LearningGUI

移植参考

Graphic Library with
Graphical User Interface

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版本发布历史记录

LearningGUI 版本发布历史记录如表 0-1 所示。

版本	发布日期	描述
0.2.0	2017-10-12	初始发布版本

表 0-1　版本发布历史记录

关于本文档的假设和约定

对 LearningGUI 应用开发者的假定

本文档假定 LearningGUI 应用开发者具备以下基本技能：

一、C 语言软件开发环境的使用。
二、C 语言编程、调试基本能力。
三、GUI 基本知识。
四、嵌入式系统基本知识。

本文档缩写约定

本文档缩写约定如表 0-2 所示。

缩写	描述
GUI	Graphical User Interface
MTJT	Mouse-Touch-Joystick-Tablet（鼠标类）
KB	Kilo-byte（千字节）
2D	二维平面
系统	如特殊说明，特指 LearningGUI
应用	如特殊说明，特指 LearningGUI 应用程序
IDE	软件集成开发环境

表 0-2　本文档缩写约定表

目　录

第一章　LearningGUI 移植概述

　　LearningGUI(儿科 GUI)被设计成独立于具体的硬件平台和软件平台，是一款通用嵌入式 GUI 系统，而且是开源系统。它 100%使用 ISO C89 和 ISO C99 标准 C 语言开发，只调用 C 库，无浮点数运算，无汇编代码。显示、键盘、鼠标等驱动由用户在应用中编写注册。显示驱动主要是提供像素输出点接口，键盘和鼠标驱动主要是提供消息接口。因此，LearningGUI 通用性、可移植性非常好。LearningGUI 应用可以裸奔，也可以在 RTOS 中运行，同时也适合在嵌入式 Linux 系统下运行。

　　LearningGUI 系统发布包包括三个主要部分：一是 LearningGUI 库源码；二是 LearningGUI 系统所需的工具软件；三是 LearningGUI 演示程序源码。其中，LearningGUI 的工具软件主要作用是将图片转换成 LearningGUI 所支持的 C 语言数组等数据结构，目前在微软 Windows 平台中运行。

　　LearningGUI 只提供.c 和.h 代码级别上的纯 GUI 移植，并不提供软件引导和硬件初始化，硬件配置代码，也不提供具体的项目工程等 IDE 工程移植。但是 LearningGUI 库源码和演示程序中保留了 Linux 系统开发的 Makefile 文件。

　　LearningGUI 移植包括 LearningGUI 库的定制和编译、LearningGUI 驱动接口开发等两大步骤。

第二章 LearningGUI 库的定制和编译

　　解压 LearningGUI 发布包后，出现 source 目录，也就是源码总目录。该目录下有 code 目录和 include 目录，分别是库源码目录和公共头文件目录（也是 LearningGUI 应用头文件目录）。

　　code 目录结构如图 2-1 所示。
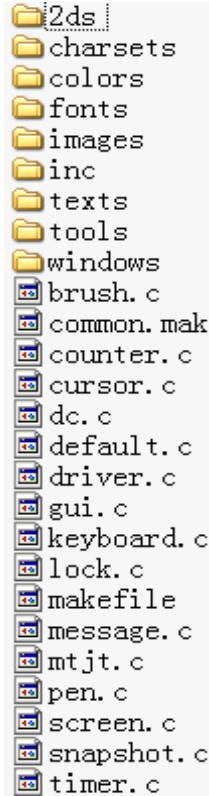
图 2-1　code 目录结构

其中 code/inc 目录是 Basic 版内部头文件目录，其目录结构如图 2-2 所示。
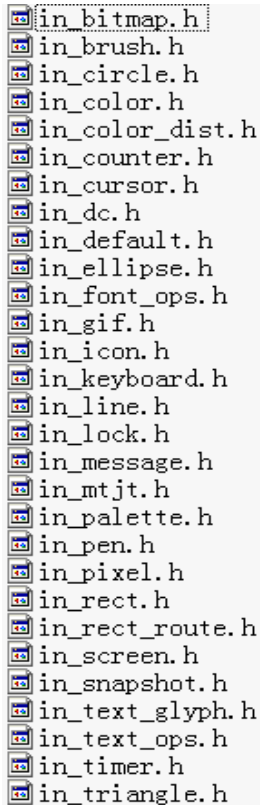
图 2-2　code/inc 目录结构

code/windows 目录是 Windows 版文件目录，其目录结构如图 2-3 所示。

📁inc
📁widgets
arithmetic.c
callback.c
caret.c
clip.c
desktop.c
init.c
interface.c
invalidate.c
makefile
rect_ops.c
scbar.c
tools.c
widget_group.c
win_bar.c
win_dc.c
win_default.c
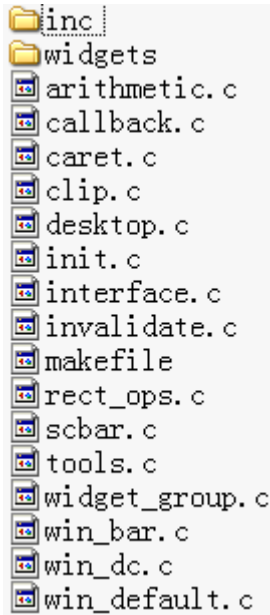
图 2-3　code/windows 目录结构

code/windows/inc 目录是 Windows 版内部头文件目录，其目录结构如图 2-4 所示。

in_arithmetic.h
in_callback.h
in_caret.h
in_cell.h
in_check_box.h
in_clip.h
in_com_box.h
in_const.h
in_desktop.h
in_frame.h
in_group_box.h
in_image.h
in_init.h
in_interface.h
in_invalidate.h
in_item_data.h
in_label.h
in_line_edit.h
in_list_box.h
in_progress_bar.h
in_push_button.h
in_radio_button.h
in_rect_ops.h
in_scbar.h
in_slider_bar.h
in_tools.h
in_widget.h
in_widget_group.h
in_win_bar.h
in_win_dc.h
in_win_default.h

图 2-4　code/windows/inc 目录结构

include 目录结构如图 2-5 所示。
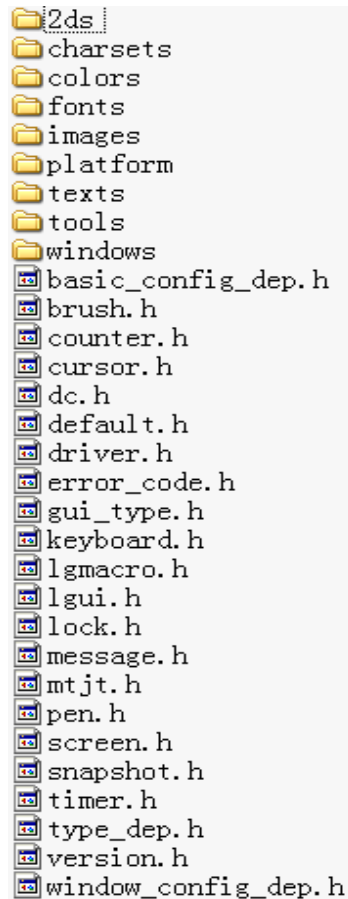
图 2-5 include 目录结构

在 include 目录中，lgui.h 文件是总头文件，包括了其它所有头文件，在应用中只需插入该文件即可。

同时，在 include 目录中有一个对用户来说非常重要的子目录 platform 目录，该目录结构如图 2-6 所示。
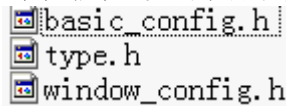
图 2-6 include/platform 目录结构

LearningGUI 的定制本质上是修改 include/platform 目录下 type.h、basic_config.h 和 window_config.h 三个文件。

2.1 include/platform/type.h 文件详解

include/platform/type.h 文件主要定义与用户开发平台相关的数据类型。在一般情况下，需要用户根据自己的开发平台做出相应的修改。其缺省的内容如下：

```
/* User type definition */
#define  INT8      char
#define  INT16     short int
#define  INT32     int
#define  INT64     long long

#define  UINT8     unsigned char
#define  UINT16    unsigned short int
#define  UINT32    unsigned int
#define  UINT64    unsigned long long

#define  UINT      unsigned int

#define  BYTE      unsigned char
#define  WORD      unsigned short int
#define  DWORD     unsigned int

#define  UCHAR     unsigned char
#define  BOOL      unsigned char
```

```
/* Sram or ram access bus width. It can be more than real bus width, but can not be less than real bus width. */
#define  BINT      int
#define  BUINT     unsigned int
```

与用户开发平台相关的数据类型描述说明如表 2-1 所示。

LearningGUI 自定义数据类型	C 数据类型 （需要用户修改）	描述说明
INT8	char	8 位整型
INT16	short int	16 位整型
INT32	int	32 位整型
INT64	long long	64 位整型
UINT8	unsigned char	8 位无符号整型
UINT16	unsigned short int	16 位无符号整型
UINT32	unsigned int	32 位无符号整型
UINT64	unsigned long long	64 位无符号整型
UINT	unsigned int	无符号整型
BYTE	unsigned char	8 位无符号整型
WORD	unsigned short int	16 位无符号整型
DWORD	unsigned int	32 位无符号整型
UCHAR	unsigned char	8 位无符号字符型
BOOL	unsigned char	布尔型
BINT	int	符号型 RAM 数据总线宽度
BUINT	unsigned int	无符号型 RAM 数据总线宽度

表 2-1　与用户开发平台向光的数据类型表

提示：BINT 和 BUINT 数据类型，分别指符号型 RAM 数据总线宽度和无符号型 RAM 数据总线宽度，主要用于优化 LearningGUI 性能。如果用户不清楚细节的话，将这两个数据类型采用默认的设置数值即可。

2.2　LearningGUI 配置宏说明

在 LearningGUI 配置文件中，宏被划分为多个级别：

一级宏：独立宏，最高级别宏，不依赖其它的宏。

二级宏：依赖于一级宏，只有一级宏有效时，二级宏才有意义；如果一级宏无效，无论二级宏是否定义，二级宏都是无效的。一般情况下，二级宏在一级宏下前置 4 个空格，以示区分。

三级宏：依赖于二级宏，只有二级宏有效时，三级宏才有意义；如果二级宏无效，无论三级宏是否定义，三级宏都是无效的。一般情况下，三级宏在二级宏下前置 4 个空格，以示区分。

2.3　include/platform/basic_config.h 文件详解

include/platform/basic_config.h 文件是 LearningGUI Basic 版配置文件，也是 LearningGUI 核心配置文件，LearningGUI 功能、参数设置和裁剪都由此文件决定；同时，Windows 版是否有效，也是由该文件决定。该文件主要是 C 宏定义和参数大小配置，如果用户定义某个宏，则 LearningGUI 库具备相应的功能；如果用户需要裁剪某项功能，则需要屏蔽相应的宏。

