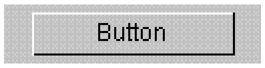
```
void  GLUI::add_column( int draw_bar = true );
void  GLUI::add_column_to_panel( GLUI_Panel *panel,
                                 int draw_bar = true );
```

`draw_bar` - If `true`, a vertical bar is drawn at the column boundary.
`panel` - Panel to place column in.

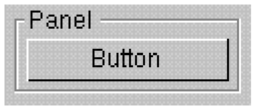
Returns: Pointer to a new button control

4.2.4 Buttons

Buttons are used in conjunction with callbacks to trigger events within an application



Button



Button nested within panel

add_button, add_button_to_panel

Adds a new button to a GLUI window, optionally nested within a panel

Usage

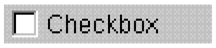
```
GLUI_Button  *GLUI::add_button( char *name, int id=-1,
                                GLUI_Update_CB callback=NULL);

GLUI_Button  *GLUI::add_button_to_panel( GLUI_Panel *panel,
                                  char *name, int id=-1,
                                  GLUI_Update_CB callback=NULL);
```

`name`	-	Name of button
`id`	-	If `callback` is defined, it will be passed this integer value
`callback`	-	Pointer to callback function (taking single `int` argument) to be called when the button is pressed
`panel`	-	Existing panel to nest button in

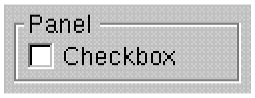
Returns: Pointer to a new button control

4.2.5 Checkboxes

Checkboxes are used to handle boolean variables. They take on either the value zero or one. The current value of a checkbox can be read with `GLUI_Checkbox::get_int_val()`, or set with `GLUI_Checkbox::set_int_val()`.



Checkbox



Checkbox nested within panel

add_checkbox, add_checkbox_to_panel

Usage

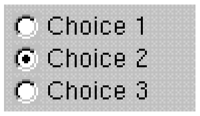
```
GLUI_Checkbox *GLUI::add_checkbox( char *name,
                              int *live_var=NULL, int id=-1,
                              GLUI_Update_CB callback=NULL);

GLUI_Checkbox  *GLUI::add_checkbox_to_panel( GLUI_Panel *panel,
                                char *name,
                                int *live_var=NULL, int id=-1,
                                GLUI_Update_CB callback=NULL);
```

`name`	-	Name of checkbox
`live_var`	-	An optional pointer to a variable of type `int`. This variable will be automatically updated with the value of the checkbox (either zero or one) whenever it is toggled.
`id`	-	If `callback` is defined, it will be passed this integer value
`callback`	-	Pointer to callback function (taking single `int` argument) to be called when the checkbox state changed is pressed. The callback will be passed the value `id`, listed above
`panel`	-	Existing panel to nest checkbox in

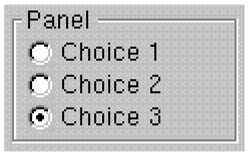
Returns: Pointer to a new checkbox control

4.2.6 Radio Buttons

Radio buttons are used to handle mutually exclusive options. Radio buttons exist only in conjunction with an associated radio group. First a group is created, then buttons are added to it. Radio buttons are assigned a number in the order in which they are added to the group, beginning with zero. The currently selected button can be determined with `GLUI_RadioGroup::get_int_val()`, or set with `GLUI_RadioGroup::set_int_val()`.



Radio group with 3 radio buttons



Radio group with 3 radio buttons, nested within panel

add_radiogroup, add_radiogroup_to_panel

Usage

```
GLUI_RadioGroup *GLUI::add_radiogroup( int *live_var=NULL,
                                 int user_id=-1,
                                 GLUI_Update_CB callback=NULL);

GLUI_RadioGroup *GLUI::add_radiogroup_to_panel(
                            GLUI_Panel *panel,
                            int *live_var=NULL, int user_id=-1,
                            GLUI_Update_CB callback=NULL );
```

`panel` -	Panel to nest radio group in
`live_var` -	An optional pointer to a variable of type `int`. This variable will be automatically updated with the number of the currently selected radio button. Buttons are numbered from zero in the order in which they are added to the group
`id` -	If `callback` is defined, it will be passed this integer value when a new radio button is selected
`callback` -	Pointer to callback function (taking single `int` argument) to be called when different radio button is selected. The callback will be passed the value `id`, listed above. Use `GLUI_RadioGroup::get_int_val()` to determine within the callback which button is selected.

