LittlevGL Documentation

Release 6.0

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CONTENTS

English (en) - (zh-CN) - Français (fr) - Magyar (hu) - Türk (tr)

PDF : `LittlevGL.pdf`

LittlevGL GUI

· **GitHub** · · · ·

CHAPTER

ONE

- Powerful building blocks such as buttons, charts, lists, sliders, images etc.
-
- Various input devices such as touchpad, mouse, keyboard, encoder etc.
- UTF-8
- TFT, monochrome
- Fully customizable graphic elements
-
- (64 kB Flash, 16 kB RAM)
- GPU
-
- C (C++)
- Simulator to start embedded GUI design on a PC without embedded hardware
- GUI ,
- Documentation is available as online and offline
- MIT

CHAPTER

TWO

- 16 32 64
- Greater than 16 MHz clock speed is recommended
- Flash/ROM: Greater than 64 kB size for the very essential components (greater than 180 kB is recommended)
- RAM:
  - Static RAM usage: approximately 8 to 16 kB depending on the used features and objects types
  - Stack: greater than 2kB (greater than 4 kB is recommended)
  - Dynamic data (heap): greater than 4 KB (greater than 16 kB is recommended if using several objects). Set by `LV_MEM_SIZE` in *lv_conf.h*
  - Display buffer: greater than *"Horizontal resolution"* pixels (greater than 10 × *"Horizontal resolution"* is recommended)
- C99
- Basic C (or C++) knowledge: pointers, structs, callbacks

CHAPTER

THREE

3.1

- LittlevGL littlevgl.com
- Go to the *Get started* section to try Live demos in you browser, learn about the Simulator(s) and learn the basics of LittlevGL
- A detailed porting guide can be found in the *Porting* section
- To learn how LittlevGL works go to the *Overview*
-
- To see the source code of the library check it on GitHub: https://github.com/littlevgl/lvgl/

3.2 ?

: https://forum.littlevgl.com/.

GitHub bug Github

3.3 ?

Every MCU which is capable of driving a display via Parallel port, SPI, RGB interface or anything else and fulfills the *Requirements* is supported by LittlevGL.

It includes:

- " " STM32F, STM32H, NXP Kinetis, LPC, iMX, dsPIC33, PIC32 .
- , GSM, WiFi Nordic NRF Espressif ESP32
- Linux frame buffer like /dev/fb0 which includes Single board computers too like Raspberry Pi
- And anything else with a strong enough MCU and a periphery to drive a display

3.4 ?

LittlevGL needs just one simple driver to copy an array of pixels into a given area of the display. If you can do this with your display then you can use the same display with LittlevGL.

It includes:

- 16 24 TFT
- HDMI
-
-
- LED
-

3.5 LittlevGL

LittlevGL comes with MIT license which means you can download and use it for any purpose you want without any obligations.

3.6

`lv_tick_inc(x)` main `while(1)` `lv_task_handler()`

Tick

3.7

Be sure you are calling `lv_disp_flush_ready(drv)` at the end of your "*display flush callback*".

3.8 ?

bug LittlevGL :

```
#define BUF_W 20
#define BUF_H 10
lv_color_t buf[BUF_W * BUF_H];
lv_color_t * buf_p = buf;
uint16_t x, y;
for(y = 0; y < BUF_H; y++) {
    lv_color_t c = lv_color_mix(LV_COLOR_BLUE, LV_COLOR_RED, (y * 255) / BUF_H);
    for(x = 0; x < BUF_W; x++){
        (*buf_p) =  c;
        buf_p++;
    }
}

lv_area_t a;
a.x1 = 10;
a.y1 = 40;
a.x2 = a.x1 + BUF_W - 1;
```

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```
a.y2 = a.y1 + BUF_H - 1;
my_flush_cb(NULL, &a, buf);
```

3.9

Probably LittlevGL's color format is not compatible with your displays color format. Check `LV_COLOR_DEPTH` in *lv_conf.h*.

16 SPI ( ) *lv_conf.h* `LV_COLOR_16_SWAP 1`

3.10 UI ?

- (gcc -O)
-
- DMA
- SPI
- SPI
- Keep the display buffer in the internal RAM (not in external SRAM) because LittlevGL uses it a lot and it should have a small access time

3.11 flash/ROM ?

You can disable all the unused feature (such as animations, file system, GPU etc.) and object types in *lv_conf.h*.

If you are using GCC you can add

- `-fdata-sections -ffunction-sections`
- `--gc-sections`

3.12 RAM

-
- Reduce `LV_MEM_SIZE` in *lv_conf.h*. This memory used when you create objects like buttons, labels, etc.
- To work with lower `LV_MEM_SIZE` you can create the objects only when required and deleted them when they are not required anymore

3.13 ?

To work with an operating system where tasks can interrupt each other you should protect LittlevGL related function calls with a mutex. See the *Operating system and interrupts* section to learn more.

3.14 LittlevGL ?

LittlevGL :

- Write a few lines about your project to inspire others
- Answer other's questions
- Report and/or fix bugs
- Suggest and/or implement new features
- Improve and/or translate the documentation
- Write a blog post about your experiences

3.15 How is LittlevGL versioned?

LittlevGL follows the rules of Semantic versioning:

- *Major* versions for incompatible API changes. E.g. v5.0.0, v6.0.0
- *Minor* version for new but backwards-compatible functionalities. E.g. v6.1.0, v6.2.0
- *Patch* version for backwards-compatible bug fixes. E.g. v6.1.1, v6.1.2

The new versions are developed in `dev-X.Y` branchs on GitHub. It can be cloned to test the newset features, however, still anything can be changed there.

The bugfixes are added directly to the `master` branch on GitHub and a bugfix release is created every month.

3.16 (v5.3)?

:

`Docs-v5-3.zip`

3.16.1

You can see how LittlevGL looks like without installing and downloading anything either on target platform or on the host machine. There are some ready made user interfaces which you can easily try in your browser.

PC

You can try out the LittlevGL **using only your PC** (i.e. without any development boards). The LittlevGL will run on a simulator environment on the PC where anyone can write and experiment the real LittlevGL applications.

Simulator on the PC have the following advantages:

- Hardware independent - Write a code, run it on the PC and see the result on the PC monitor.
- Cross-platform - Any Windows, Linux or OSX PC can run the PC simulator.
- Portability - the written code is portable, which means you can simply copy it when using an embedded hardware.
- Easy Validation - The simulator is also very useful to report bugs because it means common platform for every user. So it's a good idea to reproduce a bug in simulator and use the code snippet in the Forum.

IDE

The simulator is ported to various IDEs (Integrated Development Environments). Choose your favorite IDE, read its README on GitHub, download the project, and load it to the IDE.

You can use any IDEs for the development but, for simplicity, the configuration for Eclipse CDT is focused in this tutorial. The following section describes the set-up guide of Eclipse CDT in more details.

Note: If you are on Windows, it's usually better to use the Visual Studio or CodeBlocks projects instead. They work out of the box without requiring extra steps.

Eclipse CDT

Eclipse CDT

Eclipse CDT is a C/C++ IDE.

Eclipse Java **Java** **JRE**

Debian (Ubuntu): `sudo apt-get install default-jre`

Note: If you are using other distros, then please refer and install 'Java Runtime Environment' suitable to your distro.

You can download Eclipse's CDT from: https://www.eclipse.org/cdt/downloads.php. Start the installer and choose *Eclipse CDT* from the list.

SDL 2

PC SDL 2 TFT

Linux

Linux SDL2

1. SDL2 : `apt-cache search libsdl2 (□□ libsdl2-2.0-0)`

2. SDL2: `sudo apt-get install libsdl2-2.0-0` ( )
3. SDL2 : `sudo apt-get install libsdl2-dev`
4. build essentials : `sudo apt-get install build-essential`

Windows

If you are using **Windows** firstly you need to install MinGW (64 bit version). After installing MinGW, do the following steps to add SDL2:

1. SDL https://www.libsdl.org/download-2.0.php *: SDL2-devel-2.0.5-mingw.tar.gz*
2. *x86_64-w64-mingw32* (64 MinGW) *i686-w64-mingw32* (32 MinGW)
3. _*...mingw32/include/SDL2* *C:/MinGW/.../x86_64-w64-mingw32/include*
4. _*...mingw32/lib/* *C:/MinGW/.../x86_64-w64-mingw32/lib*
5. _*...mingw32/bin/SDL2.dll* _{eclipse_worksapce}/pc_simulator/Debug/_ Eclipse

Note: If you are using **Microsoft Visual Studio** instead of Eclipse then you don't have to install MinGW.

OSX

brew **OSX** SDL2 `brew install sdl2`

If something is not working, then please refer this tutorial to get started with SDL.

A pre-configured graphics library project (based on the latest release) is always available to get started easily. You can find the latest one on GitHub or on the Download page. (Please note that, the project is configured for Eclipse CDT).

Eclipse CDT

Run Eclipse CDT. It will show a dialogue about the **workspace path**. Before accepting the path, check that path and copy (and unzip) the downloaded pre-configured project there. After that, you can accept the workspace path. Of course you can modify this path but, in that case copy the project to the corresponding location.

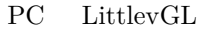
File->Import General->Existing project into Workspace. Finish

Windows

- **SDL2.dll** Debug
- -> Project properties -> C/C++ Build -> Settings -> Libraries -> Add ... *mingw32* SDLmain SDL (: mingw32, SDLmain, SDL)

Now you are ready to run the LittlevGL Graphics Library on your PC. Click on the Hammer Icon on the top menu bar to Build the project. If you have done everything right, then you will not get any errors. Note that on some systems additional steps might be required to "see" SDL 2 from Eclipse but, in most of cases the configurations in the downloaded project is enough.

After a success build, click on the Play button on the top menu bar to run the project. Now a window should appear in the middle of your screen.



Quick overview

Here you can learn the most important things about LittlevGL. You should read it first to get a general impression and read the detailed *Porting* and *Overview* sections after that.

Add LittlevGL into your project

The following steps show how to setup LittlevGL on an embedded system with a display and a touchpad. You can use the *Simulators* to get 'ready to use' projects which can be run on your PC.

- Download or Clone the library
- Copy the `lvgl` folder into your project
- Copy `lvgl/lv_conf_templ.h` as `lv_conf.h` next to the `lvgl` folder and set at least `LV_HOR_RES_MAX`, `LV_VER_RES_MAX` and `LV_COLOR_DEPTH` macros.
- Include `lvgl/lvgl.h` where you need to use LittlevGL related functions.
- Call `lv_tick_inc(x)` every `x` milliseconds **in a Timer or Task** (`x` should be between 1 and 10). It is required for the internal timing of LittlevGL.
- Call `lv_init()`
- Create a display buffer for LittlevGL

```
static lv_disp_buf_t disp_buf;
static lv_color_t buf[LV_HOR_RES_MAX * 10];                    /*Declare a buffer␣
↪for 10 lines*/
lv_disp_buf_init(&disp_buf, buf, NULL, LV_HOR_RES_MAX * 10);   /*Initialize the␣
↪display buffer*/
```

- Implement and register a function which can **copy a pixel array** to an area of your display:

```
lv_disp_drv_t disp_drv;               /*Descriptor of a display driver*/
lv_disp_drv_init(&disp_drv);          /*Basic initialization*/
disp_drv.flush_cb = my_disp_flush;    /*Set your driver function*/
disp_drv.buffer = &disp_buf;          /*Assign the buffer to the display*/
lv_disp_drv_register(&disp_drv);      /*Finally register the driver*/

void my_disp_flush(lv_disp_t * disp, const lv_area_t * area, lv_color_t * color_p)
{
    int32_t x, y;
    for(y = area->y1; y <= area->y2; y++) {
        for(x = area->x1; x <= area->x2; x++) {
```

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```
            set_pixel(x, y, *color_p);  /* Put a pixel to the display.*/
            color_p++;
        }
    }

    lv_disp_flush_ready(disp);         /* Indicate you are ready with the flushing*/
}
```

- Implement and register a function which can **read an input device**. E.g. for a touch pad:

```
lv_indev_drv_t indev_drv;                       /*Descriptor of a input device driver*/
lv_indev_drv_init(&indev_drv);                  /*Basic initialization*/
indev_drv.type = LV_INDEV_TYPE_POINTER;         /*Touch pad is a pointer-like device*/
indev_drv.read_cb = my_touchpad_read;           /*Set your driver function*/
lv_indev_drv_register(&indev_drv);              /*Finally register the driver*/

bool my_touchpad_read(lv_indev_t * indev, lv_indev_data_t * data)
{
    static lv_coord_t last_x = 0;
    static lv_coord_t last_y = 0;

    /*Save the state and save the pressed coordinate*/
    data->state = touchpad_is_pressed() ? LV_INDEV_STATE_PR : LV_INDEV_STATE_REL;
    if(data->state == LV_INDEV_STATE_PR) touchpad_get_xy(&last_x, &last_y);

    /*Set the coordinates (if released use the last pressed coordinates)*/
    data->point.x = last_x;
    data->point.y = last_y;

    return false; /*Return `false` because we are not buffering and no more data to␣
↪read*/
}
```

- Call `lv_task_handler()` periodically every few milliseconds in the main `while(1)` loop, in Timer interrupt or in an Operation system task. It will redraw the screen if required, handle input devices etc.

Learn the basics

Objects (Widgets)

The graphical elements like Buttons, Labels, Sliders, Charts etc are called objects in LittelvGL. Go to *Object types* to see the full list of available types.

Every object has a parent object. The child object moves with the parent and if you delete the parent the children will be deleted too. Children can be visible only on their parent.

The *screen* is the "root" parent. To get the current screen call `lv_scr_act()`.

You can create a new object with `lv_<type>_create(parent, obj_to_copy)`. It will return an `lv_obj_t *` variable which should be used as a reference to the object to set its parameters. The first parameter is the desired *parent*, the second parameters can be an object to copy (`NULL` is unused). For example:

```
lv_obj_t * slider1 = lv_slider_create(lv_scr_act(), NULL);
```

To set some basic attribute `lv_obj_set_<paramters_name>(obj, <value>)` function can be used. For example:

```
lv_obj_set_x(btn1, 30);
lv_obj_set_y(btn1, 10);
lv_obj_set_size(btn1, 200, 50);
```

The objects has type specific parameters too which can be set by `lv_<type>_set_<paramters_name>(obj, <value>)` functions. For example:

```
lv_slider_set_value(slider1, 70, LV_ANIM_ON);
```

To see the full API visit the documentation of the object types or the related header file (e.g. `lvgl/src/lv_objx/lv_slider.h`).

Styles

Styles can be assigned to the objects to changed their appearance. A style describes the appearance of rectangle-like objects (like a button or slider), texts, images and lines at once.

You can create a new style like this:

```
static lv_style_t style1;                  /*Declare a new style. Should be `static`*/
lv_style_copy(&style1, &lv_style_plain);  /*Copy a buil-in style*/
style1.body.main_color = LV_COLOR_RED;          /*Main color*/
style1.body.grad_color = lv_color_hex(0xffd83c) /*Gradient color (orange)*/
style1.body.radius = 3;
style1.text.color = lv_color_hex3(0x0F0)        /*Label color (green)*/
style1.text.font = &lv_font_dejavu_22;          /*Change font*/
...
```

To set a new style for an object use the `lv_<type>set_style(obj, LV_<TYPE>_STYLE_<NAME>, &my_style)` functions. For example:

```
lv_slider_set_style(slider1, LV_SLIDER_STYLE_BG, &slider_bg_style);
lv_slider_set_style(slider1, LV_SLIDER_STYLE_INDIC, &slider_indic_style);
lv_slider_set_style(slider1, LV_SLIDER_STYLE_KNOB, &slider_knob_style);
```

If an object's style is `NULL` then it will inherit its parent's style. For example, the labels' style are `NULL` by default. If you place them on a button then they will use the `style.text` properties from the button's style.

Learn more in *Style overview* section.

Events

Events are used to inform the user if something has happened with an object. You can assign a callback to an object which will be called if the object is clicked, released, dragged, being deleted etc. It should look like this:

```
lv_obj_set_event_cb(btn, btn_event_cb);                 /*Assign a callback to the␣
↪button*/

...
```

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```
void btn_event_cb(lv_obj_t * btn, lv_event_t event)
{
    if(event == LV_EVENT_CLICKED) {
        printf("Clicked\n");
    }
}
```

Learn more about the events in the *Event overview* section.

Examples

Button with label

```
lv_obj_t * btn = lv_btn_create(lv_scr_act(), NULL);      /*Add a button the current␣
↪screen*/
lv_obj_set_pos(btn, 10, 10);                             /*Set its position*/
lv_obj_set_size(btn, 100, 50);                           /*Set its size*/
lv_obj_set_event_cb(btn, btn_event_cb);                  /*Assign a callback to the␣
↪button*/

lv_obj_t * label = lv_label_create(btn, NULL);           /*Add a label to the button*/
lv_label_set_text(label, "Button");                      /*Set the labels text*/

...

void btn_event_cb(lv_obj_t * btn, lv_event_t event)
{
    if(event == LV_EVENT_CLICKED) {
        printf("Clicked\n");
    }
}
```

Button with styles

Add styles to the button from the previous example:

```
static lv_style_t style_btn_rel;                         /*A variable to store the␣
↪released style*/
lv_style_copy(&style_btn_rel, &lv_style_plain);          /*Initialize from a built-in␣
↪style*/
style_btn_rel.body.border.color = lv_color_hex3(0x269);
style_btn_rel.body.border.width = 1;
style_btn_rel.body.main_color = lv_color_hex3(0xADF);
style_btn_rel.body.grad_color = lv_color_hex3(0x46B);
style_btn_rel.body.shadow.width = 4;
style_btn_rel.body.shadow.type = LV_SHADOW_BOTTOM;
```

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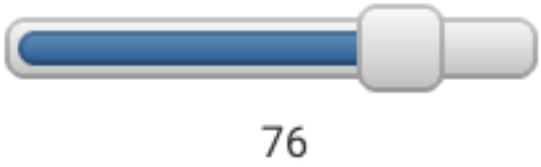
```
style_btn_rel.body.radius = LV_RADIUS_CIRCLE;
style_btn_rel.text.color = lv_color_hex3(0xDEF);

static lv_style_t style_btn_pr;                         /*A variable to store the␣
↪pressed style*/
lv_style_copy(&style_btn_pr, &style_btn_rel);           /*Initialize from the␣
↪released style*/
style_btn_pr.body.border.color = lv_color_hex3(0x46B);
style_btn_pr.body.main_color = lv_color_hex3(0x8BD);
style_btn_pr.body.grad_color = lv_color_hex3(0x24A);
style_btn_pr.body.shadow.width = 2;
style_btn_pr.text.color = lv_color_hex3(0xBCD);

lv_btn_set_style(btn, LV_BTN_STYLE_REL, &style_btn_rel);    /*Set the button's␣
↪released style*/
lv_btn_set_style(btn, LV_BTN_STYLE_PR, &style_btn_pr);      /*Set the button's␣
↪pressed style*/
```

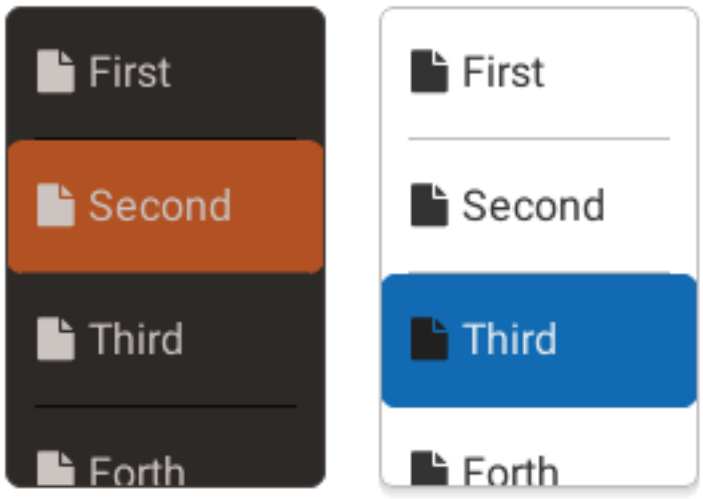
Slider and object alignment

```
lv_obj_t * label;

...

/* Create a slider in the center of the display */
lv_obj_t * slider = lv_slider_create(lv_scr_act(), NULL);
lv_obj_set_width(slider, 200);                          /*Set the width*/
lv_obj_align(slider, NULL, LV_ALIGN_CENTER, 0, 0);    /*Align to the center of the␣
↪parent (screen)*/
lv_obj_set_event_cb(slider, slider_event_cb);         /*Assign an event function*/

/* Create a label below the slider */
label = lv_label_create(lv_scr_act(), NULL);
lv_label_set_text(label, "0");
lv_obj_set_auto_realign(slider, true);
lv_obj_align(label, slider, LV_ALIGN_OUT_BOTTOM_MID, 0, 10);

...

void slider_event_cb(lv_obj_t * slider, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        static char buf[4];                                 /* max 3 bytes  for␣
↪number plus 1 null terminating byte */
        snprintf(buf, 4, "%u", lv_slider_get_value(slider));
        lv_label_set_text(slider_label, buf);               /*Refresh the text*/
    }
}
```



List and themes

```
/*Texts of the list elements*/
const char * txts[] = {"First", "Second", "Third", "Forth", "Fifth", "Sixth", NULL};

/* Initialize and set a theme. `LV_THEME_NIGHT` needs to enabled in lv_conf.h. */
lv_theme_t * th = lv_theme_night_init(20, NULL);
lv_theme_set_current(th);

/*Create a list*/
lv_obj_t* list = lv_list_create(lv_scr_act(), NULL);
lv_obj_set_size(list, 120, 180);
lv_obj_set_pos(list, 10, 10);

/*Add buttons*/
uint8_t i;
for(i = 0; txts[i]; i++) {
    lv_obj_t * btn = lv_list_add_btn(list, LV_SYMBOL_FILE, txts[i]);
    lv_obj_set_event_cb(btn, list_event);       /*Assign event function*/
    lv_btn_set_toggle(btn, true);               /*Enable on/off states*/
}

/* Initialize and set an other theme. `LV_THEME_MATERIAL` needs to enabled in lv_conf.
↪h.
 * If `LV_TEHE_LIVE_UPDATE  1` then the previous list's style will be updated too.*/
th = lv_theme_material_init(210, NULL);
lv_theme_set_current(th);

/*Create an other list*/
list = lv_list_create(lv_scr_act(), NULL);
lv_obj_set_size(list, 120, 180);
lv_obj_set_pos(list, 150, 10);

/*Add buttons with the same texts*/
for(i = 0; txts[i]; i++) {
    lv_obj_t * btn = lv_list_add_btn(list, LV_SYMBOL_FILE, txts[i]);
    lv_obj_set_event_cb(btn, list_event);
    lv_btn_set_toggle(btn, true);
}

...

static void list_event(lv_obj_t * btn, lv_event_t e)
{
    if(e == LV_EVENT_CLICKED) {
        printf("%s\n", lv_list_get_btn_text(btn));
    }

}
```



Use LittlevGL from Micropython

Learn more about *Micropython*.

```
# Create a Button and a Label
scr = lv.obj()
btn = lv.btn(scr)
btn.align(lv.scr_act(), lv.ALIGN.CENTER, 0, 0)
label = lv.label(btn)
label.set_text("Button")

# Load the screen
lv.scr_load(scr)
```

Contributing

LittlevGL uses the Forum to ask and answer questions and GitHub's Issue tracker for development-related discussion (such as bug reports, feature suggestions etc.).

There are many opportunities to contribute to LittlevGL such as:

- **Help others** in the Forum.
- **Inspire people** by speaking about your project in My project category in the Forum or add it to the References post
- **Improve and/or translate the documentation.** Go to the Documentation repository to learn more
- **Write a blog post** about your experiences. See how to do it in the Blog repository
- **Report and/or fix bugs** in GitHub's issue tracker
- **Help in the developement**. Check the Open issues especially the ones with Help wanted label and tell your ideas about a topic or implement a feature.

If you are interested in contributing to LittlevGL, then please read the guides below to get started.

- Contributing guide

- Coding style guide

Micropython

What is Micropython?

Micropython is Python for microcontrollers.Using Micropython, you can write Python3 code and run it even on a bare metal architecture with limited resources.

Highlights of Micropython

- **Compact** - Fits and runs within just 256k of code space and 16k of RAM. No OS is needed, although you can also run it with an OS, if you want.
- **Compatible** - Strives to be as compatible as possible with normal Python (known as CPython).
- **Versatile** - Supports many architectures (x86, x86-64, ARM, ARM Thumb, Xtensa).
- **Interactive** - No need for the compile-flash-boot cycle. With the REPL (interactive prompt) you can type commands and execute them immediately, run scripts etc.
- **Popular** - Many platforms are supported. The user base is growing bigger. Notable forks: MicroPython, CircuitPython, MicroPython_ESP32_psRAM_LoBo
- **Embedded Oriented** - Comes with modules specifically for embedded systems, such as the machine module for accessing low-level hardware (I/O pins, ADC, UART, SPI, I2C, RTC, Timers etc.)

Why Micropython + LittlevGL?

Currently, Micropython does not have a good high-level GUI library by default. LittlevGL is an Object Oriented Component Based high-level GUI library, which seems to be a natural candidate to map into a higher level language, such as Python. LittlevGL is implemented in C and its APIs are in C.

Here are some advantages of using LittlevGL in Micropython:

- Develop GUI in Python, a very popular high level language. Use paradigms such as Object Oriented Programming.
- Usually, GUI development requires multiple iterations to get things right. With C, each iteration consists of **`Change code`** > **`Build`** > **`Flash`** > **`Run`**.In Micropython it's just **`Change code`** > **`Run`** ! You can even run commands interactively using the REPL (the interactive prompt)

Micropython + LittlevGL could be used for:

- Fast prototyping GUI.
- Shorten the cycle of changing and fine-tuning the GUI.
- Model the GUI in a more abstract way by defining reusable composite objects, taking advantage of Python's language features such as Inheritance, Closures, List Comprehension, Generators, Exception Handling, Arbitrary Precision Integers and others.

- Make LittlevGL accessible to a larger audience. No need to know C in order to create a nice GUI on an embedded system.This goes well with CircuitPython vision. CircuitPython was designed with education in mind, to make it easier for new or unexperienced users to get started with embedded development.
- Creating tools to work with LittlevGL at a higher level (e.g. drag-and-drop designer).

So what does it look like?

TL;DR: It's very much like the C API, but Object Oriented for LittlevGL components.

Let's dive right into an example!

A simple example

```
import lvgl as lv
lv.init()
scr = lv.obj()
btn = lv.btn(scr)
btn.align(lv.scr_act(), lv.ALIGN.CENTER, 0, 0)
label = lv.label(btn)
label.set_text("Button")
lv.scr_load(scr)
```

How can I use it?

Online Simulator

If you want to experiment with LittlevGL + Micropython without downloading anything - you can use our online simulator!It's a fully functional LittlevGL + Micropython that runs entirely in the browser and allows you to edit a python script and run it.

Click here to experiment on the online simulator

PC Simulator

Micropython is ported to many platforms. One notable port is "unix", which allows you to build and run Micropython (+LittlevGL) on a Linux machine. (On a Windows machine you might need Virtual Box or WSL or MinGW or Cygwin etc.)

Click here to know more information about building and running the unix port

Embedded platform

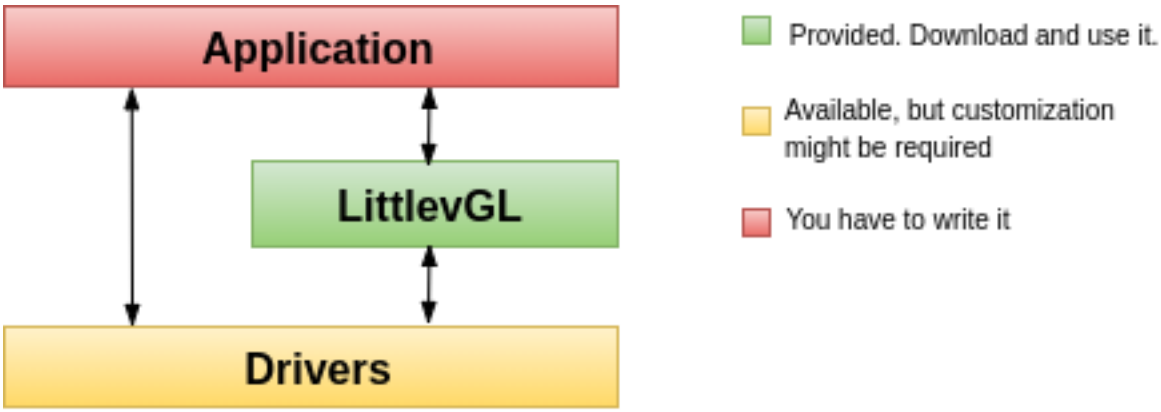
At the end, the goal is to run it all on an embedded platform.Both Micropython and LittlevGL can be used on many embedded architectures, such as stm32, ESP32 etc.You would also need display and input drivers. We have some sample drivers (ESP32+ILI9341, as well as some other examples), but most chances are you would want to create your own input/display drivers for your specific purposes.Drivers can be implemented either in C as Micropython module, or in pure Micropython!

Where can I find more information?

- On the Blog Post
- On `lv_micropython` README
- On `lv_binding_micropython` README
- On LittlevGL forum (Feel free to ask anything!)
- On Micropython docs and forum

3.16.2

System overview



Application Your application which creates the GUI and handles the specific tasks.

LittlevGL The graphics library itself. Your application can communicate with the library to create a GUI. It contains a HAL (Hardware Abstraction Layer) interface to register your display and input device drivers.

Driver Besides your specific drivers, it contains functions to drive your display, optionally to a GPU and to read the touchpad or buttons.

Depending on the MCU, there are two typical hardware set-ups. One with built-in LCD/TFT driver periphery and another without it. In both cases, a frame buffer will be required to store the current image of the screen.

1. **MCU with TFT/LCD driver** If your MCU has a TFT/LCD driver periphery then you can connect a display directly via RGB interface. In this case, the frame buffer can be in the internal RAM (if the MCU has enough RAM) or in the external RAM (if the MCU has a memory interface).
2. **External display controller** If the MCU doesn't have TFT/LCD driver interface then an external display controller (E.g. SSD1963, SSD1306, ILI9341) has to be used. In this case, the MCU can communicate with the display controller via Parallel port, SPI or sometimes I2C. The frame buffer is usually located in the display controller which saves a lot of RAM for the MCU.

Set-up a project

Get the library

LittlevGL Graphics Library is available on GitHub: https://github.com/littlevgl/lvgl.

You can clone it or download the latest version of the library from GitHub or you can use the Download page as well.

The graphics library is the **lvgl** directory which should be copied into your project.

Configuration file

There is a configuration header file for LittlevGL called **lv_conf.h**. It sets the library's basic behaviour, disables unused modules and features, adjusts the size of memory buffers in compile-time, etc.

Copy **lvgl/lv_conf_template.h** next to the *lvgl* directory and rename it to *lv_conf.h*. Open the file and change the `#if 0` at the beginning to `#if 1` to enable its content.

lv_conf.h can be copied other places as well but then you should add `LV_CONF_INCLUDE_SIMPLE` define to your compiler options (e.g. `-DLV_CONF_INCLUDE_SIMPLE` for gcc compiler) and set the include path manually.

In the config file comments explain the meaning of the options. Check at least these three configuration options and modify them according to your hardware:

1. **LV_HOR_RES_MAX** Your display's horizontal resolution.
2. **LV_VER_RES_MAX** Your display's vertical resolution.
3. **LV_COLOR_DEPTH** 8 for (RG332), 16 for (RGB565) or 32 for (RGB888 and ARGB8888).

Initialization

To use the graphics library you have to initialize it and the other components too. The order of the initialization is:

1. Call *lv_init()*.
2. Initialize your drivers.
3. Register the display and input devices drivers in LittlevGL. More about *Display* and *Input device* registration.
4. Call `lv_tick_inc(x)` in every `x` milliseconds in an interrupt to tell the elapsed time. *Learn more*.
5. Call `lv_task_handler()` periodically in every few milliseconds to handle LittlevGL related tasks. *Learn more*.

Display interface

To set up a display an `lv_disp_buf_t` and an `lv_disp_drv_t` variable has to be initialized.

- **lv_disp_buf_t** contains internal graphics buffer(s).
- **lv_disp_drv_t** contains callback functions to interact with the display and manipulate drawing related things.

Display buffer

`lv_disp_buf_t` can be initialized like this:

```
/*A static or global variable to store the buffers*/
static lv_disp_buf_t disp_buf;

/*Static or global buffer(s). The second buffer is optional*/
static lv_color_t buf_1[MY_DISP_HOR_RES * 10];
static lv_color_t buf_2[MY_DISP_HOR_RES * 10];

/*Initialize `disp_buf` with the buffer(s) */
lv_disp_buf_init(&disp_buf, buf_1, buf_2, MY_DISP_HOR_RES*10);
```

There are 3 possible configurations regarding the buffer size:

1. **One buffer** LittlevGL draws the content of the screen into a buffer and sends it to the display. The buffer can be smaller than the screen. In this case, the larger areas will be redrawn in multiple parts. If only small areas changes (e.g. button press) then only those areas will be refreshed.
2. **Two non-screen-sized buffers** having two buffers LittlevGL can draw into one buffer while the content of the other buffer is sent to display in the background. DMA or other hardware should be used to transfer the data to the display to let the CPU draw meanwhile. This way the rendering and refreshing of the display become parallel. Similarly to the *One buffer*, LittlevGL will draw the display's content in chunks if the buffer is smaller than the area to refresh.
3. **Two screen-sized buffers**. In contrast to *Two non-screen-sized buffers* LittlevGL will always provide the whole screen's content not only chunks. This way the driver can simply change the address of the frame buffer to the buffer received from LittlevGL. Therefore this method works the best when the MCU has an LCD/TFT interface and the frame buffer is just a location in the RAM.

Display driver

Once the buffer initialization is ready the display drivers need to be initialized. In the most simple case only the following two fields of `lv_disp_drv_t` needs to be set:

- **buffer** pointer to an initialized `lv_disp_buf_t` variable.
- **flush_cb** a callback function to copy a buffer's content to a specific area of the display.

There are some optional data fields:

- **hor_res** horizontal resolution of the display. (`LV_HOR_RES_MAX` by default from *lv_conf.h*).
- **ver_res** vertical resolution of the display. (`LV_VER_RES_MAX` by default from *lv_conf.h*).
- **color_chroma_key** a color which will be drawn as transparent on chrome keyed images. `LV_COLOR_TRANSP` by default from *lv_conf.h*).
- **user_data** custom user data for the driver. Its type can be modified in lv_conf.h.
- **anti-aliasing** use anti-aliasing (edge smoothing). `LV_ANTIALIAS` by default from *lv_conf.h*.
- **rotated** if `1` swap `hor_res` and `ver_res`. LittlevGL draws in the same direction in both cases (in lines from top to bottom) so the driver also needs to be reconfigured to change the display's fill direction.
- **screen_transp** if `1` the screen can have transparent or opaque style. `LV_COLOR_SCREEN_TRANSP` needs to enabled in *lv_conf.h*.

To use a GPU the following callbacks can be used:

- **gpu_fill_cb** fill an area in memory with colors.
- **gpu_blend_cb** blend two memory buffers using opacity.

Note that, these functions need to draw to the memory (RAM) and not your display directly.

Some other optional callbacks to make easier and more optimal to work with monochrome, grayscale or other non-standard RGB displays:

- **rounder_cb** round the coordinates of areas to redraw. E.g. a 2x2 px can be converted to 2x8. It can be used if the display controller can refresh only areas with specific height or width (usually 8 px height with monochrome displays).
- **set_px_cb** a custom function to write the *display buffer*. It can be used to store the pixels more compactly if the display has a special color format. (e.g. 1-bit monochrome, 2-bit grayscale etc.) This way the buffers used in `lv_disp_buf_t` can be smaller to hold only the required number of bits for the given area size. `set_px_cb` is not working with `Two screen-sized buffers` display buffer configuration.
- **monitor_cb** a callback function tells how many pixels were refreshed in how much time.

To set the fields of *lv_disp_drv_t* variable it needs to be initialized with `lv_disp_drv_init(&disp_drv)`. And finally to register a display for LittlevGL `lv_disp_drv_register(&disp_drv)` needs to be called.

All together it looks like this:

```
    lv_disp_drv_t disp_drv;                 /*A variable to hold the drivers. Can be␣
↪local variable*/
    lv_disp_drv_init(&disp_drv);            /*Basic initialization*/
    disp_drv.buffer = &disp_buf;            /*Set an initialized buffer*/
    disp_drv.flush_cb = my_flush_cb;        /*Set a flush callback to draw to the␣
↪display*/
    lv_disp_t * disp;
    disp = lv_disp_drv_register(&disp_drv); /*Register the driver and save the␣
↪created display objects*/
```

Here some simple examples of the callbacks:

```
void my_flush_cb(lv_disp_drv_t * disp_drv, const lv_area_t * area, lv_color_t * color_
↪p)
{
    /*The most simple case (but also the slowest) to put all pixels to the screen one-
↪by-one*/
    int32_t x, y;
    for(y = area->y1; y <= area->y2; y++) {
        for(x = area->x1; x <= area->x2; x++) {
            put_px(x, y, *color_p)
            color_p++;
        }
    }

    /* IMPORTANT!!!
     * Inform the graphics library that you are ready with the flushing*/
    lv_disp_flush_ready(disp);
}

void my_gpu_fill_cb(lv_disp_drv_t * disp_drv, lv_color_t * dest_buf, const lv_area_t␣
↪* dest_area, const lv_area_t * fill_area, lv_color_t color);
{
```

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```
    /*It's an example code which should be done by your GPU*/
    uint32_t x, y;
    dest_buf += dest_width * fill_area->y1; /*Go to the first line*/

    for(y = fill_area->y1; y < fill_area->y2; y++) {
        for(x = fill_area->x1; x < fill_area->x2; x++) {
            dest_buf[x] = color;
        }
        dest_buf+=dest_width;    /*Go to the next line*/
    }
}

void my_gpu_blend_cb(lv_disp_drv_t * disp_drv, lv_color_t * dest, const lv_color_t *␣
↪src, uint32_t length, lv_opa_t opa)
{
    /*It's an example code which should be done by your GPU*/
    uint32_t i;
    for(i = 0; i < length; i++) {
        dest[i] = lv_color_mix(dest[i], src[i], opa);
    }
}

void my_rounder_cb(lv_disp_drv_t * disp_drv, lv_area_t * area)
{
  /* Update the areas as needed. Can be only larger.
   * For example to always have lines 8 px height:*/
   area->y1 = area->y1 & 0x07;
   area->y2 = (area->y2 & 0x07) + 8;
}

void my_set_px_cb(lv_disp_drv_t * disp_drv, uint8_t * buf, lv_coord_t buf_w, lv_coord_
↪t x, lv_coord_t y, lv_color_t color, lv_opa_t opa)
{
    /* Write to the buffer as required for the display.
     * Write only 1-bit for monochrome displays mapped vertically:*/
 buf += buf_w * (y >> 3) + x;
 if(lv_color_brightness(color) > 128) (*buf) |= (1 << (y % 8));
 else (*buf) &= ~(1 << (y % 8));
}

void my_monitor_cb(lv_disp_drv_t * disp_drv, uint32_t time, uint32_t px)
{
  printf("%d px refreshed in %d ms\n", time, ms);
}
```

API

Display Driver HAL interface header file

Typedefs

typedef struct *__disp_drv_t* **lv_disp_drv_t**

Display Driver structure to be registered by HAL

typedef struct *_disp_t* **lv_disp_t**
Display structure. *lv_disp_drv_t* is the first member of the structure.