提示：屏蔽相应的宏，也就是将相应的宏作为注释。在大多数情况下，注释需要采用 C89 的注释式样：

```
/*  Macro  */
```

而不能采用 C99 的注释式样：

```
// Macro
```

basic_config.h 缺省内容如下：

```
/* Multi-thread support macro */
#define  _LG_MULTI_THREAD_

/* Window support macro */
#define  _LG_WINDOW_

/* Color support macro */
#define  _LG_COLOR_
    /* For screen color bit deepth */
    #define  _LG_1_BIT_COLOR_
    #define  _LG_2_BIT_COLOR_
    #define  _LG_4_BIT_COLOR_
    #define  _LG_8_BIT_COLOR_
    #define  _LG_15_BIT_COLOR_
    #define  _LG_16_BIT_COLOR_
    #define  _LG_24_BIT_COLOR_
    #define  _LG_32_BIT_COLOR_

    /* Common palette data set */
    #define   _LG_COMMON_PALETTE_

    /* Palette routine */
    #define  _LG_PALETTE_ROUTINE_
        #define  _LG_8_BIT_SYSTEM_PALETTE_
        /* #define  _LG_RESTORE_SYSTEM_PALETTE_ */

    /* Screen color conversion routine */
    #define   _LG_COLOR_CONVERSION_
        /* Palette conversion */
        #define  _LG_PALETTE_CONVERSION_

        /* Black and white screen color conversion */
        #define  _LG_BW01_CONVERSION_
        #define  _LG_BW10_CONVERSION_

        /* 4 gray screen color conversion */
        #define  _LG_2_BIT_GRAY_CONVERSION_

        /* 3-bit screen color conversion */
        #define  _LG_R1G1B1_CONVERSION_
        #define  _LG_B1G1R1_CONVERSION_

        /* 6-bit screen color conversion */
        #define  _LG_R2G2B2_CONVERSION_
        #define  _LG_B2G2R2_CONVERSION_

        /* 8-bit screen color conversion */
        #define  _LG_R2G3B3_CONVERSION_
        #define  _LG_R3G2B3_CONVERSION_
        #define  _LG_R3G3B2_CONVERSION_

        #define  _LG_B3G3R2_CONVERSION_
        #define  _LG_B3G2R3_CONVERSION_
        #define  _LG_B2G3R3_CONVERSION_

        /* 12-bit screen color conversion */
        #define  _LG_R4G4B4_CONVERSION_
        #define  _LG_B4G4R4_CONVERSION_

        /* 15-bit screen color conversion */
        #define  _LG_R5G5B5_CONVERSION_
        #define  _LG_B5G5R5_CONVERSION_

        /* 16-bit screen color conversion */
        #define  _LG_R5G6B5_CONVERSION_
        #define  _LG_B5G6R5_CONVERSION_

        /* 18-bit screen color conversion */
```

```
        #define  _LG_R6G6B6_CONVERSION_
        #define  _LG_B6G6R6_CONVERSION_

        /* 24-bit screen color conversion */
        #define  _LG_R8G8B8_CONVERSION_
        #define  _LG_B8G8R8_CONVERSION_

        /* 32-bit screen color conversion */
        #define  _LG_A8R8G8B8_CONVERSION_
        #define  _LG_A8B8G8R8_CONVERSION_

/* DC support macro */
#define  _LG_DC_
    #define  MAX_DC_NUM                            32

    #define  _LG_PEN_
    #define  _LG_BRUSH_

    #define  _LG_2D_
        #define  _LG_LINE_
        #define  _LG_RECTANGLE_
        #define  _LG_TRIANGLE_
        #define  _LG_CIRCLE_
        #define  _LG_ELLIPSE_

    #define  _LG_FONT_
        #define  FONT_NAME_LEN                     8
        #define  _LG_MONO_CHARSET_FONT_
        #define  _LG_MONO_DISCRETE_FONT_
        #define  _LG_MIXED_CHARSET_FONT_
        #define  _LG_MIXED_DISCRETE_FONT_

        #define  _LG_FONT_ID_

        #define  MISSING_CHAR_BLANK_WIDTH          8

        #define _LG_ASCII_LATIN_D0816C_FONT_
        #define _LG_ASCII_LATIN_D0612C_FONT_

        #define  _LG_MULTI_BYTE_CODE_VERSION_
            #define MULTI_BYTE_START_CODE          0xA1

            #define  _LG_GB2312_D1616CS_C1_FONT_
                #define  INCLUDE_GB2312_D1616CS_SYSBOL
                #define  INCLUDE_GB2312_D1616CS_C2

    #define  _LG_TEXT_METRIC_
    #define  _LG_TEXT_OUT_EXTENSION_
    #undef   _LG_TEXT_GLYPH_

    #define  _LG_BITMAP_
        #define  _LG_1_BIT_BITMAP_
        #define  _LG_2_BIT_BITMAP_
        #define  _LG_4_BIT_BITMAP_
        #define  _LG_8_BIT_BITMAP_
        #define  _LG_16_BIT_BITMAP_
        #define  _LG_24_BIT_BITMAP_
        #define  _LG_32_BIT_BITMAP_

        #define  _LG_FILL_BITMAP_EXTENSION_

    #define  _LG_ICON_
        #define  _LG_1_BIT_ICON_
        #define  _LG_2_BIT_ICON_
        #define  _LG_4_BIT_ICON_
        #define  _LG_8_BIT_ICON_
        #define  _LG_16_BIT_ICON_
        #define  _LG_24_BIT_ICON_
        #define  _LG_32_BIT_ICON_
```

```
            #define    _LG_FILL_ICON_EXTENSION_

     #define    _LG_GIF_
          #define    _LG_1_BIT_GIF_
          #define    _LG_2_BIT_GIF_
          #define    _LG_4_BIT_GIF_
          #define    _LG_8_BIT_GIF_


/* Screen support macro */
#define  _LG_SCREEN_
     /* #undef  _LG_NEED_REFRESH_SCREEN_ */
     #define  _LG_SNAPSHOT_
          #define  DEFAULT_SNAPSHOT_DIR                    "snapshot/"


/* Keyboard support macro */
#define    _LG_KEYBOARD_

/* MTJT: Mouse-Touchscreen-Joystick-Tablet */
/* MTJT support macro */
#define    _LG_MTJT_

/* Cursor support macro */
#define  _LG_CURSOR_
     #define   MAX_CURSOR_WIDTH                    16
     #define   MAX_CURSOR_HEIGHT                   16

/* Message support macro */
#define  _LG_MESSAGE_
     #define   MESSAGE_QUEUE_LEN                   128
     #undef  _LG_LONG_MESSAGE_

     #define    _LG_COUNTER_
          #define    MAX_COUNTER                   8

     #undef  _LG_TIMER_
          #define    MAX_TIMER                     4
          #define    TIMER_OFFSET                  75    /* microseconds */

/* Function tools support macro */
#define    _LG_TOOLS_
     #define  _LG_GB2312_TO_UNICODE_
     #define  _LG_UNICODE_TO_GB2312_
          #define  _LG_FAST_UNICODE_TO_GB2312_

/* Optization storage support macro */
#define  GUI_VAR_CONST                         const
#define  GUI_DATA_CONST                        const
```

basic_config.h 文件主要宏描述说明如表 2-2 所示。

一级宏	二级宏	三级宏	描述说明
_LG_MULTI_THREAD_			支持多线程（多任务）
_LG_WINDOW_			支持 Windows 版
_LG_DC_			支持 HDC 操作
	MAX_DC_NUM		系统所支持的最大 HDC 数目
	_LG_2D_		支持 2D 操作
		_LG_LINE_	支持画线接口
		_LG_RECTANGLE_	支持绘制矩形接口
		_LG_TRIANGLE_	支持绘制三角形接口
		_LG_CIRCLE_	支持绘制圆接口
	_LG_FONT_		支持字库接口

		_LG_MONO_CHARSET_FONT_	支持 MONO_CHARSET 字库接口
		_LG_MONO_DISCRETE_FONT_	支持 MONI_DISCRETE 字库接口
		_LG_MIXED_CHARSET_FONT_	支持 MIXED_CHARSET 字库接口
		_LG_MIXED_DISCRETE_FONT_	支持 MIXED_DISCRETE 字库接口
		_LG_ASCII_LATIN_D0816C_FONT_	支持 8*16 ASCII 字库
		_LG_ASCII_LATIN_D0612C_FONT_	支持 6*12 ASCII 字库
		_LG_MULTI_BYTE_CODE_VERSION_	支持多字节字库接口
		_LG_GB2312_D1616CS_C1_FONT_	支持 16*16 GB2312 一级字库
		INCLUDE_GB2312_D1616CS_SYSBOL（四级）	支持 16*16 GB2312 符号字库
		INCLUDE_GB2312_D1616CS_C2（四级）	支持 16*16 GB2312 二级字库
	_LG_TEXT_METRIC_		支持文本输出格式修饰
	_LG_TEXT_OUT_EXTENSION_		支持扩展文本输出接口
	_LG_BITMAP_		支持 BITMAP 操作接口
		_LG_1_BIT_BITMAP_	支持 1 位 BITMAP 操作接口
		_LG_2_BIT_BITMAP_	支持 2 位颜色 BITMAP 操作接口
		_LG_4_BIT_BITMAP_	支持 4 位颜色 BITMAP 操作接口
		_LG_8_BIT_BITMAP_	支持 8 位颜色 BITMAP 操作接口
		_LG_24_BIT_BITMAP_	支持 24 位颜色 BITMAP 操作接口
		_LG_32_BIT_BITMAP_	支持 32 位颜色 BITMAP 操作接口
		_LG_FILL_BITMAP_EXTENSION_	支持 BITMAP 缩放操作接口
	_LG_ICON_		支持 ICON 操作接口
		_LG_1_BIT_ICON_	支持 1 位 ICON 操作接口
		_LG_2_BIT_ICON_	支持 2 位 ICON 操作接口
		_LG_4_BIT_ICON_	支持 4 位 ICON 操作接口
		_LG_8_BIT_ICON_	支持 8 位 ICON 操作接口
		_LG_24_BIT_ICON_	支持 24 位 ICON 操作接口
		_LG_32_BIT_ICON_	支持 32 位 ICON 操作接口
		_LG_FILL_ICON_EXTENSION_	支持缩放 ICON 操作接口
	_LG_GIF_		支持 GIF 操作接口
		_LG_1_BIT_GIF_	支持 1 位 GIF 操作接口
		_LG_2_BIT_GIF_	支持 2 位 GIF 操作接口
		_LG_4_BIT_GIF_	支持 4 位 GIF 操作接口
		_LG_8_BIT_GIF_	支持 8 位 GIF 操作接口
_LG_SCREEN_			支持显示屏
	_LG_SNAPSHOT_		支持屏幕快照
		DEFAULT_SNAPSHOT_DIR	屏幕快照存储路径
_LG_KEYBOARD_			支持键盘
_LG_MTJT_			支持鼠标
_LG_CURSOR_			支持光标
_LG_MESSAGE_			支持消息
	MESSAGE_QUEUE_LEN		系统内置消息队列长度
	_LG_LONG_MESSAGE_		支持长消息

	_LG_COUNTER_		支持计数器
		MAX_COUNTER	系统最大计数器数目
	_LG_TIMER_		支持定时器
		MAX_TIMER	系统最大定时器数目
		TIMER_OFFSET	定时偏差（us）
_LG_TOOLS_			支持工具函数接口
	_LG_GB2312_TO_UNICODE_		GB2312 编码转换成 Unicode16 编码
	_LG_UNICODE_TO_GB2312_		Unicode16 编码转换成 GB2312 编码
		_LG_FAST_UNICODE_TO_GB2312_	Unicode16 编码快速转换 GB2312 编码
GUI_VAR_CONST			变量宏
GUI_DATA_CONST			数据宏