Returns: Pointer to a new radio group

add_radiobutton_to_group

Usage

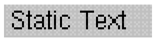
```
GLUI_RadioButton  *GLUI::add_radiobutton_to_group(
                           GLUI_RadioGroup *group, char *name );
```

`group` -	Radio group to add button to
`name` -	Name for radio button

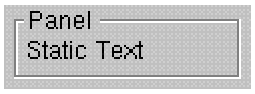
Returns: Pointer to a new radio button

4.2.7 Static Text

Static text controls are used to display simple text labels within a GLUI window. The text to display can be changed with `GLUI_StaticText::set_text()`



Static text



Static text nested within panel

add_statictext, add_statictext_to_panel

Usage

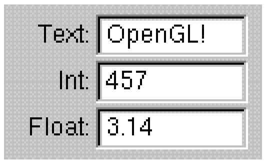
```
GLUI_StaticText  *GLUI::add_statictext( char *name );

GLUI_StaticText  *GLUI::add_statictext_to_panel(
                               GLUI_Panel *panel, char *name );
```

`name` - Text to display
`panel` - Panel to add static text to

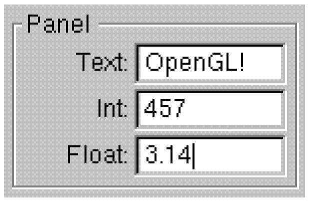
Returns: Pointer to a new static text control

4.2.8 Editable Text Boxes

Editable text boxes can be used to input plain text, integer values, or floating point values. An EditText box designated for integer values will only accept numbers and a preceding minus sign. An EditText box designated for floating-point values will accept numbers, a minus sign, and a decimal point. One can jump ahead or back a word using the Control key in conjunction with the Left or Right keys. Home and End will jump the cursor to the first or last character. EditText controls support text selection using the mouse, or using the Shift key in conjunction with the Left, Right, Control, Home and End keys. The current text of an EditText box can be retrieved using `GLUI_EditText::get_text()`. If the control stores an integer value, it can be retrieved via `GLUI_EditText::get_int_val()`, or a floating-point value using `GLUI_EditText::get_float_val()`. These can also be set using `GLUI_EditText::set_text()`, `GLUI_EditText::set_int_val()`, or `GLUI_EditText::set_float_val()`.



Editable text boxes



Editable text boxes nested within panel

add_edittext, add_edittext_to_panel

Usage

```
GLUI_EditText  *GLUI::add_edittext( char *name,
                              int data_type=GLUI_EDITTEXT_TEXT,
                              void *live_var=NULL, int id=-1,
                              GLUI_Update_CB callback=NULL );
```

```
GLUI_EditText  *GLUI::add_edittext_to_panel(
                                      GLUI_Panel *panel, char *name,
                                      int data_type=GLUI_EDITTEXT_TEXT,
                                      void *live_var=NULL, int id=-1,
                                      GLUI_Update_CB callback=NULL );
```

`name`	- Label to display left of text box
`data_type`	- The type of input the EditText control will accept. The following values are accepted: `GLUI_EDITTEXT_TEXT` - The default: regular text input `GLUI_EDITTEXT_INT` - Integer input `GLUI_EDITTEXT_FLOAT` - Floating-point input
`live_var`	- If specified, this must be a pointer to either a character array [of length at least equal to `sizeof(GLUI_String)`], a variable of type `int`, or a variable of type `float`, depending on the value of `data_type`. The string, integer, or float will be modified when the user changes the text in the EditText control
`id`	- If `callback` is defined, it will be passed this integer value when the text is changed
`callback`	- Pointer to callback function to be called when text is changed. Callback will be passed the single `int` argument '`id`', listed above.
`panel`	- Panel to add spinner to

Returns: Pointer to a new editable text control

set_int_limits, set_float_limits

These functions define upper and lower limits on the integer or float values that an editable text box can accept.