Functions

void **lv_disp_drv_init**(*lv_disp_drv_t *driver*)
Initialize a display driver with default values. It is used to have known values in the fields and not junk in memory. After it you can safely set only the fields you need.

Parameters

- `driver`: pointer to driver variable to initialize

void **lv_disp_buf_init**(*lv_disp_buf_t *disp_buf*, void *buf1*, void *buf2*, uint32_t *size_in_px_cnt*)
Initialize a display buffer

Parameters

- `disp_buf`: pointer *`lv_disp_buf_t`* variable to initialize
- `buf1`: A buffer to be used by LittlevGL to draw the image. Always has to specified and can't be NULL. Can be an array allocated by the user. E.g. `static lv_color_t disp_buf1[1024 * 10]` Or a memory address e.g. in external SRAM
- `buf2`: Optionally specify a second buffer to make image rendering and image flushing (sending to the display) parallel. In the `disp_drv->flush` you should use DMA or similar hardware to send the image to the display in the background. It lets LittlevGL to render next frame into the other buffer while previous is being sent. Set to `NULL` if unused.
- `size_in_px_cnt`: size of the `buf1` and `buf2` in pixel count.

lv_disp_t ***lv_disp_drv_register**(*lv_disp_drv_t *driver*)
Register an initialized display driver. Automatically set the first display as active.

Return pointer to the new display or NULL on error

Parameters

- `driver`: pointer to an initialized 'lv_disp_drv_t' variable (can be local variable)

void **lv_disp_drv_update**(*lv_disp_t *disp*, *lv_disp_drv_t *new_drv*)
Update the driver in run time.

Parameters

- `disp`: pointer to a display. (return value of `lv_disp_drv_register`)
- `new_drv`: pointer to the new driver

void **lv_disp_remove**(*lv_disp_t *disp*)
Remove a display

Parameters

- `disp`: pointer to display

void **lv_disp_set_default**(*lv_disp_t *disp*)
Set a default screen. The new screens will be created on it by default.

Parameters

- `disp`: pointer to a display

lv_disp_t ***lv_disp_get_default**(void)*
Get the default display

Return pointer to the default display

lv_coord_t **lv_disp_get_hor_res**(*lv_disp_t *disp*)
Get the horizontal resolution of a display

Return the horizontal resolution of the display

Parameters

- `disp`: pointer to a display (NULL to use the default display)

lv_coord_t **lv_disp_get_ver_res**(*lv_disp_t *disp*)
Get the vertical resolution of a display

Return the vertical resolution of the display

Parameters

- `disp`: pointer to a display (NULL to use the default display)

bool **lv_disp_get_antialiasing**(*lv_disp_t *disp*)
Get if anti-aliasing is enabled for a display or not

Return true: anti-aliasing is enabled; false: disabled

Parameters

- `disp`: pointer to a display (NULL to use the default display)

lv_disp_t ***lv_disp_get_next**(*lv_disp_t *disp*)
Get the next display.

Return the next display or NULL if no more. Give the first display when the parameter is NULL

Parameters

- `disp`: pointer to the current display. NULL to initialize.

lv_disp_buf_t ***lv_disp_get_buf**(*lv_disp_t *disp*)
Get the internal buffer of a display

Return pointer to the internal buffers

Parameters

- `disp`: pointer to a display

uint16_t **lv_disp_get_inv_buf_size**(*lv_disp_t *disp*)
Get the number of areas in the buffer

Return number of invalid areas

void **lv_disp_pop_from_inv_buf**(*lv_disp_t *disp*, uint16_t *num*)
Pop (delete) the last 'num' invalidated areas from the buffer

Parameters

- `num`: number of areas to delete

bool **lv_disp_is_double_buf**(*lv_disp_t *disp*)
Check the driver configuration if it's double buffered (both `buf1` and `buf2` are set)

Return true: double buffered; false: not double buffered

Parameters

- `disp`: pointer to to display to check

bool **lv_disp_is_true_double_buf**(*lv_disp_t *disp*)

Check the driver configuration if it's TRUE double buffered (both `buf1` and `buf2` are set and `size` is screen sized)

Return true: double buffered; false: not double buffered

Parameters

- `disp`: pointer to to display to check

struct lv_disp_buf_t

#include <lv_hal_disp.h> Structure for holding display buffer information.

Public Members

void ***buf1**

First display buffer.

void ***buf2**

Second display buffer.

void ***buf_act**

uint32_t **size**

lv_area_t **area**

volatile uint32_t **flushing**

struct _disp_drv_t

#include <lv_hal_disp.h> Display Driver structure to be registered by HAL

Public Members

lv_coord_t **hor_res**

Horizontal resolution.

lv_coord_t **ver_res**

Vertical resolution.

lv_disp_buf_t ***buffer**

Pointer to a buffer initialized with *`lv_disp_buf_init()`*. LittlevGL will use this buffer(s) to draw the screens contents

uint32_t **antialiasing**

1: antialiasing is enabled on this display.

uint32_t **rotated**

1: turn the display by 90 degree.

Warning Does not update coordinates for you!

uint32_t **screen_transp**

Handle if the the screen doesn't have a solid (opa == LV_OPA_COVER) background. Use only if required because it's slower.

void (***flush_cb**)(**struct** *_disp_drv_t* *disp_drv, **const** lv_area_t *area, *lv_color_t* *color_p)

MANDATORY: Write the internal buffer (VDB) to the display. 'lv_disp_flush_ready()' has to be called when finished

void (*__rounder_cb__)(__struct__ *_disp_drv_t* *disp_drv, lv_area_t *area)
OPTIONAL: Extend the invalidated areas to match with the display drivers requirements E.g. round `y` to, 8, 16 ..) on a monochrome display

void (*__set_px_cb__)(__struct__ *_disp_drv_t* *disp_drv, uint8_t *buf, lv_coord_t buf_w, lv_coord_t x, lv_coord_t y, *lv_color_t* color, *lv_opa_t* opa)
OPTIONAL: Set a pixel in a buffer according to the special requirements of the display Can be used for color format not supported in LittelvGL. E.g. 2 bit -> 4 gray scales

Note Much slower then drawing with supported color formats.

void (*__monitor_cb__)(__struct__ *_disp_drv_t* *disp_drv, uint32_t time, uint32_t px)
OPTIONAL: Called after every refresh cycle to tell the rendering and flushing time + the number of flushed pixels

void (*__gpu_blend_cb__)(__struct__ *_disp_drv_t* *disp_drv, *lv_color_t* *dest, __const__ *lv_color_t* *src, uint32_t length, *lv_opa_t* opa)
OPTIONAL: Blend two memories using opacity (GPU only)

void (*__gpu_fill_cb__)(__struct__ *_disp_drv_t* *disp_drv, *lv_color_t* *dest_buf, lv_coord_t dest_width, __const__ lv_area_t *fill_area, *lv_color_t* color)
OPTIONAL: Fill a memory with a color (GPU only)

lv_color_t __color_chroma_key__
On CHROMA_KEYED images this color will be transparent. `LV_COLOR_TRANSP` by default. (lv_conf.h)

lv_disp_drv_user_data_t __user_data__
Custom display driver user data

__struct _disp_t__
#include <lv_hal_disp.h> Display structure. *lv_disp_drv_t* is the first member of the structure.

Public Members

lv_disp_drv_t __driver__
< Driver to the display A task which periodically checks the dirty areas and refreshes them

lv_task_t *__refr_task__

lv_ll_t __scr_ll__
Screens of the display

__struct__ *_lv_obj_t* *__act_scr__
Currently active screen on this display

__struct__ *_lv_obj_t* *__top_layer__

See *lv_disp_get_layer_top*

__struct__ *_lv_obj_t* *__sys_layer__

See *lv_disp_get_layer_sys*

lv_area_t __inv_areas__[__LV_INV_BUF_SIZE__]
Invalidated (marked to redraw) areas

uint8_t __inv_area_joined__[__LV_INV_BUF_SIZE__]

uint32_t __inv_p__

uint32_t __last_activity_time__
Last time there was activity on this display

Input device interface

Types of input devices

To set up an input device an `lv_indev_drv_t` variable has to be initialized:

```
lv_indev_drv_t indev_drv;
lv_indev_drv_init(&indev_drv);      /*Basic initialization*/
indev_drv.type =...                 /*See below.*/
indev_drv.read_cb =...              /*See below.*/
/*Register the driver in LittlevGL and save the created input device object*/
lv_indev_t * my_indev = lv_indev_drv_register(&indev_drv);
```

type can be

- **LV_INDEV_TYPE_POINTER** touchpad or mouse
- **LV_INDEV_TYPE_KEYPAD** keyboard or keypad
- **LV_INDEV_TYPE_ENCODER** encoder with left, right, push options
- **LV_INDEV_TYPE_BUTTON** external buttons pressing the screen

read_cb is a function pointer which will be called periodically to report the current state of an input device. It can also buffer data and return `false` when no more data to be read or `true` when the buffer is not empty.

Visit *Input devices* to learn more about input devices in general.

Touchpad, mouse or any pointer

Input devices which can click points of the screen belong to this category.

```
indev_drv.type = LV_INDEV_TYPE_POINTER;
indev_drv.read_cb = my_input_read;

...

bool my_input_read(lv_indev_drv_t * drv, lv_indev_data_t*data)
{
    data->point.x = touchpad_x;
    data->point.y = touchpad_y;
    data->state = LV_INDEV_STATE_PR or LV_INDEV_STATE_REL;
    return false; /*No buffering now so no more data read*/
}
```

Important: Touchpad drivers must return the last X/Y coordinates even when the state is *LV_INDEV_STATE_REL*.

To set a mouse cursor use `lv_indev_set_cursor(my_indev, &img_cursor)`. (`my_indev` is the return value of `lv_indev_drv_register`)

Keypad or keyboard

Full keyboards with all the letters or simple keypads with a few navigation buttons belong here.

To use a keyboard/keypad:

- Register a `read_cb` function with `LV_INDEV_TYPE_KEYPAD` type.
- Enable `LV_USE_GROUP` in *lv_conf.h*
- An object group has to be created: `lv_group_t * g = lv_group_create()` and objects have to be added to it with `lv_group_add_obj(g, obj)`
- The created group has to be assigned to an input device: `lv_indev_set_group(my_indev, g)` (`my_indev` is the return value of `lv_indev_drv_register`)
- Use `LV_KEY_...` to navigate among the objects in the group. See `lv_core/lv_group.h` for the available keys.

```
indev_drv.type = LV_INDEV_TYPE_KEYPAD;
indev_drv.read_cb = my_input_read;

...

bool keyboard_read(lv_indev_drv_t * drv, lv_indev_data_t*data){
  data->key = last_key();            /*Get the last pressed or released key*/

  if(key_pressed()) data->state = LV_INDEV_STATE_PR;
  else data->state = LV_INDEV_STATE_REL;

  return false; /*No buffering now so no more data read*/
}
```

Encoder

With an encoder you can do 4 things:

1. Press its button
2. Long-press its button
3. Turn left
4. Turn right

In short, the Encoder input devices work like this:

- By turning the encoder you can focus on the next/previous object.
- When you press the encoder on a simple object (like a button), it will be clicked.
- If you press the encoder on a complex object (like a list, message box, etc.) the object will go to edit mode whereby turning the encoder you can navigate inside the object.
- To leave edit mode press long the button.

To use an *Encoder* (similarly to the *Keypads*) the objects should be added to groups.

```
indev_drv.type = LV_INDEV_TYPE_ENCODER;
indev_drv.read_cb = my_input_read;

...

bool encoder_read(lv_indev_drv_t * drv, lv_indev_data_t*data){
  data->enc_diff = enc_get_new_moves();
```

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```
  if(enc_pressed()) data->state = LV_INDEV_STATE_PR;
  else data->state = LV_INDEV_STATE_REL;

  return false; /*No buffering now so no more data read*/
}
```

Button

Buttons mean external "hardware" buttons next to the screen which are assigned to specific coordinates of the screen. If a button is pressed it will simulate the pressing on the assigned coordinate. (Similarly to a touchpad)

To assign buttons to coordinates use `lv_indev_set_button_points(my_indev, points_array)`.`points_array` should look like `const lv_point_t points_array[] = { {12,30},{60,90}, ...}`

Important: The points_array can't go out of scope. Either declare it as a global variable or as a static variable inside a function.

```
indev_drv.type = LV_INDEV_TYPE_BUTTON;
indev_drv.read_cb = my_input_read;

...

bool button_read(lv_indev_drv_t * drv, lv_indev_data_t*data){
    static uint32_t last_btn = 0;   /*Store the last pressed button*/
    int btn_pr = my_btn_read();     /*Get the ID (0,1,2...) of the pressed button*/
    if(btn_pr >= 0) {               /*Is there a button press? (E.g. -1 indicated no␣
↪button was pressed)*/
       last_btn = btn_pr;           /*Save the ID of the pressed button*/
       data->state = LV_INDEV_STATE_PR;  /*Set the pressed state*/
    } else {
       data->state = LV_INDEV_STATE_REL; /*Set the released state*/
    }

    data->btn = last_btn;            /*Save the last button*/

    return false;                    /*No buffering now so no more data read*/
}
```

Other features

Besides `read_cb` a `feedback_cb` callback can be also specified in `lv_indev_drv_t`. `feedback_cb` is called when any type of event is sent by the input devices. (independently from its type). It allows making feedback for the user e.g. to play a sound on `LV_EVENT_CLICK`.

The default value of the following parameters can be set in *lv_conf.h* but the default value can be overwritten in `lv_indev_drv_t`:

- **drag_limit** Number of pixels to slide before actually drag the object
- **drag_throw** Drag throw slow-down in [%]. Greater value means faster slow-down

- **long_press_time** Press time to send `LV_EVENT_LONG_PRESSED` (in milliseconds)
- **long_press_rep_time** Interval of sending `LV_EVENT_LONG_PRESSED_REPEAT` (in milliseconds)
- **read_task** pointer to the `lv_task` which reads the input device. Its parameters can be changed by `lv_task_...()` functions

Every Input device is associated with a display. By default, a new input device is added to the lastly created or the explicitly selected (using `lv_disp_set_default()`) display. The associated display is stored and can be changed in `disp` field of the driver.

API

Input Device HAL interface layer header file

Typedefs

typedef uint8_t **lv_indev_type_t**

typedef uint8_t **lv_indev_state_t**

typedef struct *_lv_indev_drv_t* **lv_indev_drv_t**
Initialized by the user and registered by 'lv_indev_add()'

typedef struct *_lv_indev_proc_t* **lv_indev_proc_t**
Run time data of input devices Internally used by the library, you should not need to touch it.

typedef struct *_lv_indev_t* **lv_indev_t**
The main input device descriptor with driver, runtime data ('proc') and some additional information

Enums

enum [anonymous]
Possible input device types

Values:

LV_INDEV_TYPE_NONE
Uninitialized state

LV_INDEV_TYPE_POINTER
Touch pad, mouse, external button

LV_INDEV_TYPE_KEYPAD
Keypad or keyboard

LV_INDEV_TYPE_BUTTON
External (hardware button) which is assigned to a specific point of the screen

LV_INDEV_TYPE_ENCODER
Encoder with only Left, Right turn and a Button

enum [anonymous]
States for input devices

Values:

LV_INDEV_STATE_REL = 0

LV_INDEV_STATE_PR

Functions

void **lv_indev_drv_init**(*lv_indev_drv_t *driver*)
Initialize an input device driver with default values. It is used to surly have known values in the fields ant not memory junk. After it you can set the fields.

Parameters

- `driver`: pointer to driver variable to initialize

lv_indev_t ***lv_indev_drv_register**(*lv_indev_drv_t *driver*)
Register an initialized input device driver.

Return pointer to the new input device or NULL on error

Parameters

- `driver`: pointer to an initialized 'lv_indev_drv_t' variable (can be local variable)

void **lv_indev_drv_update**(*lv_indev_t *indev*, *lv_indev_drv_t *new_drv*)
Update the driver in run time.

Parameters

- `indev`: pointer to a input device. (return value of `lv_indev_drv_register`)
- `new_drv`: pointer to the new driver

lv_indev_t ***lv_indev_get_next**(*lv_indev_t *indev*)
Get the next input device.

Return the next input devise or NULL if no more. Give the first input device when the parameter is NULL

Parameters

- `indev`: pointer to the current input device. NULL to initialize.

bool **lv_indev_read**(*lv_indev_t *indev*, *lv_indev_data_t *data*)
Read data from an input device.

Return false: no more data; true: there more data to read (buffered)

Parameters

- `indev`: pointer to an input device
- `data`: input device will write its data here

struct lv_indev_data_t
#include <lv_hal_indev.h> Data structure passed to an input driver to fill

Public Members

lv_point_t **point**
For LV_INDEV_TYPE_POINTER the currently pressed point

uint32_t **key**
For LV_INDEV_TYPE_KEYPAD the currently pressed key

uint32_t **btn_id**
For LV_INDEV_TYPE_BUTTON the currently pressed button

int16_t **enc_diff**
For LV_INDEV_TYPE_ENCODER number of steps since the previous read

lv_indev_state_t **state**
LV_INDEV_STATE_REL or LV_INDEV_STATE_PR

struct _lv_indev_drv_t
#include <lv_hal_indev.h> Initialized by the user and registered by 'lv_indev_add()'

Public Members

lv_indev_type_t **type**
< Input device type Function pointer to read input device data. Return 'true' if there is more data to be read (buffered). Most drivers can safely return 'false'

bool (***read_cb**)(**struct** *_lv_indev_drv_t* *indev_drv, *lv_indev_data_t* *data)

void (***feedback_cb**)(**struct** *_lv_indev_drv_t* *, uint8_t)
Called when an action happened on the input device. The second parameter is the event from `lv_event_t`

lv_indev_drv_user_data_t **user_data**

struct *_disp_t* ***disp**
< Pointer to the assigned display Task to read the periodically read the input device

lv_task_t ***read_task**
Number of pixels to slide before actually drag the object

uint8_t **drag_limit**
Drag throw slow-down in [%]. Greater value means faster slow-down

uint8_t **drag_throw**
Long press time in milliseconds

uint16_t **long_press_time**
Repeated trigger period in long press [ms]

uint16_t **long_press_rep_time**

struct _lv_indev_proc_t
#include <lv_hal_indev.h> Run time data of input devices Internally used by the library, you should not need to touch it.

Public Members

lv_indev_state_t **state**
Current state of the input device.

lv_point_t **act_point**
Current point of input device.

lv_point_t **last_point**
Last point of input device.

lv_point_t **vect**
Difference between `act_point` and `last_point`.

lv_point_t **drag_sum**

lv_point_t **drag_throw_vect**

struct *_lv_obj_t* ***act_obj**

struct *_lv_obj_t* ***last_obj**

struct *_lv_obj_t* ***last_pressed**

uint8_t **drag_limit_out**

uint8_t **drag_in_prog**

struct *_lv_indev_proc_t*::[**anonymous**]::[**anonymous**] **pointer**

lv_indev_state_t **last_state**

uint32_t **last_key**

struct *_lv_indev_proc_t*::[**anonymous**]::[**anonymous**] **keypad**

union *_lv_indev_proc_t*::[**anonymous**] **types**

uint32_t **pr_timestamp**
Pressed time stamp

uint32_t **longpr_rep_timestamp**
Long press repeat time stamp

uint8_t **long_pr_sent**

uint8_t **reset_query**

uint8_t **disabled**

uint8_t **wait_until_release**

struct _lv_indev_t
#include <lv_hal_indev.h> The main input device descriptor with driver, runtime data ('proc') and some additional information

Public Members

lv_indev_drv_t **driver**

lv_indev_proc_t **proc**

struct *_lv_obj_t* ***cursor**
Cursor for LV_INPUT_TYPE_POINTER

struct *_lv_group_t* ***group**
Keypad destination group

const lv_point_t ***btn_points**
Array points assigned to the button ()screen will be pressed here by the buttons

Tick interface

The LittlevGL needs a system tick to know the elapsed time for animation and other tasks.

You need to call the `lv_tick_inc(tick_period)` function periodically and tell the call period in milliseconds. For example, `lv_tick_inc(1)` for calling in every millisecond.

`lv_tick_inc` should be called in a higher priority routine than `lv_task_handler()` (e.g. in an interrupt) to precisely know the elapsed milliseconds even if the execution of `lv_task_handler` takes longer time.

With FreeRTOS `lv_tick_inc` can be called in `vApplicationTickHook`.

On Linux based operating system (e.g. on Raspberry Pi) `lv_tick_inc` can be called in a thread as below:

```
void * tick_thread (void *args)
{
      while(1) {
        usleep(5*1000);   /*Sleep for 5 millisecond*/
        lv_tick_inc(5);      /*Tell LittlevGL that 5 milliseconds were elapsed*/
    }
}
```

API

Provide access to the system tick with 1 millisecond resolution

Functions

uint32_t **lv_tick_get**(void)
Get the elapsed milliseconds since start up

Return the elapsed milliseconds

uint32_t **lv_tick_elaps**(uint32_t *prev_tick*)
Get the elapsed milliseconds since a previous time stamp

Return the elapsed milliseconds since 'prev_tick'

Parameters

- `prev_tick`: a previous time stamp (return value of systick_get())

Task Handler

To handle the tasks of LittlevGL you need to call `lv_task_handler()` periodically in one of the followings:

- *while(1)* of *main()* function
- timer interrupt periodically (low priority then `lv_tick_inc()`)
- an OS task periodically

The timing is not critical but it should be about 5 milliseconds to keep the system responsive.

Example:

```
while(1) {
  lv_task_handler();
  my_delay_ms(5);
}
```

To learn more about task visit the *Tasks* section.

Sleep management

The MCU can go to sleep when no user input happens. In this case, the main `while(1)` should look like this:

```
while(1) {
  /*Normal operation (no sleep) in < 1 sec inactivity*/
  if(lv_disp_get_inactive_time(NULL) < 1000) {
          lv_task_handler();
  }
  /*Sleep after 1 sec inactivity*/
  else {
          timer_stop();   /*Stop the timer where lv_tick_inc() is called*/
          sleep();                    /*Sleep the MCU*/
  }
  my_delay_ms(5);
}
```

You should also add below lines to your input device read function if a wake-up (press, touch or click etc.) happens:

```
lv_tick_inc(LV_DISP_DEF_REFR_PERIOD);  /*Force task execution on wake-up*/
timer_start();                         /*Restart the timer where lv_tick_inc() is␣
↪called*/
lv_task_handler();                     /*Call `lv_task_handler()` manually to process␣
↪the wake-up event*/
```

In addition to `lv_disp_get_inactive_time()` you can check `lv_anim_count_running()` to see if every animations are finished.

Operating system and interrupts

LittlevGL is **not thread-safe** by default.

However, in the following conditions it's valid to call LittlevGL related functions:

- In *events*. Learn more in *Events*.
- In *lv_tasks*. Learn more in *Tasks*.

Tasks and threads

If you need to use real tasks or threads, you need a mutex which should be invoked before the call of `lv_task_handler` and released after it. Also, you have to use the same mutex in other tasks and threads around every LittlevGL (`lv_...`) related function calls and codes. This way you can use LittlevGL in a real multitasking environment. Just make use of a mutex to avoid the concurrent calling of LittlevGL functions.

Interrupts

Try to avoid calling LittlevGL functions from the interrupts (except `lv_tick_inc()` and `lv_disp_flush_ready()`). But, if you need to do this you have to disable the interrupt which uses LittlevGL functions while `lv_task_handler` is running. It's a better approach to set a flag or some value and periodically check it in an `lv_task`.

Logging

LittlevGL has built-in *log* module to inform the user about what is happening in the library.

Log level

To enable logging, set `LV_USE_LOG 1` in *lv_conf.h* and set `LV_LOG_LEVEL` to one of the following values:

- **LV_LOG_LEVEL_TRACE** A lot of logs to give detailed information
- **LV_LOG_LEVEL_INFO** Log important events
- **LV_LOG_LEVEL_WARN** Log if something unwanted happened but didn't cause a problem
- **LV_LOG_LEVEL_ERROR** Only critical issue, when the system may fail
- **LV_LOG_LEVEL_NONE** Do not log anything

The events which have a higher level than the set log level will be logged too. E.g. if you `LV_LOG_LEVEL_WARN`, *errors* will be also logged.

Logging with printf

If your system supports `printf`, you just need to enable `LV_LOG_PRINTF` in *lv_conf.h* to send the logs with `printf`.

Custom log function

If you can't use `printf` or want to use a custom function to log, you can register a "logger" callback with `lv_log_register_print_cb()`.

For example:

```
void my_log_cb(lv_log_level_t level, const char * file, int line, const char * dsc)
{
  /*Send the logs via serial port*/
  if(level == LV_LOG_LEVEL_ERROR) serial_send("ERROR: ");
  if(level == LV_LOG_LEVEL_WARN)  serial_send("WARNING: ");
  if(level == LV_LOG_LEVEL_INFO)  serial_send("INFO: ");
  if(level == LV_LOG_LEVEL_TRACE) serial_send("TRACE: ");

  serial_send("File: ");
  serial_send(file);

  char line_str[8];
  sprintf(line_str,"%d", line);
  serial_send("#");
  serial_send(line_str);

  serial_send(": ");
  serial_send(dsc);
  serial_send("\n");
}

...


lv_log_register_print_cb(my_log_cb);
```

Add logs

You can also use the log module via the `LV_LOG_TRACE/INFO/WARN/ERROR(description)` functions.

3.16.3 Overview

In the LittlevGL the **basic building blocks** of a user interface are the objects, also called *Widgets*. ,
, , ,

All object types share some basic attributes:

- (Position)
- (Size)
- (Parent)
- (Drag enable)
- (Click enable)

You can set/get these attributes with `lv_obj_set_...` and `lv_obj_get_...` functions. For example:

```
/*□□□□□□□□□□*/
lv_obj_set_size(btn1, 100, 50);          /*□□□□*/
lv_obj_set_pos(btn1, 20,30);      /*□□□□*/
```

.

- (Min. max. values)
- (Current value)
- (Custom styles)

For these attributes, every object type have unique API functions. For example for a slider:

```
/*□□□□□□□□□□□*/
lv_slider_set_range(slider1, 0, 100);            /*□□□□□□□□*/
lv_slider_set_value(slider1, 40, LV_ANIM_ON);         /*□□□□□□□□□□□*/
lv_slider_set_action(slider1, my_action);     /*□□□□□□□*/
```

API (*lv_objx/lv_slider.h*)

A parent object can be considered as the container of its children. Every object has exactly one parent object (except screens), but a parent can have an unlimited number of children. There is no limitation for the type of the parent but, there are typical parent (e.g. button) and typical child (e.g. label) objects.

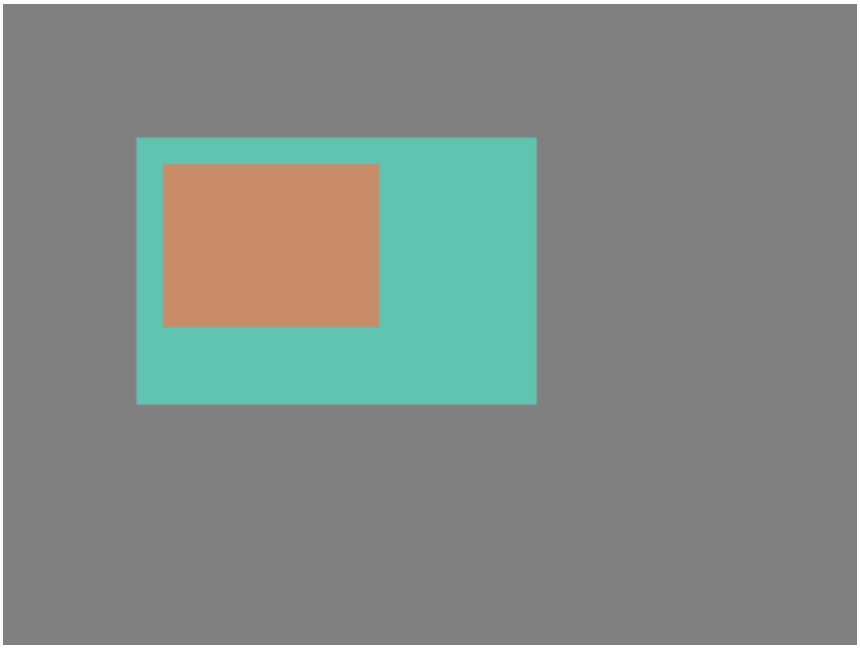
(Moving together)

If the position of the parent is changed the children will move with the parent. Therefore all positions are relative to the parent.

(0;0)

```
lv_obj_t * par = lv_obj_create(lv_scr_act(), NULL); /*□□□□□□□□□□□□□□□□*/
lv_obj_set_size(par, 100, 80);                          /*□□□□□□□□*/

lv_obj_t * obj1 = lv_obj_create(par, NULL);                /*□□□□□□□□□□□□□□□□□□□□*/
lv_obj_set_pos(obj1, 10, 10);                           /*□□□□□□□□□□□□*/
```



```
lv_obj_set_pos(par, 50, 50);          /*□□□□□□□□□□□□□□□□□*/
```

( )

If a child is partially or fully out of its parent then the parts outside will not be visible.

```
lv_obj_set_x(obj1, -30);          /*□□□□□□□□□□□□□□□*/
```

-

In LittlevGL objects can be created and deleted dynamically in run-time. It means only the currently created objects consume RAM. For example, if you need a chart, you can create it when required and delete it when it is not visible or necessary.

Every object type has its own **create** function with a unified prototype. It needs two parameters:

- A pointer to the *parent* object. To create a screen give *NULL* as parent.
- Optionally, a pointer to *copy* object with the same type to copy it. This *copy* object can be *NULL* to avoid the copy operation.

All objects are referenced in C code using an `lv_obj_t` pointer as a handle. This pointer can later be used to set or get the attributes of the object.

```
lv_obj_t * lv_ <type>_create(lv_obj_t * parent, lv_obj_t * copy);
```

```
void lv_obj_del(lv_obj_t * obj);
```

`lv_obj_del` will delete the object immediately. If for any reason you can't delete the object immediately you can use `lv_obj_del_async(obj)`. It is useful e.g. if you want to delete the parent of an object in the child's `LV_EVENT_DELETE` signal.

You can remove all the children of an object (but not the object itself) using `lv_obj_clean`:

```
void lv_obj_clean(lv_obj_t * obj);
```

(Screen)–

```
lv_obj_t * scr1 = lv_obj_create(NULL, NULL);
```

There is always an active screen on each display. By default, the library creates and loads a "Base object" as the screen for each display.To get the currently active screen use the `lv_scr_act()` function. To load a new one, use `lv_scr_load(scr1)`.

Screens are created on the currently selected *default display*. The *default screen* is the last registered screen with `lv_disp_drv_register` or you can explicitly select a new default display using `lv_disp_set_default(disp)`. `lv_scr_act()` and `lv_scr_load()` operate on the currently default screen.

Visit *Multi-display support* to learn more.

Layers

Order of creation

By default, LittlevGL draws old objects on the background and new objects on the foreground.

For example, assume we added a button to a parent object named button1 and then another button named button2. Then button1 (with its child object(s)) will be in the background and can be covered by button2 and its children.


```
/*Create a screen*/
lv_obj_t * scr = lv_obj_create(NULL, NULL);
lv_scr_load(scr);           /*Load the screen*/

/*Create 2 buttons*/
lv_obj_t * btn1 = lv_btn_create(scr, NULL);         /*Create a button on the screen*/
lv_btn_set_fit(btn1, true, true);                   /*Enable to automatically set the␣
↪size according to the content*/
lv_obj_set_pos(btn1, 60, 40);                         /*Set the position of the␣
↪button*/

lv_obj_t * btn2 = lv_btn_create(scr, btn1);         /*Copy the first button*/
lv_obj_set_pos(btn2, 180, 80);                     /*Set the position of the button*/

/*Add labels to the buttons*/
lv_obj_t * label1 = lv_label_create(btn1, NULL);        /*Create a label on the first␣
↪button*/
lv_label_set_text(label1, "Button 1");                  /*Set the text of the label*/

lv_obj_t * label2 = lv_label_create(btn2, NULL);          /*Create a label on the␣
↪second button*/
lv_label_set_text(label2, "Button 2");                    /*Set the text of the␣
↪label*/

/*Delete the second label*/
lv_obj_del(label2);
```

Bring to the foreground

There are several ways to bring an object to the foreground:

- Use `lv_obj_set_top(obj, true)`. If `obj` or any of its children is clicked, then LittlevGL will automatically bring the object to the foreground. It works similarly to a typical GUI on a PC. When a window in the background is clicked, it will come to the foreground automatically.
- Use `lv_obj_move_foreground(obj)` to explicitly tell the library to bring an object to the foreground. Similarly, use `lv_obj_move_background(obj)` to move to the background.
- When `lv_obj_set_parent(obj, new_parent)` is used, `obj` will be on the foreground on the `new_parent`.

Top and sys layers

LittlevGL uses two special layers named as `layer_top` and `layer_sys`. Both are visible and common on all screens of a display. **They are not, however, shared among multiple physical displays.** The `layer_top` is always on top of the default screen (`lv_scr_act()`), and `layer_sys` is on top of `layer_top`.

The `layer_top` can be used by the user to create some content visible everywhere. For example, a menu bar, a pop-up, etc. If the `click` attribute is enabled, then `layer_top` will absorb all user click and acts as a modal.

```
lv_obj_set_click(lv_layer_top(), true);
```

The `layer_sys` is also using for similar purpose on LittlevGL. For example, it places the mouse cursor there to be sure it's always visible.

Events

Events are triggered in LittlevGL when something happens which might be interesting to the user, e.g. if an object:

- is clicked
- is dragged
- its value has changed, etc.

The user can assign a callback function to an object to see these events. In practice, it looks like this:

```
lv_obj_t * btn = lv_btn_create(lv_scr_act(), NULL);
lv_obj_set_event_cb(btn, my_event_cb);   /*Assign an event callback*/

...

static void my_event_cb(lv_obj_t * obj, lv_event_t event)
{
    switch(event) {
        case LV_EVENT_PRESSED:
            printf("Pressed\n");
            break;

        case LV_EVENT_SHORT_CLICKED:
            printf("Short clicked\n");
            break;

        case LV_EVENT_CLICKED:
            printf("Clicked\n");
```

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```
            break;

        case LV_EVENT_LONG_PRESSED:
            printf("Long press\n");
            break;

        case LV_EVENT_LONG_PRESSED_REPEAT:
            printf("Long press repeat\n");
            break;

        case LV_EVENT_RELEASED:
            printf("Released\n");
            break;
    }

    /*Etc.*/
}
```

More objects can use the same *event callback*.