<div align="center">表 2-2 basic_config.h 文件配置表</div>

2.4 include/platform/window_config.h 文件详解

include/platform/window_config.h 文件是 LearningGUI Windows 版配置文件，Windows 功能、参数设置和裁剪都由此文件决定；同时，该文件主要是 C 宏定义和参数大小配置，如果用户定义某个宏，则 LearningGUI 库时能相应的功能；如果用户需要裁剪某项功能，则需要屏蔽相应的宏。

提示：对大多数用户来说，并不需要修改该文件。

window_config.h 缺省内容如下：

```
/* Window border default width */
#define  WIN_BORDER_WIDTH                    3

/* Default window back color */
#define  DEFAULT_WINDOW_BCOLOR               GUI_GREEN

/* Window background image */
#define  _LG_WINDOW_BACKGROUND_IMAGE_

/* Caret support macro */
#define  _LG_CARET_

/*
 * Widgets
 */

/* Widget user data interface */
#define  _LG_WIDGET_USER_DATA_
    #define  MAX_USER_DATA_LEN              32

/* Window bar */
#define  _LG_WINDOW_BAR_
    /* Window bar default height */
    #define  WIN_BAR_HEIGHT                20

    /* Window text max byte length */
    #define  MAX_WIN_TEXT_LEN              32

    /* Window bar default color */
    #define  WINBAR_WIN_DISABLE_BCOLOR     0x00606060
    #define  WINBAR_WIN_DISABLE_FCOLOR     GUI_GRAY
    #define  WINBAR_WIN_DISABLE_TBCOLOR    0x00606060
    #define  WINBAR_WIN_DISABLE_TFCOLOR    GUI_BLACK

    #define  WINBAR_WIN_INACTIVE_BCOLOR    0x007A96DF
    #define  WINBAR_WIN_INACTIVE_FCOLOR    GUI_BLACK
    #define  WINBAR_WIN_INACTIVE_TBCOLOR   0x007A96DF
```

```
        #define   WINBAR_WIN_INACTIVE_TFCOLOR          GUI_BLACK

        #define   WINBAR_WIN_ACTIVE_BCOLOR             0x000055E5
        #define   WINBAR_WIN_ACTIVE_FCOLOR             GUI_BLACK
        #define   WINBAR_WIN_ACTIVE_TBCOLOR            0x000055E5
        #define   WINBAR_WIN_ACTIVE_TFCOLOR            GUI_BLACK

        #define   WINBAR_CLI_DISABLE_BCOLOR            0x00606060
        #define   WINBAR_CLI_DISABLE_FCOLOR            GUI_WHITE
        #define   WINBAR_CLI_DISABLE_TBCOLOR           0x00606060
        #define   WINBAR_CLI_DISABLE_TFCOLOR           GUI_BLACK

        #define   WINBAR_CLI_INACTIVE_BCOLOR           0x007A96DF
        #define   WINBAR_CLI_INACTIVE_FCOLOR           GUI_WHITE
        #define   WINBAR_CLI_INACTIVE_TBCOLOR          0x007A96DF
        #define   WINBAR_CLI_INACTIVE_TFCOLOR          GUI_BLACK

        #define   WINBAR_CLI_ACTIVE_BCOLOR             0x000055E5
        #define   WINBAR_CLI_ACTIVE_FCOLOR             GUI_WHITE
        #define   WINBAR_CLI_ACTIVE_TBCOLOR            0x000055E5
        #define   WINBAR_CLI_ACTIVE_TFCOLOR            GUI_BLACK

        #define   WINBAR_CLOSE_DISABLED_BCOLOR         0x00D0C0C0
        #define   WINBAR_CLOSE_INACTIVE_BCOLOR         0x00D0A0A0
        #define   WINBAR_CLOSE_ACTIVE_BCOLOR           0x00E15025

        /* Window system button default width */
        #define   SYSTEM_BTN_WIDTH                     16

/* Scroll bar */
#define   _LG_SCROLL_BAR_
        /* Scroll bar default height or width */
        #define   SCBAR_HEIGHT_WIDTH                   20

        /* Scroll bar x multi step */
        #define   SCBAR_X_MULTI_STEP                   10

        /* Scroll bar y multi step */
        #define   SCBAR_Y_MULTI_STEP                   10

        /* Scroll bar default color */
        #define   SCBAR_WIN_DISABLE_BCOLOR             0x00606060
        #define   SCBAR_WIN_DISABLE_FCOLOR             GUI_BLACK
        #define   SCBAR_WIN_DISABLE_TBCOLOR            0x00606060
        #define   SCBAR_WIN_DISABLE_TFCOLOR            GUI_BLACK

        #define   SCBAR_WIN_INACTIVE_BCOLOR            0x007A96DF
        #define   SCBAR_WIN_INACTIVE_FCOLOR            GUI_BLACK
        #define   SCBAR_WIN_INACTIVE_TBCOLOR           0x007A96DF
        #define   SCBAR_WIN_INACTIVE_TFCOLOR           GUI_BLACK

        #define   SCBAR_WIN_ACTIVE_BCOLOR              0x000055E5
        #define   SCBAR_WIN_ACTIVE_FCOLOR              GUI_BLACK
        #define   SCBAR_WIN_ACTIVE_TBCOLOR             0x000055E5
        #define   SCBAR_WIN_ACTIVE_TFCOLOR             GUI_BLACK

        #define   SCBAR_CLI_DISABLE_BCOLOR             0x00606060
        #define   SCBAR_CLI_DISABLE_FCOLOR             GUI_WHITE
        #define   SCBAR_CLI_DISABLE_TBCOLOR            0x00606060
        #define   SCBAR_CLI_DISABLE_TFCOLOR            GUI_BLACK

        #define   SCBAR_CLI_INACTIVE_BCOLOR            0x007A96DF
        #define   SCBAR_CLI_INACTIVE_FCOLOR            GUI_WHITE
        #define   SCBAR_CLI_INACTIVE_TBCOLOR           0x007A96DF
        #define   SCBAR_CLI_INACTIVE_TFCOLOR           GUI_BLACK

        #define   SCBAR_CLI_ACTIVE_BCOLOR              0x000055E5
        #define   SCBAR_CLI_ACTIVE_FCOLOR              GUI_WHITE
        #define   SCBAR_CLI_ACTIVE_TBCOLOR             0x000055E5
```

```
    #define   SCBAR_CLI_ACTIVE_TFCOLOR             GUI_BLACK


    #define   SCBAR_CLOSE_DISABLED_BCOLOR          0x00D0C0C0
    #define   SCBAR_CLOSE_INACTIVE_BCOLOR          0x00D0A0A0
    #define   SCBAR_CLOSE_ACTIVE_BCOLOR            0x00E15025

/* Frame */
#define  _LG_FRAME_WIDGET_

/* Dialog */
#define  _LG_DIALOG_WIDGET_

/* GroupBox */
#define  _LG_GROUP_BOX_WIDGET_
    /* Max GroupBox text length */
    #define   MAX_GROUP_BOX_TEXT_LEN               63

    /* GroupBox window color */
    #define   GBOX_WIN_DISABLED_BCOLOR             GUI_LIGHT_GRAY
    #define   GBOX_WIN_DISABLED_FCOLOR             GUI_DARK

    #define   GBOX_WIN_INACTIVE_BCOLOR             GUI_LIGHT_GRAY
    #define   GBOX_WIN_INACTIVE_FCOLOR             GUI_GRAY

    #define   GBOX_WIN_ACTIVE_BCOLOR               GUI_LIGHT_GRAY
    #define   GBOX_WIN_ACTIVE_FCOLOR               GUI_BLACK

    /* GroupBox client color */
    #define   GBOX_CLI_DISABLED_BCOLOR             GUI_LIGHT_GRAY
    #define   GBOX_CLI_DISABLED_FCOLOR             GUI_GRAY
    #define   GBOX_CLI_DISABLED_TBCOLOR            GUI_LIGHT_GRAY
    #define   GBOX_CLI_DISABLED_TFCOLOR            GUI_BLACK

    #define   GBOX_CLI_INACTIVE_BCOLOR             GUI_LIGHT_GRAY
    #define   GBOX_CLI_INACTIVE_FCOLOR             GUI_BLACK
    #define   GBOX_CLI_INACTIVE_TBCOLOR            GUI_LIGHT_GRAY
    #define   GBOX_CLI_INACTIVE_TFCOLOR            GUI_BLACK

    #define   GBOX_CLI_ACTIVE_BCOLOR               GUI_LIGHT_GRAY
    #define   GBOX_CLI_ACTIVE_FCOLOR               GUI_BLACK
    #define   GBOX_CLI_ACTIVE_TBCOLOR              GUI_LIGHT_GRAY
    #define   GBOX_CLI_ACTIVE_TFCOLOR              GUI_BLACK


/* Cell widget */
#define  _LG_CELL_WIDGET_
    /* Cell window color */
    #define   CELL_WIN_DISABLED_BCOLOR             GUI_LIGHT_GRAY
    #define   CELL_WIN_DISABLED_FCOLOR             GUI_DARK

    #define   CELL_WIN_INACTIVE_BCOLOR             GUI_LIGHT_GRAY
    #define   CELL_WIN_INACTIVE_FCOLOR             GUI_GRAY

    #define   CELL_WIN_ACTIVE_BCOLOR               GUI_LIGHT_GRAY
    #define   CELL_WIN_ACTIVE_FCOLOR               GUI_BLACK

    /* Cell client color */
    #define   CELL_CLI_DISABLED_BCOLOR             GUI_LIGHT_GRAY
    #define   CELL_CLI_DISABLED_FCOLOR             GUI_GRAY
    #define   CELL_CLI_DISABLED_TBCOLOR            GUI_LIGHT_GRAY
    #define   CELL_CLI_DISABLED_TFCOLOR            GUI_BLACK

    #define   CELL_CLI_INACTIVE_BCOLOR             GUI_BLACK
    #define   CELL_CLI_INACTIVE_FCOLOR             GUI_WHITE
    #define   CELL_CLI_INACTIVE_TBCOLOR            GUI_BLACK
    #define   CELL_CLI_INACTIVE_TFCOLOR            GUI_WHITE

    #define   CELL_CLI_ACTIVE_BCOLOR               GUI_BLACK
    #define   CELL_CLI_ACTIVE_FCOLOR               GUI_WHITE
```

```
        #define  CELL_CLI_ACTIVE_TBCOLOR              GUI_BLACK
        #define  CELL_CLI_ACTIVE_TFCOLOR              GUI_WHITE

/* Label */
#define  _LG_LABEL_WIDGET_
        /* Label max length */
        #define  MAX_LABEL_TEXT_LEN                   255
        /* Label align type */
        #define  LABEL_ALIGN_TYPE                     (TEXT_HCENTER_ALIGN | TEXT_VCENTER_ALIGN)

        /* Label window color */
        #define  LBL_WIN_DISABLED_BCOLOR             GUI_LIGHT_GRAY
        #define  LBL_WIN_DISABLED_FCOLOR             GUI_DARK

        #define  LBL_WIN_INACTIVE_BCOLOR             GUI_LIGHT_GRAY
        #define  LBL_WIN_INACTIVE_FCOLOR             GUI_GRAY

        #define  LBL_WIN_ACTIVE_BCOLOR               GUI_LIGHT_GRAY
        #define  LBL_WIN_ACTIVE_FCOLOR               GUI_BLACK

        /* Label client color */
        #define  LBL_CLI_DISABLED_BCOLOR             GUI_LIGHT_GRAY
        #define  LBL_CLI_DISABLED_FCOLOR             GUI_GRAY
        #define  LBL_CLI_DISABLED_TBCOLOR            GUI_LIGHT_GRAY
        #define  LBL_CLI_DISABLED_TFCOLOR            GUI_BLACK

        #define  LBL_CLI_INACTIVE_BCOLOR             GUI_LIGHT_GRAY
        #define  LBL_CLI_INACTIVE_FCOLOR             GUI_BLACK
        #define  LBL_CLI_INACTIVE_TBCOLOR            GUI_LIGHT_GRAY
        #define  LBL_CLI_INACTIVE_TFCOLOR            GUI_BLACK

        #define  LBL_CLI_ACTIVE_BCOLOR               GUI_LIGHT_GRAY
        #define  LBL_CLI_ACTIVE_FCOLOR               GUI_BLACK
        #define  LBL_CLI_ACTIVE_TBCOLOR              GUI_LIGHT_GRAY
        #define  LBL_CLI_ACTIVE_TFCOLOR              GUI_BLACK

/* PushButton widget */
#define  _LG_PUSH_BUTTON_WIDGET_
        /* PushButton window color */
        #define  PBTN_WIN_DISABLED_BCOLOR            GUI_LIGHT_GRAY
        #define  PBTN_WIN_DISABLED_FCOLOR            GUI_DARK

        #define  PBTN_WIN_INACTIVE_BCOLOR            GUI_LIGHT_GRAY
        #define  PBTN_WIN_INACTIVE_FCOLOR            GUI_GRAY

        #define  PBTN_WIN_ACTIVE_BCOLOR              GUI_LIGHT_GRAY
        #define  PBTN_WIN_ACTIVE_FCOLOR              GUI_BLACK

        /* PushButton client color */
        #define  PBTN_CLI_DISABLED_BCOLOR            GUI_LIGHT_GRAY
        #define  PBTN_CLI_DISABLED_FCOLOR            GUI_GRAY
        #define  PBTN_CLI_DISABLED_TBCOLOR           GUI_LIGHT_GRAY
        #define  PBTN_CLI_DISABLED_TFCOLOR           GUI_BLACK

        #define  PBTN_CLI_INACTIVE_BCOLOR            GUI_LIGHT_GRAY
        #define  PBTN_CLI_INACTIVE_FCOLOR            GUI_BLACK
        #define  PBTN_CLI_INACTIVE_TBCOLOR           GUI_LIGHT_GRAY
        #define  PBTN_CLI_INACTIVE_TFCOLOR           GUI_BLACK

        #define  PBTN_CLI_ACTIVE_BCOLOR              0x00E0E0E0
        #define  PBTN_CLI_ACTIVE_FCOLOR              GUI_BLACK
        #define  PBTN_CLI_ACTIVE_TBCOLOR             GUI_LIGHT_GRAY
        #define  PBTN_CLI_ACTIVE_TFCOLOR             GUI_BLACK