Usage

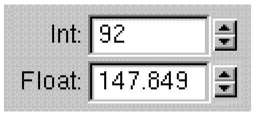
```
void  GLUI_EditText::set_int_limits( int low, int high,
                     int limit_type = GLUI_LIMIT_CLAMP );

void  GLUI_EditText::set_float_limits( float low, float high,
                     int limit_type = GLUI_LIMIT_CLAMP );
```

`low`	- Lower bound for acceptable values
`high`	- Upper bound for acceptable values
`limit_type`	- How to handle out-of-bounds values. If `GLUI_LIMIT_CLAMP`, then out-of-bounds values are simply clamped to the lower or upper limit. If `GLUI_LIMIT_WRAP`, then values that are too low are set to the upper bound, while values that are too high are set to the lower bound. `GLUI_LIMIT_WRAP` is of limited use for editable text boxes, but can be used with spinners to provide continuous cycling over a range (e.g., to continuously increase a rotation amount over the range 0 - 360).

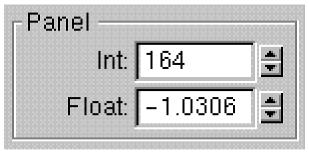
4.2.9 Spinners

A spinner is an integer or floating-point editable text box with two attached arrows, which increase or decrease the current value of the control. The arrows work in three ways: click an arrow once to increase or decrease the spinner's value by a single step, click and hold to continuously increase or decrease the spinner value, or click and drag the mouse to increase and decrease the value as the mouse moves up and down. The rate at which the spinner changes can be varied with the SHIFT and CONTROL keys. Hold SHIFT while initially clicking an arrow to increase the step amount by a factor of 100, or CONTROL to decrease the step amount to 1/100th its usual value.

The current value can be retrieved with either `GLUI_Spinner::get_int_val()` or `GLUI_Spinner::get_float_val()`, depending on the type of data stored. It can be set using `GLUI_Spinner::set_int_val()` or `GLUI_EditText::set_float_val()`.



Int and float spinners



Int and float spinners nested within panel

add_spinner, add_spinner_to_panel

Add a new spinner to a GLUI window.

Usage

```
GLUI_Spinner   *GLUI::add_spinner( char *name,
                                   int data_type=GLUI_SPINNER_INT,
                                   void *live_var=NULL, int id=-1,
                                   GLUI_Update_CB callback=NULL );

GLUI_Spinner  *GLUI::add_spinner_to_panel( GLUI_Panel *panel, char *name,
                                         int data_type=GLUI_SPINNER_INT,
                                         void *live_var=NULL, int id=-1,
                                         GLUI_Update_CB callback=NULL );
```

`name`	-	Label to display
`data_type`	-	The type of input the Spinner control will accept. The following values are accepted: `GLUI_SPINNER_INT` - Integer input `GLUI_SPINNER_FLOAT` - Floating-point input
`live_var`	-	If specified, this must be a pointer to either a variable of type `int` or a variable of type `float`, depending on the value of `data_type`. The integer or float will be modified when the user changes the value
`id`	-	If `callback` is defined, it will be passed this integer when the spinner's value is modified
`callback`	-	Pointer to callback function to be called when spinner's value is modified. Callback will be passed the single `int` argument '`id`', listed above.
`panel`	-	Panel to add spinner to

Returns: Pointer to a new spinner control

set_int_limits, set_float_limits

These functions define upper and lower limits on the integer or float values that an editable text box can accept.