Event types

The following event types exist:

Generic events

All objects (such as Buttons/Labels/Sliders etc.) receive these generic events regardless of their type.

Related to the input devices

These are sent when an object is pressed/released etc. by the user. They are used not only for *Pointers* but can used for *Keypad*, *Encoder* and *Button* input devices as well. Visit the *Overview of input devices* section to learn more about them.

- **LV_EVENT_PRESSED** The object has been pressed
- **LV_EVENT_PRESSING** The object is being pressed (sent continuously while pressing)
- **LV_EVENT_PRESS_LOST** The input device is still being pressed but is no longer on the object
- **LV_EVENT_SHORT_CLICKED** Released before `LV_INDEV_LONG_PRESS_TIME` time. Not called if dragged.
- **LV_EVENT_LONG_PRESSED** Pressing for `LV_INDEV_LONG_PRESS_TIME` time. Not called if dragged.
- **LV_EVENT_LONG_PRESSED_REPEAT** Called after `LV_INDEV_LONG_PRESS_TIME` in every `LV_INDEV_LONG_PRESS_REP_TIME` ms. Not called if dragged.
- **LV_EVENT_CLICKED** Called on release if not dragged (regardless to long press)
- **LV_EVENT_RELEASED** Called in every case when the object has been released even if it was dragged. Not called if slid from the object while pressing and released outside of the object. In this case, `LV_EVENT_PRESS_LOST` is sent.

Related to pointer

These events are sent only by pointer-like input devices (E.g. mouse or touchpad)

- **LV_EVENT_DRAG_BEGIN** Dragging of the object has started
- **LV_EVENT_DRAG_END** Dragging finished (including drag throw)
- **LV_EVENT_DRAG_THROW_BEGIN** Drag throw started (released after drag with "momentum")

Related to keypad and encoder

These events are sent by keypad and encoder input devices. Learn more about *Groups* in [overview/indev](Input devices) section.

- **LV_EVENT_KEY** A *Key* is sent to the object. Typically when it was pressed or repeated after a long press
- **LV_EVENT_FOCUSED** The object is focused in its group
- **LV_EVENT_DEFOCUSED** The object is defocused in its group

General events

Other general events sent by the library.

- **LV_EVENT_DELETE** The object is being deleted. Free the related user-allocated data.

Special events

These events are specific to a particular object type.

- **LV_EVENT_VALUE_CHANGED** The object value has changed (e.g. for a *Slider*)
- **LV_EVENT_INSERT** Something is inserted to the object. (Typically to a *Text area*)
- **LV_EVENT_APPLY** "Ok", "Apply" or similar specific button has clicked. (Typically from a *Keyboard* object)
- **LV_EVENT_CANCEL** "Close", "Cancel" or similar specific button has clicked. (Typically from a *Keyboard* object)
- **LV_EVENT_REFRESH** Query to refresh the object. Never sent by the library but can be sent by the user.

Visit particular *Object type's documentation* to understand which events are used by an object type.

Custom data

Some events might contain custom data. For example, `LV_EVENT_VALUE_CHANGED` in some cases tells the new value. For more information, see the particular *Object type's documentation*. To get the custom data in the event callback use `lv_event_get_data()`.

The type of the custom data depends on the sending object but if it's a

- single number then it's `uint32_t *` or `int32_t *`

- text then `char *` or `const char *`

Send events manually

To manually send events to an object, use `lv_event_send(obj, LV_EVENT_..., &custom_data)`.

For example, it can be used to manually close a message box by simulating a button press (although there are simpler ways of doing this):

```
/*Simulate the press of the first button (indexes start from zero)*/
uint32_t btn_id = 0;
lv_event_send(mbox, LV_EVENT_VALUE_CHANGED, &btn_id);
```

Or to perform refresh generically:

```
lv_event_send(label, LV_EVENT_REFRESH, NULL);
```

Styles

Styles are used to set the appearance of the objects. A style is a structure with attributes like colors, paddings, opacity, font, etc.

There is a common style type called **lv_style_t** for every object type.

By setting the fields of the `lv_style_t` variables and assigning them to objects with `lv_obj_set_style`, you can influence the appearance of the objects.

Important: The objects only store a pointer to a style so the style cannot be a local variable which is destroyed after the function exits. **You should use static, global or dynamically allocated variables.**

```
/* file scope */
lv_style_t style_1;             /*OK! Global variables for styles are fine*/
static lv_style_t style_2;      /*OK! Static variables outside the functions are␣
↪fine*/
void my_screen_create(void)
{
  /* function scope */
  static lv_style_t style_3;    /*OK! Static variables in the functions are fine*/
  lv_style_t style_4;           /*WRONG! Styles can't be local variables*/

  ...
}
```

Use the styles

Objects have a *main style* which determines the appearance of their background or main section. However, some object types have additional styles too.

For example, a slider has 3 styles:

- Background (main style)
- Indicator

- Know

Some object types only have one style. For example:

- Label
- Image
- Line, etc.

Every object type implements its own version of the style setter and getter functions. You should use these instead of `lv_obj_set_style` where possible. For example:

```
const lv_style_t * btn_style = lv_btn_get_style(btn, LV_BTN_STYLE_REL);
lv_btn_set_style(btn, LV_BTN_STYLE_REL, &new_style);
```

To see the styles supported by an object type (*LV_<OBJ_TYPE>*STYLE*<STYLE_TYPE>*), check the documentation of the particular *Object type*.

If you **modify a style which is already used** by one or more objects, then the objects have to be notified about the style is changed. There are two options to do this notification:

```
/*Notify an object about its style is modified*/
void lv_obj_refresh_style(lv_obj_t * obj);

/*Notify all objects with a given style. (NULL to notify all objects)*/
void lv_obj_report_style_mod(void * style);
```

`lv_obj_report_style_mod` will only refresh the *Main styles* of objects. If you change a different style, you will have to use `lv_obj_refresh_style`.

Inherit styles

If the *Main style* of an object is `NULL`, then its style will be inherited from its parent's style. It makes easier to create a consistent design. Don't forget a style describes a lot of properties at the same time. So for example, if you set a button's style and create a label on it with `NULL` style, then the label will be rendered according to the button's style. In other words, the button makes sure its children will look good on it.

Setting the `glass` style property will prevent inheriting that style (i.e. cause the child object to inherit its style from its grandparent). You should use it if the style is transparent so children use colors and features from its grandparent. Otherwise, the child objects would also be transparent.

Style properties

A style has 5 main parts: common, body, text, image and line. Each object type only uses the fields which are relevant to it. For example, *Lines* don't care about the *letter_space*, because they are not concerned with rendering text.

To see which fields are used by an object type, see their *Documentation*.

The fields of a style structure are the followings:

Common properties

- **glass** 1: Do not inherit this style

Body style properties

Used by the rectangle-like objects

- **body.main_color** Main color (top color)
- **body.grad_color** Gradient color (bottom color)
- **body.radius** Corner radius. (set to `LV_RADIUS_CIRCLE` to draw circle)
- **body.opa** Opacity (0..255 or *LV_OPA_TRANSP*, *LV_OPA_10*, *LV_OPA_20* ... *LV_OPA_COVER*)
- **body.border.color** Border color
- **body.border.width** Border width
- **body.border.part** Border parts (*LV_BORDER_LEFT/RIGHT/TOP/BOTTOM/FULL* or 'OR'ed values)
- **body.border.opa** Border opacity (0..255 or *LV_OPA_TRANSP*, *LV_OPA_10*, *LV_OPA_20* ... *LV_OPA_COVER*)
- **body.shadow.color** Shadow color
- **body.shadow.width** Shadow width
- **body.shadow.type** Shadow type (*LV_SHADOW_BOTTOM/FULL*)
- **body.padding.top** Top padding
- **body.padding.bottom** Bottom padding
- **body.padding.left** Left padding
- **body.padding.right** Right padding
- **body.padding.inner** Inner padding (between content elements or children)

Text style properties

Used by the objects which show texts

- **text.color** Text color
- **text.sel_color** Selected text color
- **text.font** Pointer to a font
- **text.opa** Text opacity (0..255 or LV_OPA_TRANSP, LV_OPA_10, LV_OPA_20 ... LV_OPA_COVER*)
- **text.letter_space** Letter space
- **text.line_space** Line space

Image style properties

Used by image-like objects or icons on objects

- **image.color** Color for image re-coloring based on the brightness of its pixels
- **image.intense** Re-color intensity (0..255 or *LV_OPA_TRANSP*, *LV_OPA_10*, *LV_OPA_20* ... *LV_OPA_COVER*)

- **image.opa** Overall image opacity (0..255 or *LV_OPA_TRANSP*, *LV_OPA_10*, *LV_OPA_20* ... *LV_OPA_COVER*)

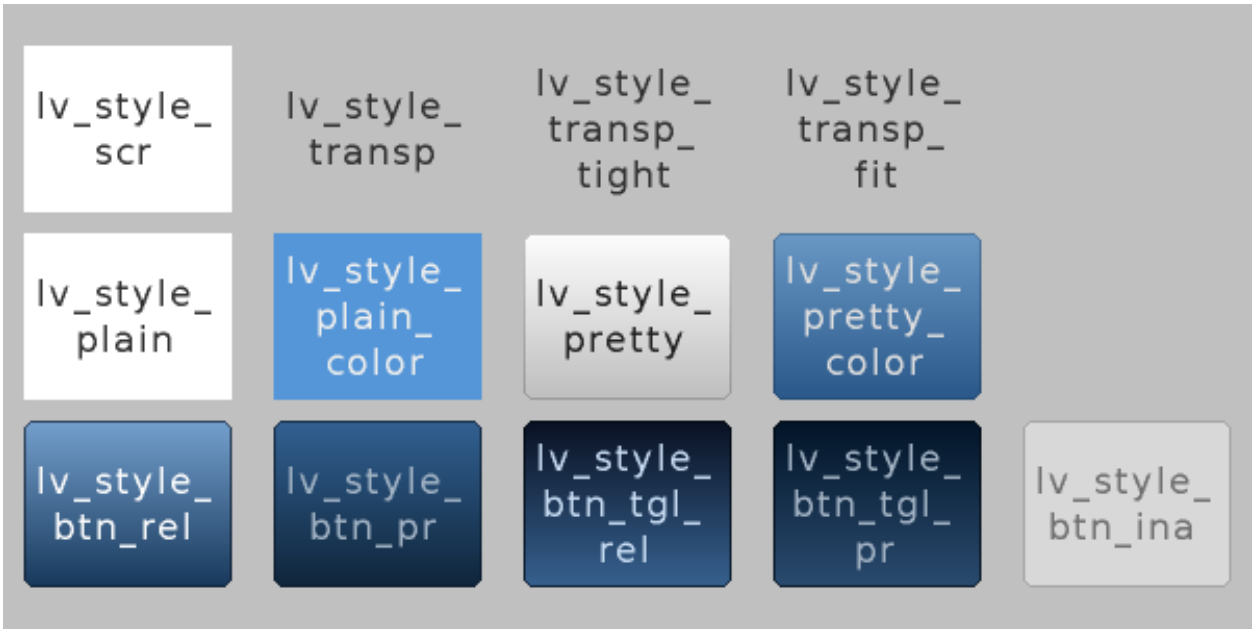
Line style properties

Used by objects containing lines or line-like elements

- **line.color** Line color
- **line.width** Line width
- **line.opa** Line opacity (0..255 or *LV_OPA_TRANSP*, *LV_OPA_10*, *LV_OPA_20* ... *LV_OPA_COVER*)

Built-in styles

There are several built-in styles in the library:



As you can see, there are built-in styles for screens, buttons, solid containers, and transparent containers.

The `lv_style_transp`, `lv_style_transp_fit` and `lv_style_transp_tight` differ only in paddings: for `lv_style_transp_tight` all paddings are zero, for `lv_style_transp_fit` only horizontal and vertical paddings are zero but has inner padding.

Important: Transparent built-in styles have *glass = 1* by default which means these styles (e.g. their colors) won't be inherited by children.

The built in styles are global `lv_style_t` variables. You can use them like:

```
lv_btn_set_style(obj, LV_BTN_STYLE_REL, &lv_style_btn_rel)
```

Create new styles

You can either modify the built-in styles or can create new styles.

When creating new styles, it's recommended to first copy a built-in style with `lv_style_copy(&dest_style, &src_style)` to be sure all fields are initialized with the proper value.

Do not forget to initialize the new style as `static` or `global`. For example:

```
static lv_style_t my_red_style;
lv_style_copy(&my_red_style, &lv_style_plain);
my_red_style.body.main_color = LV_COLOR_RED;
my_red_style.body.grad_color = LV_COLOR_RED;
```

Style animations

You can change the styles with animations using `lv_style_anim_...()` function. The `lv_style_anim_set_styles()` uses 3 styles. Two styles are required to represent the *start* and *end* state, and a third style required for the *animation*.

Here is an example to show how it works.

```
lv_anim_t a;
lv_style_anim_init(&a);                                                    /*A basic␣
↪initialization*/
lv_style_anim_set_styles(&a, &style_to_anim, &style_start, &style_end); /*Set the␣
↪styles to use*/
lv_style_anim_set_time(&a, duration, delay);                              /*Set the␣
↪duration and delay*/
lv_style_anim_create(&a);                                                  /*Create the␣
↪animation*/
```

Essentially, `style_start` and `style_end` remain unchanged, and `style_to_anim` is interpolated over the course of the animation.

See `lv_core/lv_style.h` to know the whole API of style animations.

Check *Animations* for more information.

Style example

The example below demonstrates the usage of styles.

```
/*Create a style*/
static lv_style_t style1;
lv_style_copy(&style1, &lv_style_plain);    /*Copy a built-in style to initialize the␣
↪new style*/
style1.body.main_color = LV_COLOR_WHITE;
style1.body.grad_color = LV_COLOR_BLUE;
style1.body.radius = 10;
style1.body.border.color = LV_COLOR_GRAY;
style1.body.border.width = 2;
style1.body.border.opa = LV_OPA_50;
style1.body.padding.left = 5;            /*Horizontal padding, used by the bar␣
↪indicator below*/
style1.body.padding.right = 5;
style1.body.padding.top = 5;            /*Vertical padding, used by the bar indicator␣
↪below*/
style1.body.padding.bottom = 5;
style1.text.color = LV_COLOR_RED;

/*Create a simple object*/
lv_obj_t *obj1 = lv_obj_create(lv_scr_act(), NULL);
lv_obj_set_style(obj1, &style1);                        /*Apply the created style*/
lv_obj_set_pos(obj1, 20, 20);                           /*Set the position*/

/*Create a label on the object. The label's style is NULL by default*/
lv_obj_t *label = lv_label_create(obj1, NULL);
lv_obj_align(label, NULL, LV_ALIGN_CENTER, 0, 0);       /*Align the label to the␣
↪middle*/

/*Create a bar*/
lv_obj_t *bar1 = lv_bar_create(lv_scr_act(), NULL);
lv_bar_set_style(bar1, LV_BAR_STYLE_INDIC, &style1);    /*Modify the indicator's␣
↪style*/
lv_bar_set_value(bar1, 70);                             /*Set the bar's value*/
```

Themes

Creating styles for the GUI is challenging because you need a deeper understanding of the library, and you need to have some design skills. Also, it takes a lot of time to create so many styles for many different objects.

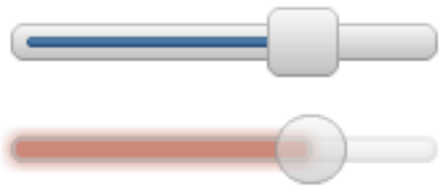
Themes are introduced to speed up the design part. A theme is a style collection which contains the required styles for every object type. For example, 5 styles for a button to describe its 5 possible states. Check the Existing themes or try some in the Live demo section. The theme selector demo is useful to see how a given theme and color hue looks on the display.

To be more specific, a theme is a structure variable that contains a lot of `lv_style_t *` fields. For buttons:

```
theme.btn.rel       /*Released button style*/
theme.btn.pr        /*Pressed button style*/
theme.btn.tgl_rel   /*Toggled released button style*/
theme.btn.tgl_pr    /*Toggled pressed button style*/
theme.btn.ina       /*Inactive button style*/
```

A theme can initialized by: `lv_theme_<name>_init(hue, font)`. Where `hue` is a Hue value from HSV color space (0..360) and `font` is the font applied in the theme (`NULL` to use the `LV_FONT_DEFAULT`)

When a theme is initialized its styles can be used like this:



```
/*Create a default slider*/
lv_obj_t *slider = lv_slider_create(lv_scr_act(), NULL);
lv_slider_set_value(slider, 70);
lv_obj_set_pos(slider, 10, 10);

/*Initialize the alien theme with a reddish hue*/
lv_theme_t *th = lv_theme_alien_init(10, NULL);

/*Create a new slider and apply the themes styles*/
slider = lv_slider_create(lv_scr_act(), NULL);
lv_slider_set_value(slider, 70);
lv_obj_set_pos(slider, 10, 50);
lv_slider_set_style(slider, LV_SLIDER_STYLE_BG, th->slider.bg);
lv_slider_set_style(slider, LV_SLIDER_STYLE_INDIC, th->slider.indic);
lv_slider_set_style(slider, LV_SLIDER_STYLE_KNOB, th->slider.knob);
```

You can ask the library to automatically apply the styles from a theme when you create new objects. To do this use `lv_theme_set_current(th)`.

```
/*Initialize the alien theme with a reddish hue*/
lv_theme_t *th = lv_theme_alien_init(10, NULL);
lv_theme_set_current(th);

/*Create a slider. It will use the style from teh current theme.*/
slider = lv_slider_create(lv_scr_act(), NULL);
```

Themes can be enabled or disabled one by one in `lv_conf.h`.

Live update

By default, if `lv_theme_set_current(th)` is called again, it won't refresh the styles of the existing objects. To enable live update of themes, enable `LV_THEME_LIVE_UPDATE` in `lv_conf.h`.

Live update will only update objects using the unchanged theme styles, i.e. objects created after the first call of `lv_theme_set_current(th)` or to which the theme's styles were applied manually.

Input devices

An input device usually means:

- Pointer-like input device like touchpad or mouse
- Keypads like a normal keyboard or simple numeric keypad
- Encoders with left/right turn and push options
- External hardware buttons which are assigned to specific points on the screen

Important: Before reading further, please read the [Porting](/porting/indev) section of Input devices

Pointers

Pointer input devices can have a cursor. (typically for mouses)

```
...
lv_indev_t * mouse_indev = lv_indev_drv_register(&indev_drv);

LV_IMG_DECLARE(mouse_cursor_icon);                          /*Declare the image file.
↪*/
lv_obj_t * cursor_obj =  lv_img_create(lv_scr_act(), NULL); /*Create an image object␣
↪for the cursor */
lv_img_set_src(cursor_obj, &mouse_cursor_icon);             /*Set the image source*/
lv_indev_set_cursor(mouse_indev, cursor_obj);               /*Connect the image ␣
↪object to the driver*/
```

Note that the cursor object should have `lv_obj_set_click(cursor_obj, false)`. For images, *clicking* is disabled by default.

Keypad and encoder

You can fully control the user interface without touchpad or mouse using a keypad or encoder(s). It works similar to the *TAB* key on the PC to select the element in an application or a web page.

Groups

The objects, you want to control with keypad or encoder, needs to be added to a *Group*. In every group, there is exactly one focused object which receives the pressed keys or the encoder actions. For example, if a *Text area* is focused and you press some letter on a keyboard, the keys will be sent and inserted into the text area. Similarly, if a *Slider* is focused and you press the left or right arrows, the slider's value will be changed.

You need to associate an input device with a group. An input device can send the keys to only one group but, a group can receive data from more than one input device too.

To create a group use `lv_group_t * g = lv_group_create()` and to add an object to the group use `lv_group_add_obj(g, obj)`.

The associate a group with an input device use `lv_indev_set_group(indev, g)`, where `indev` is the return value of `lv_indev_drv_register()`

Keys

There are some predefined keys which have special meaning:

- **LV_KEY_NEXT** Focus on the next object
- **LV_KEY_PREV** Focus on the previous object
- **LV_KEY_ENTER** Triggers `LV_EVENT_PRESSED/CLICKED/LONG_PRESSED` etc. events
- **LV_KEY_UP** Increase value or move upwards

- **LV_KEY_DOWN** Decrease value or move downwards
- **LV_KEY_RIGHT** Increase value or move the the right
- **LV_KEY_LEFT** Decrease value or move the the left
- **LV_KEY_ESC** Close or exit (E.g. close a *Drop down list*)
- **LV_KEY_DEL** Delete (E.g. a character on the right in a *Text area*)
- **LV_KEY_BACKSPACE** Delete a character on the left (E.g. in a *Text area*)
- **LV_KEY_HOME** Go to the beginning/top (E.g. in a *Text area*)
- **LV_KEY_END** Go to the end (E.g. in a *Text area*))

The most important special keys are `LV_KEY_NEXT/PREV`, `LV_KEY_ENTER` and `LV_KEY_UP/DOWN/LEFT/RIGHT`. In your `read_cb` function, you should translate some of your keys to these special keys to navigate in the group and interact with the selected object.

Usually, it's enough to use only `LV_KEY_LEFT/RIGHT` because most of the objects can be fully controlled with them.

With an encoder, you should use only `LV_KEY_LEFT`, `LV_KEY_RIGHT`, and `LV_KEY_ENTER`.

Edit and navigate mode

Since keypad has plenty of keys, it's easy to navigate between the objects and edit them using the keypad. But, the encoders have a limited number of "keys" hence, difficult to navigate using the default options. *Navigate* and *Edit* are created to avoid this problem with the encoders.

In *Navigate* mode, the encoders `LV_KEY_LEFT/RIGHT` is translated to `LV_KEY_NEXT/PREV`. Therefore the next or previous object will be selected by turning the encoder. Pressing `LV_KEY_ENTER` will change to *Edit* mode.

In *Edit* mode, `LV_KEY_NEXT/PREV` is usually used to edit the object. Depending on the object's type, a short or long press of `LV_KEY_ENTER` changes back to *Navigate* mode. Usually, an object which can not be pressed (like a *Slider*) leaves *Edit* mode on short click. But with object where short click has meaning (e.g. *Button*), long press is required.

Styling the focused object

To visually highlight the focused element, its Main style will be updated. By default, some orange color is mixed with the original colors of the style. A new style modifier callback be set by `lv_group_set_style_mod_cb(g, my_style_mod_cb)`. A style modifier callback receives a pointer to a caller group and a pointer to a style to modify. The default style modifier looks like this (slightly simplified):

```
static void default_style_mod_cb(lv_group_t * group, lv_style_t * style)
{
    /*Make the bodies a little bit orange*/
    style->body.border.opa   = LV_OPA_COVER;
    style->body.border.color = LV_COLOR_ORANGE;
    style->body.border.width = LV_DPI / 20;

    style->body.main_color   = lv_color_mix(style->body.main_color, LV_COLOR_ORANGE,␣
↪LV_OPA_70);
    style->body.grad_color   = lv_color_mix(style->body.grad_color, LV_COLOR_ORANGE,␣
↪LV_OPA_70);
```

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```
    style->body.shadow.color = lv_color_mix(style->body.shadow.color, LV_COLOR_ORANGE,
↪ LV_OPA_60);

    /*Recolor text*/
    style->text.color = lv_color_mix(style->text.color, LV_COLOR_ORANGE, LV_OPA_70);

    /*Add some recolor to the images*/
    if(style->image.intense < LV_OPA_MIN) {
        style->image.color = LV_COLOR_ORANGE;
        style->image.intense = LV_OPA_40;
    }
}
```

This style modifier callback is used for keypads and encoder in *Navigate* mode. For the *Edit* mode and other callback is used which can be set with `lv_group_set_style_mod_edit_cb()`. By default, it has a greenish color.

Live demo

Try this Live demo to see how a group and touchpad-less navigation works in the practice.

API

Input device

Functions

void **lv_indev_init**(void)
Initialize the display input device subsystem

void **lv_indev_read_task**(*lv_task_t* **task*)
Called periodically to read the input devices

Parameters

- `task`: pointer to the task itself

lv_indev_t ***lv_indev_get_act**(void)
Get the currently processed input device. Can be used in action functions too.

Return pointer to the currently processed input device or NULL if no input device processing right now

lv_indev_type_t **lv_indev_get_type**(**const** *lv_indev_t* **indev*)
Get the type of an input device

Return the type of the input device from `lv_hal_indev_type_t` (`LV_INDEV_TYPE_...`)

Parameters

- `indev`: pointer to an input device

void **lv_indev_reset**(*lv_indev_t* **indev*)
Reset one or all input devices

Parameters

- `indev`: pointer to an input device to reset or NULL to reset all of them

void **lv_indev_reset_long_press**(*lv_indev_t *indev*)
Reset the long press state of an input device

Parameters

- `indev_proc`: pointer to an input device

void **lv_indev_enable**(*lv_indev_t *indev*, bool *en*)
Enable or disable an input devices

Parameters

- `indev`: pointer to an input device
- `en`: true: enable; false: disable

void **lv_indev_set_cursor**(*lv_indev_t *indev*, *lv_obj_t *cur_obj*)
Set a cursor for a pointer input device (for LV_INPUT_TYPE_POINTER and LV_INPUT_TYPE_BUTTON)

Parameters

- `indev`: pointer to an input device
- `cur_obj`: pointer to an object to be used as cursor

void **lv_indev_set_group**(*lv_indev_t *indev*, *lv_group_t *group*)
Set a destination group for a keypad input device (for LV_INDEV_TYPE_KEYPAD)

Parameters

- `indev`: pointer to an input device
- `group`: point to a group

void **lv_indev_set_button_points**(*lv_indev_t *indev*, **const** lv_point_t *points*)
Set the an array of points for LV_INDEV_TYPE_BUTTON. These points will be assigned to the buttons to press a specific point on the screen

Parameters

- `indev`: pointer to an input device
- `group`: point to a group

void **lv_indev_get_point**(**const** *lv_indev_t *indev*, lv_point_t *point*)
Get the last point of an input device (for LV_INDEV_TYPE_POINTER and LV_INDEV_TYPE_BUTTON)

Parameters

- `indev`: pointer to an input device
- `point`: pointer to a point to store the result

uint32_t **lv_indev_get_key**(**const** *lv_indev_t *indev*)
Get the last pressed key of an input device (for LV_INDEV_TYPE_KEYPAD)

Return the last pressed key (0 on error)

Parameters

- `indev`: pointer to an input device

bool **lv_indev_is_dragging**(**const** *lv_indev_t* *indev)
Check if there is dragging with an input device or not (for LV_INDEV_TYPE_POINTER and LV_INDEV_TYPE_BUTTON)

Return true: drag is in progress

Parameters

- `indev`: pointer to an input device

void **lv_indev_get_vect**(**const** *lv_indev_t* *indev, lv_point_t *point)
Get the vector of dragging of an input device (for LV_INDEV_TYPE_POINTER and LV_INDEV_TYPE_BUTTON)

Parameters

- `indev`: pointer to an input device
- `point`: pointer to a point to store the vector

void **lv_indev_wait_release**(*lv_indev_t* *indev)
Do nothing until the next release

Parameters

- `indev`: pointer to an input device

lv_task_t ***lv_indev_get_read_task**(*lv_disp_t* *indev)
Get a pointer to the indev read task to modify its parameters with `lv_task_...` functions.

Return pointer to the indev read refresher task. (NULL on error)

Parameters

- `indev`: pointer to an inout device

lv_obj_t ***lv_indev_get_obj_act**(void)
Gets a pointer to the currently active object in indev proc functions. NULL if no object is currently being handled or if groups aren't used.

Return pointer to currently active object

Groups

Typedefs

typedef uint8_t **lv_key_t**

typedef void (***lv_group_style_mod_cb_t**)(**struct** *_lv_group_t* *, lv_style_t *)

typedef void (***lv_group_focus_cb_t**)(**struct** *_lv_group_t* *)

typedef struct *_lv_group_t* **lv_group_t**
Groups can be used to logically hold objects so that they can be individually focused. They are NOT for laying out objects on a screen (try `lv_cont` for that).

typedef uint8_t **lv_group_refocus_policy_t**

Enums

enum [anonymous]
Values:

LV_KEY_UP = 17

LV_KEY_DOWN = 18

LV_KEY_RIGHT = 19

LV_KEY_LEFT = 20

LV_KEY_ESC = 27

LV_KEY_DEL = 127

LV_KEY_BACKSPACE = 8

LV_KEY_ENTER = 10

LV_KEY_NEXT = 9

LV_KEY_PREV = 11

LV_KEY_HOME = 2

LV_KEY_END = 3

enum [anonymous]

Values:

LV_GROUP_REFOCUS_POLICY_NEXT = 0

LV_GROUP_REFOCUS_POLICY_PREV = 1

Functions

void **lv_group_init**(void)

Init. the group module

Remark Internal function, do not call directly.

lv_group_t ***lv_group_create**(void)

Create a new object group

Return pointer to the new object group

void **lv_group_del**(*lv_group_t* **group*)

Delete a group object

Parameters

- `group`: pointer to a group

void **lv_group_add_obj**(*lv_group_t* **group*, *lv_obj_t* **obj*)

Add an object to a group

Parameters

- `group`: pointer to a group
- `obj`: pointer to an object to add

void **lv_group_remove_obj**(*lv_obj_t* **obj*)

Remove an object from its group

Parameters

- `obj`: pointer to an object to remove

void **lv_group_remove_all_objs**(*lv_group_t *group*)
Remove all objects from a group

Parameters

- group: pointer to a group

void **lv_group_focus_obj**(*lv_obj_t *obj*)
Focus on an object (defocus the current)

Parameters

- obj: pointer to an object to focus on

void **lv_group_focus_next**(*lv_group_t *group*)
Focus the next object in a group (defocus the current)

Parameters

- group: pointer to a group

void **lv_group_focus_prev**(*lv_group_t *group*)
Focus the previous object in a group (defocus the current)

Parameters

- group: pointer to a group

void **lv_group_focus_freeze**(*lv_group_t *group*, bool *en*)
Do not let to change the focus from the current object

Parameters

- group: pointer to a group
- en: true: freeze, false: release freezing (normal mode)

lv_res_t **lv_group_send_data**(*lv_group_t *group*, uint32_t *c*)
Send a control character to the focuses object of a group

Return result of focused object in group.

Parameters

- group: pointer to a group
- c: a character (use LV_KEY_.. to navigate)

void **lv_group_set_style_mod_cb**(*lv_group_t *group*, *lv_group_style_mod_cb_t style_mod_cb*)
Set a function for a group which will modify the object's style if it is in focus

Parameters

- group: pointer to a group
- style_mod_cb: the style modifier function pointer

void **lv_group_set_style_mod_edit_cb**(*lv_group_t *group*, *lv_group_style_mod_cb_t style_mod_edit_cb*)
Set a function for a group which will modify the object's style if it is in focus in edit mode

Parameters

- group: pointer to a group
- style_mod_edit_cb: the style modifier function pointer

void **lv_group_set_focus_cb**(*lv_group_t *group*, *lv_group_focus_cb_t focus_cb*)
Set a function for a group which will be called when a new object is focused

Parameters

- `group`: pointer to a group
- `focus_cb`: the call back function or NULL if unused

void **lv_group_set_refocus_policy**(*lv_group_t *group*, *lv_group_refocus_policy_t policy*)
Set whether the next or previous item in a group is focused if the currently focussed obj is deleted.

Parameters

- `group`: pointer to a group
- `new`: refocus policy enum

void **lv_group_set_editing**(*lv_group_t *group*, bool *edit*)
Manually set the current mode (edit or navigate).

Parameters

- `group`: pointer to group
- `edit`: true: edit mode; false: navigate mode

void **lv_group_set_click_focus**(*lv_group_t *group*, bool *en*)
Set the `click_focus` attribute. If enabled then the object will be focused then it is clicked.

Parameters

- `group`: pointer to group
- `en`: true: enable `click_focus`

void **lv_group_set_wrap**(*lv_group_t *group*, bool *en*)
Set whether focus next/prev will allow wrapping from first->last or last->first object.

Parameters

- `group`: pointer to group
- `en`: true: wrapping enabled; false: wrapping disabled

lv_style_t ***lv_group_mod_style**(*lv_group_t *group*, **const** lv_style_t *style*)
Modify a style with the set 'style_mod' function. The input style remains unchanged.

Return a copy of the input style but modified with the 'style_mod' function

Parameters

- `group`: pointer to group
- `style`: pointer to a style to modify

lv_obj_t ***lv_group_get_focused**(**const** *lv_group_t *group*)
Get the focused object or NULL if there isn't one

Return pointer to the focused object

Parameters

- `group`: pointer to a group

lv_group_user_data_t ***lv_group_get_user_data**(*lv_group_t *group*)
Get a pointer to the group's user data

Return pointer to the user data

Parameters

- `group`: pointer to an group

lv_group_style_mod_cb_t **lv_group_get_style_mod_cb(const** *lv_group_t *group*)
Get a the style modifier function of a group

Return pointer to the style modifier function

Parameters

- `group`: pointer to a group

lv_group_style_mod_cb_t **lv_group_get_style_mod_edit_cb(const** *lv_group_t *group*)
Get a the style modifier function of a group in edit mode

Return pointer to the style modifier function

Parameters

- `group`: pointer to a group

lv_group_focus_cb_t **lv_group_get_focus_cb(const** *lv_group_t *group*)
Get the focus callback function of a group

Return the call back function or NULL if not set

Parameters

- `group`: pointer to a group

bool **lv_group_get_editing(const** *lv_group_t *group*)
Get the current mode (edit or navigate).

Return true: edit mode; false: navigate mode

Parameters

- `group`: pointer to group

bool **lv_group_get_click_focus(const** *lv_group_t *group*)
Get the `click_focus` attribute.

Return true: `click_focus` is enabled; false: disabled

Parameters

- `group`: pointer to group

bool **lv_group_get_wrap(***lv_group_t *group*)
Get whether focus next/prev will allow wrapping from first->last or last->first object.

Parameters

- `group`: pointer to group
- `en`: true: wrapping enabled; false: wrapping disabled

void **lv_group_report_style_mod(***lv_group_t *group*)
Notify the group that current theme changed and style modification callbacks need to be refreshed.

Parameters

- `group`: pointer to group. If NULL then all groups are notified.

struct _lv_group_t
#include <lv_group.h> Groups can be used to logically hold objects so that they can be individually focused. They are NOT for laying out objects on a screen (try `lv_cont` for that).

Public Members

lv_ll_t **obj_ll**
Linked list to store the objects in the group

lv_obj_t ****obj_focus**
The object in focus

lv_group_style_mod_cb_t **style_mod_cb**
A function to modifies the style of the focused object

lv_group_style_mod_cb_t **style_mod_edit_cb**
A function which modifies the style of the edited object

lv_group_focus_cb_t **focus_cb**
A function to call when a new object is focused (optional)

lv_style_t **style_tmp**
Stores the modified style of the focused object

lv_group_user_data_t **user_data**

uint8_t **frozen**
1: can't focus to new object

uint8_t **editing**
1: Edit mode, 0: Navigate mode

uint8_t **click_focus**
1: If an object in a group is clicked by an indev then it will be focused

uint8_t **refocus_policy**
1: Focus prev if focused on deletion. 0: Focus next if focused on deletion.

uint8_t **wrap**
1: Focus next/prev can wrap at end of list. 0: Focus next/prev stops at end of list.

Displays

Important: The basic concept of *display* in LittlevGL is explained in the [Porting](/porting/display) section. So before reading further, please read the [Porting](/porting/display) section first.

In LittlevGL, you can have multiple displays, each with their own driver and objects.

Creating more displays is easy: just initialize more display buffers and register another driver for every display. When you create the UI, use `lv_disp_set_default(disp)` to tell the library which display to create objects on.

Why would you want multi-display support? Here are some examples:

- Have a "normal" TFT display with local UI and create "virtual" screens on VNC on demand. (You need to add your VNC driver).
- Have a large TFT display and a small monochrome display.
- Have some smaller and simple displays in a large instrument or technology.
- Have two large TFT displays: one for a customer and one for the shop assistant.

Using only one display

Using more displays can be useful, but in most cases, it's not required. Therefore, the whole concept of multi-display is completely hidden if you register only one display. By default, the lastly created (the only one) display is used as default.

`lv_scr_act()`, `lv_scr_load(scr)`, `lv_layer_top()`, `lv_layer_sys()`, `LV_HOR_RES` and `LV_VER_RES` are always applied on the lastly created (default) screen. If you pass `NULL` as `disp` parameter to display related function, usually the default display will be used. E.g. `lv_disp_trig_activity(NULL)` will trigger a user activity on the default screen. (See below in *Inactivity*).

Mirror display

To mirror the image of the display to another display, you don't need to use the multi-display support. Just transfer the buffer received in `drv.flush_cb` to another display too.

Split image

You can create a larger display from smaller ones. You can create it as below:

1. Set the resolution of the displays to the large display's resolution.
2. In `drv.flush_cb`, truncate and modify the `area` parameter for each display.
3. Send the buffer's content to each display with the truncated area.

Screens

Every display has each set of Screens and the object on the screens.

Be sure not to confuse displays and screens:

- **Displays** are the physical hardware drawing the pixels.
- **Screens** are the high-level root objects associated with a particular display. One display can have multiple screens associated with it, but not vice versa.

Screens can be considered the highest level containers which have no parent. The screen's size is always equal to its display and size their position is (0;0). Therefore, the screens coordinates can't be changed, i.e. `lv_obj_set_pos()`, `lv_obj_set_size()` or similar functions can't be used on screens.

A screen can be created from any object type but, the two most typical types are the *Base object* and the *Image* (to create a wallpaper).

To create a screen, use `lv_obj_t * scr = lv_<type>_create(NULL, copy)`. `copy` can be an other screen to copy it.

To load a screen, use `lv_scr_load(scr)`. To get the active screen, use `lv_scr_act()`. These functions works on the default display. If you want to to specify which display to work on, use `lv_disp_get_scr_act(disp)` and `lv_disp_load_scr(disp, scr)`.

Screens can be deleted with `lv_obj_del(scr)`, but ensure that you do not delete the currently loaded screen.

Opaque screen

Usually, the opacity of the screen is `LV_OPA_COVER` to provide a solid background for its children.

However, in some special cases, you might want a transparent screen. For example, if you have a video player that renders video frames on a lower layer, you want to create an OSD menu on the upper layer (over the video) using LittlevGL.

To do this, the screen should have a style that sets `body.opa` or `image.opa` to `LV_OPA_TRANSP` (or another non-opaque value) to make the screen opaque.

Also, `LV_COLOR_SCREEN_TRANSP` needs to be enabled. Please note that it only works with `LV_COLOR_DEPTH = 32`.

The Alpha channel of 32-bit colors will be 0 where there are no objects and will be 255 where there are solid objects.

Features of displays

Inactivity

The user's inactivity is measured on each display. Every use of an *Input device* (if associated with the display) counts as an activity. To get time elapsed since the last activity, use `lv_disp_get_inactive_time(disp)`. If `NULL` is passed, the overall smallest inactivity time will be returned from all displays (**not the default display**).

You can manually trigger an activity using `lv_disp_trig_activity(disp)`. If `disp` is `NULL`, the default screen will be used (**and not all displays**).

Colors

The color module handles all color-related functions like changing color depth, creating colors from hex code, converting between color depths, mixing colors, etc.

The following variable types are defined by the color module:

- **lv_color1_t** Store monochrome color. For compatibility, it also has R, G, B fields but they are always the same value (1 byte)
- **lv_color8_t** A structure to store R (3 bit),G (3 bit),B (2 bit) components for 8-bit colors (1 byte)
- **lv_color16_t** A structure to store R (5 bit),G (6 bit),B (5 bit) components for 16-bit colors (2 byte)
- **lv_color32_t** A structure to store R (8 bit),G (8 bit), B (8 bit) components for 24-bit colors (4 byte)
- **lv_color_t** Equal to `lv_color1/8/16/24_t` according to color depth settings
- **lv_color_int_t** `uint8_t`, `uint16_t` or `uint32_t` according to color depth setting. Used to build color arrays from plain numbers.
- **lv_opa_t** A simple `uint8_t` type to describe opacity.

The `lv_color_t`, `lv_color1_t`, `lv_color8_t`, `lv_color16_t` and `lv_color32_t` types have got four fields:

- **ch.red** red channel
- **ch.green** green channel
- **ch.blue** blue channel

- **full** red + green + blue as one number

You can set the current color depth in *lv_conf.h*, by setting the `LV_COLOR_DEPTH` define to 1 (monochrome), 8, 16 or 32.

Convert color

You can convert a color from the current color depth to another. The converter functions return with a number, so you have to use the `full` field:

```
lv_color_t c;
c.red   = 0x38;
c.green = 0x70;
c.blue  = 0xCC;

lv_color1_t c1;
c1.full = lv_color_to1(c);        /*Return 1 for light colors, 0 for dark colors*/

lv_color8_t c8;
c8.full = lv_color_to8(c);        /*Give a 8 bit number with the converted color*/

lv_color16_t c16;
c16.full = lv_color_to16(c); /*Give a 16 bit number with the converted color*/

lv_color32_t c24;
c32.full = lv_color_to32(c);        /*Give a 32 bit number with the converted color*/
```

Swap 16 colors

You may set `LV_COLOR_16_SWAP` in *lv_conf.h* to swap the bytes of *RGB565* colors. It's useful if you send the 16-bit colors via a byte-oriented interface like SPI.

As 16-bit numbers are stored in Little Endian format (lower byte on the lower address), the interface will send the lower byte first. However, displays usually need the higher byte first. A mismatch in the byte order will result in highly distorted colors.

Create and mix colors

You can create colors with the current color depth using the LV_COLOR_MAKE macro. It takes 3 arguments (red, green, blue) as 8-bit numbers. For example to create light red color: `my_color = COLOR_MAKE(0xFF,0x80,0x80)`.

Colors can be created from HEX codes too: `my_color = lv_color_hex(0x288ACF)` or `my_color = lv_folro_hex3(0x28C)`.

Mixing two colors is possible with `mixed_color = lv_color_mix(color1, color2, ratio)`. Ration can be 0..255. 0 results fully color2, 255 result fully color1.

Colors can be created with from HSV space too using `lv_color_hsv_to_rgb(hue, saturation, value)` . `hue` should be in 0..360 range, `saturation` and `value` in 0..100 range.

Opacity

To describe opacity the `lv_opa_t` type is created as a wrapper to `uint8_t`. Some defines are also introduced:

- **LV_OPA_TRANSP** Value: 0, means the opacity makes the color completely transparent
- **LV_OPA_10** Value: 25, means the color covers only a little
- **LV_OPA_20 ... OPA_80** come logically
- **LV_OPA_90** Value: 229, means the color near completely covers
- **LV_OPA_COVER** Value: 255, means the color completely covers

You can also use the `LV_OPA_*` defines in `lv_color_mix()` as a *ratio*.

Built-in colors

The color module defines the most basic colors such as:

- #FFFFFF `LV_COLOR_WHITE`
- #000000 `LV_COLOR_BLACK`
- #808080 `LV_COLOR_GRAY`
- #c0c0c0 `LV_COLOR_SILVER`
- #ff0000 `LV_COLOR_RED`
- #800000 `LV_COLOR_MAROON`
- #00ff00 `LV_COLOR_LIME`
- #008000 `LV_COLOR_GREEN`
- #808000 `LV_COLOR_OLIVE`
- #0000ff `LV_COLOR_BLUE`
- #000080 `LV_COLOR_NAVY`
- #008080 `LV_COLOR_TAIL`
- #00ffff `LV_COLOR_CYAN`
- #00ffff `LV_COLOR_AQUA`
- #800080 `LV_COLOR_PURPLE`
- #ff00ff `LV_COLOR_MAGENTA`
- #ffa500 `LV_COLOR_ORANGE`
- #ffff00 `LV_COLOR_YELLOW`

as well as `LV_COLOR_WHITE` (fully white).

API

Display

Functions

lv_obj_t ***lv_disp_get_scr_act**(*lv_disp_t *disp*)
Return with a pointer to the active screen

Return pointer to the active screen object (loaded by 'lv_scr_load()')

Parameters

- `disp`: pointer to display which active screen should be get. (NULL to use the default screen)

void **lv_disp_load_scr**(*lv_obj_t *scr*)
Make a screen active

Parameters

- `scr`: pointer to a screen

lv_obj_t ***lv_disp_get_layer_top**(*lv_disp_t *disp*)
Return with the top layer. (Same on every screen and it is above the normal screen layer)

Return pointer to the top layer object (transparent screen sized lv_obj)

Parameters

- `disp`: pointer to display which top layer should be get. (NULL to use the default screen)

lv_obj_t ***lv_disp_get_layer_sys**(*lv_disp_t *disp*)
Return with the sys. layer. (Same on every screen and it is above the normal screen and the top layer)

Return pointer to the sys layer object (transparent screen sized lv_obj)

Parameters

- `disp`: pointer to display which sys. layer should be get. (NULL to use the default screen)

void **lv_disp_assign_screen**(*lv_disp_t *disp*, *lv_obj_t *scr*)
Assign a screen to a display.

Parameters

- `disp`: pointer to a display where to assign the screen
- `scr`: pointer to a screen object to assign

lv_task_t ***lv_disp_get_refr_task**(*lv_disp_t *disp*)
Get a pointer to the screen refresher task to modify its parameters with `lv_task_...` functions.

Return pointer to the display refresher task. (NULL on error)

Parameters

- `disp`: pointer to a display

uint32_t **lv_disp_get_inactive_time**(**const** *lv_disp_t *disp*)
Get elapsed time since last user activity on a display (e.g. click)

Return elapsed ticks (milliseconds) since the last activity

Parameters

- `disp`: pointer to an display (NULL to get the overall smallest inactivity)

void **lv_disp_trig_activity**(*lv_disp_t* **disp*)
Manually trigger an activity on a display

Parameters

- `disp`: pointer to an display (NULL to use the default display)

static *lv_obj_t* ***lv_scr_act**(void)
Get the active screen of the default display

Return pointer to the active screen

static *lv_obj_t* ***lv_layer_top**(void)
Get the top layer of the default display

Return pointer to the top layer

static *lv_obj_t* ***lv_layer_sys**(void)
Get the active screen of the deafult display

Return pointer to the sys layer

static void **lv_scr_load**(*lv_obj_t* **scr*)

Colors

Typedefs

typedef uint32_t **lv_color_int_t**

typedef *lv_color32_t* **lv_color_t**

typedef uint8_t **lv_opa_t**

Enums

enum [anonymous]
Opacity percentages.

Values:

LV_OPA_TRANSP = 0

LV_OPA_0 = 0

LV_OPA_10 = 25

LV_OPA_20 = 51

LV_OPA_30 = 76

LV_OPA_40 = 102

LV_OPA_50 = 127

LV_OPA_60 = 153

LV_OPA_70 = 178

LV_OPA_80 = 204

LV_OPA_90 = 229

LV_OPA_100 = 255

LV_OPA_COVER = 255

Functions

static uint8_t **lv_color_to1**(*lv_color_t color*)

union lv_color1_t

Public Members

uint8_t **blue**

uint8_t **green**

uint8_t **red**

uint8_t **full**

union lv_color8_t

Public Members

uint8_t **blue**

uint8_t **green**

uint8_t **red**

struct *lv_color8_t*::[anonymous] **ch**

uint8_t **full**

union lv_color16_t

Public Members

uint16_t **blue**

uint16_t **green**

uint16_t **red**

uint16_t **green_h**

uint16_t **green_l**

struct *lv_color16_t*::[anonymous] **ch**

uint16_t **full**

union lv_color32_t

Public Members

uint8_t **blue**

uint8_t **green**

uint8_t **red**

uint8_t **alpha**

struct *lv_color32_t*::[**anonymous**] **ch**

uint32_t **full**

struct lv_color_hsv_t

Public Members

uint16_t **h**

uint8_t **s**

uint8_t **v**

Fonts

In LittlevGL fonts are collections of bitmaps and other information required to render the images of the letters (glyph). A font is stored in a **lv_font_t** variable and can be set in style's *text.font* field. For example:

```
my_style.text.font = &lv_font_roboto_28;  /*Set a larger font*/
```

The fonts have a **bpp (bits per pixel)** property. It shows how many bits are used to describe a pixel in the font. The value stored for a pixel determines the pixel's opacity. This way, with higher *bpp*, the edges of the letter can be smoother. The possible *bpp* values are 1, 2, 4 and 8 (higher value means better quality).

The *bpp* also affects the required memory size to store the font. For example, *bpp = 4* makes the font nearly 4 times greater compared to *bpp = 1*.

Unicode support

LittlevGL supports **UTF-8** encoded Unicode characters. You need to configure your editor to save your code/text as UTF-8 (usually this the default) and be sure that, `LV_TXT_ENC` is set to `LV_TXT_ENC_UTF8` in *lv_conf.h*. (This is the default value)

To test it try

```
lv_obj_t * label1 = lv_label_create(lv_scr_act(), NULL);
lv_label_set_text(label1, LV_SYMBOL_OK);
```

If all works well, a ✓ character should be displayed.

Built-in fonts

There are several built-in fonts in different sizes, which can be enabled in lv_conf.h by *LV_FONT_...* defines:

- `LV_FONT_ROBOTO_12` 12 px
- `LV_FONT_ROBOTO_16` 16 px
- `LV_FONT_ROBOTO_22` 22 px
- `LV_FONT_ROBOTO_28` 28 px

The built-in fonts are **global variables** with names like `lv_font_roboto_16` for 16 px hight font. To use them in a style, just add a pointer to a font variable like shown above.

The built-in fonts have *bpp = 4*, contains the ASCII characters and uses the Roboto font.

In addition to the ASCII range, the following symbols are also added to the built-in fonts from the FontAwesome font.

LV_SYMBOL_AUDIO
LV_SYMBOL_VIDEO
LV_SYMBOL_LIST
LV_SYMBOL_OK
LV_SYMBOL_CLOSE
LV_SYMBOL_POWER
LV_SYMBOL_SETTINGS
LV_SYMBOL_TRASH
LV_SYMBOL_HOME
LV_SYMBOL_DOWNLOAD
LV_SYMBOL_DRIVE
LV_SYMBOL_REFRESH
LV_SYMBOL_MUTE
LV_SYMBOL_VOLUME_MID
LV_SYMBOL_VOLUME_MAX
LV_SYMBOL_IMAGE
LV_SYMBOL_EDIT
LV_SYMBOL_PREV
LV_SYMBOL_PLAY
LV_SYMBOL_PAUSE
LV_SYMBOL_STOP
LV_SYMBOL_NEXT
LV_SYMBOL_EJECT
LV_SYMBOL_LEFT
LV_SYMBOL_RIGHT
LV_SYMBOL_PLUS
LV_SYMBOL_MINUS
LV_SYMBOL_WARNING
LV_SYMBOL_SHUFFLE
LV_SYMBOL_UP
LV_SYMBOL_DOWN
LV_SYMBOL_LOOP
LV_SYMBOL_DIRECTORY
LV_SYMBOL_UPLOAD
LV_SYMBOL_CALL
LV_SYMBOL_CUT
LV_SYMBOL_COPY
LV_SYMBOL_SAVE
LV_SYMBOL_CHARGE
LV_SYMBOL_BELL
LV_SYMBOL_KEYBOARD
LV_SYMBOL_GPS
LV_SYMBOL_FILE
LV_SYMBOL_WIFI
LV_SYMBOL_BATTERY_FULL
LV_SYMBOL_BATTERY_3
LV_SYMBOL_BATTERY_2
LV_SYMBOL_BATTERY_1
LV_SYMBOL_BATTERY_EMPTY
LV_SYMBOL_BLUETOOTH

The symbols can be used as:

```
lv_label_set_text(my_label, LV_SYMBOL_OK);
```

Or with together with strings:

```
lv_label_set_text(my_label, LV_SYMBOL_OK "Apply");
```

Or more symbols together:

```
lv_label_set_text(my_label, LV_SYMBOL_OK LV_SYMBOL_WIFI LV_SYMBOL_PLAY);
```

Add new font

There are several ways to add a new font to your project:

1. The simplest method is to use the Online font converter. Just set the parameters, click the *Convert* button, copy the font to your project and use it. **Be sure to carefully read the steps provided on that site or you will get an error while converting.**
2. Use the Offline font converter. (Requires Node.js to be installed)
3. If you want to create something like the built-in fonts (Roboto font and symbols) but in different size and/or ranges, you can use the `built_in_font_gen.py` script in `lvgl/scripts/built_in_font` folder. (It requires Python and `lv_font_conv` to be installed)

To declare the font in a file, use `LV_FONT_DECLARE(my_font_name)`.

To make the fonts globally available (like the builtin fonts), add them to `LV_FONT_CUSTOM_DECLARE` in *lv_conf.h*.

Add new symbols

The built-in symbols are created from FontAwesome font. To add new symbols from the FontAwesome font do the following steps:

1. Search symbol on https://fontawesome.com. For example the USB symbol
2. Open the Online font converter add FontAwesome.ttf and add the Unicode ID of the symbol to the range field. E.g. `0xf287` for the USB symbol. More symbols can be enumerated with `,`.
3. Convert the font and copy it to your project.
4. Convert the Unicode value to UTF8. You can do it e.g.on this site. For `0xf287` the *Hex UTF-8 bytes* are `EF 8A 87`.
5. Create a `define` from the UTF8 values: `#define MY_USB_SYMBOL "\xEF\x8A\x87"`
6. Use the symbol as the built-in symbols. `lv_label_set_text(label, MY_USB_SYMBOL)`

Add a new font engine

LittlevGL's font interface is designed to be very flexible. You don't need to use LittlevGL's internal font engine but, you can add your own. For example, use FreeType to real-time render glyphs from TTF fonts or use an external flash to store the font's bitmap and read them when the library needs them.

To do this a custom `lv_font_t` variable needs to be created:

```
/*Describe the properties of a font*/
lv_font_t my_font;
my_font.get_glyph_dsc = my_get_glyph_dsc_cb;        /*Set a callback to get info␣
↪about gylphs*/
my_font.get_glyph_bitmap = my_get_glyph_bitmap_cb;  /*Set a callback to get bitmap of␣
↪a glyp*/
my_font.line_height = height;                       /*The real line height where any␣
↪text fits*/
my_font.base_line = base_line;                      /*Base line measured from the top␣
↪of line_height*/
my_font.dsc = something_required;                   /*Store any implementation␣
↪specific data here*/
my_font.user_data = user_data;                      /*Optionally some extra user␣
↪data*/

...

/* Get info about glyph of `unicode_letter` in `font` font.
 * Store the result in `dsc_out`.
 * The next letter (`unicode_letter_next`) might be used to calculate the width␣
↪required by this glyph (kerning)
 */
bool my_get_glyph_dsc_cb(const lv_font_t * font, lv_font_glyph_dsc_t * dsc_out,␣
↪uint32_t unicode_letter, uint32_t unicode_letter_next)
{
    /*Your code here*/

    /* Store the result.
     * For example ...
     */
    dsc_out->adv_w = 12;        /*Horizontal space required by the glyph in [px]*/
    dsc_out->box_h = 8;         /*Height of the bitmap in [px]*/
    dsc_out->box_w = 6;         /*Width of the bitmap in [px]*/
    dsc_out->ofs_x = 0;         /*X offset of the bitmap in [pf]*/
    dsc_out->ofs_y = 3;         /*Y offset of the bitmap measured from the as line*/
    dsc_out->bpp   = 2;         /*Bits per pixel: 1/2/4/8*/

    return true;                /*true: glyph found; false: glyph was not found*/
}


/* Get the bitmap of `unicode_letter` from `font`. */
const uint8_t * my_get_glyph_bitmap_cb(const lv_font_t * font, uint32_t unicode_
↪letter)
{
    /* Your code here */

    /* The bitmap should be a continuous bitstream where
     * each pixel is represented by `bpp` bits */

    return bitmap;    /*Or NULL if not found*/
}
```

An image can be a file or variable which stores the bitmap itself and some metadata.

- (RAM ROM)
- as a file

The images stored internally in a variable is composed mainly of an `lv_img_dsc_t` structure with the following fields:

- **header**
  - *cf*
  - *w* (<= 2048)
  - *h* (<= 2048)
  - *always zero* 3 bits which need to be always zero
  - *reserved* reserved for future use
- **data** pointer to an array where the image itself is stored
- **data_size** length of `data` in bytes

These are usually stored within a project as C files. They are linked into the resulting executable like any other constant data.

Files

To deal with files you need to add a *Drive* to LittlevGL. In short, a *Drive* is a collection of functions (*open*, *read*, *close*, etc.) registered in LittlevGL to make file operations. You can add an interface to a standard file system (FAT32 on SD card) or you create your simple file system to read data from an SPI Flash memory. In every case, a *Drive* is just an abstraction to read and/or write data to a memory. See the *File system* section to learn more.

Images stored as files are not linked into the resulting executable, and must be read to RAM before being drawn. As a result, they are not as resource-friendly as variable images. However, they are easier to replace without needing to recompile the main program.

Color formats

Various built-in color formats are supported:

- **LV_IMG_CF_TRUE_COLOR** Simply stores the RGB colors (in whatever color depth LittlevGL is configured for).
- **LV_IMG_CF_TRUE_COLOR_ALPHA** Like `LV_IMG_CF_TRUE_COLOR` but it also adds an alpha (transparency) byte for every pixel.
- **LV_IMG_CF_TRUE_COLOR_CHROMA_KEYED** Like `LV_IMG_CF_TRUE_COLOR` but if a pixel has `LV_COLOR_TRANSP` (set in *lv_conf.h*) color the pixel will be transparent.
- **LV_IMG_CF_INDEXED_1/2/4/8BIT** Uses a palette with 2, 4, 16 or 256 colors and stores each pixel in 1, 2, 4 or 8 bits.

- **LV_IMG_CF_ALPHA_1/2/4/8BIT Only stores the Alpha value on 1, 2, 4 or 8 bits.** The pixels take the color of `style.image.color` and the set opacity. The source image has to be an alpha channel. This is ideal for bitmaps similar to fonts (where the whole image is one color but you'd like to be able to change it).

The bytes of the `LV_IMG_CF_TRUE_COLOR` images are stored in the following order.

For 32-bit color depth:

- Byte 0: Blue
- Byte 1: Green
- Byte 2: Red
- Byte 3: Alpha

For 16-bit color depth:

- Byte 0: Green 3 lower bit, Blue 5 bit
- Byte 1: Red 5 bit, Green 3 higher bit
- Byte 2: Alpha byte (only with LV_IMG_CF_TRUE_COLOR_ALPHA)

For 8-bit color depth:

- Byte 0: Red 3 bit, Green 3 bit, Blue 2 bit
- Byte 2: Alpha byte (only with LV_IMG_CF_TRUE_COLOR_ALPHA)

You can store images in a *Raw* format to indicate that, it's not a built-in color format and an external *Image decoder* needs to be used to decode the image.

- **LV_IMG_CF_RAW** Indicates a basic raw image (e.g. a PNG or JPG image).
- **LV_IMG_CF_RAW_ALPHA** Indicates that the image has alpha and an alpha byte is added for every pixel.
- **LV_IMG_CF_RAW_CHROME_KEYED** Indicates that the image is chrome keyed as described in `LV_IMG_CF_TRUE_COLOR_CHROMA_KEYED` above.

Add and use images

You can add images to LittlevGL in two ways:

- using the online converter
- manually create images

Online converter

The online Image converter is available here: https://littlevgl.com/image-to-c-array

Adding an image to LittlevGL via online converter is easy.

1. You need to select a *BMP*, *PNG* or *JPG* image first.
2. Give the image a name that will be used within LittlevGL.
3. Select the *Color format*.

4. Select the type of image you want. Choosing a binary will generate a `.bin` file that must be stored separately and read using the *file support*. Choosing a variable will generate a standard C file that can be linked into your project.
5. Hit the *Convert* button. Once the conversion is finished, your browser will automatically download the resulting file.

In the converter C arrays (variables), the bitmaps for all the color depths (1, 8, 16 or 32) are included in the C file, but only the color depth that matches `LV_COLOR_DEPTH` in *lv_conf.h* will actually be linked into the resulting executable.

In case of binary files, you need to specify the color format you want:

- RGB332 for 8-bit color depth
- RGB565 for 16-bit color depth
- RGB565 Swap for 16-bit color depth (two bytes are swapped)
- RGB888 for 32-bit color depth

Manually create an image

If you are generating an image at run-time, you can craft an image variable to display it using LittlevGL. For example:

```
uint8_t my_img_data[] = {0x00, 0x01, 0x02, ...};

static lv_img_dsc_t my_img_dsc = {
    .header.always_zero = 0,
    .header.w = 80,
    .header.h = 60,
    .data_size = 80 * 60 * LV_COLOR_DEPTH / 8,
    .header.cf = LV_IMG_CF_TRUE_COLOR,          /*Set the color format*/
    .data = my_img_data,
};
```

If the color format is `LV_IMG_CF_TRUE_COLOR_ALPHA` you can set `data_size` like `80 * 60 * LV_IMG_PX_SIZE_ALPHA_BYTE`.

Another (possibly simpler) option to create and display an image at run-time is to use the *Canvas* object.

Use images

The simplest way to use an image in LittlevGL is to display it with an *lv_img* object:

```
lv_obj_t * icon = lv_img_create(lv_scr_act(), NULL);

/*From variable*/
lv_img_set_src(icon, &my_icon_dsc);

/*From file*/
lv_img_set_src(icon, "S:my_icon.bin");
```

If the image was converted with the online converter, you should use `LV_IMG_DECLARE(my_icon_dsc)` to declare the image in the file where you want to use it.

Image decoder

As you can see in the *Color formats* section, LittlevGL supports several built-in image formats. In many cases, these will be all you need. LittlevGL doesn't directly support, however, generic image formats like PNG or JPG.

To handle non-built-in image formats, you need to use external libraries and attach them to LittlevGL via the *Image decoder* interface.

The image decoder consists of 4 callbacks:

- **info** get some basic info about the image (width, height and color format).
- **open** open the image: either store the decoded image or set it to `NULL` to indicate the image can be read line-by-line.
- **read** if *open* didn't fully open the image this function should give some decoded data (max 1 line) from a given position.
- **close** close the opened image, free the allocated resources.

You can add any number of image decoders. When an image needs to be drawn, the library will try all the registered image decoder until finding one which can open the image, i.e. knowing that format.

The `LV_IMG_CF_TRUE_COLOR_...`, `LV_IMG_INDEXED_...` and `LV_IMG_ALPHA_...` formats (essentially, all non-`RAW` formats) are understood by the built-in decoder.

Custom image formats

The easiest way to create a custom image is to use the online image converter and set `Raw`, `Raw with alpha` or `Raw with chrome keyed` format. It will just take every byte of the binary file you uploaded and write it as the image "bitmap". You then need to attach an image decoder that will parse that bitmap and generate the real, renderable bitmap.

`header.cf` will be `LV_IMG_CF_RAW`, `LV_IMG_CF_RAW_ALPHA` or `LV_IMG_CF_RAW_CHROME_KEYED` accordingly. You should choose the correct format according to your needs: fully opaque image, use alpha channel or use chroma keying.

After decoding, the *raw* formats are considered *True color* by the library. In other words, the image decoder must decode the *Raw* images to *True color* according to the format described in [#color-formats](Color formats) section.

If you want to create a custom image, you should use `LV_IMG_CF_USER_ENCODED_0..7` color formats. However, the library can draw the images only in *True color* format (or *Raw* but finally it's supposed to be in *True color* format). So the `LV_IMG_CF_USER_ENCODED_...` formats are not known by the library, therefore, they should be decoded to one of the known formats from [#color-formats](Color formats) section. It's possible to decode the image to a non-true color format first, for example, `LV_IMG_INDEXED_4BITS`, and then call the built-in decoder functions to convert it to *True color*.

With *User encoded* formats, the color format in the open function (`dsc->header.cf`) should be changed according to the new format.

Register an image decoder

Here's an example of getting LittlevGL to work with PNG images.

First, you need to create a new image decoder and set some functions to open/close the PNG files. It should looks like this:

```
/*Create a new decoder and register functions */
lv_img_decoder_t * dec = lv_img_decoder_create();
lv_img_decoder_set_info_cb(dec, decoder_info);
lv_img_decoder_set_open_cb(dec, decoder_open);
lv_img_decoder_set_close_cb(dec, decoder_close);


/**
 * Get info about a PNG image
 * @param decoder pointer to the decoder where this function belongs
 * @param src can be file name or pointer to a C array
 * @param header store the info here
 * @return LV_RES_OK: no error; LV_RES_INV: can't get the info
 */
static lv_res_t decoder_info(lv_img_decoder_t * decoder, const void * src, lv_img_
↪header_t * header)
{
  /*Check whether the type `src` is known by the decoder*/
  if(is_png(src) == false) return LV_RES_INV;

  /* Read the PNG header and find `width` and `height` */
  ...

  header->cf = LV_IMG_CF_RAW_ALPHA;
  header->w = width;
  header->h = height;
}

/**
 * Open a PNG image and return the decided image
 * @param decoder pointer to the decoder where this function belongs
 * @param dsc pointer to a descriptor which describes this decoding session
 * @return LV_RES_OK: no error; LV_RES_INV: can't get the info
 */
static lv_res_t decoder_open(lv_img_decoder_t * decoder, lv_img_decoder_dsc_t * dsc)
{

  /*Check whether the type `src` is known by the decoder*/
  if(is_png(src) == false) return LV_RES_INV;

  /*Decode and store the image. If `dsc->img_data` is `NULL`, the `read_line`␣
↪function will be called to get the image data line-by-line*/
  dsc->img_data = my_png_decoder(src);

  /*Change the color format if required. For PNG usually 'Raw' is fine*/
  dsc->header.cf = LV_IMG_CF_...

  /*Call a built in decoder function if required. It's not required if`my_png_
↪decoder` opened the image in true color format.*/
  lv_res_t res = lv_img_decoder_built_in_open(decoder, dsc);

  return res;
}

/**
 * Decode `len` pixels starting from the given `x`, `y` coordinates and store them in␣
↪`buf`.
```

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```
 * Required only if the "open" function can't open the whole decoded pixel array.␣
↪(dsc->img_data == NULL)
 * @param decoder pointer to the decoder the function associated with
 * @param dsc pointer to decoder descriptor
 * @param x start x coordinate
 * @param y start y coordinate
 * @param len number of pixels to decode
 * @param buf a buffer to store the decoded pixels
 * @return LV_RES_OK: ok; LV_RES_INV: failed
 */
lv_res_t decoder_built_in_read_line(lv_img_decoder_t * decoder, lv_img_decoder_dsc_t␣
↪* dsc, lv_coord_t x,
                                                lv_coord_t y, lv_coord_t len, uint8_
↪t * buf)
{
   /*With PNG it's usually not required*/

   /*Copy `len` pixels from `x` and `y` coordinates in True color format to `buf` */

}

/**
 * Free the allocated resources
 * @param decoder pointer to the decoder where this function belongs
 * @param dsc pointer to a descriptor which describes this decoding session
 */
static void decoder_close(lv_img_decoder_t * decoder, lv_img_decoder_dsc_t * dsc)
{
  /*Free all allocated data*/

  /*Call the built-in close function if the built-in open/read_line was used*/
  lv_img_decoder_built_in_close(decoder, dsc);

}
```

So in summary:

- In `decoder_info`, you should collect some basic information about the image and store it in `header`.
- In `decoder_open`, you should try to open the image source pointed by `dsc->src`. Its type is already in `dsc->src_type == LV_IMG_SRC_FILE/VARIABLE`. If this format/type is not supported by the decoder, return `LV_RES_INV`. However, if you can open the image, a pointer to the decoded *True color* image should be set in `dsc->img_data`. If the format is known but, you don't want to decode while image (e.g. no memory for it) set `dsc->img_data = NULL` to call `read_line` to get the pixels.
- In `decoder_close` you should free all the allocated resources.
- `decoder_read` is optional. Decoding the whole image requires extra memory and some computational overhead. However, if can decode one line of the image without decoding the whole image, you can save memory and time. To indicate that, the *line read* function should be used, set `dsc->img_data = NULL` in the open function.

Manually use an image decoder

LittlevGL will use the registered image decoder automatically if you try and draw a raw image (i.e. using the `lv_img` object) but you can use them manually too. Create a `lv_img_decoder_dsc_t` variable to

describe the decoding session and call `lv_img_decoder_open()`, `lv_img_decoder_open()`.

```
lv_res_t res;
lv_img_decoder_dsc_t dsc;
res = lv_img_decoder_open(&dsc, &my_img_dsc, &lv_style_plain);

if(res == LV_RES_OK) {
  /*Do something with `dsc->img_data`*/
  lv_img_decoder_close(&dsc);
}
```

Image caching

Sometimes it takes a lot of time to open an image. Continuously decoding a PNG image or loading images from a slow external memory would be inefficient and detrimental to the user experience.

Therefore, LittlevGL caches a given number of images. Caching means some images will be left open, hence LittlevGL can quickly access them from `dsc->img_data` instead of needing to decode them again.

Of course, caching images is resource-intensive as it uses more RAM (to store the decoded image). LittlevGL tries to optimize the process as much as possible (see below), but you will still need to evaluate if this would be beneficial for your platform or not. If you have a deeply embedded target which decodes small images from a relatively fast storage medium, image caching may not be worth it.

Cache size

The number of cache entries can be defined in `LV_IMG_CACHE_DEF_SIZE` in *lv_conf.h*. The default value is 1 so only the most recently used image will be left open.

The size of the cache can be changed at run-time with `lv_img_cache_set_size(entry_num)`.

Value of images

When you use more images than cache entries, LittlevGL can't cache all of the images. Instead, the library will close one of the cached images (to free space).

To decide which image to close, LittlevGL uses a measurement it previously made of how long it took to open the image. Cache entries that hold slower-to-open images are considered more valuable and are kept in the cache as long as possible.

If you want or need to override LittlevGL's measurement, you can manually set the *time to open* value in the decoder open function in `dsc->time_to_open = time_ms` to give a higher or lower value. (Leave it unchanged to let LittlevGL set it.)

Every cache entry has a *"life"* value. Every time an image opening happens through the cache, the *life* of all entries are decreased to make them older. When a cached image is used, its *life* is increased by the *time to open* value to make it more alive.

If there is no more space in the cache, always the entry with the smallest life will be closed.

Memory usage

Note that, the cached image might continuously consume memory. For example, if 3 PNG images are cached, they will consume memory while they are opened.

Therefore, it's the user's responsibility to be sure there is enough RAM to cache, even the largest images at the same time.

Clean the cache

Let's say you have loaded a PNG image into a `lv_img_dsc_t my_png` variable and use it in an `lv_img` object. If the image is already cached and you then change the underlying PNG file, you need to notify LittlevGL to cache the image again. Otherwise, there is no easy way of detecting that the underlying file changed and LittlevGL will still draw the old image.

To do this, use `lv_img_cache_invalidate_src(&my_png)`. If `NULL` is passed as a parameter, the whole cache will be cleaned.

API

Image decoder

Typedefs

typedef uint8_t **lv_img_src_t**

typedef uint8_t **lv_img_cf_t**

typedef lv_res_t (***lv_img_decoder_info_f_t**)(**struct** *_lv_img_decoder* *decoder, **const** void *src, *lv_img_header_t* *header)

Get info from an image and store in the `header`

Return LV_RES_OK: info written correctly; LV_RES_INV: failed

Parameters

- `src`: the image source. Can be a pointer to a C array or a file name (Use `lv_img_src_get_type` to determine the type)
- `header`: store the info here

typedef lv_res_t (***lv_img_decoder_open_f_t**)(**struct** *_lv_img_decoder* *decoder, **struct** *_lv_img_decoder_dsc* *dsc)

Open an image for decoding. Prepare it as it is required to read it later

Parameters

- `decoder`: pointer to the decoder the function associated with
- `dsc`: pointer to decoder descriptor. `src`, `style` are already initialized in it.

typedef lv_res_t (***lv_img_decoder_read_line_f_t**)(**struct** *_lv_img_decoder* *decoder, **struct** *_lv_img_decoder_dsc* *dsc, lv_coord_t x, lv_coord_t y, lv_coord_t len, uint8_t *buf)

Decode `len` pixels starting from the given `x`, `y` coordinates and store them in `buf`. Required only if the "open" function can't return with the whole decoded pixel array.

Return LV_RES_OK: ok; LV_RES_INV: failed

Parameters

- `decoder`: pointer to the decoder the function associated with
- `dsc`: pointer to decoder descriptor
- `x`: start x coordinate
- `y`: start y coordinate
- `len`: number of pixels to decode
- `buf`: a buffer to store the decoded pixels

typedef void (***lv_img_decoder_close_f_t**)(**struct** *_lv_img_decoder* *decoder, **struct** *_lv_img_decoder_dsc* *dsc)

Close the pending decoding. Free resources etc.

Parameters

- `decoder`: pointer to the decoder the function associated with
- `dsc`: pointer to decoder descriptor

typedef struct *_lv_img_decoder* **lv_img_decoder_t**

typedef struct *_lv_img_decoder_dsc* **lv_img_decoder_dsc_t**

Describe an image decoding session. Stores data about the decoding

Enums

enum [**anonymous**]

Source of image.