/* WidgetGroup widget */
#define  _LG_WIDGET_GROUP_

/* RadioButton widget */
#define  _LG_RADIO_BUTTON_WIDGET_
```

```
    #define  RBTN_RADIUS_OFFSET                4

    /* RadioButton window color */
    #define  RBTN_WIN_DISABLED_BCOLOR          GUI_LIGHT_GRAY
    #define  RBTN_WIN_DISABLED_FCOLOR          GUI_DARK

    #define  RBTN_WIN_INACTIVE_BCOLOR          GUI_LIGHT_GRAY
    #define  RBTN_WIN_INACTIVE_FCOLOR          GUI_GRAY

    #define  RBTN_WIN_ACTIVE_BCOLOR            GUI_LIGHT_GRAY
    #define  RBTN_WIN_ACTIVE_FCOLOR            GUI_BLACK

    /* RadioButton client color */
    #define  RBTN_CLI_DISABLED_BCOLOR          GUI_LIGHT_GRAY
    #define  RBTN_CLI_DISABLED_FCOLOR          GUI_GRAY
    #define  RBTN_CLI_DISABLED_TBCOLOR         GUI_LIGHT_GRAY
    #define  RBTN_CLI_DISABLED_TFCOLOR         GUI_BLACK

    #define  RBTN_CLI_INACTIVE_BCOLOR          GUI_LIGHT_GRAY
    #define  RBTN_CLI_INACTIVE_FCOLOR          GUI_WHITE
    #define  RBTN_CLI_INACTIVE_TBCOLOR         GUI_LIGHT_GRAY
    #define  RBTN_CLI_INACTIVE_TFCOLOR         GUI_BLACK

    #define  RBTN_CLI_ACTIVE_BCOLOR            GUI_LIGHT_GRAY
    #define  RBTN_CLI_ACTIVE_FCOLOR            GUI_WHITE
    #define  RBTN_CLI_ACTIVE_TBCOLOR           GUI_LIGHT_GRAY
    #define  RBTN_CLI_ACTIVE_TFCOLOR           GUI_BLACK

/* CheckBox widget */
#define  _LG_CHECK_BOX_WIDGET_
    /* CheckBox window color */
    #define  CKBOX_WIN_DISABLED_BCOLOR         GUI_LIGHT_GRAY
    #define  CKBOX_WIN_DISABLED_FCOLOR         GUI_DARK

    #define  CKBOX_WIN_INACTIVE_BCOLOR         GUI_LIGHT_GRAY
    #define  CKBOX_WIN_INACTIVE_FCOLOR         GUI_GRAY

    #define  CKBOX_WIN_ACTIVE_BCOLOR           GUI_LIGHT_GRAY
    #define  CKBOX_WIN_ACTIVE_FCOLOR           GUI_BLACK

    /* CheckBox client color */
    #define  CKBOX_CLI_DISABLED_BCOLOR         GUI_LIGHT_GRAY
    #define  CKBOX_CLI_DISABLED_FCOLOR         GUI_GRAY
    #define  CKBOX_CLI_DISABLED_TBCOLOR        GUI_LIGHT_GRAY
    #define  CKBOX_CLI_DISABLED_TFCOLOR        GUI_BLACK

    #define  CKBOX_CLI_INACTIVE_BCOLOR         GUI_LIGHT_WHITE
    #define  CKBOX_CLI_INACTIVE_FCOLOR         GUI_BLACK
    #define  CKBOX_CLI_INACTIVE_TBCOLOR        GUI_WHITE
    #define  CKBOX_CLI_INACTIVE_TFCOLOR        GUI_BLACK

    #define  CKBOX_CLI_ACTIVE_BCOLOR           GUI_YELLOW
    #define  CKBOX_CLI_ACTIVE_FCOLOR           GUI_BLACK
    #define  CKBOX_CLI_ACTIVE_TBCOLOR          GUI_WHITE
    #define  CKBOX_CLI_ACTIVE_TFCOLOR          GUI_BLACK

/* LineEdit */
#define  _LG_LINE_EDIT_WIDGET_
    /* Text max length */
    #define  MAX_LINE_EDIT_TEXT_LEN            255

    /* LineEdit window color */
    #define  LEDIT_WIN_DISABLED_BCOLOR         GUI_LIGHT_GRAY
    #define  LEDIT_WIN_DISABLED_FCOLOR         GUI_DARK

    #define  LEDIT_WIN_INACTIVE_BCOLOR         GUI_LIGHT_GRAY
    #define  LEDIT_WIN_INACTIVE_FCOLOR         GUI_GRAY
```

```
    #define   LEDIT_WIN_ACTIVE_BCOLOR               GUI_LIGHT_GRAY
    #define   LEDIT_WIN_ACTIVE_FCOLOR               GUI_BLACK

    /* LineEdit client color */
    #define   LEDIT_CLI_DISABLED_BCOLOR             GUI_LIGHT_GRAY
    #define   LEDIT_CLI_DISABLED_FCOLOR             GUI_GRAY
    #define   LEDIT_CLI_DISABLED_TBCOLOR            GUI_LIGHT_GRAY
    #define   LEDIT_CLI_DISABLED_TFCOLOR            GUI_BLACK

    #define   LEDIT_CLI_INACTIVE_BCOLOR             GUI_LIGHT_WHITE
    #define   LEDIT_CLI_INACTIVE_FCOLOR             GUI_BLACK
    #define   LEDIT_CLI_INACTIVE_TBCOLOR            GUI_WHITE
    #define   LEDIT_CLI_INACTIVE_TFCOLOR            GUI_BLACK

    #define   LEDIT_CLI_ACTIVE_BCOLOR               GUI_YELLOW
    #define   LEDIT_CLI_ACTIVE_FCOLOR               GUI_BLACK
    #define   LEDIT_CLI_ACTIVE_TBCOLOR              GUI_WHITE
    #define   LEDIT_CLI_ACTIVE_TFCOLOR              GUI_BLACK

/* ListBox */
#define   _LG_LIST_BOX_WIDGET_
    /* ListBox min row height */
    #define   MIN_LIST_BOX_ROW_HEIGHT               16

    /* ListBox min char width */
    #define   MIN_LIST_BOX_CHAR_WIDTH               8

    /* ListBox window color */
    #define   LBOX_WIN_DISABLED_BCOLOR              GUI_LIGHT_GRAY
    #define   LBOX_WIN_DISABLED_FCOLOR              GUI_DARK

    #define   LBOX_WIN_INACTIVE_BCOLOR              GUI_LIGHT_GRAY
    #define   LBOX_WIN_INACTIVE_FCOLOR              GUI_GRAY

    #define   LBOX_WIN_ACTIVE_BCOLOR                GUI_LIGHT_GRAY
    #define   LBOX_WIN_ACTIVE_FCOLOR                GUI_BLACK

    /* ListBox client color */
    #define   LBOX_CLI_DISABLED_BCOLOR              GUI_LIGHT_GRAY
    #define   LBOX_CLI_DISABLED_FCOLOR              GUI_GRAY
    #define   LBOX_CLI_DISABLED_TBCOLOR             GUI_LIGHT_GRAY
    #define   LBOX_CLI_DISABLED_TFCOLOR             GUI_BLACK

    #define   LBOX_CLI_INACTIVE_BCOLOR              GUI_LIGHT_WHITE
    #define   LBOX_CLI_INACTIVE_FCOLOR              GUI_BLACK
    #define   LBOX_CLI_INACTIVE_TBCOLOR             GUI_WHITE
    #define   LBOX_CLI_INACTIVE_TFCOLOR             GUI_BLACK

    #define   LBOX_CLI_ACTIVE_BCOLOR                GUI_WHITE
    #define   LBOX_CLI_ACTIVE_FCOLOR                GUI_BLACK
    #define   LBOX_CLI_ACTIVE_TBCOLOR               GUI_WHITE
    #define   LBOX_CLI_ACTIVE_TFCOLOR               GUI_BLACK

/* ComBox */
#define   _LG_COM_BOX_WIDGET_

    #define    _LG_COM_BOX_EXTENSION_

    /* ComBox window color */
    #define   CBBOX_WIN_DISABLED_BCOLOR             GUI_LIGHT_GRAY
    #define   CBBOX_WIN_DISABLED_FCOLOR             GUI_DARK

    #define   CBBOX_WIN_INACTIVE_BCOLOR             GUI_LIGHT_GRAY
    #define   CBBOX_WIN_INACTIVE_FCOLOR             GUI_GRAY
    #define   CBBOX_WIN_ACTIVE_BCOLOR               GUI_LIGHT_GRAY
    #define   CBBOX_WIN_ACTIVE_FCOLOR               GUI_BLACK

    /* ComBox client color */
    #define   CBBOX_CLI_DISABLED_BCOLOR             GUI_LIGHT_GRAY
```

```
    #define   CBBOX_CLI_DISABLED_FCOLOR              GUI_GRAY
    #define   CBBOX_CLI_DISABLED_TBCOLOR             GUI_LIGHT_GRAY
    #define   CBBOX_CLI_DISABLED_TFCOLOR             GUI_BLACK

    #define   CBBOX_CLI_INACTIVE_BCOLOR              GUI_LIGHT_WHITE
    #define   CBBOX_CLI_INACTIVE_FCOLOR              GUI_BLACK
    #define   CBBOX_CLI_INACTIVE_TBCOLOR             GUI_WHITE
    #define   CBBOX_CLI_INACTIVE_TFCOLOR             GUI_BLACK

    #define   CBBOX_CLI_ACTIVE_BCOLOR                GUI_YELLOW
    #define   CBBOX_CLI_ACTIVE_FCOLOR                GUI_BLACK
    #define   CBBOX_CLI_ACTIVE_TBCOLOR               GUI_WHITE
    #define   CBBOX_CLI_ACTIVE_TFCOLOR               GUI_BLACK

/* ProgressBar widget */
#define   _LG_PROGRESS_BAR_WIDGET_
    /* ProgressBar window color */
    #define   PGBAR_WIN_DISABLED_BCOLOR              GUI_LIGHT_GRAY
    #define   PGBAR_WIN_DISABLED_FCOLOR              GUI_DARK

    #define   PGBAR_WIN_INACTIVE_BCOLOR              GUI_LIGHT_GRAY
    #define   PGBAR_WIN_INACTIVE_FCOLOR              GUI_GRAY

    #define   PGBAR_WIN_ACTIVE_BCOLOR                GUI_LIGHT_GRAY
    #define   PGBAR_WIN_ACTIVE_FCOLOR                GUI_BLACK

    /* ProgressBar client color */
    #define   PGBAR_CLI_DISABLED_BCOLOR              GUI_LIGHT_GRAY
    #define   PGBAR_CLI_DISABLED_FCOLOR              GUI_GRAY
    #define   PGBAR_CLI_DISABLED_TBCOLOR             GUI_LIGHT_GRAY
    #define   PGBAR_CLI_DISABLED_TFCOLOR             GUI_BLACK

    #define   PGBAR_CLI_INACTIVE_BCOLOR              GUI_GRAY
    #define   PGBAR_CLI_INACTIVE_FCOLOR              GUI_BLACK
    #define   PGBAR_CLI_INACTIVE_TBCOLOR             GUI_GRAY
    #define   PGBAR_CLI_INACTIVE_TFCOLOR             GUI_BLACK

    #define   PGBAR_CLI_ACTIVE_BCOLOR                GUI_GRAY
    #define   PGBAR_CLI_ACTIVE_FCOLOR                GUI_BLACK
    #define   PGBAR_CLI_ACTIVE_TBCOLOR               GUI_GRAY
    #define   PGBAR_CLI_ACTIVE_TFCOLOR               GUI_BLACK

/* SliderBar widget */
#define   _LG_SLIDER_BAR_WIDGET_
    /* SliderBar window color */
    #define   SLBAR_WIN_DISABLED_BCOLOR              GUI_LIGHT_GRAY
    #define   SLBAR_WIN_DISABLED_FCOLOR              GUI_DARK

    #define   SLBAR_WIN_INACTIVE_BCOLOR              GUI_LIGHT_GRAY
    #define   SLBAR_WIN_INACTIVE_FCOLOR              GUI_GRAY

    #define   SLBAR_WIN_ACTIVE_BCOLOR                GUI_LIGHT_GRAY
    #define   SLBAR_WIN_ACTIVE_FCOLOR                GUI_BLACK

    /* SliderBar client color */
    #define   SLBAR_CLI_DISABLED_BCOLOR              GUI_LIGHT_GRAY
    #define   SLBAR_CLI_DISABLED_FCOLOR              GUI_GRAY
    #define   SLBAR_CLI_DISABLED_TBCOLOR             GUI_LIGHT_GRAY
    #define   SLBAR_CLI_DISABLED_TFCOLOR             GUI_BLACK

    #define   SLBAR_CLI_INACTIVE_BCOLOR              GUI_LIGHT_GRAY
    #define   SLBAR_CLI_INACTIVE_FCOLOR              GUI_BLACK
    #define   SLBAR_CLI_INACTIVE_TBCOLOR             GUI_LIGHT_GRAY
    #define   SLBAR_CLI_INACTIVE_TFCOLOR             GUI_BLACK

    #define   SLBAR_CLI_ACTIVE_BCOLOR                0x00E0E0E0
    #define   SLBAR_CLI_ACTIVE_FCOLOR                GUI_BLACK
    #define   SLBAR_CLI_ACTIVE_TBCOLOR               GUI_LIGHT_GRAY
    #define   SLBAR_CLI_ACTIVE_TFCOLOR               GUI_BLACK
```

```
/* Image widget */
#define  _LG_IMAGE_WIDGET_

    /* Image window color */
    #define  IMAGE_WIN_DISABLED_BCOLOR            GUI_LIGHT_GRAY
    #define  IMAGE_WIN_DISABLED_FCOLOR            GUI_DARK

    #define  IMAGE_WIN_INACTIVE_BCOLOR            GUI_LIGHT_GRAY
    #define  IMAGE_WIN_INACTIVE_FCOLOR            GUI_GRAY
    #define  IMAGE_WIN_ACTIVE_BCOLOR              GUI_LIGHT_GRAY
    #define  IMAGE_WIN_ACTIVE_FCOLOR              GUI_BLACK

    /* ComBox client color */
    #define  IMAGE_CLI_DISABLED_BCOLOR            GUI_LIGHT_GRAY
    #define  IMAGE_CLI_DISABLED_FCOLOR            GUI_GRAY
    #define  IMAGE_CLI_DISABLED_TBCOLOR           GUI_LIGHT_GRAY
    #define  IMAGE_CLI_DISABLED_TFCOLOR           GUI_BLACK

    #define  IMAGE_CLI_INACTIVE_BCOLOR            GUI_LIGHT_WHITE
    #define  IMAGE_CLI_INACTIVE_FCOLOR            GUI_BLACK
    #define  IMAGE_CLI_INACTIVE_TBCOLOR           GUI_WHITE
    #define  IMAGE_CLI_INACTIVE_TFCOLOR           GUI_BLACK

    #define  IMAGE_CLI_ACTIVE_BCOLOR              GUI_YELLOW
    #define  IMAGE_CLI_ACTIVE_FCOLOR              GUI_BLACK
    #define  IMAGE_CLI_ACTIVE_TBCOLOR             GUI_WHITE
    #define  IMAGE_CLI_ACTIVE_TFCOLOR             GUI_BLACK
```