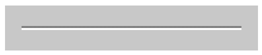
Usage

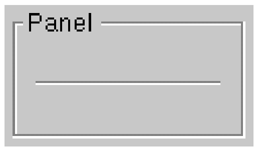
```
void  GLUI_Spinner::set_int_limits( int low, int high,
                      int limit_type = GLUI_LIMIT_CLAMP );

void  GLUI_Spinner::set_float_limits( float low, float high,
                      int limit_type = GLUI_LIMIT_CLAMP );
```

`low`	- Lower bound for acceptable values
`high`	- Upper bound for acceptable values
`limit_type`	- How to handle out-of-bounds values. If `GLUI_LIMIT_CLAMP`, then out-of-bounds values are simply clamped to the lower or upper limit. If `GLUI_LIMIT_WRAP`, then values that are too low are set to the upper bound, while values that are too high are set to the lower bound. This can be used to provide continuous cycling over a range (e.g., to continuously increase a rotation amount over the range 0 - 360).

4.2.10 Separators

Separators are simple horizontal lines that can be used to divide a series of controls into groups.


Separator



Separator nested within panel

add_separator, add_separator_to_panel

Adds a separator to a GLUI window

Usage

```
void     GLUI::add_separator( void );

void     GLUI::add_separator_to_panel( GLUI_Panel *panel );
```

`panel` - Panel to add separator to

Returns: -

5 Usage Advice

- Register your Idle callback with GLUI, not with GLUT. Otherwise, GLUI will be unable to receive idle events (*do not register your idle callback with both GLUI and GLUT, since one will override the other).* Also, check the current window in your Idle callback before rendering or posting a GLUT redisplay event, and set it to the main graphics window if necessary, since GLUT does not guarantee which will be the current window when an Idle callback function is called.

- If you do not have an Idle callback, pass `NULL` to `GLUI_Master.set_glutIdleFunc()`

- If live variables are used, GLUI will take their value as the initial value for a control. Always initialize your live variables to some appropriate value before passing them to GLUI. For example, the following code may initialize a checkbox to an invalid value (neither one or zero):

```
int some_var;   // This variable may contain any integer value
glui->add_checkbox( "Some Var", &some_var );
```

  Instead, the code should be written as:

```
int some_var = 1;   // Or zero, if appropriate
glui->add_checkbox( "Some Var", &some_var );
```

- String buffers passed to editable text controls must be at least of size `sizeof(GLUI_String)`. Otherwise, a segmentation fault may occur as GLUI overwrites the buffer.

- Do not pass in a static string as a live variable in an editable text control, as GLUI will attempt to use that space as a buffer for user-typed text:

```
glui->add_edittext( "Text", GLUI_EDITTEXT_TEXT, "Hello!" );
            // This is incorrect, as "Hello!" is a static string

char   buffer[sizeof(GLUI_String)];
glui->add_edittext( "Text", GLUI_EDITTEXT_TEXT, buffer );
            // This will work without crashing

GLUI_String   buffer2;
glui->add_edittext( "Text", GLUI_EDITTEXT_TEXT, buffer2 );
            // This will also work
```

- Also, do not pass in a pointer to a *local* variable as a live variable, as this pointer will be invalid outside the local function, and a segmentation fault will likely occur.

- The various set/get functions (`set_int_val, set_float_val, set_text, get_...`) alter the current value of a control, and *also* update any associated live variables. They will not generate a callback.

- Remember to call `GLUI::set_main_gfx_window()` to link a standard GLUT window (typically the main graphics window) to each GLUI window. This allows GLUI to generate a redisplay event for the graphics window whenever a control value changes.

- During a GLUI callback, the current GLUT window is set to the main graphics window, provided one has been defined with `GLUI::set_main_gfx_window()`. If none has been defined, then the current window is undefined - be sure to explicitly set it to the desired window before executing any OpenGL functions.