Values:

LV_IMG_SRC_VARIABLE

LV_IMG_SRC_FILE

Binary/C variable

LV_IMG_SRC_SYMBOL

File in filesystem

LV_IMG_SRC_UNKNOWN

Symbol (lv_symbol_def.h)

enum [**anonymous**]

Values:

LV_IMG_CF_UNKNOWN = 0

LV_IMG_CF_RAW

Contains the file as it is. Needs custom decoder function

LV_IMG_CF_RAW_ALPHA

Contains the file as it is. The image has alpha. Needs custom decoder function

LV_IMG_CF_RAW_CHROMA_KEYED

Contains the file as it is. The image is chroma keyed. Needs custom decoder function

LV_IMG_CF_TRUE_COLOR

Color format and depth should match with LV_COLOR settings

LV_IMG_CF_TRUE_COLOR_ALPHA
Same as LV_IMG_CF_TRUE_COLOR but every pixel has an alpha byte

LV_IMG_CF_TRUE_COLOR_CHROMA_KEYED
Same as LV_IMG_CF_TRUE_COLOR but LV_COLOR_TRANSP pixels will be transparent

LV_IMG_CF_INDEXED_1BIT
Can have 2 different colors in a palette (always chroma keyed)

LV_IMG_CF_INDEXED_2BIT
Can have 4 different colors in a palette (always chroma keyed)

LV_IMG_CF_INDEXED_4BIT
Can have 16 different colors in a palette (always chroma keyed)

LV_IMG_CF_INDEXED_8BIT
Can have 256 different colors in a palette (always chroma keyed)

LV_IMG_CF_ALPHA_1BIT
Can have one color and it can be drawn or not

LV_IMG_CF_ALPHA_2BIT
Can have one color but 4 different alpha value

LV_IMG_CF_ALPHA_4BIT
Can have one color but 16 different alpha value

LV_IMG_CF_ALPHA_8BIT
Can have one color but 256 different alpha value

LV_IMG_CF_RESERVED_15
Reserved for further use.

LV_IMG_CF_RESERVED_16
Reserved for further use.

LV_IMG_CF_RESERVED_17
Reserved for further use.

LV_IMG_CF_RESERVED_18
Reserved for further use.

LV_IMG_CF_RESERVED_19
Reserved for further use.

LV_IMG_CF_RESERVED_20
Reserved for further use.

LV_IMG_CF_RESERVED_21
Reserved for further use.

LV_IMG_CF_RESERVED_22
Reserved for further use.

LV_IMG_CF_RESERVED_23
Reserved for further use.

LV_IMG_CF_USER_ENCODED_0
User holder encoding format.

LV_IMG_CF_USER_ENCODED_1
User holder encoding format.

LV_IMG_CF_USER_ENCODED_2
User holder encoding format.

LV_IMG_CF_USER_ENCODED_3
User holder encoding format.

LV_IMG_CF_USER_ENCODED_4
User holder encoding format.

LV_IMG_CF_USER_ENCODED_5
User holder encoding format.

LV_IMG_CF_USER_ENCODED_6
User holder encoding format.

LV_IMG_CF_USER_ENCODED_7
User holder encoding format.

Functions

void **lv_img_decoder_init**(void)
Initialize the image decoder module

lv_res_t **lv_img_decoder_get_info**(**const** char *src, *lv_img_header_t* *header)
Get information about an image. Try the created image decoder one by one. Once one is able to get info that info will be used.

Return LV_RES_OK: success; LV_RES_INV: wasn't able to get info about the image

Parameters

- `src`: the image source. Can be 1) File name: E.g. "S:folder/img1.png" (The drivers needs to registered via `lv_fs_add_drv()`) 2) Variable: Pointer to an *`lv_img_dsc_t`* variable 3) Symbol: E.g. `LV_SYMBOL_OK`
- `header`: the image info will be stored here

lv_res_t **lv_img_decoder_open**(*lv_img_decoder_dsc_t* *dsc, **const** void *src, **const** lv_style_t *style)
Open an image. Try the created image decoder one by one. Once one is able to open the image that decoder is save in `dsc`

Return LV_RES_OK: opened the image. `dsc->img_data` and `dsc->header` are set. LV_RES_INV: none of the registered image decoders were able to open the image.

Parameters

- `dsc`: describe a decoding session. Simply a pointer to an `lv_img_decoder_dsc_t` variable.
- `src`: the image source. Can be 1) File name: E.g. "S:folder/img1.png" (The drivers needs to registered via `lv_fs_add_drv()`) 2) Variable: Pointer to an *`lv_img_dsc_t`* variable 3) Symbol: E.g. `LV_SYMBOL_OK`
- `style`: the style of the image

lv_res_t **lv_img_decoder_read_line**(*lv_img_decoder_dsc_t* *dsc, lv_coord_t *x*, lv_coord_t *y*, lv_coord_t *len*, uint8_t *buf)
Read a line from an opened image

Return LV_RES_OK: success; LV_RES_INV: an error occurred

Parameters

- `dsc`: pointer to `lv_img_decoder_dsc_t` used in `lv_img_decoder_open`

- `x`: start X coordinate (from left)
- `y`: start Y coordinate (from top)
- `len`: number of pixels to read
- `buf`: store the data here

void **lv_img_decoder_close**(*lv_img_decoder_dsc_t *dsc*)
Close a decoding session

Parameters

- `dsc`: pointer to `lv_img_decoder_dsc_t` used in `lv_img_decoder_open`

lv_img_decoder_t ***lv_img_decoder_create**(void)
Create a new image decoder

Return pointer to the new image decoder

void **lv_img_decoder_delete**(*lv_img_decoder_t *decoder*)
Delete an image decoder

Parameters

- `decoder`: pointer to an image decoder

void **lv_img_decoder_set_info_cb**(*lv_img_decoder_t *decoder, lv_img_decoder_info_f_t info_cb*)
Set a callback to get information about the image

Parameters

- `decoder`: pointer to an image decoder
- `info_cb`: a function to collect info about an image (fill an *`lv_img_header_t`* struct)

void **lv_img_decoder_set_open_cb**(*lv_img_decoder_t *decoder, lv_img_decoder_open_f_t open_cb*)
Set a callback to open an image

Parameters

- `decoder`: pointer to an image decoder
- `open_cb`: a function to open an image

void **lv_img_decoder_set_read_line_cb**(*lv_img_decoder_t *decoder, lv_img_decoder_read_line_f_t read_line_cb*)
Set a callback to a decoded line of an image

Parameters

- `decoder`: pointer to an image decoder
- `read_line_cb`: a function to read a line of an image

void **lv_img_decoder_set_close_cb**(*lv_img_decoder_t *decoder, lv_img_decoder_close_f_t close_cb*)
Set a callback to close a decoding session. E.g. close files and free other resources.

Parameters

- `decoder`: pointer to an image decoder
- `close_cb`: a function to close a decoding session

lv_res_t **lv_img_decoder_built_in_info**(*lv_img_decoder_t* *decoder, **const** void *src, *lv_img_header_t* *header)

Get info about a built-in image

Return LV_RES_OK: the info is successfully stored in `header`; LV_RES_INV: unknown format or other error.

Parameters

- `decoder`: the decoder where this function belongs
- `src`: the image source: pointer to an *`lv_img_dsc_t`* variable, a file path or a symbol
- `header`: store the image data here

lv_res_t **lv_img_decoder_built_in_open**(*lv_img_decoder_t* *decoder, *lv_img_decoder_dsc_t* *dsc)

Open a built in image

Return LV_RES_OK: the info is successfully stored in `header`; LV_RES_INV: unknown format or other error.

Parameters

- `decoder`: the decoder where this function belongs
- `dsc`: pointer to decoder descriptor. `src`, `style` are already initialized in it.

lv_res_t **lv_img_decoder_built_in_read_line**(*lv_img_decoder_t* *decoder, *lv_img_decoder_dsc_t* *dsc, lv_coord_t *x*, lv_coord_t *y*, lv_coord_t *len*, uint8_t *buf)

Decode `len` pixels starting from the given `x`, `y` coordinates and store them in `buf`. Required only if the "open" function can't return with the whole decoded pixel array.

Return LV_RES_OK: ok; LV_RES_INV: failed

Parameters

- `decoder`: pointer to the decoder the function associated with
- `dsc`: pointer to decoder descriptor
- `x`: start x coordinate
- `y`: start y coordinate
- `len`: number of pixels to decode
- `buf`: a buffer to store the decoded pixels

void **lv_img_decoder_built_in_close**(*lv_img_decoder_t* *decoder, *lv_img_decoder_dsc_t* *dsc)

Close the pending decoding. Free resources etc.

Parameters

- `decoder`: pointer to the decoder the function associated with
- `dsc`: pointer to decoder descriptor

struct lv_img_header_t

#include <lv_img_decoder.h> LittlevGL image header

Public Members

uint32_t **cf**

uint32_t **always_zero**

uint32_t **reserved**

uint32_t **w**

uint32_t **h**

struct lv_img_dsc_t

#include <lv_img_decoder.h> Image header it is compatible with the result from image converter utility

Public Members

lv_img_header_t **header**

uint32_t **data_size**

const uint8_t ***data**

struct _lv_img_decoder

Public Members

lv_img_decoder_info_f_t **info_cb**

lv_img_decoder_open_f_t **open_cb**

lv_img_decoder_read_line_f_t **read_line_cb**

lv_img_decoder_close_f_t **close_cb**

lv_img_decoder_user_data_t **user_data**

struct _lv_img_decoder_dsc

#include <lv_img_decoder.h> Describe an image decoding session. Stores data about the decoding

Public Members

lv_img_decoder_t ***decoder**
The decoder which was able to open the image source

const void ***src**
The image source. A file path like "S:my_img.png" or pointer to an *`lv_img_dsc_t`* variable

const lv_style_t ***style**
Style to draw the image.

lv_img_src_t **src_type**
Type of the source: file or variable. Can be set in `open` function if required

lv_img_header_t **header**
Info about the opened image: color format, size, etc. MUST be set in `open` function

const uint8_t ***img_data**
Pointer to a buffer where the image's data (pixels) are stored in a decoded, plain format. MUST be set in `open` function

uint32_t **time_to_open**
How much time did it take to open the image. [ms] If not set `lv_img_cache` will measure and set the time to open

const char ***error_msg**
A text to display instead of the image when the image can't be opened. Can be set in `open` function or set NULL.

void ***user_data**
Store any custom data here is required

Image cache

Functions

lv_img_cache_entry_t ***lv_img_cache_open**(**const** void **src*, **const** lv_style_t **style*)
Open an image using the image decoder interface and cache it. The image will be left open meaning if the image decoder open callback allocated memory then it will remain. The image is closed if a new image is opened and the new image takes its place in the cache.

Return pointer to the cache entry or NULL if can open the image

Parameters

- `src`: source of the image. Path to file or pointer to an *`lv_img_dsc_t`* variable
- `style`: style of the image

void **lv_img_cache_set_size**(uint16_t *new_slot_num*)
Set the number of images to be cached. More cached images mean more opened image at same time which might mean more memory usage. E.g. if 20 PNG or JPG images are open in the RAM they consume memory while opened in the cache.

Parameters

- `new_entry_cnt`: number of image to cache

void **lv_img_cache_invalidate_src**(**const** void **src*)
Invalidate an image source in the cache. Useful if the image source is updated therefore it needs to be cached again.

Parameters

- `src`: an image source path to a file or pointer to an *`lv_img_dsc_t`* variable.

struct lv_img_cache_entry_t
#include <lv_img_cache.h> When loading images from the network it can take a long time to download and decode the image.

To avoid repeating this heavy load images can be cached.

Public Members

lv_img_decoder_dsc_t **dec_dsc**
Image information

int32_t **life**
Count the cache entries's life. Add `time_tio_open` to `life` when the entry is used. Decrement all lifes by one every in every *lv_img_cache_open*. If life == 0 the entry can be reused

LittlevGL has a 'File system' abstraction module that enables you to attach any type of file systems. The file system is identified by a drive letter. For example, if the SD card is associated with the letter `'S'`, a file can be reached like `"S:path/to/file.txt"`.

To add a driver, `lv_fs_drv_t` needs to be initialized like this:

```
lv_fs_drv_t drv;
lv_fs_drv_init(&drv);                     /*□□□□□*/

drv.letter = 'S';                         /*␣
↪□□□□□□□□□□□drive□□□□□□□□□□□□□□□□□□□□□□□□□□□□ - □□□□□□□□□□ */
drv.file_size = sizeof(my_file_object);   /*□□□□□□□□□□□□□*/
drv.rddir_size = sizeof(my_dir_object);   /*Size required to store a directory object␣
↪(used by dir_open/close/read)*/
drv.ready_cb = my_ready_cb;               /*□□□□□□□□□□□□□□□□*/
drv.open_cb = my_open_cb;                 /*□□□□□□□□□□ */
drv.close_cb = my_close_cb;               /*□□□□□□□□□□ */
drv.read_cb = my_read_cb;                 /*□□□□□□□ */
drv.write_cb = my_write_cb;               /*□□□□□□□ */
drv.seek_cb = my_seek_cb;                 /*□□seek□□ (□□□□□□□) */
drv.tell_cb = my_tell_cb;                 /*□□□□□□□□□□□□□□  */
drv.trunc_cb = my_trunc_cb;               /*□□□□□□□*/
drv.size_cb = my_size_cb;                 /*□□□□□□□□□ */
drv.rename_cb = my_size_cb;               /*□□□□□□□□ */


drv.dir_open_cb = my_dir_open_cb;         /*□□□□□□□□□□□□□□ */
drv.dir_read_cb = my_dir_read_cb;         /*□□□□□□□□□*/
drv.dir_close_cb = my_dir_close_cb;       /*□□□□□□□*/

drv.free_space_cb = my_size_cb;           /*□□□□□□□□□□□□□ */

drv.user_data = my_user_data;             /*□□□□□□□□□□□□□□□□*/

lv_fs_drv_register(&drv);                 /*□□□□□□□*/
```

Any of the callbacks can be `NULL` to indicate that that operation is not supported.

As an example of how the callbacks are used, if you use `lv_fs_open(&file, "S:/folder/file.txt", LV_FS_MODE_WR)`, LittlevGL:

1. Verifies that a registered drive exists with the letter `'S'`.
2. Checks if it's `open_cb` is implemented (not `NULL`).
3. Calls the set `open_cb` with `"folder/file.txt"` path.

```
lv_fs_file_t f;
lv_fs_res_t res;
res = lv_fs_open(&f, "S:folder/file.txt", LV_FS_MODE_RD);
if(res != LV_FS_RES_OK) my_error_handling();

uint32_t read_num;
uint8_t buf[8];
res = lv_fs_read(&f, buf, 8, &read_num);
if(res != LV_FS_RES_OK || read_num != 8) my_error_handling();

lv_fs_close(&f);
```

lv_fs_open *LV_FS_MODE_WR* *LV_FS_MODE_RD | LV_FS_MODE_WR*

This example shows how to read a directory's content. It's up to the driver how to mark the directories, but it can be a good practice to insert a `'/'` in front of the directory name.

```
lv_fs_dir_t dir;
lv_fs_res_t res;
res = lv_fs_dir_open(&dir, "S:/folder");
if(res != LV_FS_RES_OK) my_error_handling();

char fn[256];
while(1) {
    res = lv_fs_dir_read(&dir, fn);
    if(res != LV_FS_RES_OK) {
        my_error_handling();
        break;
    }

    /*fn is empty, if not more files to read*/
    if(strlen(fn) == 0) {
        break;
    }

    printf("%s\n", fn);
}

lv_fs_dir_close(&dir);
```

Image objects can be opened from files too (besides variables stored in the flash).

To initialize the image, the following callbacks are required:

- open
- close
- read
- seek
- tell

API

Typedefs

typedef uint8_t **lv_fs_res_t**

typedef uint8_t **lv_fs_mode_t**

typedef struct *_lv_fs_drv_t* **lv_fs_drv_t**

Enums

enum [**anonymous**]
Errors in the filesystem module.

Values:

LV_FS_RES_OK = 0

LV_FS_RES_HW_ERR

LV_FS_RES_FS_ERR

LV_FS_RES_NOT_EX

LV_FS_RES_FULL

LV_FS_RES_LOCKED

LV_FS_RES_DENIED

LV_FS_RES_BUSY

LV_FS_RES_TOUT

LV_FS_RES_NOT_IMP

LV_FS_RES_OUT_OF_MEM

LV_FS_RES_INV_PARAM

LV_FS_RES_UNKNOWN

enum [**anonymous**]
Filesystem mode.

Values:

LV_FS_MODE_WR = 0x01

LV_FS_MODE_RD = 0x02

Functions

void **lv_fs_init**(void)
Initialize the File system interface

void **lv_fs_drv_init**(*lv_fs_drv_t* *drv)
Initialize a file system driver with default values. It is used to surly have known values in the fields ant not memory junk. After it you can set the fields.

Parameters

- `drv`: pointer to driver variable to initialize

void **lv_fs_drv_register**(*lv_fs_drv_t *drv_p*)
Add a new drive

Parameters

- `drv_p`: pointer to an lv_fs_drv_t structure which is inited with the corresponding function pointers. The data will be copied so the variable can be local.

lv_fs_drv_t ***lv_fs_get_drv**(char *letter*)
Give a pointer to a driver from its letter

Return pointer to a driver or NULL if not found

Parameters

- `letter`: the driver letter

bool **lv_fs_is_ready**(char *letter*)
Test if a drive is rady or not. If the `ready` function was not initialized `true` will be returned.

Return true: drive is ready; false: drive is not ready

Parameters

- `letter`: letter of the drive

lv_fs_res_t **lv_fs_open**(*lv_fs_file_t *file_p*, **const** char **path*, *lv_fs_mode_t mode*)
Open a file

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `file_p`: pointer to a *lv_fs_file_t* variable
- `path`: path to the file beginning with the driver letter (e.g. S:/folder/file.txt)
- `mode`: read: FS_MODE_RD, write: FS_MODE_WR, both: FS_MODE_RD | FS_MODE_WR

lv_fs_res_t **lv_fs_close**(*lv_fs_file_t *file_p*)
Close an already opened file

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `file_p`: pointer to a *lv_fs_file_t* variable

lv_fs_res_t **lv_fs_remove**(**const** char **path*)
Delete a file

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `path`: path of the file to delete

lv_fs_res_t **lv_fs_read**(*lv_fs_file_t *file_p*, void **buf*, uint32_t *btr*, uint32_t **br*)
Read from a file

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `file_p`: pointer to a *lv_fs_file_t* variable
- `buf`: pointer to a buffer where the read bytes are stored

- `btr`: Bytes To Read
- `br`: the number of real read bytes (Bytes Read). NULL if unused.

lv_fs_res_t **lv_fs_write**(*lv_fs_file_t* **file_p*, **const** void **buf*, uint32_t *btw*, uint32_t **bw*)
Write into a file

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `file_p`: pointer to a *lv_fs_file_t* variable
- `buf`: pointer to a buffer with the bytes to write
- `btr`: Bytes To Write
- `br`: the number of real written bytes (Bytes Written). NULL if unused.

lv_fs_res_t **lv_fs_seek**(*lv_fs_file_t* **file_p*, uint32_t *pos*)
Set the position of the 'cursor' (read write pointer) in a file

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `file_p`: pointer to a *lv_fs_file_t* variable
- `pos`: the new position expressed in bytes index (0: start of file)

lv_fs_res_t **lv_fs_tell**(*lv_fs_file_t* **file_p*, uint32_t **pos*)
Give the position of the read write pointer

Return LV_FS_RES_OK or any error from 'fs_res_t'

Parameters

- `file_p`: pointer to a *lv_fs_file_t* variable
- `pos_p`: pointer to store the position of the read write pointer

lv_fs_res_t **lv_fs_trunc**(*lv_fs_file_t* **file_p*)
Truncate the file size to the current position of the read write pointer

Return LV_FS_RES_OK: no error, the file is read any error from lv_fs_res_t enum

Parameters

- `file_p`: pointer to an 'ufs_file_t' variable. (opened with lv_fs_open)

lv_fs_res_t **lv_fs_size**(*lv_fs_file_t* **file_p*, uint32_t **size*)
Give the size of a file bytes

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `file_p`: pointer to a *lv_fs_file_t* variable
- `size`: pointer to a variable to store the size

lv_fs_res_t **lv_fs_rename**(**const** char **oldname*, **const** char **newname*)
Rename a file

Return LV_FS_RES_OK or any error from 'fs_res_t'

Parameters

- `oldname`: path to the file

- `newname`: path with the new name

lv_fs_res_t **lv_fs_dir_open**(*lv_fs_dir_t *rddir_p*, **const** char **path*)
Initialize a 'fs_dir_t' variable for directory reading

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `rddir_p`: pointer to a 'fs_read_dir_t' variable
- `path`: path to a directory

lv_fs_res_t **lv_fs_dir_read**(*lv_fs_dir_t *rddir_p*, char **fn*)
Read the next filename form a directory. The name of the directories will begin with '/'

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `rddir_p`: pointer to an initialized 'fs_rdir_t' variable
- `fn`: pointer to a buffer to store the filename

lv_fs_res_t **lv_fs_dir_close**(*lv_fs_dir_t *rddir_p*)
Close the directory reading

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `rddir_p`: pointer to an initialized 'fs_dir_t' variable

lv_fs_res_t **lv_fs_free_space**(char *letter*, uint32_t **total_p*, uint32_t **free_p*)
Get the free and total size of a driver in kB

Return LV_FS_RES_OK or any error from lv_fs_res_t enum

Parameters

- `letter`: the driver letter
- `total_p`: pointer to store the total size [kB]
- `free_p`: pointer to store the free size [kB]

char ***lv_fs_get_letters**(char **buf*)
Fill a buffer with the letters of existing drivers

Return the buffer

Parameters

- `buf`: buffer to store the letters ('\0' added after the last letter)

const char ***lv_fs_get_ext**(**const** char **fn*)
Return with the extension of the filename

Return pointer to the beginning extension or empty string if no extension

Parameters

- `fn`: string with a filename

char ***lv_fs_up**(char **path*)
Step up one level

Return the truncated file name

Parameters

- `path`: pointer to a file name

const char ***lv_fs_get_last(const** char **path*)
Get the last element of a path (e.g. U:/folder/file -> file)

Return pointer to the beginning of the last element in the path

Parameters

- `buf`: buffer to store the letters ('\0' added after the last letter)

struct _lv_fs_drv_t

Public Members

char **letter**

uint16_t **file_size**

uint16_t **rddir_size**

bool (***ready_cb**)(**struct** *_lv_fs_drv_t* *drv)

lv_fs_res_t (***open_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p, **const** char *path, *lv_fs_mode_t* mode)

lv_fs_res_t (***close_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p)

lv_fs_res_t (***remove_cb**)(**struct** *_lv_fs_drv_t* *drv, **const** char *fn)

lv_fs_res_t (***read_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p, void *buf, uint32_t btr, uint32_t *br)

lv_fs_res_t (***write_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p, **const** void *buf, uint32_t btw, uint32_t *bw)

lv_fs_res_t (***seek_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p, uint32_t pos)

lv_fs_res_t (***tell_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p, uint32_t *pos_p)

lv_fs_res_t (***trunc_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p)

lv_fs_res_t (***size_cb**)(**struct** *_lv_fs_drv_t* *drv, void *file_p, uint32_t *size_p)

lv_fs_res_t (***rename_cb**)(**struct** *_lv_fs_drv_t* *drv, **const** char *oldname, **const** char *newname)

lv_fs_res_t (***free_space_cb**)(**struct** *_lv_fs_drv_t* *drv, uint32_t *total_p, uint32_t *free_p)

lv_fs_res_t (***dir_open_cb**)(**struct** *_lv_fs_drv_t* *drv, void *rddir_p, **const** char *path)

lv_fs_res_t (***dir_read_cb**)(**struct** *_lv_fs_drv_t* *drv, void *rddir_p, char *fn)

lv_fs_res_t (***dir_close_cb**)(**struct** *_lv_fs_drv_t* *drv, void *rddir_p)

lv_fs_drv_user_data_t **user_data**
Custom file user data

struct lv_fs_file_t

Public Members

void *__file_d__

lv_fs_drv_t *__drv__

struct lv_fs_dir_t

Public Members

void *__dir_d__

lv_fs_drv_t *__drv__

#

You can automatically change the value of a variable between a start and an end value using animations.
“animator”

animator

```
void func(void * var, lv_anim_var_t value);
```

LittlevGL * set * `lv_obj_set_x(obj, value)` or `lv_obj_set_width(obj, value)`

`lv_anim_set_...()` `lv_anim_t`

```
lv_anim_t a;
lv_anim_set_exec_cb(&a, btn1, lv_obj_set_x);    /*Set the animator function and␣
↪variable to animate*/
lv_anim_set_time(&a, duration, delay);
lv_anim_set_values(&a, start, end);             /*Set start and end values. E.g. 0,␣
↪150*/
lv_anim_set_path_cb(&a, lv_anim_path_linear);   /*Set path from `lv_anim_path_...`␣
↪functions or a custom one.*/
lv_anim_set_ready_cb(&a, ready_cb);             /*Set a callback to call then␣
↪animation is ready. (Optional)*/
lv_anim_set_playback(&a, wait_time);            /*Enable playback of teh animation␣
↪with `wait_time` delay*/
lv_anim_set_repeat(&a, wait_time);              /*Enable repeat of teh animation with␣
↪`wait_time` delay. Can be compiled with playback*/

lv_anim_create(&a);                             /*Start the animation*/
```

You can apply **multiple different animations** on the same variable at the same time. For example, animate the x and y coordinates with `lv_obj_set_x` and `lv_obj_set_y`. However, only one animation can exist with a given variable and function pair. Therefore `lv_anim_create()` will delete the already existing variable-function animations.

Animation path

You can determinate the **path of animation**. In the most simple case, it is linear, which means the current value between *start* and *end* is changed linearly. A *path* is a function which calculates the next value to set based on the current state of the animation. Currently, there are the following built-in paths:

- **lv_anim_path_linear** linear animation
- **lv_anim_path_step** change in one step at the end

- **lv_anim_path_ease_in** slow at the beginning
- **lv_anim_path_ease_out** slow at the end
- **lv_anim_path_ease_in_out** slow at the beginning and end too
- **lv_anim_path_overshoot** overshoot the end value
- **lv_anim_path_bounce** bounce back a little from the end value (like hitting a wall)

Speed vs time

By default, you can set the animation time. But, in some cases, the **animation speed** is more practical.

The `lv_anim_speed_to_time(speed, start, end)` function calculates the required time in milliseconds to reach the end value from a start value with the given speed. The speed is interpreted in *unit/sec* dimension. For example, `lv_anim_speed_to_time(20,0,100)` will give 5000 milliseconds. For example, in case of `lv_obj_set_x` *unit* is pixels so *20* means *20 px/sec* speed.

Delete animations

You can **delete an animation** by `lv_anim_del(var, func)` by providing the animated variable and its animator function.

API

Input device

Typedefs

typedef uint8_t **lv_anim_enable_t**

typedef lv_coord_t **lv_anim_value_t**
Type of the animated value

typedef void (***lv_anim_exec_xcb_t**)(void *, *lv_anim_value_t*)
Generic prototype of "animator" functions. First parameter is the variable to animate. Second parameter is the value to set. Compatible with `lv_xxx_set_yyy(obj, value)` functions The `x` in `_xcb_t` means its not a fully generic prototype because it doesn't receive `lv_anim_t *` as its first argument

typedef void (***lv_anim_custom_exec_cb_t**)(**struct** *lv_anim_t* *, *lv_anim_value_t*)
Same as `lv_anim_exec_xcb_t` but receives `lv_anim_t *` as the first parameter. It's more consistent but less convenient. Might be used by binding generator functions.

typedef *lv_anim_value_t* (***lv_anim_path_cb_t**)(**const struct** *lv_anim_t* *)
Get the current value during an animation

typedef void (***lv_anim_ready_cb_t**)(**struct** *lv_anim_t* *)
Callback to call when the animation is ready

typedef struct *lv_anim_t* **lv_anim_t**
Describes an animation

Enums

enum [anonymous]
Can be used to indicate if animations are enabled or disabled in a case

Values:

LV_ANIM_OFF

LV_ANIM_ON

Functions

void **lv_anim_core_init**(void)
Init. the animation module

void **lv_anim_init**(*lv_anim_t *a*)
Initialize an animation variable. E.g.: lv_anim_t a; lv_anim_init(&a); lv_anim_set_...(&a); lv_anim_create(&a);

Parameters

- `a`: pointer to an `lv_anim_t` variable to initialize

static void **lv_anim_set_exec_cb**(*lv_anim_t *a*, void **var*, *lv_anim_exec_xcb_t exec_cb*)
Set a variable to animate function to execute on `var`

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `var`: pointer to a variable to animate
- `exec_cb`: a function to execute. LittelvGL's built-in functions can be used. E.g. lv_obj_set_x

static void **lv_anim_set_time**(*lv_anim_t *a*, uint16_t *duration*, uint16_t *delay*)
Set the duration and delay of an animation

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `duration`: duration of the animation in milliseconds
- `delay`: delay before the animation in milliseconds

static void **lv_anim_set_values**(*lv_anim_t *a*, *lv_anim_value_t start*, *lv_anim_value_t end*)
Set the start and end values of an animation

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `start`: the start value
- `end`: the end value

static void **lv_anim_set_custom_exec_cb**(*lv_anim_t *a*, *lv_anim_custom_exec_cb_t exec_cb*)
Similar to `lv_anim_set_var_and_cb` but `lv_anim_custom_exec_cb_t` receives `lv_anim_t *` as its first parameter instead of `void *`. This function might be used when LittlevGL is binded to other languages because it's more consistent to have `lv_anim_t *` as first parameter.

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `exec_cb`: a function to execute.

static void **lv_anim_set_path_cb**(*lv_anim_t *a*, *lv_anim_path_cb_t path_cb*)
Set the path (curve) of the animation.

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `path_cb`: a function the get the current value of the animation. The built in functions starts with `lv_anim_path_...`

static void **lv_anim_set_ready_cb**(*lv_anim_t *a*, *lv_anim_ready_cb_t ready_cb*)
Set a function call when the animation is ready

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `ready_cb`: a function call when the animation is ready

static void **lv_anim_set_playback**(*lv_anim_t *a*, uint16_t *wait_time*)
Make the animation to play back to when the forward direction is ready

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `wait_time`: time in milliseconds to wait before starting the back direction

static void **lv_anim_clear_playback**(*lv_anim_t *a*)
Disable playback. (Disabled after `lv_anim_init()`)

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable

static void **lv_anim_set_repeat**(*lv_anim_t *a*, uint16_t *wait_time*)
Make the animation to start again when ready.

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable
- `wait_time`: time in milliseconds to wait before starting the animation again

static void **lv_anim_clear_repeat**(*lv_anim_t *a*)
Disable repeat. (Disabled after `lv_anim_init()`)

Parameters

- `a`: pointer to an initialized `lv_anim_t` variable

void **lv_anim_create**(*lv_anim_t *a*)
Create an animation

Parameters

- `a`: an initialized 'anim_t' variable. Not required after call.

bool **lv_anim_del**(void **var*, *lv_anim_exec_xcb_t exec_cb*)
Delete an animation of a variable with a given animator function

Return true: at least 1 animation is deleted, false: no animation is deleted

Parameters

- `var`: pointer to variable
- `exec_cb`: a function pointer which is animating 'var', or NULL to ignore it and delete all the animations of 'var

static bool **lv_anim_custom_del**(*lv_anim_t *a*, *lv_anim_custom_exec_cb_t exec_cb*)

Delete an aniamation by getting the animated variable from `a`. Only animations with `exec_cb` will be deleted. This function exist becasue it's logical that all anim functions receives an `lv_anim_t` as their first parameter. It's not practical in C but might makes the API more conequent and makes easier to genrate bindings.

Return true: at least 1 animation is deleted, false: no animation is deleted

Parameters

- `a`: pointer to an animation.
- `exec_cb`: a function pointer which is animating 'var', or NULL to ignore it and delete all the animations of 'var

uint16_t **lv_anim_count_running**(void)

Get the number of currently running animations

Return the number of running animations

uint16_t **lv_anim_speed_to_time**(uint16_t *speed*, *lv_anim_value_t start*, *lv_anim_value_t end*)

Calculate the time of an animation with a given speed and the start and end values

Return the required time [ms] for the animation with the given parameters

Parameters

- `speed`: speed of animation in unit/sec
- `start`: start value of the animation
- `end`: end value of the animation

lv_anim_value_t **lv_anim_path_linear**(**const** *lv_anim_t *a*)

Calculate the current value of an animation applying linear characteristic

Return the current value to set

Parameters

- `a`: pointer to an animation

lv_anim_value_t **lv_anim_path_ease_in**(**const** *lv_anim_t *a*)

Calculate the current value of an animation slowing down the start phase

Return the current value to set

Parameters

- `a`: pointer to an animation

lv_anim_value_t **lv_anim_path_ease_out**(**const** *lv_anim_t *a*)

Calculate the current value of an animation slowing down the end phase

Return the current value to set

Parameters

- `a`: pointer to an animation

lv_anim_value_t **lv_anim_path_ease_in_out(const** *lv_anim_t *a***)**
Calculate the current value of an animation applying an "S" characteristic (cosine)

Return the current value to set

Parameters

- a: pointer to an animation

lv_anim_value_t **lv_anim_path_overshoot(const** *lv_anim_t *a***)**
Calculate the current value of an animation with overshoot at the end

Return the current value to set

Parameters

- a: pointer to an animation

lv_anim_value_t **lv_anim_path_bounce(const** *lv_anim_t *a***)**
Calculate the current value of an animation with 3 bounces

Return the current value to set

Parameters

- a: pointer to an animation

lv_anim_value_t **lv_anim_path_step(const** *lv_anim_t *a***)**
Calculate the current value of an animation applying step characteristic. (Set end value on the end of the animation)

Return the current value to set

Parameters

- a: pointer to an animation

struct _lv_anim_t
#include <lv_anim.h> Describes an animation

Public Members

void ***var**
Variable to animate

lv_anim_exec_xcb_t **exec_cb**
Function to execute to animate

lv_anim_path_cb_t **path_cb**
Function to get the steps of animations

lv_anim_ready_cb_t **ready_cb**
Call it when the animation is ready

int32_t **start**
Start value

int32_t **end**
End value

uint16_t **time**
Animation time in ms

int16_t **act_time**
Current time in animation. Set to negative to make delay.

uint16_t **playback_pause**
: Wait before play back

uint16_t **repeat_pause**
: Wait before repeat

lv_anim_user_data_t **user_data**
: Custom user data

uint8_t **playback**
: When the animation is ready play it back

uint8_t **repeat**
: Repeat the animation infinitely

uint8_t **playback_now**
: Play back is in progress

uint32_t **has_run**
: Indicates the animation has run in this round

Tasks

LittlevGL has a built-in task system. You can register a function to have it be called periodically. The tasks are handled and called in `lv_task_handler()`, which needs to be called periodically every few milliseconds. See *Porting* for more information.

The tasks are non-preemptive, which means a task cannot interrupt another task. Therefore, you can call any LittlevGL related function in a task.

Create a task

To create a new task, use `lv_task_create(task_cb, period_ms, LV_TASK_PRIO_OFF/LOWEST/LOW/MID/HIGH/HIGHEST, user_data)`. It will create an `lv_task_t *` variable, which can be used later to modify the parameters of the task. `lv_task_create_basic()` can also be used. It allows you to create a new task without specifying any parameters.

A task callback should have `void (*lv_task_cb_t)(lv_task_t *);` prototype.

For example:

```
void my_task(lv_task_t * task)
{
  /*Use the user_data*/
  uint32_t * user_data = task->user_data;
  printf("my_task called with user data: %d\n", *user_data);

  /*Do something with LittlevGL*/
  if(something_happened) {
    something_happened = false;
    lv_btn_create(lv_scr_act(), NULL);
  }
}

...

static uint32_t user_data = 10;
lv_task_t * task = lv_task_create(my_task, 500, LV_TASK_PRIO_MID, &user_data);
```

Ready and Reset

`lv_task_ready(task)` makes the task run on the next call of `lv_task_handler()`.

`lv_task_reset(task)` resets the period of a task. It will be called again after the defined period of milliseconds has elapsed.

Set parameters

You can modify some parameters of the tasks later:

- `lv_task_set_cb(task, new_cb)`
- `lv_task_set_period(task, new_period)`
- `lv_task_set_prio(task, new_priority)`

One-shot tasks

You can make a task to run only once by calling`lv_task_once(task)`. The task will automatically be deleted after being called for the first time.

Measure idle time

You can get the idle percentage time `lv_task_handler` with `lv_task_get_idle()`. Note that, it doesn't measure the idle time of the overall system, only `lv_task_handler`. It can be misleading if you use an operating system and call `lv_task_handler` in an task, as it won't actually measure the time the OS spends in an idle thread.

Asynchronous calls

In some cases, you can't do an action immediately. For example, you can't delete an object right now because something else is still using it or you don't want to block the execution now. For these cases, you can use the `lv_async_call(my_function, data_p)` to make `my_function` be called on the next call of `lv_task_handler`. `data_p` will be passed to function when it's called. Note that, only the pointer of the data is saved so you need to ensure that the variable will be "alive" while the function is called. You can use *static*, global or dynamically allocated data.

For example:

```
void my_screen_clean_up(void * scr)
{
  /*Free some resources related to `scr`*/

  /*Finally delete the screen*/
  lv_obj_del(scr);
}

...

/*Do somethings with the object on the current screen*/
```

(continues on next page)

(continued from previous page)

```
/*Delete screen on next call of `lv_task_handler`. So not now.*/
lv_async_call(my_screen_clean_up, lv_scr_act());

/*The screen is still valid so you can do other things with it*/
```

If you just want to delete an object, and don't need to clean anything up in `my_screen_cleanup`, you could just use `lv_obj_del_async`, which will delete the object on the next call to `lv_task_handler`.