window_config.h 文件主要宏描述说明如表 2-3 所示。

一级宏	二级宏	三级宏	描述说明
WIN_BORDER_WIDTH			控件边界宽度（像素）
DEFAULT_WINDOW_BCOLOR			控件缺省背景颜色
_LG_WINDOW_BACKGROUND_IMAGE_			支持控件背景图片
_LG_CARET_			支持插入定位符
_LG_WIDGET_USER_DATA_			支持控件用户数据区
	MAX_USER_DATA_LEN		控件用户数据区长度
_LG_WINDOW_BAR_			支持控件标题栏
	WIN_BAR_HEIGHT		标题栏高度
	MAX_WIN_TEXT_LEN		标题栏文本长度
	WINBAR_WIN_DISABLE_BCOLOR		标题栏缺省禁止组 WIN 背景颜色
	WINBAR_WIN_DISABLE_FCOLOR		标题栏缺省禁止组 WIN 前景颜色
	WINBAR_WIN_DISABLE_TBCOLOR		标题栏缺省禁止组文本 WIN 背景颜色
	WINBAR_WIN_DISABLE_TFCOLOR		标题栏缺省禁止组文本 WIN 前景颜色
	WINBAR_WIN_INACTIVE_BCOLOR		标题栏缺省非活动组 WIN 背景颜色
	WINBAR_WIN_INACTIVE_FCOLOR		标题栏缺省非活动组 WIN 前景颜色
	WINBAR_WIN_INACTIVE_TBCOLOR		标题栏缺省非活动组文本 WIN 背景颜色
	WINBAR_WIN_INACTIVE_TFCOLOR		标题栏缺省非活动组文本 WIN 前景颜色
	WINBAR_WIN_ACTIVE_BCOLOR		标题栏缺省活动组 WIN 背景颜色
	WINBAR_WIN_ACTIVE_FCOLOR		标题栏缺省活动组 WIN 前景颜色
	WINBAR_WIN_ACTIVE_TBCOLOR		标题栏缺省活动组文本 WIN 背景颜色

	WINBAR_WIN_ACTIVE_TFCOLOR		标题栏缺省活动组文本 WIN 前景颜色
	WINBAR_CLI_DISABLE_BCOLOR		标题栏缺省禁止组 CLIENT 背景颜色
	WINBAR_CLI_DISABLE_FCOLOR		标题栏缺省禁止组 CLIENT 前景颜色
	WINBAR_CLI_DISABLE_TBCOLOR		标题栏缺省禁止组文本 CLIENT 背景颜色
	WINBAR_CLI_DISABLE_TFCOLOR		标题栏缺省禁止组文本 CLIENT 前景颜色
	WINBAR_CLI_INACTIVE_BCOLOR		标题栏缺省非活动组 CLIENT 背景颜色
	WINBAR_CLI_INACTIVE_FCOLOR		标题栏缺省非活动组 CLIENT 前景颜色
	WINBAR_CLI_INACTIVE_TBCOLOR		标题栏缺省非活动组文本 CLIENT 背景颜色
	WINBAR_CLI_INACTIVE_TFCOLOR		标题栏缺省非活动组文本 CLIENT 前景颜色
	WINBAR_CLI_ACTIVE_BCOLOR		标题栏缺省活动组 CLIENT 背景颜色
	WINBAR_CLI_ACTIVE_FCOLOR		标题栏缺省活动组 CLIENT 前景颜色
	WINBAR_CLI_ACTIVE_TBCOLOR		标题栏缺省活动组文本 CLIENT 背景颜色
	WINBAR_CLI_ACTIVE_TFCOLOR		标题栏缺省活动组文本 CLIENT 前景颜色
	SYSTEM_BTN_WIDTH		关闭、极大化、极小化按钮宽度
_LG_SCROLL_BAR_			支持滑竿
	SCBAR_HEIGHT_WIDTH		滑竿高度或者宽度
	SCBAR_X_MULTI_STEP		滑竿 X 步长
	SCBAR_Y_MULTI_STEP		滑竿 Y 步长
	SCBAR_WIN_DISABLE_BCOLOR		缺省禁止组 WIN 背景颜色
	SCBAR_WIN_DISABLE_FCOLOR		缺省禁止组 WIN 前景颜色
	SCBAR_WIN_DISABLE_TBCOLOR		缺省禁止组文本 WIN 背景颜色
	SCBAR_WIN_DISABLE_TFCOLOR		缺省禁止组文本 WIN 前景颜色
	SCBAR_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	SCBAR_WIN_INACTIVE_FCOLOR		缺省非活动能够组 WIN 前景颜色
	SCBAR_WIN_INACTIVE_TBCOLOR		缺省非活动能够组文本 WIN 背景颜色
	SCBAR_WIN_INACTIVE_TFCOLOR		缺省非活动能够组文本 WIN 前景颜色
	SCBAR_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	SCBAR_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 背景颜色
	SCBAR_WIN_ACTIVE_TBCOLOR		缺省活动组文本 WIN 背景颜色
	SCBAR_WIN_ACTIVE_TFCOLOR		缺省活动组文本 WIN 前景颜色
	SCBAR_CLI_DISABLE_BCOLOR		缺省禁止组 CLIENT 背景颜色
	SCBAR_CLI_DISABLE_FCOLOR		缺省禁止组 CLIENT 前景颜色
	SCBAR_CLI_DISABLE_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	SCBAR_CLI_DISABLE_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色

	SCBAR_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	SCBAR_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	SCBAR_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	SCBAR_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	SCBAR_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	SCBAR_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	SCBAR_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	SCBAR_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
	SCBAR_CLOSE_DISABLED_BCOLOR		缺省禁止组 CLOSE BUTTON 背景颜色
	SCBAR_CLOSE_INACTIVE_BCOLOR		缺省非活动组 CLOSE BUTTON 背景颜色
	SCBAR_CLOSE_ACTIVE_BCOLOR		缺省活动组 CLOSE BUTTON 背景颜色
_LG_FRAME_WIDGET_			支持 FRAME 小部件
_LG_GROUP_BOX_WIDGET_			支持 GroupBox 小部件
	MAX_GROUP_BOX_TEXT_LEN		最大 GroupBox 所容纳的文本长度
	GBOX_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	GBOX_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	GBOX_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	GBOX_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	GBOX_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	GBOX_WIN_ACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	GBOX_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	GBOX_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	GBOX_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	GBOX_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	GBOX_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 前景颜色
	GBOX_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 背景颜色
	GBOX_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	GBOX_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	GBOX_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 前景颜色
	GBOX_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 背景颜色
	GBOX_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 前景颜色
	GBOX_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 背景颜色

_LG_CELL_WIDGET_			支持 cell 控件
	CELL_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	CELL_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	CELL_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	CELL_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	CELL_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	CELL_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	CELL_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	CELL_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	CELL_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	CELL_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	CELL_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	CELL_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	CELL_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	CELL_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	CELL_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	CELL_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	CELL_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	CELL_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_LABEL_WIDGET_			支持 LABEL 小部件
	MAX_LABEL_TEXT_LEN		最大标签长度
	LABEL_ALIGN_TYPE		标签对齐方式
	LBL_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	LBL_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	LBL_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	LBL_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	LBL_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	LBL_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	LBL_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	LBL_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	LBL_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	LBL_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色

	LBL_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	LBL_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	LBL_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	LBL_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	LBL_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	LBL_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	LBL_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	LBL_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_PUSH_BUTTON_WIDGET_			支持 PushButton 小部件
	PBTN_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	PBTN_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	PBTN_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	PBTN_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	PBTN_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	PBTN_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	PBTN_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	PBTN_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	PBTN_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	PBTN_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	PBTN_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	PBTN_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	PBTN_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	PBTN_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	PBTN_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	PBTN_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	PBTN_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	PBTN_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_WIDGET_GROUP_			支持 WidgetGrop 分组小部件 （用于 RadioButton 分组管理）
_LG_RADIO_BUTTON_WIDGET_			支持 RadioButton 小部件
	RBTN_RADIUS_OFFSET		当选中时，填充半径和实际半径偏差（像素）
	RBTN_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色

	RBTN_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	RBTN_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	RBTN_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	RBTN_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	RBTN_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	RBTN_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	RBTN_CLI_DISABLED_FCOLOR		缺省禁止组 CLINET 前景颜色
	RBTN_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	RBTN_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	RBTN_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	RBTN_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	RBTN_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	RBTN_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	RBTN_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	RBTN_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	RBTN_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	RBTN_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_CHECK_BOX_WIDGET_			支持 CheckBox 小部件
	CKBOX_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	CKBOX_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	CKBOX_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	CKBOX_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	CKBOX_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	CKBOX_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	CKBOX_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	CKBOX_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	CKBOX_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	CKBOX_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	CKBOX_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	CKBOX_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	CKBOX_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	CKBOX_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色

	CKBOX_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	CKBOX_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	CKBOX_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	CKBOX_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_LINE_EDIT_WIDGET_			支持 LineEdit 小部件
	MAX_LINE_EDIT_TEXT_LEN		所容纳的最大文本长度
	LEDIT_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	LEDIT_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	LEDIT_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	LEDIT_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	LEDIT_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	LEDIT_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	LEDIT_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	LEDIT_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	LEDIT_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	LEDIT_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	LEDIT_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	LEDIT_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	LEDIT_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	LEDIT_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	LEDIT_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	LEDIT_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	LEDIT_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	LEDIT_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_LIST_BOX_WIDGET_			支持 ListBox 小部件
	MIN_LIST_BOX_ROW_HEIGHT		最小行高
	MIN_LIST_BOX_CHAR_WIDTH		最小字符宽度
	LBOX_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	LBOX_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	LBOX_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	LBOX_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	LBOX_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色

	LBOX_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	LBOX_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	LBOX_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	LBOX_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	LBOX_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	LBOX_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	LBOX_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	LBOX_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	LBOX_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	LBOX_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	LBOX_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	LBOX_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	LBOX_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_COM_BOX_WIDGET_			支持 ComBox 小部件
	_LG_COM_BOX_EXTENSION_		支持 CombBox 扩展 API (可以作为 LineEdit 和 ListBox 接口访问)
	CBBOX_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	CBBOX_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	CBBOX_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	CBBOX_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	CBBOX_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	CBBOX_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	CBBOX_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	CBBOX_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	CBBOX_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	CBBOX_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	CBBOX_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	CBBOX_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	CBBOX_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	CBBOX_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	CBBOX_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	CBBOX_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	CBBOX_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色

	CBBOX_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_PROGRESS_BAR_WIDGET_			支持 ProgressBar 小部件
	PGBAR_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	PGBAR_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	PGBAR_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	PGBAR_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	PGBAR_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	PGBAR_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	PGBAR_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	PGBAR_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	PGBAR_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	PGBAR_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	PGBAR_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	PGBAR_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	PGBAR_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	PGBAR_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	PGBAR_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	PGBAR_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	PGBAR_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	PGBAR_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_SLIDER_BAR_WIDGET_			支持 SliderBar 小部件
	SLBAR_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	SLBAR_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	SLBAR_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	SLBAR_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	SLBAR_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	SLBAR_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	SLBAR_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	SLBAR_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	SLBAR_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	SLBAR_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	SLBAR_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色

	SLBAR_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	SLBAR_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	SLBAR_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	SLBAR_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	SLBAR_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	SLBAR_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	SLBAR_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色
_LG_IMAGE_WIDGET_			支持 Image 小部件
	IMAGE_WIN_DISABLED_BCOLOR		缺省禁止组 WIN 背景颜色
	IMAGE_WIN_DISABLED_FCOLOR		缺省禁止组 WIN 前景颜色
	IMAGE_WIN_INACTIVE_BCOLOR		缺省非活动组 WIN 背景颜色
	IMAGE_WIN_INACTIVE_FCOLOR		缺省非活动组 WIN 前景颜色
	IMAGE_WIN_ACTIVE_BCOLOR		缺省活动组 WIN 背景颜色
	IMAGE_WIN_ACTIVE_FCOLOR		缺省活动组 WIN 前景颜色
	IMAGE_CLI_DISABLED_BCOLOR		缺省禁止组 CLIENT 背景颜色
	IMAGE_CLI_DISABLED_FCOLOR		缺省禁止组 CLIENT 前景颜色
	IMAGE_CLI_DISABLED_TBCOLOR		缺省禁止组文本 CLIENT 背景颜色
	IMAGE_CLI_DISABLED_TFCOLOR		缺省禁止组文本 CLIENT 前景颜色
	IMAGE_CLI_INACTIVE_BCOLOR		缺省非活动组 CLIENT 背景颜色
	IMAGE_CLI_INACTIVE_FCOLOR		缺省非活动组 CLIENT 前景颜色
	IMAGE_CLI_INACTIVE_TBCOLOR		缺省非活动组文本 CLIENT 背景颜色
	IMAGE_CLI_INACTIVE_TFCOLOR		缺省非活动组文本 CLIENT 前景颜色
	IMAGE_CLI_ACTIVE_BCOLOR		缺省活动组 CLIENT 背景颜色
	IMAGE_CLI_ACTIVE_FCOLOR		缺省活动组 CLIENT 前景颜色
	IMAGE_CLI_ACTIVE_TBCOLOR		缺省活动组文本 CLIENT 背景颜色
	IMAGE_CLI_ACTIVE_TFCOLOR		缺省活动组文本 CLIENT 前景颜色

表 2-3 window_config.h 文件配置表

2.5 编译 LearningGUI 库

在配置和定制好 LearningGUI 后，就可以编译 LearningGUI 库。编译 LearningGUI 库(静态库或动态库)的方法和步骤由用户 IDE 决定，并且由用户自行完成。在大多数 IDE 中，需要配置头文件目录路径。

例如在 Linux 系统中，编译方法和步骤如下：

```
cd code
make clean
make
```

这样在 code 目录下生成 liblgui.a 库。

第三章　LearningGUI 驱动接口概述

　　系统驱动接口是指显示驱动程序、键盘驱动程序、MTJT(鼠标)驱动程序、多任务（多线程）同步信号驱动程序。系统提供开放式注册驱动接口，系统驱动需要用户编写。在系统驱动接口开发中，不建议调用 LearningGUI 函数。如果需要的话，只能调用内部函数。

　　在显示驱动接口中，需要提供 32 位的逻辑颜色转换成物理颜色的接口函数、LCD 初始化接口函数、LCD 像素点输出接口函数；如果需要支持鼠标指针显示或屏幕快照的话，那么需要再提供 LCD 读像素点接口函数；如果采用硬件加速的话，那么需要再提供画水平线接口函数、画垂直线接口函数、填充矩形接口函数；如果需要优化性能的话，那么需要提供读像素序列前、后控制接口函数和写像素序列前、后控制接口函数。在完成这些接口函数开发后，使用 in_register_driver 函数将这些函数指针注册到 LearningGUI 系统中。

　　在键盘驱动接口中，需要提供初始化键盘接口函数、读键盘接口函数。其中读键盘接口函数会返回一个键盘消息指针。在准备好这些函数后，同样使用 in_register_driver 函数将这些函数注册到 LearningGUI 系统中。也可以实现另外一种键盘驱动方式：消息驱动方式。在应用形成键盘消息后，使用 message_post 函数将这个消息邮寄到 LearningGUI 系统中。

3.1　注册系统驱动接口函数

系统预定义五个驱动类型宏，如表 3-1 所示。

系统驱动类型	描述
DRIVER_SCREEN	显示驱动
DRIVER_KEYBOARD	键盘驱动
DRIVER_MTJT	鼠标驱动
DRIVER_THREAD_GUI_LOCKER	GUI 同步信号驱动
DRIVER_THREAD_CALLBACK_LOCKER	回调函数同步信号驱动

表 3-1　LearningGUI 驱动类型定义表

注册驱动接口函数声明：

```
int  in_driver_register(unsigned int driver_type, void *driver);
```