API

Typedefs

typedef void (***lv_task_cb_t**)(**struct** *_lv_task_t* *)
Tasks execute this type type of functions.

typedef uint8_t **lv_task_prio_t**

typedef struct *_lv_task_t* **lv_task_t**
Descriptor of a lv_task

Enums

enum [anonymous]
Possible priorities for lv_tasks

Values:

LV_TASK_PRIO_OFF = 0

LV_TASK_PRIO_LOWEST

LV_TASK_PRIO_LOW

LV_TASK_PRIO_MID

LV_TASK_PRIO_HIGH

LV_TASK_PRIO_HIGHEST

_LV_TASK_PRIO_NUM

Functions

void **lv_task_core_init**(void)
Init the lv_task module

lv_task_t ***lv_task_create_basic**(void)
Create an "empty" task. It needs to initialzed with at least `lv_task_set_cb` and `lv_task_set_period`

Return pointer to the craeted task

lv_task_t ***lv_task_create**(*lv_task_cb_t task_xcb*, uint32_t *period*, *lv_task_prio_t prio*, void **user_data*)
Create a new lv_task

Return pointer to the new task

Parameters

- `task_xcb`: a callback which is the task itself. It will be called periodically. (the 'x' in the argument name indicates that its not a fully generic function because it not follows the `func_name(object, callback, ...)` convention)
- `period`: call period in ms unit
- `prio`: priority of the task (LV_TASK_PRIO_OFF means the task is stopped)
- `user_data`: custom parameter

void **lv_task_del**(*lv_task_t *task*)
Delete a lv_task

Parameters

- `task`: pointer to task_cb created by task

void **lv_task_set_cb**(*lv_task_t *task*, *lv_task_cb_t task_cb*)
Set the callback the task (the function to call periodically)

Parameters

- `task`: pointer to a task
- `task_cb`: the function to call periodically

void **lv_task_set_prio**(*lv_task_t *task*, *lv_task_prio_t prio*)
Set new priority for a lv_task

Parameters

- `task`: pointer to a lv_task
- `prio`: the new priority

void **lv_task_set_period**(*lv_task_t *task*, uint32_t *period*)
Set new period for a lv_task

Parameters

- `task`: pointer to a lv_task
- `period`: the new period

void **lv_task_ready**(*lv_task_t *task*)
Make a lv_task ready. It will not wait its period.

Parameters

- `task`: pointer to a lv_task.

void **lv_task_once**(*lv_task_t *task*)
Delete the lv_task after one call

Parameters

- `task`: pointer to a lv_task.

void **lv_task_reset**(*lv_task_t *task*)
Reset a lv_task. It will be called the previously set period milliseconds later.

Parameters

- `task`: pointer to a lv_task.

void **lv_task_enable**(bool *en*)
Enable or disable the whole lv_task handling

Parameters

- en: true: lv_task handling is running, false: lv_task handling is suspended

uint8_t **lv_task_get_idle**(void)
Get idle percentage

Return the lv_task idle in percentage

struct _lv_task_t
#include <lv_task.h> Descriptor of a lv_task

Public Members

uint32_t **period**
How often the task should run

uint32_t **last_run**
Last time the task ran

lv_task_cb_t **task_cb**
Task function

void ***user_data**
Custom user data

uint8_t **prio**
Task priority

uint8_t **once**
1: one shot task

Drawing

With LittlevGL, you don't need to draw anything manually. Just create objects (like buttons and labels), move and change them and LittlevGL will refresh and redraw what is required.

However, it might be useful to have a basic understanding of how drawing happens in LittlevGL.

The basic concept is to not draw directly to the screen, but draw to an internal buffer first and then copy that buffer to screen when the rendering is ready. It has two main advantages:

1. **Avoids flickering** while layers of the UI are drawn. For example, when drawing a *background + button + text*, each "stage" would be visible for a short time.
2. **It's faster** to modify a buffer in RAM and finally write one pixel once than read/write a display directly on each pixel access. (e.g. via a display controller with SPI interface). Hence, it's suitable for pixels that are redrawn multiple times (e.g. background + button + text).

Buffering types

As you already might learn in the *Porting* section, there are 3 types of buffers:

1. **One buffer** - LittlevGL draws the content of the screen into a buffer and sends it to the display. The buffer can be smaller than the screen. In this case, the larger areas will be redrawn in multiple parts. If only small areas changes (e.g. button press), then only those areas will be refreshed.

2. **Two non-screen-sized buffers** - having two buffers, LittlevGL can draw into one buffer while the content of the other buffer is sent to display in the background. DMA or other hardware should be used to transfer the data to the display to let the CPU draw meanwhile. This way, the rendering and refreshing of the display become parallel. If the buffer is smaller than the area to refresh, LittlevGL will draw the display's content in chunks similar to the *One buffer*.
3. **Two screen-sized buffers** - In contrast to *Two non-screen-sized buffers*, LittlevGL will always provide the whole screen's content, not only chunks. This way, the driver can simply change the address of the frame buffer to the buffer received from LittlevGL. Therefore, this method works best when the MCU has an LCD/TFT interface and the frame buffer is just a location in the RAM.

Mechanism of screen refreshing

1. Something happens on the GUI which requires redrawing. For example, a button has been pressed, a chart has been changed or an animation happened, etc.
2. LittlevGL saves the changed object's old and new area into a buffer, called an *Invalid area buffer*. For optimization, in some cases, objects are not added to the buffer:
   - Hidden objects are not added.
   - Objects completely out of their parent are not added.
   - Areas out of the parent are cropped to the parent's area.
   - The object on other screens are not added.
3. In every `LV_DISP_DEF_REFR_PERIOD` (set in *lv_conf.h*):
   - LittlevGL checks the invalid areas and joins the adjacent or intersecting areas.
   - Takes the first joined area, if it's smaller than the *display buffer*, then simply draw the areas' content to the *display buffer*. If the area doesn't fit into the buffer, draw as many lines as possible to the *display buffer*.
   - When the area is drawn, call `flush_cb` from the display driver to refresh the display.
   - If the area was larger than the buffer, redraw the remaining parts too.
   - Do the same with all the joined areas.

While an area is redrawn, the library searches the most top object which covers the area to redraw, and starts to draw from that object. For example, if a button's label has changed, the library will see that it's enough to draw the button under the text, and it's not required to draw the background too.

The difference between buffer types regarding the drawing mechanism is the following:

1. **One buffer** - LittlevGL needs to wait for `lv_disp_flush_ready()` (called at the end of `flush_cb`) before starting to redraw the next part.
2. **Two non-screen-sized buffers** - LittlevGL can immediately draw to the second buffer when the first is sent to `flush_cb` because the flushing should be done by DMA (or similar hardware) in the background.
3. **Two screen-sized buffers** - After calling `flush_cb`, the first buffer, if being displayed as frame buffer. Its content is copied to the second buffer and all the changes are drawn on top of it.

3.16.4 ( )

(lv_obj)

The 'Base Object' implements the basic properties of an object on a screen, such as:

- (coordinates)

- (parent object)
- (children)
- (main style)
- *(Click enable)*, * (Drag enable)*

In object-oriented thinking, it is the base class which all other objects in LittlevGL inherit from. This, among another things, helps reduce code duplication.

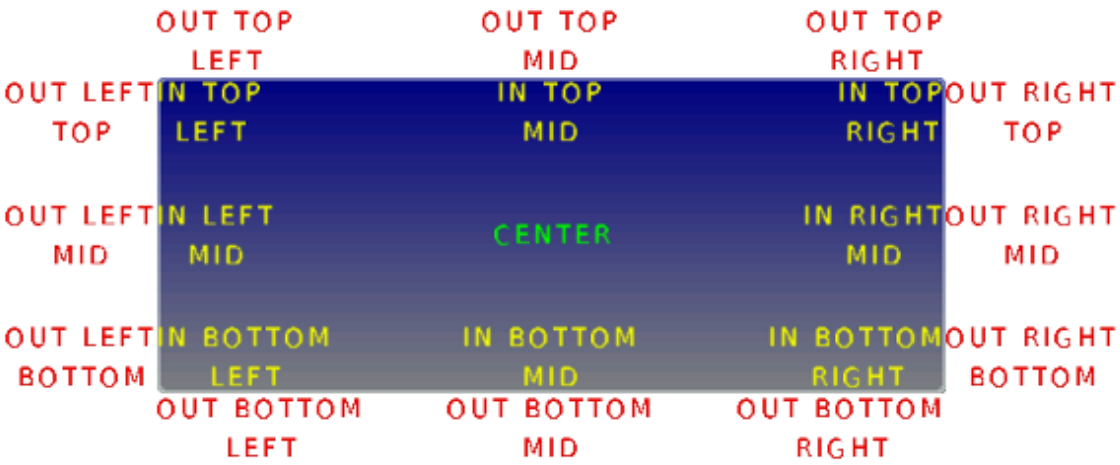
(Coordinates)

The object size can be modified on individual axes with `lv_obj_set_width(obj, new_width)` and `lv_obj_set_height(obj, new_height)`, or both axes can be modified at the same time with `lv_obj_set_size(obj, new_width, new_height)`.

You can set the x and y coordinates relative to the parent with `lv_obj_set_x(obj, new_x)` and `lv_obj_set_y(obj, new_y)`, or both at the same time with `lv_obj_set_pos(obj, new_x, new_y)`.

You can align the object to another with `lv_obj_align(obj, obj_ref, LV_ALIGN_..., x_shift, y_shift)`.

- `obj` is the object to align.
- `obj_ref` is a reference object. `obj` will be aligned to it. If `obj_ref = NULL`, then the parent of `obj` will be used.
- The third argument is the *type* of alignment. These are the possible options:



  The alignment types build like `LV_ALIGN_OUT_TOP_MID`.

- The last two arguments allow you to shift the object by a specified number of pixels after aligning it.

For example, to align a text below an image: `lv_obj_align(text, image, LV_ALIGN_OUT_BOTTOM_MID, 0, 10)`.Or to align a text in the middle of its parent: `lv_obj_align(text, NULL, LV_ALIGN_CENTER, 0, 0)`.

`lv_obj_align_origo` works similarly to `lv_obj_align` but, it aligns the center of the object rather than the top-left corner.

For example, `lv_obj_align_origo(btn, image, LV_ALIGN_OUT_BOTTOM_MID, 0, 0)` will align the center of the button the bottom of the image.

The parameters of the alignment will be saved in the object if `LV_USE_OBJ_REALIGN` is enabled in *lv_conf.h*. You can then realign the objects simply by calling `lv_obj_realign(obj)`. (It's equivalent to calling `lv_obj_align` again with the same parameters.)

If the alignment happened with `lv_obj_align_origo`, then it will be used when the object is realigned.

If `lv_obj_set_auto_realign(obj, true)` is used the object will be realigned automatically, if its size changes in `lv_obj_set_width/height/size()` functions. It's very useful when size animations are applied to the object and the original position needs to be kept.

Note that the coordinates of screens can't be changed. Attempting to use these functions on screens will result in undefined behavior.

You can set a new parent for an object with `lv_obj_set_parent(obj, new_parent)`. To get the current parent, use `lv_obj_get_parent(obj)`.

To get the children of an object, use `lv_obj_get_child(obj, child_prev)` (from last to first) or `lv_obj_get_child_back(obj, child_prev)` (from first to last). To get the first child, pass `NULL` as the second parameter and use the return value to iterate through the children. The function will return `NULL` if there are no more children. For example:

```
lv_obj_t * child;
child = lv_obj_get_child(parent, NULL);
while(child) {
    /*□□"□□□" □□□□□*/
    child = lv_obj_get_child(parent, child);
}
```

`lv_obj_count_children(obj)` `lv_obj_count_children_recursive(obj)`

(Screens)

When you have created a screen like `lv_obj_create(NULL, NULL)`, you can load it with `lv_scr_load(screen1)`. The `lv_scr_act()` function gives you a pointer to the current screen.

(`lv_disp_set_default`)

To get the screen an object is assigned to, use the `lv_obj_get_screen(obj)` function.

(Layers)

- (top layer)

- (system layer)

They are independent of the screens and the same layers will be shown on every screen. The *top layer* is above every object on the screen and the *system layer* is above the *top layer* too. You can add any pop-up windows to the *top layer* freely. But, the *system layer* is restricted to system-level things (e.g. mouse cursor will be placed here in `lv_indev_set_cursor()`).

`lv_layer_top()` `lv_layer_sys()`

You can bring an object to the foreground or send it to the background with `lv_obj_move_foreground(obj)` and `lv_obj_move_background(obj)`.

Read the *Layer overview* section to learn more about layers.

(Style)

The base object stores the *Main style* of the object. To set a new style, use `lv_obj_set_style(obj, &new_style)` function. If `NULL` is set as style, then the object will inherit its parent's style.

Note that, you should use `lv_obj_set_style` only for "Base objects". Every other object type has its own style set function which should be used for them. For example, a button should use `lv_btn_set_style()`.

If you modify a style, which is already used by objects, in order to refresh the affected objects you can use either `lv_obj_refresh_style(obj)` on each object using it or to notify all objects with a given style use `lv_obj_report_style_mod(&style)`. If the parameter of `lv_obj_report_style_mod` is `NULL`, all objects will be notified.

(Events)

To set an event callback for an object, use `lv_obj_set_event_cb(obj, event_cb)`,

To manually send an event to an object, use `lv_event_send(obj, LV_EVENT_..., data)`

(Attributes)

`lv_obj_set_...(obj, true/false)` /

- **hidden** - Hide the object. It will not be drawn and will be considered by input devices as if it doesn't exist., Its children will be hidden too.
- **click** - Allows you to click the object via input devices. If disabled, then click events are passed to the object behind this one. (E.g. *Labels* are not clickable by default)
- **top** - If enabled then when this object or any of its children is clicked then this object comes to the foreground.
- **drag** - Enable dragging (moving by an input device)
- **drag_dir** - Enable dragging only in specific directions. Can be `LV_DRAG_DIR_HOR/VER/ALL`.
- **drag_throw** - Enable "throwing" with dragging as if the object would have momentum
- **drag_parent** - If enabled then the object's parent will be moved during dragging. It will look like as if the parent is dragged. Checked recursively, so can propagate to grandparents too.

- **parent_event** - Propagate the events to the parents too. Checked recursively, so can propagate to grandparents too.
- **opa_scale_enable** - Enable opacity scaling. See the [#opa-scale](Opa scale) section.

(Opa scale)

If `lv_obj_set_opa_scale_enable(obj, true)` is set for an object, then the object's and all of its children's opacity can be adjusted with `lv_obj_set_opa_scale(obj, LV_OPA_...)`.

A little bit of technical background: during the rendering process, the opacity of the object is decided by searching recursively up the object's family tree to find the first object with opacity scaling (Opa scale) enabled.

If an object is found with an enabled *Opa scale*, then that *Opa scale* will be used by the rendered object too.

Therefore, if you want to disable the Opa scaling for an object when the parent has Opa scale, just enable Opa scaling for the object and set its value to `LV_OPA_COVER`. It will overwrite the parent's settings.

(Protect)

There are some specific actions which happen automatically in the library. To prevent one or more that kind of actions, you can protect the object against them. The following protections exists:

- **LV_PROTECT_NONE**
- **LV_PROTECT_POS** ( )
- **LV_PROTECT_FOLLOW** Prevent the object be followed (make a "line break") in automatic ordering (e.g. Layout in *Containers*)
- **LV_PROTECT_PARENT** ( )
- **LV_PROTECT_PRESS_LOST** Prevent losing press when the press is slid out of the objects. (E.g. a *Button* can be released out of it if it was being pressed)
- **LV_PROTECT_CLICK_FOCUS** * (Group)*
- **LV_PROTECT_CHILD_CHG**

`lv_obj_set/clear_protect(obj, LV_PROTECT_...)` / *'OR'ed*

(Groups)

Once, an object is added to *group* with `lv_group_add_obj(group, obj)` the object's current group can be get with `lv_obj_get_group(obj)`.

`lv_obj_is_focused(obj)` tells if the object is currently focused on its group or not. If the object is not added to a group, `false` will be returned.

(Extended click area)

By default, the objects can be clicked only on their coordinates, however, this area can be extended with `lv_obj_set_ext_click_area(obj, left, right, top, bottom)`. `left/right/top/bottom` describes how far the clickable area should extend past the default in each direction.

lv_conf.h `LV_USE_EXT_CLICK_AREA`

- **LV_EXT_CLICK_AREA_FULL** `lv_coord_t` 4
- **LV_EXT_CLICK_AREA_TINY** (horizontal) (vertical) (left/right top/bottom) `uint8_t`
- **LV_EXT_CLICK_AREA_OFF**

(Styles)

Use `lv_obj_set_style(obj, &style)` to set a style for a base object.

`style.body` `lv_style_scr` `lv_style_plain_color`

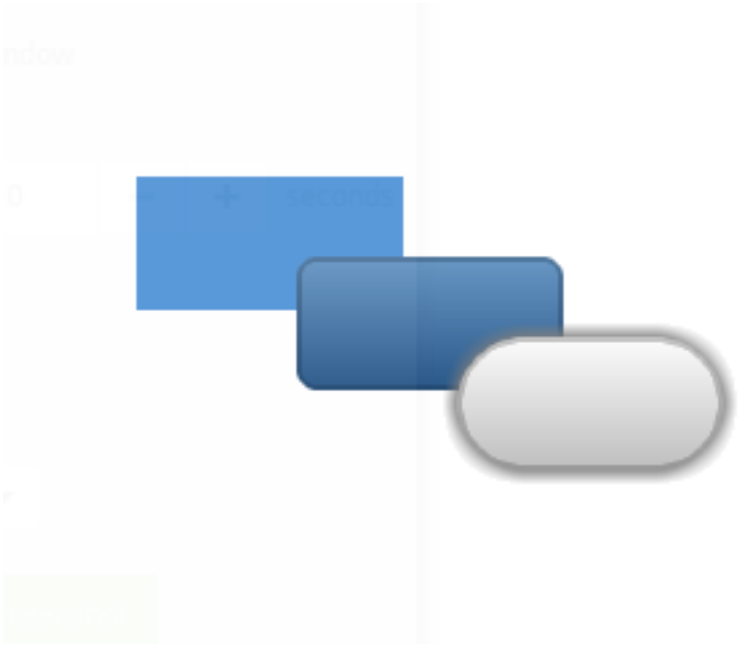
(Events)

(Keys)

No *Keys* are processed by the object type.

C

Base obejcts with custom styles



code

```
#include "lvgl/lvgl.h"

void lv_ex_obj_1(void)
{
    lv_obj_t * obj1;
    obj1 = lv_obj_create(lv_scr_act(), NULL);
    lv_obj_set_size(obj1, 100, 50);
    lv_obj_set_style(obj1, &lv_style_plain_color);
    lv_obj_align(obj1, NULL, LV_ALIGN_CENTER, -60, -30);

    /*Copy the previous object and enable drag*/
    lv_obj_t * obj2;
    obj2 = lv_obj_create(lv_scr_act(), obj1);
    lv_obj_set_style(obj2, &lv_style_pretty_color);
    lv_obj_align(obj2, NULL, LV_ALIGN_CENTER, 0, 0);

    static lv_style_t style_shadow;
    lv_style_copy(&style_shadow, &lv_style_pretty);
    style_shadow.body.shadow.width = 6;
    style_shadow.body.radius = LV_RADIUS_CIRCLE;

    /*Copy the previous object (drag is already enabled)*/
    lv_obj_t * obj3;
    obj3 = lv_obj_create(lv_scr_act(), obj2);
    lv_obj_set_style(obj3, &style_shadow);
    lv_obj_align(obj3, NULL, LV_ALIGN_CENTER, 60, 30);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_design_mode_t**

typedef bool (***lv_design_cb_t**)(**struct** *lv_obj_t* *obj, **const** lv_area_t *mask_p, *lv_design_mode_t* mode)

The design callback is used to draw the object on the screen. It accepts the object, a mask area, and the mode in which to draw the object.

typedef uint8_t **lv_event_t**

Type of event being sent to the object.

typedef void (***lv_event_cb_t**)(**struct** *lv_obj_t* *obj, *lv_event_t* event)

Event callback. Events are used to notify the user of some action being taken on the object. For details, see *lv_event_t*.

typedef uint8_t **lv_signal_t**

typedef lv_res_t (***lv_signal_cb_t**)(**struct** *lv_obj_t* *obj, *lv_signal_t* sign, void *param)

typedef uint8_t **lv_align_t**

typedef uint8_t **lv_drag_dir_t**

typedef **struct** *lv_obj_t* **lv_obj_t**

typedef uint8_t **lv_protect_t**

Enums

enum [anonymous]

Design modes

Values:

LV_DESIGN_DRAW_MAIN

Draw the main portion of the object

LV_DESIGN_DRAW_POST

Draw extras on the object

LV_DESIGN_COVER_CHK

Check if the object fully covers the 'mask_p' area

enum [anonymous]

Values:

LV_EVENT_PRESSED

The object has been pressed

LV_EVENT_PRESSING

The object is being pressed (called continuously while pressing)

LV_EVENT_PRESS_LOST

User is still pressing but slid cursor/finger off of the object

LV_EVENT_SHORT_CLICKED
User pressed object for a short period of time, then released it. Not called if dragged.

LV_EVENT_LONG_PRESSED
Object has been pressed for at least `LV_INDEV_LONG_PRESS_TIME`. Not called if dragged.

LV_EVENT_LONG_PRESSED_REPEAT
Called after `LV_INDEV_LONG_PRESS_TIME` in every `LV_INDEV_LONG_PRESS_REP_TIME` ms. Not called if dragged.

LV_EVENT_CLICKED
Called on release if not dragged (regardless to long press)

LV_EVENT_RELEASED
Called in every cases when the object has been released

LV_EVENT_DRAG_BEGIN

LV_EVENT_DRAG_END

LV_EVENT_DRAG_THROW_BEGIN

LV_EVENT_KEY

LV_EVENT_FOCUSED

LV_EVENT_DEFOCUSED

LV_EVENT_VALUE_CHANGED
The object's value has changed (i.e. slider moved)

LV_EVENT_INSERT

LV_EVENT_REFRESH

LV_EVENT_APPLY
"Ok", "Apply" or similar specific button has clicked

LV_EVENT_CANCEL
"Close", "Cancel" or similar specific button has clicked

LV_EVENT_DELETE
Object is being deleted

enum [**anonymous**]
Signals are for use by the object itself or to extend the object's functionality. Applications should use *lv_obj_set_event_cb* to be notified of events that occur on the object.

Values:

LV_SIGNAL_CLEANUP
Object is being deleted

LV_SIGNAL_CHILD_CHG
Child was removed/added

LV_SIGNAL_CORD_CHG
Object coordinates/size have changed

LV_SIGNAL_PARENT_SIZE_CHG
Parent's size has changed

LV_SIGNAL_STYLE_CHG
Object's style has changed

LV_SIGNAL_REFR_EXT_DRAW_PAD
Object's extra padding has changed

LV_SIGNAL_GET_TYPE
LittlevGL needs to retrieve the object's type

LV_SIGNAL_PRESSED
The object has been pressed

LV_SIGNAL_PRESSING
The object is being pressed (called continuously while pressing)

LV_SIGNAL_PRESS_LOST
User is still pressing but slid cursor/finger off of the object

LV_SIGNAL_RELEASED
User pressed object for a short period of time, then released it. Not called if dragged.

LV_SIGNAL_LONG_PRESS
Object has been pressed for at least LV_INDEV_LONG_PRESS_TIME. Not called if dragged.

LV_SIGNAL_LONG_PRESS_REP
Called after LV_INDEV_LONG_PRESS_TIME in every LV_INDEV_LONG_PRESS_REP_TIME ms. Not called if dragged.

LV_SIGNAL_DRAG_BEGIN

LV_SIGNAL_DRAG_END

LV_SIGNAL_FOCUS

LV_SIGNAL_DEFOCUS

LV_SIGNAL_CONTROL

LV_SIGNAL_GET_EDITABLE

enum [**anonymous**]
Object alignment.

Values:

LV_ALIGN_CENTER = 0

LV_ALIGN_IN_TOP_LEFT

LV_ALIGN_IN_TOP_MID

LV_ALIGN_IN_TOP_RIGHT

LV_ALIGN_IN_BOTTOM_LEFT

LV_ALIGN_IN_BOTTOM_MID

LV_ALIGN_IN_BOTTOM_RIGHT

LV_ALIGN_IN_LEFT_MID

LV_ALIGN_IN_RIGHT_MID

LV_ALIGN_OUT_TOP_LEFT

LV_ALIGN_OUT_TOP_MID

LV_ALIGN_OUT_TOP_RIGHT

LV_ALIGN_OUT_BOTTOM_LEFT

LV_ALIGN_OUT_BOTTOM_MID

LV_ALIGN_OUT_BOTTOM_RIGHT

LV_ALIGN_OUT_LEFT_TOP

LV_ALIGN_OUT_LEFT_MID

LV_ALIGN_OUT_LEFT_BOTTOM

LV_ALIGN_OUT_RIGHT_TOP

LV_ALIGN_OUT_RIGHT_MID

LV_ALIGN_OUT_RIGHT_BOTTOM

enum [anonymous]
Values:

LV_DRAG_DIR_HOR = 0x1
Object can be dragged horizontally.

LV_DRAG_DIR_VER = 0x2
Object can be dragged vertically.

LV_DRAG_DIR_ALL = 0x3
Object can be dragged in all directions.

enum [anonymous]
Values:

LV_PROTECT_NONE = 0x00

LV_PROTECT_CHILD_CHG = 0x01
Disable the child change signal. Used by the library

LV_PROTECT_PARENT = 0x02
Prevent automatic parent change (e.g. in lv_page)

LV_PROTECT_POS = 0x04
Prevent automatic positioning (e.g. in lv_cont layout)

LV_PROTECT_FOLLOW = 0x08
Prevent the object be followed in automatic ordering (e.g. in lv_cont PRETTY layout)

LV_PROTECT_PRESS_LOST = 0x10
If the `indev` was pressing this object but swiped out while pressing do not search other object.

LV_PROTECT_CLICK_FOCUS = 0x20
Prevent focusing the object by clicking on it

Functions

void **lv_init**(void)
Init. the 'lv' library.

lv_obj_t ***lv_obj_create**(*lv_obj_t *parent*, **const** *lv_obj_t *copy*)
Create a basic object

Return pointer to the new object

Parameters

- `parent`: pointer to a parent object. If NULL then a screen will be created

- `copy`: pointer to a base object, if not NULL then the new object will be copied from it

lv_res_t **lv_obj_del**(*lv_obj_t *obj*)
Delete 'obj' and all of its children

Return LV_RES_INV because the object is deleted

Parameters

- `obj`: pointer to an object to delete

void **lv_obj_del_async**(**struct** *_lv_obj_t *obj*)
Helper function for asynchronously deleting objects. Useful for cases where you can't delete an object directly in an `LV_EVENT_DELETE` handler (i.e. parent).

See lv_async_call

Parameters

- `obj`: object to delete

void **lv_obj_clean**(*lv_obj_t *obj*)
Delete all children of an object

Parameters

- `obj`: pointer to an object

void **lv_obj_invalidate**(**const** *lv_obj_t *obj*)
Mark the object as invalid therefore its current position will be redrawn by 'lv_refr_task'

Parameters

- `obj`: pointer to an object

void **lv_obj_set_parent**(*lv_obj_t *obj*, *lv_obj_t *parent*)
Set a new parent for an object. Its relative position will be the same.

Parameters

- `obj`: pointer to an object. Can't be a screen.
- `parent`: pointer to the new parent object. (Can't be NULL)

void **lv_obj_move_foreground**(*lv_obj_t *obj*)
Move and object to the foreground

Parameters

- `obj`: pointer to an object

void **lv_obj_move_background**(*lv_obj_t *obj*)
Move and object to the background

Parameters

- `obj`: pointer to an object

void **lv_obj_set_pos**(*lv_obj_t *obj*, lv_coord_t *x*, lv_coord_t *y*)
Set relative the position of an object (relative to the parent)

Parameters

- `obj`: pointer to an object
- `x`: new distance from the left side of the parent
- `y`: new distance from the top of the parent

void **lv_obj_set_x**(*lv_obj_t *obj*, lv_coord_t *x*)
Set the x coordinate of a object

Parameters

- `obj`: pointer to an object
- `x`: new distance from the left side from the parent

void **lv_obj_set_y**(*lv_obj_t *obj*, lv_coord_t *y*)
Set the y coordinate of a object

Parameters

- `obj`: pointer to an object
- `y`: new distance from the top of the parent

void **lv_obj_set_size**(*lv_obj_t *obj*, lv_coord_t *w*, lv_coord_t *h*)
Set the size of an object

Parameters

- `obj`: pointer to an object
- `w`: new width
- `h`: new height

void **lv_obj_set_width**(*lv_obj_t *obj*, lv_coord_t *w*)
Set the width of an object

Parameters

- `obj`: pointer to an object
- `w`: new width

void **lv_obj_set_height**(*lv_obj_t *obj*, lv_coord_t *h*)
Set the height of an object

Parameters

- `obj`: pointer to an object
- `h`: new height

void **lv_obj_align**(*lv_obj_t *obj*, **const** *lv_obj_t *base*, *lv_align_t align*, lv_coord_t *x_mod*, lv_coord_t *y_mod*)
Align an object to an other object.

Parameters

- `obj`: pointer to an object to align
- `base`: pointer to an object (if NULL the parent is used). 'obj' will be aligned to it.
- `align`: type of alignment (see 'lv_align_t' enum)
- `x_mod`: x coordinate shift after alignment
- `y_mod`: y coordinate shift after alignment

void **lv_obj_align_origo**(*lv_obj_t *obj*, **const** *lv_obj_t *base*, *lv_align_t align*, lv_coord_t *x_mod*, lv_coord_t *y_mod*)
Align an object to an other object.

Parameters

- `obj`: pointer to an object to align
- `base`: pointer to an object (if NULL the parent is used). 'obj' will be aligned to it.
- `align`: type of alignment (see 'lv_align_t' enum)
- `x_mod`: x coordinate shift after alignment
- `y_mod`: y coordinate shift after alignment

void **lv_obj_realign**(*lv_obj_t* *obj)
Realign the object based on the last `lv_obj_align` parameters.

Parameters

- `obj`: pointer to an object

void **lv_obj_set_auto_realign**(*lv_obj_t* *obj, bool *en*)
Enable the automatic realign of the object when its size has changed based on the last `lv_obj_align` parameters.

Parameters

- `obj`: pointer to an object
- `en`: true: enable auto realign; false: disable auto realign

void **lv_obj_set_ext_click_area**(*lv_obj_t* *obj, lv_coord_t *left*, lv_coord_t *right*, lv_coord_t *top*, lv_coord_t *bottom*)
Set the size of an extended clickable area

Parameters

- `obj`: pointer to an object
- `left`: extended clickable are on the left [px]
- `right`: extended clickable are on the right [px]
- `top`: extended clickable are on the top [px]
- `bottom`: extended clickable are on the bottom [px]

void **lv_obj_set_style**(*lv_obj_t* *obj, **const** lv_style_t *style)
Set a new style for an object

Parameters

- `obj`: pointer to an object
- `style_p`: pointer to the new style

void **lv_obj_refresh_style**(*lv_obj_t* *obj)
Notify an object about its style is modified

Parameters

- `obj`: pointer to an object

void **lv_obj_report_style_mod**(lv_style_t *style)
Notify all object if a style is modified

Parameters

- `style`: pointer to a style. Only the objects with this style will be notified (NULL to notify all objects)

void **lv_obj_set_hidden**(*lv_obj_t* *obj, bool *en*)
Hide an object. It won't be visible and clickable.

Parameters

- `obj`: pointer to an object
- `en`: true: hide the object

void **lv_obj_set_click**(*lv_obj_t *obj*, bool *en*)
Enable or disable the clicking of an object

Parameters

- `obj`: pointer to an object
- `en`: true: make the object clickable

void **lv_obj_set_top**(*lv_obj_t *obj*, bool *en*)
Enable to bring this object to the foreground if it or any of its children is clicked

Parameters

- `obj`: pointer to an object
- `en`: true: enable the auto top feature

void **lv_obj_set_drag**(*lv_obj_t *obj*, bool *en*)
Enable the dragging of an object

Parameters

- `obj`: pointer to an object
- `en`: true: make the object dragable

void **lv_obj_set_drag_dir**(*lv_obj_t *obj*, *lv_drag_dir_t drag_dir*)
Set the directions an object can be dragged in

Parameters

- `obj`: pointer to an object
- `drag_dir`: bitwise OR of allowed drag directions

void **lv_obj_set_drag_throw**(*lv_obj_t *obj*, bool *en*)
Enable the throwing of an object after is is dragged

Parameters

- `obj`: pointer to an object
- `en`: true: enable the drag throw

void **lv_obj_set_drag_parent**(*lv_obj_t *obj*, bool *en*)
Enable to use parent for drag related operations. If trying to drag the object the parent will be moved instead

Parameters

- `obj`: pointer to an object
- `en`: true: enable the 'drag parent' for the object

void **lv_obj_set_parent_event**(*lv_obj_t *obj*, bool *en*)
Propagate the events to the parent too

Parameters

- `obj`: pointer to an object
- `en`: true: enable the event propagation

void **lv_obj_set_opa_scale_enable**(*lv_obj_t *obj*, bool *en*)
Set the opa scale enable parameter (required to set opa_scale with *lv_obj_set_opa_scale()*)

Parameters

- `obj`: pointer to an object
- `en`: true: opa scaling is enabled for this object and all children; false: no opa scaling

void **lv_obj_set_opa_scale**(*lv_obj_t *obj*, *lv_opa_t opa_scale*)
Set the opa scale of an object. The opacity of this object and all it's children will be scaled down with this factor. `lv_obj_set_opa_scale_enable(obj, true)` needs to be called to enable it. (not for all children just for the parent where to start the opa scaling)

Parameters

- `obj`: pointer to an object
- `opa_scale`: a factor to scale down opacity [0..255]

void **lv_obj_set_protect**(*lv_obj_t *obj*, uint8_t *prot*)
Set a bit or bits in the protect filed

Parameters

- `obj`: pointer to an object
- `prot`: 'OR'-ed values from `lv_protect_t`

void **lv_obj_clear_protect**(*lv_obj_t *obj*, uint8_t *prot*)
Clear a bit or bits in the protect filed

Parameters

- `obj`: pointer to an object
- `prot`: 'OR'-ed values from `lv_protect_t`

void **lv_obj_set_event_cb**(*lv_obj_t *obj*, *lv_event_cb_t event_cb*)
Set a an event handler function for an object. Used by the user to react on event which happens with the object.

Parameters

- `obj`: pointer to an object
- `event_cb`: the new event function

lv_res_t **lv_event_send**(*lv_obj_t *obj*, *lv_event_t event*, **const** void **data*)
Send an event to the object

Return LV_RES_OK: `obj` was not deleted in the event; LV_RES_INV: `obj` was deleted in the event

Parameters

- `obj`: pointer to an object
- `event`: the type of the event from `lv_event_t`.
- `data`: arbitrary data depending on the object type and the event. (Usually `NULL`)

lv_res_t **lv_event_send_func**(*lv_event_cb_t event_xcb*, *lv_obj_t *obj*, *lv_event_t event*, **const** void **data*)
Call an event function with an object, event, and data.

Return LV_RES_OK: `obj` was not deleted in the event; LV_RES_INV: `obj` was deleted in the event

Parameters

- `event_xcb`: an event callback function. If `NULL` `LV_RES_OK` will return without any actions. (the 'x' in the argument name indicates that its not a fully generic function because it not follows the `func_name(object, callback, ...)` convention)
- `obj`: pointer to an object to associate with the event (can be `NULL` to simply call the `event_cb`)
- `event`: an event
- `data`: pointer to a custom data

const void ***lv_event_get_data**(void)*
Get the `data` parameter of the current event

Return the `data` parameter

void **lv_obj_set_signal_cb**(*lv_obj_t *obj*, *lv_signal_cb_t signal_cb*)
Set the a signal function of an object. Used internally by the library. Always call the previous signal function in the new.

Parameters

- `obj`: pointer to an object
- `signal_cb`: the new signal function

void **lv_signal_send**(*lv_obj_t *obj*, *lv_signal_t signal*, void **param*)
Send an event to the object

Parameters

- `obj`: pointer to an object
- `event`: the type of the event from `lv_event_t`.

void **lv_obj_set_design_cb**(*lv_obj_t *obj*, *lv_design_cb_t design_cb*)
Set a new design function for an object

Parameters

- `obj`: pointer to an object
- `design_cb`: the new design function

void ***lv_obj_allocate_ext_attr**(lv_obj_t *obj*, uint16_t *ext_size*)*
Allocate a new ext. data for an object

Return pointer to the allocated ext

Parameters

- `obj`: pointer to an object
- `ext_size`: the size of the new ext. data

void **lv_obj_refresh_ext_draw_pad**(*lv_obj_t *obj*)
Send a 'LV_SIGNAL_REFR_EXT_SIZE' signal to the object

Parameters

- `obj`: pointer to an object

lv_obj_t ***lv_obj_get_screen**(**const** lv_obj_t *obj*)*
Return with the screen of an object

Return pointer to a screen

Parameters

- `obj`: pointer to an object

lv_disp_t ***lv_obj_get_disp**(**const** *lv_obj_t *obj*)
Get the display of an object

Return pointer the object's display

Parameters

- `scr`: pointer to an object

lv_obj_t ***lv_obj_get_parent**(**const** *lv_obj_t *obj*)
Returns with the parent of an object

Return pointer to the parent of 'obj'

Parameters

- `obj`: pointer to an object

lv_obj_t ***lv_obj_get_child**(**const** *lv_obj_t *obj*, **const** *lv_obj_t *child*)
Iterate through the children of an object (start from the "youngest, lastly created")

Return the child after 'act_child' or NULL if no more child

Parameters

- `obj`: pointer to an object
- `child`: NULL at first call to get the next children and the previous return value later

lv_obj_t ***lv_obj_get_child_back**(**const** *lv_obj_t *obj*, **const** *lv_obj_t *child*)
Iterate through the children of an object (start from the "oldest", firstly created)

Return the child after 'act_child' or NULL if no more child

Parameters

- `obj`: pointer to an object
- `child`: NULL at first call to get the next children and the previous return value later

uint16_t **lv_obj_count_children**(**const** *lv_obj_t *obj*)
Count the children of an object (only children directly on 'obj')

Return children number of 'obj'

Parameters

- `obj`: pointer to an object

uint16_t **lv_obj_count_children_recursive**(**const** *lv_obj_t *obj*)
Recursively count the children of an object

Return children number of 'obj'

Parameters

- `obj`: pointer to an object

void **lv_obj_get_coords**(**const** *lv_obj_t *obj*, lv_area_t *cords_p*)
Copy the coordinates of an object to an area

Parameters

- `obj`: pointer to an object

- `cords_p`: pointer to an area to store the coordinates

void **lv_obj_get_inner_coords**(**const** *lv_obj_t* *obj, lv_area_t *coords_p)
Reduce area retried by *lv_obj_get_coords()* the get graphically usable area of an object. (Without the size of the border or other extra graphical elements)

Parameters

- `coords_p`: store the result area here

lv_coord_t **lv_obj_get_x**(**const** *lv_obj_t* *obj)
Get the x coordinate of object

Return distance of 'obj' from the left side of its parent

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_y**(**const** *lv_obj_t* *obj)
Get the y coordinate of object

Return distance of 'obj' from the top of its parent

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_width**(**const** *lv_obj_t* *obj)
Get the width of an object

Return the width

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_height**(**const** *lv_obj_t* *obj)
Get the height of an object

Return the height

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_width_fit**(*lv_obj_t* *obj)
Get that width reduced by the left and right padding.

Return the width which still fits into the container

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_height_fit**(*lv_obj_t* *obj)
Get that height reduced by the top an bottom padding.

Return the height which still fits into the container

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_auto_realign**(*lv_obj_t* *obj)
Get the automatic realign property of the object.

Return true: auto realign is enabled; false: auto realign is disabled

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_ext_click_pad_left(const** *lv_obj_t *obj***)**
Get the left padding of extended clickable area

Return the extended left padding

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_ext_click_pad_right(const** *lv_obj_t *obj***)**
Get the right padding of extended clickable area

Return the extended right padding

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_ext_click_pad_top(const** *lv_obj_t *obj***)**
Get the top padding of extended clickable area

Return the extended top padding

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_ext_click_pad_bottom(const** *lv_obj_t *obj***)**
Get the bottom padding of extended clickable area

Return the extended bottom padding

Parameters

- `obj`: pointer to an object

lv_coord_t **lv_obj_get_ext_draw_pad(const** *lv_obj_t *obj***)**
Get the extended size attribute of an object

Return the extended size attribute

Parameters

- `obj`: pointer to an object

const lv_style_t ***lv_obj_get_style(const** *lv_obj_t *obj***)**
Get the style pointer of an object (if NULL get style of the parent)

Return pointer to a style

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_hidden(const** *lv_obj_t *obj***)**
Get the hidden attribute of an object

Return true: the object is hidden

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_click(const** *lv_obj_t *obj***)**
Get the click enable attribute of an object

Return true: the object is clickable

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_top**(**const** *lv_obj_t* *obj)
Get the top enable attribute of an object

Return true: the auto top feature is enabled

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_drag**(**const** *lv_obj_t* *obj)
Get the drag enable attribute of an object

Return true: the object is dragable

Parameters

- `obj`: pointer to an object

lv_drag_dir_t **lv_obj_get_drag_dir**(**const** *lv_obj_t* *obj)
Get the directions an object can be dragged

Return bitwise OR of allowed directions an object can be dragged in

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_drag_throw**(**const** *lv_obj_t* *obj)
Get the drag throw enable attribute of an object

Return true: drag throw is enabled

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_drag_parent**(**const** *lv_obj_t* *obj)
Get the drag parent attribute of an object

Return true: drag parent is enabled

Parameters

- `obj`: pointer to an object

bool **lv_obj_get_parent_event**(**const** *lv_obj_t* *obj)
Get the drag parent attribute of an object

Return true: drag parent is enabled

Parameters

- `obj`: pointer to an object

lv_opa_t **lv_obj_get_opa_scale_enable**(**const** *lv_obj_t* *obj)
Get the opa scale enable parameter

Return true: opa scaling is enabled for this object and all children; false: no opa scaling

Parameters

- `obj`: pointer to an object

lv_opa_t **lv_obj_get_opa_scale(const** *lv_obj_t *obj***)**
Get the opa scale parameter of an object

Return opa scale [0..255]

Parameters

- `obj`: pointer to an object

uint8_t **lv_obj_get_protect(const** *lv_obj_t *obj***)**
Get the protect field of an object

Return protect field ('OR'ed values of `lv_protect_t`)

Parameters

- `obj`: pointer to an object

bool **lv_obj_is_protected(const** *lv_obj_t *obj*, uint8_t *prot***)**
Check at least one bit of a given protect bitfield is set

Return false: none of the given bits are set, true: at least one bit is set

Parameters

- `obj`: pointer to an object
- `prot`: protect bits to test ('OR'ed values of `lv_protect_t`)

lv_signal_cb_t **lv_obj_get_signal_cb(const** *lv_obj_t *obj***)**
Get the signal function of an object

Return the signal function

Parameters

- `obj`: pointer to an object

lv_design_cb_t **lv_obj_get_design_cb(const** *lv_obj_t *obj***)**
Get the design function of an object

Return the design function

Parameters

- `obj`: pointer to an object

lv_event_cb_t **lv_obj_get_event_cb(const** *lv_obj_t *obj***)**
Get the event function of an object

Return the event function

Parameters

- `obj`: pointer to an object

void ***lv_obj_get_ext_attr(const** *lv_obj_t *obj***)**
Get the ext pointer

Return the ext pointer but not the dynamic version Use it as ext->data1, and NOT da(ext)->data1

Parameters

- `obj`: pointer to an object

void **lv_obj_get_type(***lv_obj_t *obj*, *lv_obj_type_t *buf***)**
Get object's and its ancestors type. Put their name in `type_buf` starting with the current type. E.g. buf.type[0]="lv_btn", buf.type[1]="lv_cont", buf.type[2]="lv_obj"

Parameters

- `obj`: pointer to an object which type should be get
- `buf`: pointer to an *`lv_obj_type_t`* buffer to store the types

lv_obj_user_data_t **lv_obj_get_user_data**(*lv_obj_t *obj*)
Get the object's user data

Return user data

Parameters

- `obj`: pointer to an object

lv_obj_user_data_t ***lv_obj_get_user_data_ptr**(*lv_obj_t *obj*)
Get a pointer to the object's user data

Return pointer to the user data

Parameters

- `obj`: pointer to an object

void **lv_obj_set_user_data**(*lv_obj_t *obj*, lv_obj_user_data_t *data*)
Set the object's user data. The data will be copied.

Parameters

- `obj`: pointer to an object
- `data`: user data

void ***lv_obj_get_group**(**const** *lv_obj_t *obj*)
Get the group of the object

Return the pointer to group of the object

Parameters

- `obj`: pointer to an object

bool **lv_obj_is_focused**(**const** *lv_obj_t *obj*)
Tell whether the object is the focused object of a group or not.

Return true: the object is focused, false: the object is not focused or not in a group

Parameters

- `obj`: pointer to an object

struct lv_reailgn_t

Public Members

const struct *_lv_obj_t ***base**

lv_coord_t **xofs**

lv_coord_t **yofs**

lv_align_t **align**

uint8_t **auto_realign**

uint8_t **origo_align**
1: the origo (center of the object) was aligned with `lv_obj_align_origo`

struct _lv_obj_t

Public Members

struct *_lv_obj_t* ***par**
Pointer to the parent object

lv_ll_t **child_ll**
Linked list to store the children objects

lv_area_t **coords**
Coordinates of the object (x1, y1, x2, y2)

lv_event_cb_t **event_cb**
Event callback function

lv_signal_cb_t **signal_cb**
Object type specific signal function

lv_design_cb_t **design_cb**
Object type specific design function

void ***ext_attr**
Object type specific extended data

const lv_style_t ***style_p**
Pointer to the object's style

void ***group_p**
Pointer to the group of the object

uint8_t **ext_click_pad_hor**
Extra click padding in horizontal direction

uint8_t **ext_click_pad_ver**
Extra click padding in vertical direction

lv_area_t **ext_click_pad**
Extra click padding area.

uint8_t **click**
1: Can be pressed by an input device

uint8_t **drag**
1: Enable the dragging

uint8_t **drag_throw**
1: Enable throwing with drag

uint8_t **drag_parent**
1: Parent will be dragged instead

uint8_t **hidden**
1: Object is hidden

uint8_t **top**
1: If the object or its children is clicked it goes to the foreground

uint8_t **opa_scale_en**
1: opa_scale is set

uint8_t **parent_event**
1: Send the object's events to the parent too.

lv_drag_dir_t **drag_dir**
Which directions the object can be dragged in

uint8_t **reserved**
Reserved for future use

uint8_t **protect**
Automatically happening actions can be prevented. 'OR'ed values from `lv_protect_t`

lv_opa_t **opa_scale**
Scale down the opacity by this factor. Effects all children as well

lv_coord_t **ext_draw_pad**
EXTtend the size in every direction for drawing.

lv_realign_t **realign**
Information about the last call to *lv_obj_align*.

lv_obj_user_data_t **user_data**
Custom user data for object.

struct lv_obj_type_t
#include <lv_obj.h> Used by *`lv_obj_get_type()`*. The object's and its ancestor types are stored here

Public Members

const char ***type**[**LV_MAX_ANCESTOR_NUM**]
[0]: the actual type, [1]: ancestor, [2] #1's ancestor ... [x]: "lv_obj"

Arc (lv_arc)

Overview

The *Arc* object **draws an arc** within **start and end angles** and with a given **thickness**.

Angles

To set the angles, use the `lv_arc_set_angles(arc, start_angle, end_angle)` function. The zero degree is at the bottom of the object and the degrees are increasing in a counter-clockwise direction. The angles should be in [0;360] range.

Notes

The **width and height** of the *Arc* should be the **same**.

Currently, the *Arc* object **does not support anti-aliasing**.

Styles

To set the style of an *Arc* object, use `lv_arc_set_style(arc, LV_ARC_STYLE_MAIN, &style)`

- **line.rounded** - make the endpoints rounded (opacity won't work properly if set to 1)

- **line.width** - the thickness of the arc
- **line.color** - the color of the arc.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Simple Arc

code