其中 driver_type 取值范围如表 3-1 所示，*driver 是用户驱动结构体指针。

　　注册系统驱动接口就是在准备好*driver 驱动结构体指针数据好，调用 in_driver_register 函数过程。显示驱动是必须的，多数情况下键盘和鼠标驱动是必要的。在单任务系统中，没有必要注册同步信号驱动。

　　注册驱动函数是 LearningGUI 系统最先调用的函数，必须在 gui_open 函数之前调用，而且各个驱动接口只能调用一次。

第四章　LearningGUI 显示驱动接口的开发

4.1　系统显示驱动数据结构

显示驱动结构体 GUI_SCREEN 定义如下：

```
struct  _GUI_SCREEN
{
    BUINT          is_hline_accelerate;
    BUINT          is_vline_accelerate;
    BUINT          is_rect_fill_accelerate;

    unsigned int   width;
    unsigned int   height;

    int            (*open)(void);
    int             (*close)(void);

    SCREEN_COLOR   (*gui_to_screen_color)(GUI_COLOR   gui_color);
    GUI_COLOR      (*screen_to_gui_color)(SCREEN_COLOR   screen_color);

    int            (*output_sequence_start)(void);
    int            (*output_pixel)(void *context, int x, int y, SCREEN_COLOR color);
    int            (*output_hline)(void *context, int left, int right, int top, SCREEN_COLOR color);
    int            (*output_vline)(void *context, int left, int top, int bottom, SCREEN_COLOR color);
    int            (*output_rect_fill)(void *context, int left, int top, int right, int bottom, SCREEN_COLOR color);
    int            (*output_sequence_end)(void);

    int            (*input_sequence_start)(void);
    int            (*input_pixel)(void *context, int x, int y, SCREEN_COLOR *color);
    int            (*input_sequence_end)(void);

    int            (*control)(void *p1, void *p2);
    int            (*on)(void);
    int            (*off)(void);
    int            (*reinit)(void);

    #ifndef _LG_WINDOW_
    int            (*clear)(void *context);
    #endif
};
typedef  struct   _GUI_SCREEN  GUI_SCREEN;
```

GUI_SCREEN 结构体各个成员描述如表 4-1 所示。

结构体成员	描述说明
is_hline_accelerate	是否使用画水平线硬件加速标志 如果数值是 0，使用打点函数输出；否则使用硬件加速函数
is_vline_accelerate	是否使用画垂直线硬件加速标志 如果数值是 0，使用打点函数输出；否则使用硬件加速函数
is_rect_fill_accelerate	使用使用填充矩形硬件加速标志 如果数值是 0，使用打点函数输出；否则使用硬件加速函数
width	屏宽度（像素）
height	屏高度（像素）
(*open)(void)	打开屏函数指针
(*close)(void)	关闭屏函数指针

(*gui_to_screen_color)(GUI_COLOR gui_color)	逻辑颜色转换物理颜色函数指针
(*screen_to_gui_color)(SCREEN_COLOR screen_color)	物理颜色转换逻辑颜色函数指针
(*output_sequence_start)(void)	写点前，系统所执行的函数指针
(*output_pixel)(void *context, int x, int y, SCREEN_COLOR color)	写像素点函数指针（打点函数）
(*output_hline)(void *context, int left, int right, int top, SCREEN_COLOR color)	画水平线硬件加速函数指针
(*output_vline)(void *context, int left, int top, int bottom, SCREEN_COLOR color)	画垂直线硬件加速函数指针
(*output_rect_fill)(void *context, int left, int top, int right, int bottom, SCREEN_COLOR color)	填充矩形硬件加速函数指针
(*output_sequence_end)(void)	写点结束后，系统所执行的函数指针
(*input_sequence_start)(void)	读点前，系统所执行的函数指针
(*input_pixel)(void *context, int x, int y, SCREEN_COLOR *color)	读像素点函数指针（读点函数）。鼠标指针显示、抓屏等功能需要调用此函数。
(*input_sequence_end)(void)	读点结束后，系统所执行的函数指针
(*control)(void *p1, void *p2)	控制屏函数指针
(*on)(void)	开屏函数指针
(*off)(void)	关屏函数指针
(*reinit)(void)	重新初始化屏函数指针
(*clear)(void *context)	清屏函数指针（Basic 版专有函数）

表 4-1 GUI_SCREEN 结构体成员描述表

4.2   颜色转换

逻辑颜色是系统所管理的颜色，独立于物理颜色。应用面向逻辑颜色编程。系统定义 GUI_COLOR 数据类型为逻辑颜色类型。GUI_COLOR 定义如下：

        #define   GUI_COLOR   UINT32

RGB 顺序定义：0x00RRGGBB。BB 表示蓝色分量，GG 表示绿色分量，RR 表示红色分量，即最低位字节表示蓝色分量，第二低字节表示绿色分量，次高字节表示红色分量。

系统预定义了常见的逻辑颜色，如表 4-2 所示。

系统颜色	颜色数值
GUI_RED	0x00FF0000
GUI_GREEN	0x0000FF00
GUI_BLUE	0x000000FF
GUI_BLACK	0x00000000
GUI_LIGHT_BLACK	0x00101010
GUI_HEAVY_DARK	0x00202020
GUI_DARK	0x00404040
GUI_LIGHT_DARK	0x00606060
GUI_GRAY	0x00808080
GUI_LIGHT_GRAY	0x00C0C0C0
GUI_YELLOW	0x00FFFF00
GUI_BROWN	0x00A52A2A
GUI_MAGENTA	0x008B008B
GUI_CYAN	0x0000FFFF

GUI_LIGHT_GREEN	0x0080FF80
GUI_LIGHT_RED	0x00FF8080
GUI_LIGHT_CYAN	0x00FFFF80
GUI_LIGHT_MAGENTA	0x00FF80FF
GUI_LIGHT_BLUE	0x008080FF
GUI_LIGHT_WHITE	0x00E0E0E0
GUI_WHITE	0x00FFFFFF

表 4-2 LearningGUI 预定义颜色表

同时，用户可以使用 GUI_ARGB 宏自定义逻辑颜色。GUI_ARGB 宏参数如下：

GUI_ARGB(alpha,red,green,blue)

其中，alpha 表示 alpha 通道数值（预留），red 表示红色分量，green 表示绿色分量，blue 表示蓝色分量。red、green、blue 取值范围为 0~255（0~0xFF）。

物理颜色是显示屏幕能够显示的颜色，它的位数和 RGB 顺序与具体显示硬件相关。系统定义 SCREEN_COLOR 数据类型为物理颜色类型。SCREEN_COLOR 定义如下：

#define   SCREEN_COLOR   UINT32

提示：用户必须清楚自己的显示屏屏物理颜色结构和顺序。

逻辑颜色和物理颜色需要相互转换。逻辑颜色转换到物理颜色，本质是将 32 位的逻辑颜色映射到具体位数和具体顺序的物理颜色；而物理颜色转换到逻辑颜色，本质是将具体位数和具体顺序的物理颜色映射到 32 位的逻辑颜色。在二者转换过程中，需要采用相关的映射算法，同时，在大多数情况下，所得到的物理颜色是近似的颜色，或者是最接近的颜色。

分别使用 A 表示 alpha 颜色分量、R 表示 red 颜色分量、G 表示 green 颜色分量、B 表示 blue 颜色分量；不同的书写书序表明不同的物理顺序，但是在实际情况中，书写顺序不代表物理顺序。

4.2.1　逻辑颜色转换物理颜色示例

4.2.1.1　逻辑颜色转换成 A8B8G8R8 物理颜色示例代码（32 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_A8B8G8R8(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xFF;
    g = gui_color&0xFF00;
    r = gui_color&0xFF0000;

    return    (r>>16)|g|(b<<16);
}
```

4.2.1.2　逻辑颜色转换成 A8R8G8B8 物理颜色示例代码（32 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_A8R8G8B8(GUI_COLOR gui_color)
{
    return  gui_color;
}
```

4.2.1.3　逻辑颜色转换成 B8G8R8 物理颜色示例代码（24 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_B8G8R8(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xFF;
    g = gui_color&0xFF00;
    r = gui_color&0xFF0000;

    return    (r>>16)|g|(b<<16);
}
```

4.2.1.4 逻辑颜色转换成 R8G8B8 物理颜色示例代码（24 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_R8G8B8(GUI_COLOR gui_color)
{
    return  gui_color;
}
```

4.2.1.5 逻辑颜色转换成 B5G6R5 物理颜色示例代码（16 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_B5G6R5(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    r = gui_color&0xF8;
    g = gui_color&0xFC00;
    b = gui_color&0xF80000;

    return  (r>>3)|(g>>5)|(b>>8);
}
```

4.2.1.6 逻辑颜色转换成 R5G6B5 物理颜色示例代码（16 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_R5G6B5(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xF8;
    g = gui_color&0xFC00;
    r = gui_color&0xF80000;

    return  (b>>3)|(g>>5)|(r>>8);
}
```

4.2.1.7 逻辑颜色转换成 R3G3B2 物理颜色示例代码（8 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_R3G3B2(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xC0;
    g = gui_color&0xE000;
    r = gui_color&0xE00000;

    return  (b>>6)|(g>>11)|(r>>16);
}
```

4.2.1.8 逻辑颜色转换成 B2G3R3 物理颜色示例代码（8 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_B2G3R3(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xC0;
    g = gui_color&0xE000;
    r = gui_color&0xE00000;

    return  b|(g>>10)|(r>>21);
}
```

4.2.1.9 逻辑颜色转换成 R3G2B3 物理颜色示例代码（8 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_R3G2B3(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xE0;
    g = gui_color&0xC000;
    r = gui_color&0xE00000;

    return  (b>>5)|(g>>11)|(r>>16);
}
```

4.2.1.10 逻辑颜色转换成 B3G2R3 物理颜色示例代码（8 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_B3G2R3(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xE0;
    g = gui_color&0xC000;
    r = gui_color&0xE00000;

    return  b|(g>>11)|(r>>21);
}
```

4.2.1.11 逻辑颜色转换成 R2G3B3 物理颜色示例代码（8 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_R2G3B3(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xE0;
    g = gui_color&0xE000;
    r = gui_color&0xC00000;

    return  (b>>5)|(g>>10)|(r>>16);
}
```

4.2.1.12 逻辑颜色转换成 B3G3R2 物理颜色示例代码（8 位物理颜色）：

```
SCREEN_COLOR  GUI_TO_B3G3R2(GUI_COLOR gui_color)
{
    SCREEN_COLOR  r, g, b;

    b = gui_color&0xE0;
    g = gui_color&0xE000;
    r = gui_color&0xC00000;

    return  b|(g>>11)|(r>>22);
}
```

4.2.1.13 逻辑颜色转换成单色物理颜色示例代码（1 位物理颜色）：

```
#define S(x)           ((x)*(x))
#define SQUARES(base)  S(base+0),  S(base+1),  S(base+2),  S(base+3), \
                       S(base+4),  S(base+5),  S(base+6),  S(base+7), \
                       S(base+8),  S(base+9), S(base+10), S(base+11), \
                       S(base+12), S(base+13), S(base+14), S(base+15)

static  GUI_VAR_CONST  UINT16  square_array[] =
{
   SQUARES(0*16),   SQUARES(1*16),   SQUARES(2*16),   SQUARES(3*16),
   SQUARES(4*16),   SQUARES(5*16),   SQUARES(6*16),   SQUARES(7*16),
   SQUARES(8*16),   SQUARES(9*16),   SQUARES(10*16), SQUARES(11*16),
   SQUARES(12*16), SQUARES(13*16), SQUARES(14*16), SQUARES(15*16)
};