```
#include "lvgl/lvgl.h"

void lv_ex_arc_1(void)
{
  /*Create style for the Arcs*/
  static lv_style_t style;
  lv_style_copy(&style, &lv_style_plain);
```

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```
  style.line.color = LV_COLOR_BLUE;           /*Arc color*/
  style.line.width = 8;                       /*Arc width*/

  /*Create an Arc*/
  lv_obj_t * arc = lv_arc_create(lv_scr_act(), NULL);
  lv_arc_set_style(arc, LV_ARC_STYLE_MAIN, &style);          /*Use the new style*/
  lv_arc_set_angles(arc, 90, 60);
  lv_obj_set_size(arc, 150, 150);
  lv_obj_align(arc, NULL, LV_ALIGN_CENTER, 0, 0);
}
```

Loader with Arc

code

```
#include "lvgl/lvgl.h"

/**
 * An `lv_task` to call periodically to set the angles of the arc
 * @param t
 */
static void arc_loader(lv_task_t * t)
{
    static int16_t a = 0;

    a+=5;
    if(a >= 359) a = 359;

    if(a < 180) lv_arc_set_angles(t->user_data, 180-a ,180);
    else lv_arc_set_angles(t->user_data, 540-a ,180);

    if(a == 359) {
```

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```
        lv_task_del(t);
        return;
    }
}

/**
 * Create an arc which acts as a loader.
 */
void lv_ex_arc_2(void)
{
  /*Create style for the Arcs*/
  static lv_style_t style;
  lv_style_copy(&style, &lv_style_plain);
  style.line.color = LV_COLOR_NAVY;           /*Arc color*/
  style.line.width = 8;                       /*Arc width*/

  /*Create an Arc*/
  lv_obj_t * arc = lv_arc_create(lv_scr_act(), NULL);
  lv_arc_set_angles(arc, 180, 180);
  lv_arc_set_style(arc, LV_ARC_STYLE_MAIN, &style);
  lv_obj_align(arc, NULL, LV_ALIGN_CENTER, 0, 0);

  /* Create an `lv_task` to update the arc.
   * Store the `arc` in the user data*/
  lv_task_create(arc_loader, 20, LV_TASK_PRIO_LOWEST, arc);

}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_arc_style_t**

Enums

enum [anonymous]

Values:

LV_ARC_STYLE_MAIN

Functions

lv_obj_t ***lv_arc_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a arc objects

Return pointer to the created arc

Parameters

- `par`: pointer to an object, it will be the parent of the new arc
- `copy`: pointer to a arc object, if not NULL then the new object will be copied from it

void **lv_arc_set_angles**(*lv_obj_t *arc*, uint16_t *start*, uint16_t *end*)
Set the start and end angles of an arc. 0 deg: bottom, 90 deg: right etc.

Parameters

- `arc`: pointer to an arc object
- `start`: the start angle [0..360]
- `end`: the end angle [0..360]

void **lv_arc_set_style**(*lv_obj_t *arc*, *lv_arc_style_t type*, **const** lv_style_t *style*)
Set a style of a arc.

Parameters

- `arc`: pointer to arc object
- `type`: which style should be set
- `style`: pointer to a style

uint16_t **lv_arc_get_angle_start**(*lv_obj_t *arc*)
Get the start angle of an arc.

Return the start angle [0..360]

Parameters

- `arc`: pointer to an arc object

uint16_t **lv_arc_get_angle_end**(*lv_obj_t *arc*)
Get the end angle of an arc.

Return the end angle [0..360]

Parameters

- `arc`: pointer to an arc object

const lv_style_t ***lv_arc_get_style**(**const** *lv_obj_t *arc*, *lv_arc_style_t type*)
Get style of a arc.

Return style pointer to the style

Parameters

- `arc`: pointer to arc object
- `type`: which style should be get

struct lv_arc_ext_t

Public Members

lv_coord_t **angle_start**

lv_coord_t **angle_end**

(lv_bar)

The 'Bar' objects have got two main parts:

1. a **background** which is the object itself.
2. an **indicator** which shape is similar to the background but its width/height can be adjusted.

The orientation of the bar can be vertical or horizontal according to the width/height ratio. Logically, on horizontal bars, the indicator's width can be changed. Similarly, on vertical bars, the indicator's height can be changed.

A new value can be set by `lv_bar_set_value(bar, new_value, LV_ANIM_ON/OFF)`. The value is interpreted in a range (minimum and maximum values) which can be modified with `lv_bar_set_range(bar, min, max)`. 1 - 100

The new value in `lv_bar_set_value` can be set with or without an animation depending on the last parameter (`LV_ANIM_ON/OFF`). The time of the animation can be adjusted by `lv_bar_set_anim_time(bar, 100)`. The time is in milliseconds unit.

The bar can be drawn symmetrical to zero (drawn from zero, left to right), if it's enabled with `lv_bar_set_sym(bar, true)`

To set the style of an *Bar* object, use `lv_bar_set_style(arc, LV_BAR_STYLE_MAIN, &style)`:

- **LV_BAR_STYLE_BG** - is a *Base object*, therefore, it uses its style elements. Its default style is: `lv_style_pretty`.
- **LV_BAR_STYLE_INDIC** - is similar to the background. It uses the *left*, *right*, *top* and *bottom* paddings to keeps some space form the edges of the background. Its default style is: `lv_style_pretty_color`.

Generic events

Learn more about *Events*.

.

C

Simple Bar

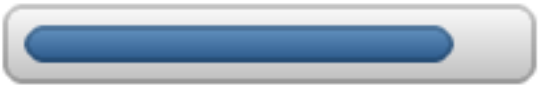
code

```
#include "lvgl/lvgl.h"

void lv_ex_bar_1(void)
{
    lv_obj_t * bar1 = lv_bar_create(lv_scr_act(), NULL);
    lv_obj_set_size(bar1, 200, 30);
    lv_obj_align(bar1, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_bar_set_anim_time(bar1, 1000);
    lv_bar_set_value(bar1, 100, LV_ANIM_ON);
}
```

MicroPython

Simple Bar



code

```
bar1 = lv.bar(lv.scr_act())
bar1.set_size(200, 30);
bar1.align(None, lv.ALIGN.CENTER, 0, 0);
bar1.set_anim_time(1000);
bar1.set_value(100, lv.ANIM.ON);
```

API

Warning: doxygenfile: No breathe_default_project config setting to fall back on for directive with no 'project' or 'path' specified.

Button (lv_btn)

Overview

Buttons are simple rectangle-like objects, but they change their style and state when they are pressed or released.

States

Buttons can be in one of the 5 possible states:

- **LV_BTN_STATE_REL** - Released state
- **LV_BTN_STATE_PR** - Pressed state
- **LV_BTN_STATE_TGL_REL** - Toggled released state

- **LV_BTN_STATE_TGL_PR** - Toggled pressed state
- **LV_BTN_STATE_INA** - Inactive state

The state from `..._REL` to `..._PR` will be changed automatically when the button is pressed or released.

You can set the button's state manually with `lv_btn_set_state(btn, LV_BTN_STATE_TGL_REL)`.

Toggle

You can configure the buttons as *toggle button* with `lv_btn_set_toggle(btn, true)`. In this case, on release, the button goes to *toggled released* state.

Layout and Fit

Similarly to *Containers*, buttons also have layout and fit attributes.

- `lv_btn_set_layout(btn, LV_LAYOUT_...)` set a layout. The default is `LV_LAYOUT_CENTER`. So, if you add a label, then it will be automatically aligned to the middle and can't be moved with `lv_obj_set_pos()`. You can disable the layout with `lv_btn_set_layout(btn, LV_LAYOUT_OFF)`.
- `lv_btn_set_fit/fit2/fit4(btn, LV_FIT_..)` enables to set the button width and/or height automatically according to the children, parent, and fit type.

Ink effect

You can enable a special animation on buttons: when a button is pressed, the pressed state will be drawn in a growing circle starting from the point of pressing. It's similar in appearance and functionality to the Material Design ripple effect.

Another way to think about it is like an ink droplet dropped into water. When the button is released, the released state will be reverted by fading. It's like the ink is fully mixed with a lot of water and becomes invisible.

To control this animation, use the following functions:

- `lv_btn_set_ink_in_time(btn, time_ms)` - time of circle growing.
- `lv_btn_set_ink_wait_time(btn, time_ms)` - minim time to keep the fully covering (pressed) state.
- `lv_btn_set_ink_out_time(btn, time_ms)` - time fade back to releases state.

This feature needs to be enabled with `LV_BTN_INK_EFFECT 1` in *lv_conf.h*.

Styles

A button can have 5 independent styles for the 5 states. You can set them via: `lv_btn_set_style(btn, LV_BTN_STYLE_..., &style)`. The styles use the `style.body` properties.

- **LV_BTN_STYLE_REL** - style of the released state. Default: `lv_style_btn_rel`.
- **LV_BTN_STYLE_PR** - style of the pressed state. Default: `lv_style_btn_pr`.
- **LV_BTN_STYLE_TGL_REL** - style of the toggled released state. Default: `lv_style_btn_tgl_rel`.

- **LV_BTN_STYLE_TGL_PR** - style of the toggled pressed state. Default: `lv_style_btn_tgl_pr`.
- **LV_BTN_STYLE_INA** - style of the inactive state. Default: `lv_style_btn_ina`.

When you create a label on a button, it's a good practice to set the button's `style.text` properties too. Because labels have `style = NULL` by default, they inherit the parent's (button) style. Hence you don't need to create a new style for the label.

Events

Besides the Generic events the following Special events are sent by the buttons:

- **LV_EVENT_VALUE_CHANGED** - sent when the button is toggled.

Note that, the generic input device-related events (like `LV_EVENT_PRESSED`) are sent in the inactive state too. You need to check the state with `lv_btn_get_state(btn)` to ignore the events from inactive buttons.

Learn more about *Events*.

Keys

The following *Keys* are processed by the Buttons:

- **LV_KEY_RIGHT/UP** - Go to toggled state if toggling is enabled.
- **LV_KEY_LEFT/DOWN** - Go to non-toggled state if toggling is enabled.

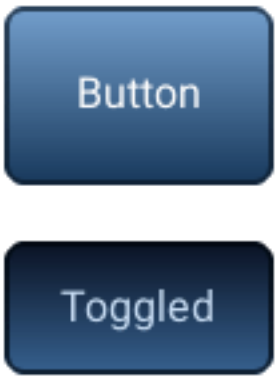
Note that, by default, the state of `LV_KEY_ENTER` is translated to `LV_EVENT_PRESSED/PRESSING/RELEASED` etc.

Learn more about *Keys*.

Example

C

Simple Buttons



code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_CLICKED) {
        printf("Clicked\n");
    }
    else if(event == LV_EVENT_VALUE_CHANGED) {
        printf("Toggled\n");
    }
}

void lv_ex_btn_1(void)
{
    lv_obj_t * label;

    lv_obj_t * btn1 = lv_btn_create(lv_scr_act(), NULL);
    lv_obj_set_event_cb(btn1, event_handler);
    lv_obj_align(btn1, NULL, LV_ALIGN_CENTER, 0, -40);

    label = lv_label_create(btn1, NULL);
    lv_label_set_text(label, "Button");

    lv_obj_t * btn2 = lv_btn_create(lv_scr_act(), NULL);
    lv_obj_set_event_cb(btn2, event_handler);
    lv_obj_align(btn2, NULL, LV_ALIGN_CENTER, 0, 40);
    lv_btn_set_toggle(btn2, true);
    lv_btn_toggle(btn2);
    lv_btn_set_fit2(btn2, LV_FIT_NONE, LV_FIT_TIGHT);

    label = lv_label_create(btn2, NULL);
```

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```
    lv_label_set_text(label, "Toggled");
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_btn_state_t**

typedef uint8_t **lv_btn_style_t**

Enums

enum [**anonymous**]

Possible states of a button. It can be used not only by buttons but other button-like objects too

Values:

LV_BTN_STATE_REL
Released

LV_BTN_STATE_PR
Pressed

LV_BTN_STATE_TGL_REL
Toggled released

LV_BTN_STATE_TGL_PR
Toggled pressed

LV_BTN_STATE_INA
Inactive

_LV_BTN_STATE_NUM
Number of states

enum [**anonymous**]

Styles

Values:

LV_BTN_STYLE_REL
Release style

LV_BTN_STYLE_PR
Pressed style

LV_BTN_STYLE_TGL_REL
Toggle released style

LV_BTN_STYLE_TGL_PR
Toggle pressed style

LV_BTN_STYLE_INA
Inactive style

Functions

lv_obj_t ***lv_btn_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a button object

Return pointer to the created button

Parameters

- `par`: pointer to an object, it will be the parent of the new button
- `copy`: pointer to a button object, if not NULL then the new object will be copied from it

void **lv_btn_set_toggle**(*lv_obj_t *btn*, bool *tgl*)
Enable the toggled states. On release the button will change from/to toggled state.

Parameters

- `btn`: pointer to a button object
- `tgl`: true: enable toggled states, false: disable

void **lv_btn_set_state**(*lv_obj_t *btn*, *lv_btn_state_t state*)
Set the state of the button

Parameters

- `btn`: pointer to a button object
- `state`: the new state of the button (from lv_btn_state_t enum)

void **lv_btn_toggle**(*lv_obj_t *btn*)
Toggle the state of the button (ON->OFF, OFF->ON)

Parameters

- `btn`: pointer to a button object

static void **lv_btn_set_layout**(*lv_obj_t *btn*, *lv_layout_t layout*)
Set the layout on a button

Parameters

- `btn`: pointer to a button object
- `layout`: a layout from 'lv_cont_layout_t'

static void **lv_btn_set_fit4**(*lv_obj_t *btn*, *lv_fit_t left*, *lv_fit_t right*, *lv_fit_t top*, *lv_fit_t bottom*)
Set the fit policy in all 4 directions separately. It tells how to change the button size automatically.

Parameters

- `btn`: pointer to a button object
- `left`: left fit policy from `lv_fit_t`
- `right`: right fit policy from `lv_fit_t`
- `top`: top fit policy from `lv_fit_t`
- `bottom`: bottom fit policy from `lv_fit_t`

static void **lv_btn_set_fit2**(*lv_obj_t *btn*, *lv_fit_t hor*, *lv_fit_t ver*)
Set the fit policy horizontally and vertically separately. It tells how to change the button size automatically.

Parameters

- `btn`: pointer to a button object
- `hor`: horizontal fit policy from `lv_fit_t`
- `ver`: vertical fit policy from `lv_fit_t`

static void **lv_btn_set_fit**(*lv_obj_t *btn*, *lv_fit_t fit*)
Set the fit policy in all 4 direction at once. It tells how to change the button size automatically.

Parameters

- `btn`: pointer to a button object
- `fit`: fit policy from `lv_fit_t`

void **lv_btn_set_ink_in_time**(*lv_obj_t *btn*, uint16_t *time*)
Set time of the ink effect (draw a circle on click to animate in the new state)

Parameters

- `btn`: pointer to a button object
- `time`: the time of the ink animation

void **lv_btn_set_ink_wait_time**(*lv_obj_t *btn*, uint16_t *time*)
Set the wait time before the ink disappears

Parameters

- `btn`: pointer to a button object
- `time`: the time of the ink animation

void **lv_btn_set_ink_out_time**(*lv_obj_t *btn*, uint16_t *time*)
Set time of the ink out effect (animate to the released state)

Parameters

- `btn`: pointer to a button object
- `time`: the time of the ink animation

void **lv_btn_set_style**(*lv_obj_t *btn*, *lv_btn_style_t type*, **const** lv_style_t *style*)
Set a style of a button.

Parameters

- `btn`: pointer to button object
- `type`: which style should be set
- `style`: pointer to a style

lv_btn_state_t **lv_btn_get_state**(**const** *lv_obj_t *btn*)
Get the current state of the button

Return the state of the button (from lv_btn_state_t enum)

Parameters

- `btn`: pointer to a button object

bool **lv_btn_get_toggle**(**const** *lv_obj_t *btn*)
Get the toggle enable attribute of the button

Return true: toggle enabled, false: disabled

Parameters

- `btn`: pointer to a button object

static *lv_layout_t* **lv_btn_get_layout**(**const** *lv_obj_t *btn*)
Get the layout of a button

Return the layout from 'lv_cont_layout_t'

Parameters

- `btn`: pointer to button object

static *lv_fit_t* **lv_btn_get_fit_left**(**const** *lv_obj_t *btn*)
Get the left fit mode

Return an element of `lv_fit_t`

Parameters

- `btn`: pointer to a button object

static *lv_fit_t* **lv_btn_get_fit_right**(**const** *lv_obj_t *btn*)
Get the right fit mode

Return an element of `lv_fit_t`

Parameters

- `btn`: pointer to a button object

static *lv_fit_t* **lv_btn_get_fit_top**(**const** *lv_obj_t *btn*)
Get the top fit mode

Return an element of `lv_fit_t`

Parameters

- `btn`: pointer to a button object

static *lv_fit_t* **lv_btn_get_fit_bottom**(**const** *lv_obj_t *btn*)
Get the bottom fit mode

Return an element of `lv_fit_t`

Parameters

- `btn`: pointer to a button object

uint16_t **lv_btn_get_ink_in_time**(**const** *lv_obj_t *btn*)
Get time of the ink in effect (draw a circle on click to animate in the new state)

Return the time of the ink animation

Parameters

- `btn`: pointer to a button object

uint16_t **lv_btn_get_ink_wait_time**(**const** *lv_obj_t *btn*)
Get the wait time before the ink disappears

Return the time of the ink animation

Parameters

- `btn`: pointer to a button object

uint16_t **lv_btn_get_ink_out_time(const** *lv_obj_t *btn*)
Get time of the ink out effect (animate to the releases state)

Return the time of the ink animation

Parameters

- `btn`: pointer to a button object

const lv_style_t ***lv_btn_get_style(const** *lv_obj_t *btn*, *lv_btn_style_t type*)
Get style of a button.

Return style pointer to the style

Parameters

- `btn`: pointer to button object
- `type`: which style should be get

struct lv_btn_ext_t
#include <lv_btn.h> Extended data of button

Public Members

lv_cont_ext_t **cont**
Ext. of ancestor

const lv_style_t ***styles**[**_LV_BTN_STATE_NUM**]
Styles in each state

uint16_t **ink_in_time**
[ms] Time of ink fill effect (0: disable ink effect)

uint16_t **ink_wait_time**
[ms] Wait before the ink disappears

uint16_t **ink_out_time**
[ms] Time of ink disappearing

lv_btn_state_t **state**
Current state of the button from 'lv_btn_state_t' enum

uint8_t **toggle**
1: Toggle enabled

Button matrix (lv_btnm)

Overview

The Button Matrix objects can display **multiple buttons** in rows and columns.

The main reasons for wanting to use a button matrix instead of a container and individual button objects are:

- The button matrix is simpler to use for grid-based button layouts.
- The button matrix consumes a lot less memory per button.

Button's text

There is a text on each button. To specify them a descriptor string array, called *map*, needs to be used. The map can be set with `lv_btnm_set_map(btnm, my_map)`. The declaration of a map should look like `const char * map[] = {"btn1", "btn2", "btn3", ""}`. Note that **the last element has to be an empty string**!

Use `"\n"` in the map to make **line break**. E.g. `{"btn1", "btn2", "\n", "btn3", ""}`. Each line's buttons have their width calculated automatically.

Control buttons

The **buttons width** can be set relative to the other button in the same line with `lv_btnm_set_btn_width(btnm, btn_id, width)` E.g. in a line with two buttons: *btnA, width = 1* and *btnB, width = 2*, *btnA* will have 33 % width and *btnB* will have 66 % width. It's similar to how the `flex-grow` property works in CSS.

In addition to width, each button can be customized with the following parameters:

- **LV_BTNM_CTRL_HIDDEN** - make a button hidden (hidden buttons still take up space in the layout, they are just not visible or clickable)
- **LV_BTNM_CTRL_NO_REPEAT** - disable repeating when the button is long pressed
- **LV_BTNM_CTRL_INACTIVE** - make a button inactive
- **LV_BTNM_CTRL_TGL_ENABLE** - enable toggling of a button
- **LV_BTNM_CTRL_TGL_STATE** - set the toggle state
- **LV_BTNM_CTRL_CLICK_TRIG** - if 0, the button will react on press, if 1, will react on release

The set or clear a button's control attribute, use `lv_btnm_set_btn_ctrl(btnm, btn_id, LV_BTNM_CTRL_...)` and `lv_btnm_clear_btn_ctrl(btnm, btn_id, LV_BTNM_CTRL_...)` respectively. More `LV_BTNM_CTRL_...` values can be *Or*ed

The set/clear the same control attribute for all buttons of a button matrix, use `lv_btnm_set_btn_ctrl_all(btnm, btn_id, LV_BTNM_CTRL_...)` and `lv_btnm_clear_btn_ctrl_all(btnm, btn_id, LV_BTNM_CTRL_...)`.

The set a control map for a button matrix (similarly to the map for the text), use `lv_btnm_set_ctrl_map(btnm, ctrl_map)`. An element of `ctrl_map` should look like `ctrl_map[0] = width | LV_BTNM_CTRL_NO_REPEAT | LV_BTNM_CTRL_TGL_ENABLE`. The number of elements should be equal to the number of buttons (excluding newlines characters).

One toggle

The "One toggle" feature can be enabled with `lv_btnm_set_one_toggle(btnm, true)` to allow only one button to be toggled at once.

Recolor

The **texts** on the button can be **recolored** similarly to the recolor feature for *Label* object. To enable it, use `lv_btnm_set_recolor(btnm, true)`. After that a button with `#FF0000 Red#` text will be red.

Notes

The Button matrix object is very light weighted because the buttons are not created just virtually drawn on the fly. This way, 1 button use only 8 extra bytes instead of the ~100-150 byte size of a normal *Button* object (plus the size of its container and a label for each button).

The disadvantage of this setup is that the ability to style individual buttons to be different from others is limited (aside from the toggling feature). If you require that ability, using individual buttons is very likely to be a better approach.

Styles

The Button matrix works with 6 styles: a background and 5 button styles for each state. You can set the styles with `lv_btnm_set_style(btn, LV_BTNM_STYLE_..., &style)`. The background and the buttons use the `style.body` properties. The labels use the `style.text` properties of the button styles.

- **LV_BTNM_STYLE_BG** - Background style. Uses all *style.body* properties including *padding* Default: *lv_style_pretty*
- **LV_BTNM_STYLE_BTN_REL** - style of the released buttons. Default: *lv_style_btn_rel*
- **LV_BTNM_STYLE_BTN_PR** - style of the pressed buttons. Default: *lv_style_btn_pr*
- **LV_BTNM_STYLE_BTN_TGL_REL** - style of the toggled released buttons. Default: *lv_style_btn_tgl_rel*
- **LV_BTNM_STYLE_BTN_TGL_PR** - style of the toggled pressed buttons. Default: *lv_style_btn_tgl_pr*
- **LV_BTNM_STYLE_BTN_INA** - style of the inactive buttons. Default: *lv_style_btn_ina*

Events

Besides the Generic events, the following Special events are sent by the button matrices:

- **LV_EVENT_VALUE_CHANGED** - sent when the button is pressed/released or repeated after long press. The event data is set to the ID of the pressed/released button.

Learn more about *Events*.

Keys

The following *Keys* are processed by the Buttons:

- **LV_KEY_RIGHT/UP/LEFT/RIGHT** - To navigate among the buttons to select one
- **LV_KEY_ENTER** - To press/release the selected button

Learn more about *Keys*.

Example

C

Simple Button matrix

code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        const char * txt = lv_btnm_get_active_btn_text(obj);

        printf("%s was pressed\n", txt);
    }
}


static const char * btnm_map[] = {"1", "2", "3", "4", "5", "\n",
                                  "6", "7", "8", "9", "0", "\n",
                                  "Action1", "Action2", ""};

void lv_ex_btnm_1(void)
{
    lv_obj_t * btnm1 = lv_btnm_create(lv_scr_act(), NULL);
    lv_btnm_set_map(btnm1, btnm_map);
    lv_btnm_set_btn_width(btnm1, 10, 2);        /*Make "Action1" twice as wide as
↪"Action2"*/
    lv_obj_align(btnm1, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_obj_set_event_cb(btnm1, event_handler);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint16_t **lv_btnm_ctrl_t**

typedef uint8_t **lv_btnm_style_t**

Enums

enum [anonymous]

Type to store button control bits (disabled, hidden etc.)

Values:

LV_BTNM_CTRL_HIDDEN = 0x0008

Button hidden

LV_BTNM_CTRL_NO_REPEAT = 0x0010

Do not repeat press this button.

LV_BTNM_CTRL_INACTIVE = 0x0020

Disable this button.

LV_BTNM_CTRL_TGL_ENABLE = 0x0040

Button *can* be toggled.

LV_BTNM_CTRL_TGL_STATE = 0x0080

Button is currently toggled (e.g. checked).

LV_BTNM_CTRL_CLICK_TRIG = 0x0100

1: Send LV_EVENT_SELECTED on CLICK, 0: Send LV_EVENT_SELECTED on PRESS

enum [anonymous]

Values:

LV_BTNM_STYLE_BG

LV_BTNM_STYLE_BTN_REL

LV_BTNM_STYLE_BTN_PR

LV_BTNM_STYLE_BTN_TGL_REL

LV_BTNM_STYLE_BTN_TGL_PR

LV_BTNM_STYLE_BTN_INA

Functions

lv_obj_t ***lv_btnm_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a button matrix objects

Return pointer to the created button matrix

Parameters

- `par`: pointer to an object, it will be the parent of the new button matrix
- `copy`: pointer to a button matrix object, if not NULL then the new object will be copied from it

void **lv_btnm_set_map(const** *lv_obj_t *btnm*, **const** char **map*[]**)**
Set a new map. Buttons will be created/deleted according to the map. The button matrix keeps a reference to the map and so the string array must not be deallocated during the life of the matrix.

Parameters

- `btnm`: pointer to a button matrix object
- `map`: pointer a string array. The last string has to be: "". Use "\n" to make a line break.

void **lv_btnm_set_ctrl_map(const** *lv_obj_t *btnm*, **const** *lv_btnm_ctrl_t ctrl_map*[]**)**
Set the button control map (hidden, disabled etc.) for a button matrix. The control map array will be copied and so may be deallocated after this function returns.

Parameters

- `btnm`: pointer to a button matrix object
- `ctrl_map`: pointer to an array of `lv_btn_ctrl_t` control bytes. The length of the array and position of the elements must match the number and order of the individual buttons (i.e. excludes newline entries). An element of the map should look like e.g.: `ctrl_map[0] = width | LV_BTNM_CTRL_NO_REPEAT | LV_BTNM_CTRL_TGL_ENABLE`

void **lv_btnm_set_pressed(const** *lv_obj_t *btnm*, uint16_t *id***)**
Set the pressed button i.e. visually highlight it. Mainly used a when the btnm is in a group to show the selected button

Parameters

- `btnm`: pointer to button matrix object
- `id`: index of the currently pressed button (`LV_BTNM_BTN_NONE` to unpress)

void **lv_btnm_set_style(***lv_obj_t *btnm*, *lv_btnm_style_t type*, **const** lv_style_t **style***)**
Set a style of a button matrix

Parameters

- `btnm`: pointer to a button matrix object
- `type`: which style should be set
- `style`: pointer to a style

void **lv_btnm_set_recolor(const** *lv_obj_t *btnm*, bool *en***)**
Enable recoloring of button's texts

Parameters

- `btnm`: pointer to button matrix object
- `en`: true: enable recoloring; false: disable

void **lv_btnm_set_btn_ctrl(const** *lv_obj_t *btnm*, uint16_t *btn_id*, *lv_btnm_ctrl_t ctrl***)**
Set the attributes of a button of the button matrix

Parameters

- `btnm`: pointer to button matrix object
- `btn_id`: 0 based index of the button to modify. (Not counting new lines)

void **lv_btnm_clear_btn_ctrl(const** *lv_obj_t *btnm*, uint16_t *btn_id*, *lv_btnm_ctrl_t ctrl***)**
Clear the attributes of a button of the button matrix

Parameters

- `btnm`: pointer to button matrix object
- `btn_id`: 0 based index of the button to modify. (Not counting new lines)

void **lv_btnm_set_btn_ctrl_all**(*lv_obj_t *btnm*, *lv_btnm_ctrl_t ctrl*)
Set the attributes of all buttons of a button matrix

Parameters

- `btnm`: pointer to a button matrix object
- `ctrl`: attribute(s) to set from `lv_btnm_ctrl_t`. Values can be ORed.

void **lv_btnm_clear_btn_ctrl_all**(*lv_obj_t *btnm*, *lv_btnm_ctrl_t ctrl*)
Clear the attributes of all buttons of a button matrix

Parameters

- `btnm`: pointer to a button matrix object
- `ctrl`: attribute(s) to set from `lv_btnm_ctrl_t`. Values can be ORed.
- `en`: true: set the attributes; false: clear the attributes

void **lv_btnm_set_btn_width**(**const** *lv_obj_t *btnm*, uint16_t *btn_id*, uint8_t *width*)
Set a single buttons relative width. This method will cause the matrix be regenerated and is a relatively expensive operation. It is recommended that initial width be specified using `lv_btnm_set_ctrl_map` and this method only be used for dynamic changes.

Parameters

- `btnm`: pointer to button matrix object
- `btn_id`: 0 based index of the button to modify.
- `width`: Relative width compared to the buttons in the same row. [1..7]

void **lv_btnm_set_one_toggle**(*lv_obj_t *btnm*, bool *one_toggle*)
Make the button matrix like a selector widget (only one button may be toggled at a time).

Toggling must be enabled on the buttons you want to be selected with `lv_btnm_set_ctrl` or `lv_btnm_set_btn_ctrl_all`.

Parameters

- `btnm`: Button matrix object
- `one_toggle`: Whether "one toggle" mode is enabled

const char ****lv_btnm_get_map_array**(**const** *lv_obj_t *btnm*)
Get the current map of a button matrix

Return the current map

Parameters

- `btnm`: pointer to a button matrix object

bool **lv_btnm_get_recolor**(**const** *lv_obj_t *btnm*)
Check whether the button's text can use recolor or not

Return true: text recolor enable; false: disabled

Parameters

- `btnm`: pointer to button matrix object

uint16_t **lv_btnm_get_active_btn(const** *lv_obj_t *btnm*)
Get the index of the lastly "activated" button by the user (pressed, released etc) Useful in the the `event_cb` to get the text of the button, check if hidden etc.

Return index of the last released button (LV_BTNM_BTN_NONE: if unset)

Parameters

- `btnm`: pointer to button matrix object

const char ***lv_btnm_get_active_btn_text(const** *lv_obj_t *btnm*)
Get the text of the lastly "activated" button by the user (pressed, released etc) Useful in the the `event_cb`

Return text of the last released button (NULL: if unset)

Parameters

- `btnm`: pointer to button matrix object

uint16_t **lv_btnm_get_pressed_btn(const** *lv_obj_t *btnm*)
Get the pressed button's index. The button be really pressed by the user or manually set to pressed with `lv_btnm_set_pressed`

Return index of the pressed button (LV_BTNM_BTN_NONE: if unset)

Parameters

- `btnm`: pointer to button matrix object

const char ***lv_btnm_get_btn_text(const** *lv_obj_t *btnm*, uint16_t *btn_id*)
Get the button's text

Return text of btn_index' button

Parameters

- `btnm`: pointer to button matrix object
- `btn_id`: the index a button not counting new line characters. (The return value of lv_btnm_get_pressed/released)

bool **lv_btnm_get_btn_ctrl(***lv_obj_t *btnm*, uint16_t *btn_id*, *lv_btnm_ctrl_t ctrl*)
Get the whether a control value is enabled or disabled for button of a button matrix

Return true: long press repeat is disabled; false: long press repeat enabled

Parameters

- `btnm`: pointer to a button matrix object
- `btn_id`: the index a button not counting new line characters. (E.g. the return value of lv_btnm_get_pressed/released)
- `ctrl`: control values to check (ORed value can be used)

const lv_style_t ***lv_btnm_get_style(const** *lv_obj_t *btnm*, *lv_btnm_style_t type*)
Get a style of a button matrix

Return style pointer to a style

Parameters

- `btnm`: pointer to a button matrix object
- `type`: which style should be get

bool **lv_btnm_get_one_toggle**(**const** *lv_obj_t* *btnm)
Find whether "one toggle" mode is enabled.

Return whether "one toggle" mode is enabled

Parameters

- `btnm`: Button matrix object

struct lv_btnm_ext_t

Public Members

const char ****map_p**

lv_area_t ***button_areas**

lv_btnm_ctrl_t ***ctrl_bits**

const lv_style_t ***styles_btn**[**_LV_BTN_STATE_NUM**]

uint16_t **btn_cnt**

uint16_t **btn_id_pr**

uint16_t **btn_id_act**

uint8_t **recolor**

uint8_t **one_toggle**

Calendar (lv_calendar)

Overview

The Calendar object is a classic calendar which can:

- highlight the current day and week
- highlight any user-defined dates
- display the name of the days
- go the next/previous month by button click
- highlight the clicked day

To set and get dates in the calendar, the `lv_calendar_date_t` type is used which is a structure with `year`, `month` and `day` fields.

Current date

To set the current date (today), use the `lv_calendar_set_today_date(calendar, &today_date)` function.

Shown date

To set the shown date, use `lv_calendar_set_shown_date(calendar, &shown_date)`;

Highlighted days

The list of highlighted dates should be stored in a `lv_calendar_date_t` array loaded by `lv_calendar_set_highlighted_dates(calendar, &highlighted_dates)`.Only the arrays pointer will be saved so the array should be a static or global variable.

Name of the days

The name of the days can be adjusted with `lv_calendar_set_day_names(calendar, day_names)` where `day_names` looks like `const char * day_names[7] = {"Su", "Mo", ...};`

Name of the months

Similarly to `day_names`, the name of the month can be set with `lv_calendar_set_month_names(calendar, month_names_array)`.

Styles

You can set the styles with `lv_calendar_set_style(btn, LV_CALENDAR_STYLE_..., &style)`.

- **LV_CALENDAR_STYLE_BG** - Style of the background using the `body` properties and the style of the date numbers using the `text` properties. `body.padding.left/right/bottom` padding will be added on the edges around the date numbers.
- **LV_CALENDAR_STYLE_HEADER** - Style of the header where the current year and month is displayed. `body` and `text` properties are used.
- **LV_CALENDAR_STYLE_HEADER_PR** - Pressed header style, used when the next/prev. month button is being pressed. `text` properties are used by the arrows.
- **LV_CALENDAR_STYLE_DAY_NAMES** - Style of the day names. `text` properties are used by the 'day' texts and `body.padding.top` determines the space above the day names.
- **LV_CALENDAR_STYLE_HIGHLIGHTED_DAYS** - `text` properties are used to adjust the style of the highlights days.
- **LV_CALENDAR_STYLE_INACTIVE_DAYS** - `text` properties are used to adjust the style of the visible days of previous/next month.
- **LV_CALENDAR_STYLE_WEEK_BOX** - `body` properties are used to set the style of the week box.
- **LV_CALENDAR_STYLE_TODAY_BOX** - `body` and `text` properties are used to set the style of the today box.

Events

Besides the Generic events, the following Special events are sent by the calendars: **LV_EVENT_VALUE_CHANGED** is sent when the current month has changed.

In *Input device related* events, `lv_calendar_get_pressed_date(calendar)` tells which day is currently being pressed or return `NULL` if no date is pressed.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Calendar with day select

code