#define  SQUARE(dist)  square_array[dist]


UINT32  COLOR_DISTANCE(GUI_COLOR color0, GUI_COLOR color1)
{
    INT16   dist = 0;
    UINT32  sum  = 0;

    dist  = (color0&0xFF) - (color1&0xFF);
    if (dist < 0)
        dist = -dist;
    sum = SQUARE(dist);

    dist  = ((color0>>8)&0xFF) - ((color1>>8)&0xFF);
    if (dist < 0)
        dist = -dist;
```

```
        sum += SQUARE(dist);

        dist = ((color0>>16)&0xFF) - ((color1>>16)&0xFF);
        if (dist < 0)
            dist = -dist;

        return (sum + SQUARE(dist));
    }

    SCREEN_COLOR  GUI_TO_BW01(GUI_COLOR gui_color)
    {
        UINT32        diff  = 0;
        SCREEN_COLOR color = 0;

        diff = COLOR_DISTANCE(gui_color, GUI_BLACK);
        if ( diff > (0x80*0x80*3) )
            color = 1;
        else
            color = 0;

        return color;
    }
```

4.2.1.14 逻辑颜色转换成单色（反色）物理颜色示例代码（1 位物理颜色）：

```
    SCREEN_COLOR  GUI_TO_BW10(GUI_COLOR gui_color)
    {
        UINT32        diff  = 0;
        SCREEN_COLOR color = 0;

        diff = COLOR_DISTANCE(gui_color, GUI_BLACK);
        if ( diff > (0x80*0x80*3) )
            color = 0;
        else
            color = 1;

        return color;
    }
```

4.2.2   物理颜色转换逻辑颜色示例

4.2.2.1   32 位 A8B8G8R8 物理颜转换成逻辑颜色示例代码：

```
    GUI_COLOR  A8B8G8R8_TO_GUI(SCREEN_COLOR screen_color)
    {
        GUI_COLOR  r, g, b;

        r = screen_color&0xFF;
        g = screen_color&0xFF00;
        b = screen_color&0xFF0000;

        return   (r<<16)|g|(b>>16);
    }
```

4.2.2.2   32 位 A8R8G8B8 物理颜色转换成逻辑颜色示例代码：

```
    GUI_COLOR  A8R8G8B8_TO_GUI(SCREEN_COLOR screen_color)
    {
        return screen_color;
    }
```

4.2.2.3   24 位 B8G8R8 物理颜色转换成逻辑颜色示例代码：

```
    GUI_COLOR  B8G8R8_TO_GUI(SCREEN_COLOR screen_color)
    {
        GUI_COLOR  r, g, b;

        r = screen_color&0xFF;
        g = screen_color&0xFF00;
        b = screen_color&0xFF0000;
```

```
        return   (r<<16)|g|(b>>16);
    }
```

4.2.2.4 24 位置 R8G8B8 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR  R8G8B8_TO_GUI(SCREEN_COLOR screen_color)
{
    return  screen_color;
}
```

4.2.2.5 16 位 B5G6R5 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR  B5G6R5_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR  r, g, b;

    r = screen_color&0x1F;
    g = screen_color&0x07E0;
    b = screen_color&0xF800;

    return  (r<<11)|(g<<5)|(b>>11);
}
```

4.2.2.6 16 位 R5G6B5 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR  R5G6B5_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR  r, g, b;

    b = screen_color&0x1F;
    g = screen_color&0x07E0;
    r = screen_color&0xF800;

    return  (b<<3)|(g<<5)|(r<<8);
}
```

4.2.2.7 8 位 R3G3B2 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR  R3G3B2_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR  r, g, b;

    b = screen_color&0x03;
    g = screen_color&0x1C;
    r = screen_color&0xE0;

    return  (b<<6)|(g<<11)|(r<<16);
}
```

4.2.2.8 8 位 B2G3R3 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR  B2G3R3_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR  r, g, b;

    r = screen_color&0x07;
    g = screen_color&0x38;
    b = screen_color&0xC0;

    return  b|(g<<10)|(r<<21);
}
```

4.2.2.9 8 位 R3G2B3 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR  R3G2B3_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR  r, g, b;

    b = screen_color&0x07;
    g = screen_color&0x18;
    r = screen_color&0xE0;
```

```
        return   (b<<5)|(g<<11)|(r<<16);
    }
```

4.2.2.10 8 位 B3G2R3 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR   B3G2R3_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR   r, g, b;

    r = screen_color&0x07;
    g = screen_color&0x18;
    b = screen_color&0xE0;

    return   b|(g<<11)|(r<<21);
}
```

4.2.2.11 8 位 R2G3B3 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR   R2G3B3_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR   r, g, b;

    b = screen_color&0x07;
    g = screen_color&0x38;
    r = screen_color&0xC0;

    return   (b<<5)|(g<<10)|(r<<16);
}
```

4.2.2.12 8 位 B3G3R2 物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR   B3G3R2_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR   r, g, b;

    r = screen_color&0x03;
    g = screen_color&0x38;
    b = screen_color&0xC0;

    return   b|(g<<11)|(r<<22);
}
```

4.2.2.13 1 位单色物理颜色转换成逻辑颜色示例代码：

```
GUI_COLOR   BW01_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR    color = GUI_BLACK;

    if ( screen_color > 0 )
        color = GUI_WHITE;
    else
        color = GUI_BLACK;

    return   color;
}
```

4.2.2.14 1 位单色（反色）物理颜转换成逻辑颜色示例代码：

```
GUI_COLOR   BW10_TO_GUI(SCREEN_COLOR screen_color)
{
    GUI_COLOR    color = GUI_BLACK;

    if ( screen_color > 0 )
        color = GUI_BLACK;
    else
        color = GUI_WHITE;

    return   color;
}
```

4.3　写点序列前后控制接口

在很多情况下，写点输出不是一次性独立输出，而是一个连续输出的过程，也称之为写点序列，如显示图片或者输出文本字符串。而对于类似于 SPI 接口的 LCD 来说，输出过程步骤如下：

1、准备相应的输出控制时序，如拉低片选。
2、输出一个像素点。
3、结束输出控制时序，如拉高片选。

如果每输出一个像素点，重复上述三个步骤的话（在打点输出接口中同时实现上述三个步骤），显示性能很低，因此，LearningGUI 从优化性能角度出发，将步骤 1 和步骤 3 独立出来，以便实现步骤 2 的连续调用。实际输出过程如下：

1、准备相应的输出控制时序，如拉低片选。
2、输出 N 个像素点。
3、结束输出控制时序，如拉高片选。

步骤 1 和步骤 3 分别由用户提供接口指针函数。

但是，也有很多情况，不需要步骤 1 和步骤 3，那么用户接口函数空转即可。

输出序列开始控制接口示例如下

```
int  lcd_output_pixel_start(void)
{
    return  1;
}
```

输出序列结束控制接口示例如下

```
int  lcd_output_pixel_end(void)
{
    return  1;
}
```

4.4　读点序列前后控制接口

类似于 4.3。待续。

4.5　显示驱动代码示例 1

以下显示驱动代码示例表示：

无硬件加速、无读点功能、无用户操作显示屏接口 API。

具体代码如下：

```
int  register_screen(void)
{
    GUI_SCREEN  screen ;

    memset(&screen, 0, sizeof(screen));

    screen.is_hline_accelerate     = 0;
    screen.is_vline_accelerate     = 0;
    screen.is_rect_fill_accelerate = 0;

    screen.width                   = 320;                  /* 屏实际宽度 */
    screen.height                  = 240;                  /* 屏实际高度 */

    screen.open                    = lcd_open;             /* 用户自定义函数 */
    screen.close                   = lcd_close;            /* 用户自定义函数 */

    screen.gui_to_screen_color     = GUI_TO_R8G8B8;        /* 用户自定义函数 */
    screen.screen_to_gui_color     = R8G8B8_TO_GUI;        /* 用户自定义函数 */

    screen.output_sequence_start   = lcd_output_pixel_start;   /* 用户自定义函数 */
    screen.output_pixel            = lcd_output_pixel;     /* 用户自定义函数 */
    screen.output_hline            = NULL;
    screen.output_vline            = NULL;
    screen.output_rect_fill        = NULL;
    screen.output_sequence_end     = lcd_outout_pixel_end;    /* 用户自定义函数 */

    screen.input_sequence_start    = NULL;
```

```
        screen. input_pixel              = NULL;
        screen. input_sequence_end       = NULL;

        screen. control                  = NULL;
        screen. on                       = NULL;
        screen. off                      = NULL;
        screen. reinit                   = NULL;

        #ifndef  _LG_WINDOW_
        screen. clear                    = NULL;
        #endif

        in_driver_register(DRIVER_SCREEN, &screen);

        return  1;
    }
```

4.6   显示驱动代码示例 2

以下显示驱动代码示例表示：

无硬件加速、有读点功能、有用户操作显示屏接口 API。

具体代码如下：

```
    int  register_screen(void)
    {
        GUI_SCREEN   screen ;

        memset(&screen, 0, sizeof(screen));

        screen. is_hline_accelerate      = 0;
        screen. is_vline_accelerate      = 0;
        screen. is_rect_fill_accelerate  = 0;

        screen. width                    = 320;                    /* 屏实际宽度 */
        screen. height                   = 240;                    /* 屏实际高度 */

        screen. open                     = lcd_open;                 /* 用户自定义函数 */
        screen. close                    = lcd_close;                /* 用户自定义函数 */

        screen. gui_to_screen_color      = in_gui_to_r8g8b8;        /* 用户自定义函数 */
        screen. screen_to_gui_color      = in_r8g8b8_to_gui;        /* 用户自定义函数 */

        screen. output_sequence_start    = fb_output_sequence_start; /* 用户自定义函数 */
        screen. output_pixel             = fb_output_pixel;          /* 用户自定义函数 */
        screen.  output_hline            = fb_output_hline;          /* 用户自定义函数 */
        screen.  output_vline            = fb_output_vline;          /* 用户自定义函数 */
        screen.  output_rect_fill        = fb_output_rect_fill;      /* 用户自定义函数 */
        screen. output_sequence_end      = fb_output_sequence_end;   /* 用户自定义函数 */

        screen. input_sequence_start     = fb_input_sequence_start;  /* 用户自定义函数 */
        screen. input_pixel              = fb_input_pixel;           /* 用户自定义函数 */
        screen. input_sequence_end       = fb_input_sequence_end;    /* 用户自定义函数 */

        screen. control                  = fb_control;               /* 用户自定义函数 */
        screen. on                       = fb_on;                    /* 用户自定义函数 */
        screen. off                      = fb_off;                   /* 用户自定义函数 */
        screen. reinit                   = fb_reinit;                /* 用户自定义函数 */

        #ifndef  _LG_WINDOW_
        screen. clear                    = fb_clear;                 /* 用户自定义函数 */
        #endif

        in_driver_register(DRIVER_SCREEN, &screen);

        return  1;
    }
```

第五章　LearningGUI 键盘驱动接口的开发

待续。

第六章　LearningGUI 鼠标驱动接口的开发

待续。