```
#include "lvgl/lvgl.h"

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_CLICKED) {
        lv_calendar_date_t * date = lv_calendar_get_pressed_date(obj);
        if(date) {
            lv_calendar_set_today_date(obj, date);
        }
    }
}

void lv_ex_calendar_1(void)
{
    lv_obj_t  * calendar = lv_calendar_create(lv_scr_act(), NULL);
    lv_obj_set_size(calendar, 230, 230);
    lv_obj_align(calendar, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_obj_set_event_cb(calendar, event_handler);
```

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```
    /*Set the today*/
    lv_calendar_date_t today;
    today.year = 2018;
    today.month = 10;
    today.day = 23;

    lv_calendar_set_today_date(calendar, &today);
    lv_calendar_set_showed_date(calendar, &today);

    /*Highlight some days*/
    static lv_calendar_date_t highlihted_days[3];       /*Only it's pointer will be␣
↪saved so should be static*/
    highlihted_days[0].year = 2018;
    highlihted_days[0].month = 10;
    highlihted_days[0].day = 6;

    highlihted_days[1].year = 2018;
    highlihted_days[1].month = 10;
    highlihted_days[1].day = 11;

    highlihted_days[2].year = 2018;
    highlihted_days[2].month = 11;
    highlihted_days[2].day = 22;

    lv_calendar_set_highlighted_dates(calendar, highlihted_days, 3);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_calendar_style_t**

Enums

enum [anonymous]

Calendar styles

Values:

LV_CALENDAR_STYLE_BG

Background and “normal” date numbers style

LV_CALENDAR_STYLE_HEADER

LV_CALENDAR_STYLE_HEADER_PR

Calendar header style

LV_CALENDAR_STYLE_DAY_NAMES

Calendar header style (when pressed)

LV_CALENDAR_STYLE_HIGHLIGHTED_DAYS
Day name style

LV_CALENDAR_STYLE_INACTIVE_DAYS
Highlighted day style

LV_CALENDAR_STYLE_WEEK_BOX
Inactive day style

LV_CALENDAR_STYLE_TODAY_BOX
Week highlight style

Functions

lv_obj_t ***lv_calendar_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a calendar objects

Return pointer to the created calendar

Parameters

- `par`: pointer to an object, it will be the parent of the new calendar
- `copy`: pointer to a calendar object, if not NULL then the new object will be copied from it

void **lv_calendar_set_today_date**(*lv_obj_t *calendar*, *lv_calendar_date_t *today*)
Set the today's date

Parameters

- `calendar`: pointer to a calendar object
- `today`: pointer to an *`lv_calendar_date_t`* variable containing the date of today. The value will be saved it can be local variable too.

void **lv_calendar_set_showed_date**(*lv_obj_t *calendar*, *lv_calendar_date_t *showed*)
Set the currently showed

Parameters

- `calendar`: pointer to a calendar object
- `showed`: pointer to an *`lv_calendar_date_t`* variable containing the date to show. The value will be saved it can be local variable too.

void **lv_calendar_set_highlighted_dates**(*lv_obj_t *calendar*, *lv_calendar_date_t *highlighted*, uint16_t *date_num*)
Set the the highlighted dates

Parameters

- `calendar`: pointer to a calendar object
- `highlighted`: pointer to an *`lv_calendar_date_t`* array containing the dates. ONLY A POINTER WILL BE SAVED! CAN'T BE LOCAL ARRAY.
- `date_num`: number of dates in the array

void **lv_calendar_set_day_names**(*lv_obj_t *calendar*, **const** char **day_names*)
Set the name of the days

Parameters

- `calendar`: pointer to a calendar object

- `day_names`: pointer to an array with the names. E.g. `const char * days[7] = {"Sun", "Mon", ...}` Only the pointer will be saved so this variable can't be local which will be destroyed later.

void **lv_calendar_set_month_names**(*lv_obj_t* **calendar*, **const** char ***day_names*)
Set the name of the month

Parameters

- `calendar`: pointer to a calendar object
- `day_names`: pointer to an array with the names. E.g. `const char * days[12] = {"Jan", "Feb", ...}` Only the pointer will be saved so this variable can't be local which will be destroyed later.

void **lv_calendar_set_style**(*lv_obj_t* **calendar*, *lv_calendar_style_t type*, **const** lv_style_t **style*)
Set a style of a calendar.

Parameters

- `calendar`: pointer to calendar object
- `type`: which style should be set
- `style`: pointer to a style

lv_calendar_date_t ***lv_calendar_get_today_date**(**const** *lv_obj_t* **calendar*)
Get the today's date

Return return pointer to an *`lv_calendar_date_t`* variable containing the date of today.

Parameters

- `calendar`: pointer to a calendar object

lv_calendar_date_t ***lv_calendar_get_showed_date**(**const** *lv_obj_t* **calendar*)
Get the currently showed

Return pointer to an *`lv_calendar_date_t`* variable containing the date is being shown.

Parameters

- `calendar`: pointer to a calendar object

lv_calendar_date_t ***lv_calendar_get_pressed_date**(**const** *lv_obj_t* **calendar*)
Get the the pressed date.

Return pointer to an *`lv_calendar_date_t`* variable containing the pressed date. `NULL` if not date pressed (e.g. the header)

Parameters

- `calendar`: pointer to a calendar object

lv_calendar_date_t ***lv_calendar_get_highlighted_dates**(**const** *lv_obj_t* **calendar*)
Get the the highlighted dates

Return pointer to an *`lv_calendar_date_t`* array containing the dates.

Parameters

- `calendar`: pointer to a calendar object

uint16_t **lv_calendar_get_highlighted_dates_num**(**const** *lv_obj_t* **calendar*)
Get the number of the highlighted dates

Return number of highlighted days

Parameters

- `calendar`: pointer to a calendar object

const char ****lv_calendar_get_day_names(const** *lv_obj_t *calendar*)
Get the name of the days

Return pointer to the array of day names

Parameters

- `calendar`: pointer to a calendar object

const char ****lv_calendar_get_month_names(const** *lv_obj_t *calendar*)
Get the name of the month

Return pointer to the array of month names

Parameters

- `calendar`: pointer to a calendar object

const lv_style_t ***lv_calendar_get_style(const** *lv_obj_t *calendar*, *lv_calendar_style_t type*)
Get style of a calendar.

Return style pointer to the style

Parameters

- `calendar`: pointer to calendar object
- `type`: which style should be get

struct lv_calendar_date_t
#include <lv_calendar.h> Represents a date on the calendar object (platform-agnostic).

Public Members

uint16_t **year**

int8_t **month**

int8_t **day**

struct lv_calendar_ext_t

Public Members

lv_calendar_date_t **today**

lv_calendar_date_t **showed_date**

lv_calendar_date_t ***highlighted_dates**

uint8_t **highlighted_dates_num**

int8_t **btn_pressing**

lv_calendar_date_t **pressed_date**

const char ****day_names**

const char ****month_names**

const lv_style_t ***style_header**

const lv_style_t ***style_header_pr**

const lv_style_t ***style_day_names**

const lv_style_t ***style_highlighted_days**

const lv_style_t ***style_inactive_days**

const lv_style_t ***style_week_box**

const lv_style_t ***style_today_box**

Canvas (lv_canvas)

Overview

A Canvas is like an *Image* where the user can draw anything.

Buffer

The Canvas needs a buffer which stores the drawn image. To assign a buffer to a Canvas, use `lv_canvas_set_buffer(canvas, buffer, width, height, LV_IMG_CF_...)`. `buffer` is a static buffer (not just a local variable) to hold the image of the canvas. For example, `static lv_color_t buffer[LV_CANVAS_BUF_SIZE_TRUE_COLOR(width, height)]`. `LV_CANVAS_BUF_SIZE_...` macros help to determine the size of the buffer with different color formats.

The canvas supports all the built-in color formats like `LV_IMG_CF_TRUE_COLOR` or `LV_IMG_CF_INDEXED_2BIT`. See the full list in the Color formats section.

Palette

For `LV_IMG_CF_INDEXED_...` color formats, a palette needs to be initialized with `lv_canvas_set_palette(canvas, 3, LV_COLOR_RED)`. It sets pixels with *index=3* to red.

Drawing

To set a pixel on the canvas, use `lv_canvas_set_px(canvas, x, y, LV_COLOR_RED)`. With `LV_IMG_CF_INDEXED_...` or `LV_IMG_CF_ALPHA_...`, the index of the color or the alpha value needs to be passed as color. E.g. `lv_color_t c; c.full = 3;`

`lv_canvas_fill_bg(canvas, LV_COLOR_BLUE)` fills the whole canvas to blue.

An array of pixels can be copied to the canvas with `lv_canvas_copy_buf(canvas, buffer_to_copy, x, y, width, height)`. The color format of the buffer and the canvas need to match.

To draw something to the canvas use

- `lv_canvas_draw_rect(canvas, x, y, width, heigth, &style)`
- `lv_canvas_draw_text(canvas, x, y, max_width, &style, txt, LV_LABEL_ALIGN_LEFT/CENTER/RIGTH)`
- `lv_canvas_draw_img(canvas, x, y, &img_src, &style)`
- `lv_canvas_draw_line(canvas, point_array, point_cnt, &style)`
- `lv_canvas_draw_polygon(canvas, points_array, point_cnt, &style)`

- `lv_canvas_draw_arc(canvas, x, y, radius, start_angle, end_angle, &style)`

The draw function can draw only to `LV_IMG_CF_TURE_COLOR`, `LV_IMG_CF_TRUE_COLOR_CHROMA_KEYED` and `LV_IMG_CF_TRUE_COLOR_ALPHA` buffers. `LV_IMG_CF_TRUE_COLOR_ALPHA` is working only with `LV_COLOR_DEPTH 32`.

Rotate

A rotated image can be added to canvas with `lv_canvas_rotate(canvas, &imd_dsc, angle, x, y, pivot_x, pivot_y)`. It will rotate the image shown by `img_dsc` around the given pivot and stores it on the `x`, `y` coordinates of `canvas`. Instead of `img_dsc`, the buffer of another canvas also can be used by `lv_canvas_get_img(canvas)`.

Note that a canvas can't be rotated on itself. You need a source and destination canvas or image.

Styles

You can set the styles with `lv_canvas_set_style(btn, LV_CANVAS_STYLE_MAIN, &style)`. `style.image.color` is used to tell the base color with `LV_IMG_CF_ALPHA_...` color format.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

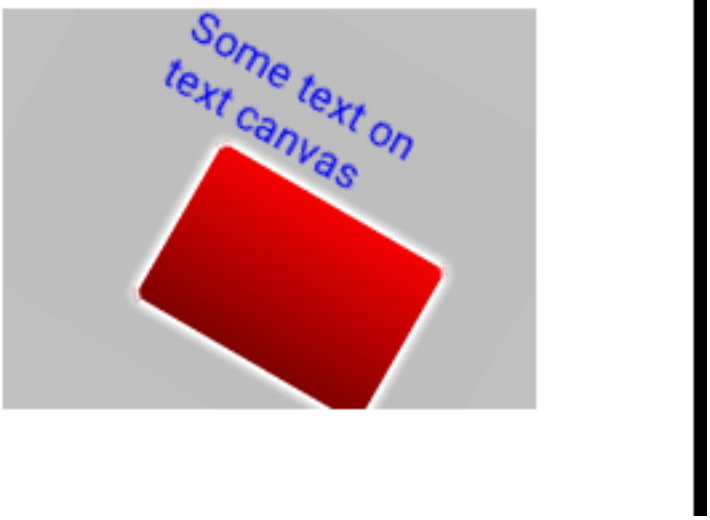
No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Drawing on the Canvas and rotate



code

```
#include "lvgl/lvgl.h"

#define CANVAS_WIDTH  200
#define CANVAS_HEIGHT  150

void lv_ex_canvas_1(void)
{
    static lv_style_t style;
    lv_style_copy(&style, &lv_style_plain);
    style.body.main_color = LV_COLOR_RED;
    style.body.grad_color = LV_COLOR_MAROON;
    style.body.radius = 4;
    style.body.border.width = 2;
    style.body.border.color = LV_COLOR_WHITE;
    style.body.shadow.color = LV_COLOR_WHITE;
    style.body.shadow.width = 4;
    style.line.width = 2;
    style.line.color = LV_COLOR_BLACK;
    style.text.color = LV_COLOR_BLUE;

    static lv_color_t cbuf[LV_CANVAS_BUF_SIZE_TRUE_COLOR(CANVAS_WIDTH, CANVAS_
↪HEIGHT)];

    lv_obj_t * canvas = lv_canvas_create(lv_scr_act(), NULL);
    lv_canvas_set_buffer(canvas, cbuf, CANVAS_WIDTH, CANVAS_HEIGHT, LV_IMG_CF_TRUE_
↪COLOR);
    lv_obj_align(canvas, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_canvas_fill_bg(canvas, LV_COLOR_SILVER);

    lv_canvas_draw_rect(canvas, 70, 60, 100, 70, &style);
```

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```
    lv_canvas_draw_text(canvas, 40, 20, 100, &style, "Some text on text canvas", LV_
↪LABEL_ALIGN_LEFT);

    /* Test the rotation. It requires an other buffer where the orignal image is␣
↪stored.
     * So copy the current image to buffer and rotate it to the canvas */
    lv_color_t cbuf_tmp[CANVAS_WIDTH * CANVAS_HEIGHT];
    memcpy(cbuf_tmp, cbuf, sizeof(cbuf_tmp));
    lv_img_dsc_t img;
    img.data = (void *)cbuf_tmp;
    img.header.cf = LV_IMG_CF_TRUE_COLOR;
    img.header.w = CANVAS_WIDTH;
    img.header.h = CANVAS_HEIGHT;

    lv_canvas_fill_bg(canvas, LV_COLOR_SILVER);
    lv_canvas_rotate(canvas, &img, 30, 0, 0, CANVAS_WIDTH / 2, CANVAS_HEIGHT / 2);
}
```

Transparent Canvas with chroma keying

code

```
#include "lvgl/lvgl.h"

#define CANVAS_WIDTH  50
#define CANVAS_HEIGHT  50

/**
 * Create a transparent canvas with Chroma keying and indexed color format (palette).
 */
void lv_ex_canvas_2(void)
{
```

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```
    /*Create a button to better see the transparency*/
    lv_btn_create(lv_scr_act(), NULL);

    /*Create a buffer for the canvas*/
    static lv_color_t cbuf[LV_CANVAS_BUF_SIZE_INDEXED_1BIT(CANVAS_WIDTH, CANVAS_
↪HEIGHT)];

    /*Create a canvas and initialize its the palette*/
    lv_obj_t * canvas = lv_canvas_create(lv_scr_act(), NULL);
    lv_canvas_set_buffer(canvas, cbuf, CANVAS_WIDTH, CANVAS_HEIGHT, LV_IMG_CF_INDEXED_
↪1BIT);
    lv_canvas_set_palette(canvas, 0, LV_COLOR_TRANSP);
    lv_canvas_set_palette(canvas, 1, LV_COLOR_RED);

    /*Create colors with the indices of the palette*/
    lv_color_t c0;
    lv_color_t c1;

    c0.full = 0;
    c1.full = 1;

    /*Transparent background*/
    lv_canvas_fill_bg(canvas, c1);

    /*Create hole on the canvas*/
    uint32_t x;
    uint32_t y;
    for( y = 10; y < 30; y++) {
        for( x = 5; x < 20; x++) {
            lv_canvas_set_px(canvas, x, y, c0);
        }
    }

}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_canvas_style_t**

Enums

enum [anonymous]

Values:

LV_CANVAS_STYLE_MAIN

Functions

lv_obj_t ***lv_canvas_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a canvas object

Return pointer to the created canvas

Parameters

- `par`: pointer to an object, it will be the parent of the new canvas
- `copy`: pointer to a canvas object, if not NULL then the new object will be copied from it

void **lv_canvas_set_buffer**(*lv_obj_t *canvas*, void *buf*, lv_coord_t *w*, lv_coord_t *h*, *lv_img_cf_t cf*)
Set a buffer for the canvas.

Parameters

- `buf`: a buffer where the content of the canvas will be. The required size is (lv_img_color_format_get_px_size(cf) * w * h) / 8) It can be allocated with `lv_mem_alloc()` or it can be statically allocated array (e.g. static lv_color_t buf[100*50]) or it can be an address in RAM or external SRAM
- `canvas`: pointer to a canvas object
- `w`: width of the canvas
- `h`: height of the canvas
- `cf`: color format. `LV_IMG_CF_...`

void **lv_canvas_set_px**(*lv_obj_t *canvas*, lv_coord_t *x*, lv_coord_t *y*, *lv_color_t c*)
Set the color of a pixel on the canvas

Parameters

- `canvas`:
- `x`: x coordinate of the point to set
- `y`: x coordinate of the point to set
- `c`: color of the point

void **lv_canvas_set_palette**(*lv_obj_t *canvas*, uint8_t *id*, *lv_color_t c*)
Set the palette color of a canvas with index format. Valid only for `LV_IMG_CF_INDEXED1/2/4/8`

Parameters

- `canvas`: pointer to canvas object
- `id`: the palette color to set:
  - for `LV_IMG_CF_INDEXED1`: 0..1
  - for `LV_IMG_CF_INDEXED2`: 0..3
  - for `LV_IMG_CF_INDEXED4`: 0..15
  - for `LV_IMG_CF_INDEXED8`: 0..255
- `c`: the color to set

void **lv_canvas_set_style**(*lv_obj_t *canvas*, *lv_canvas_style_t type*, **const** lv_style_t *style*)
Set a style of a canvas.

Parameters

- `canvas`: pointer to canvas object
- `type`: which style should be set
- `style`: pointer to a style

lv_color_t **lv_canvas_get_px**(*lv_obj_t *canvas*, lv_coord_t *x*, lv_coord_t *y*)
Get the color of a pixel on the canvas

Return color of the point

Parameters

- `canvas`:
- `x`: x coordinate of the point to set
- `y`: x coordinate of the point to set

lv_img_dsc_t ***lv_canvas_get_img**(*lv_obj_t *canvas*)
Get the image of the canvas as a pointer to an *`lv_img_dsc_t`* variable.

Return pointer to the image descriptor.

Parameters

- `canvas`: pointer to a canvas object

const lv_style_t ***lv_canvas_get_style**(**const** *lv_obj_t *canvas*, *lv_canvas_style_t type*)
Get style of a canvas.

Return style pointer to the style

Parameters

- `canvas`: pointer to canvas object
- `type`: which style should be get

void **lv_canvas_copy_buf**(*lv_obj_t *canvas*, **const** void *to_copy*, lv_coord_t *x*, lv_coord_t *y*, lv_coord_t *w*, lv_coord_t *h*)
Copy a buffer to the canvas

Parameters

- `canvas`: pointer to a canvas object
- `to_copy`: buffer to copy. The color format has to match with the canvas's buffer color format
- `x`: left side of the destination position
- `y`: top side of the destination position
- `w`: width of the buffer to copy
- `h`: height of the buffer to copy

void **lv_canvas_rotate**(*lv_obj_t *canvas*, *lv_img_dsc_t *img*, int16_t *angle*, lv_coord_t *offset_x*, lv_coord_t *offset_y*, int32_t *pivot_x*, int32_t *pivot_y*)
Rotate and image and store the result on a canvas.

Parameters

- `canvas`: pointer to a canvas object
- `img`: pointer to an image descriptor. Can be the image descriptor of an other canvas too (*`lv_canvas_get_img()`*).
- `angle`: the angle of rotation (0..360);

- `offset_x`: offset X to tell where to put the result data on destination canvas
- `offset_y`: offset X to tell where to put the result data on destination canvas
- `pivot_x`: pivot X of rotation. Relative to the source canvas Set to `source width / 2` to rotate around the center
- `pivot_y`: pivot Y of rotation. Relative to the source canvas Set to `source height / 2` to rotate around the center

void **lv_canvas_fill_bg**(*lv_obj_t *canvas*, *lv_color_t color*)
Fill the canvas with color

Parameters

- `canvas`: pointer to a canvas
- `color`: the background color

void **lv_canvas_draw_rect**(*lv_obj_t *canvas*, lv_coord_t *x*, lv_coord_t *y*, lv_coord_t *w*, lv_coord_t *h*, **const** lv_style_t *style*)
Draw a rectangle on the canvas

Parameters

- `canvas`: pointer to a canvas object
- `x`: left coordinate of the rectangle
- `y`: top coordinate of the rectangle
- `w`: width of the rectangle
- `h`: height of the rectangle
- `style`: style of the rectangle (`body` properties are used except `padding`)

void **lv_canvas_draw_text**(*lv_obj_t *canvas*, lv_coord_t *x*, lv_coord_t *y*, lv_coord_t *max_w*, **const** lv_style_t *style*, **const** char *txt*, *lv_label_align_t align*)
Draw a text on the canvas.

Parameters

- `canvas`: pointer to a canvas object
- `x`: left coordinate of the text
- `y`: top coordinate of the text
- `max_w`: max width of the text. The text will be wrapped to fit into this size
- `style`: style of the text (`text` properties are used)
- `txt`: text to display
- `align`: align of the text (`LV_LABEL_ALIGN_LEFT/RIGHT/CENTER`)

void **lv_canvas_draw_img**(*lv_obj_t *canvas*, lv_coord_t *x*, lv_coord_t *y*, **const** void *src*, **const** lv_style_t *style*)
Draw an image on the canvas

Parameters

- `canvas`: pointer to a canvas object
- `src`: image source. Can be a pointer an *`lv_img_dsc_t`* variable or a path an image.
- `style`: style of the image (`image` properties are used)

void **lv_canvas_draw_line**(*lv_obj_t* *canvas, **const** lv_point_t *points, uint32_t point_cnt, **const** lv_style_t *style)

Draw a line on the canvas

Parameters

- `canvas`: pointer to a canvas object
- `points`: point of the line
- `point_cnt`: number of points
- `style`: style of the line (`line` properties are used)

void **lv_canvas_draw_polygon**(*lv_obj_t* *canvas, **const** lv_point_t *points, uint32_t point_cnt, **const** lv_style_t *style)

Draw a polygon on the canvas

Parameters

- `canvas`: pointer to a canvas object
- `points`: point of the polygon
- `point_cnt`: number of points
- `style`: style of the polygon (`body.main_color` and `body.opa` is used)

void **lv_canvas_draw_arc**(*lv_obj_t* *canvas, lv_coord_t x, lv_coord_t y, lv_coord_t r, int32_t start_angle, int32_t end_angle, **const** lv_style_t *style)

Draw an arc on the canvas

Parameters

- `canvas`: pointer to a canvas object
- `x`: origo x of the arc
- `y`: origo y of the arc
- `r`: radius of the arc
- `start_angle`: start angle in degrees
- `end_angle`: end angle in degrees
- `style`: style of the polygon (`body.main_color` and `body.opa` is used)

struct lv_canvas_ext_t

Public Members

lv_img_ext_t **img**

lv_img_dsc_t **dsc**

Checkbox (lv_cb)

Overview

The Checkbox objects are built from a *Button* background which contains an also Button *bullet* and a *Label* to realize a classical checkbox.

Text

The text can be modified by the `lv_cb_set_text(cb, "New text")` function. It will dynamically allocate the text.

To set a static text, use `lv_cb_set_static_text(cb, txt)`. This way, only a pointer of `txt` will be stored and it shouldn't be deallocated while the checkbox exists.

Check/Uncheck

You can manually check / un-check the Checkbox via `lv_cb_set_checked(cb, true/false)`. Setting `true` will check the checkbox and `false` will un-check the checkbox.

Inactive

To make the Checkbox inactive, use `lv_cb_set_inactive(cb, true)`.

Styles

The Checkbox styles can be modified with `lv_cb_set_style(cb, LV_CB_STYLE_..., &style)`.

- **LV_CB_STYLE_BG** - Background style. Uses all `style.body` properties. The label's style comes from `style.text`. Default: `lv_style_transp`
- **LV_CB_STYLE_BOX_REL** - Style of the released box. Uses the `style.body` properties. Default: `lv_style_btn_rel`
- **LV_CB_STYLE_BOX_PR** - Style of the pressed box. Uses the `style.body` properties. Default: `lv_style_btn_pr`
- **LV_CB_STYLE_BOX_TGL_REL** - Style of the checked released box. Uses the `style.body` properties. Default: `lv_style_btn_tgl_rel`
- **LV_CB_STYLE_BOX_TGL_PR** - Style of the checked released box. Uses the `style.body` properties. Default: `lv_style_btn_tgl_pr`
- **LV_CB_STYLE_BOX_INA** - Style of the inactive box. Uses the `style.body` properties. Default: `lv_style_btn_ina`

Events

Besides the Generic events the following Special events are sent by the Checkboxes:

- **LV_EVENT_VALUE_CHANGED** - sent when the checkbox is toggled.

Note that, the generic input device-related events (like `LV_EVENT_PRESSED`) are sent in the inactive state too. You need to check the state with `lv_cb_is_inactive(cb)` to ignore the events from inactive Checkboxes.

Learn more about *Events*.

Keys

The following *Keys* are processed by the 'Buttons':

- **LV_KEY_RIGHT/UP** - Go to toggled state if toggling is enabled
- **LV_KEY_LEFT/DOWN** - Go to non-toggled state if toggling is enabled

Note that, as usual, the state of `LV_KEY_ENTER` is translated to `LV_EVENT_PRESSED/PRESSING/RELEASED` etc.

Learn more about *Keys*.

Example

C

Simple Checkbox

code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        printf("State: %s\n", lv_cb_is_checked(obj) ? "Checked" : "Unchecked");
    }
}

void lv_ex_cb_1(void)
{
    lv_obj_t * cb = lv_cb_create(lv_scr_act(), NULL);
```

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```
    lv_cb_set_text(cb, "I agree to terms and conditions.");
    lv_obj_align(cb, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_obj_set_event_cb(cb, event_handler);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_cb_style_t**

Enums

enum [**anonymous**]

Checkbox styles.

Values:

LV_CB_STYLE_BG
Style of object background.

LV_CB_STYLE_BOX_REL
Style of box (released).

LV_CB_STYLE_BOX_PR
Style of box (pressed).

LV_CB_STYLE_BOX_TGL_REL
Style of box (released but checked).

LV_CB_STYLE_BOX_TGL_PR
Style of box (pressed and checked).

LV_CB_STYLE_BOX_INA
Style of disabled box

Functions

lv_obj_t ***lv_cb_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a check box objects

Return pointer to the created check box

Parameters

- `par`: pointer to an object, it will be the parent of the new check box
- `copy`: pointer to a check box object, if not NULL then the new object will be copied from it

void **lv_cb_set_text**(*lv_obj_t *cb*, **const** char *txt*)

Set the text of a check box. `txt` will be copied and may be deallocated after this function returns.

Parameters

- `cb`: pointer to a check box
- `txt`: the text of the check box. NULL to refresh with the current text.

void **lv_cb_set_static_text**(*lv_obj_t *cb*, **const** char **txt*)
Set the text of a check box. `txt` must not be deallocated during the life of this checkbox.

Parameters

- `cb`: pointer to a check box
- `txt`: the text of the check box. NULL to refresh with the current text.

static void **lv_cb_set_checked**(*lv_obj_t *cb*, bool *checked*)
Set the state of the check box

Parameters

- `cb`: pointer to a check box object
- `checked`: true: make the check box checked; false: make it unchecked

static void **lv_cb_set_inactive**(*lv_obj_t *cb*)
Make the check box inactive (disabled)

Parameters

- `cb`: pointer to a check box object

void **lv_cb_set_style**(*lv_obj_t *cb*, *lv_cb_style_t type*, **const** lv_style_t **style*)
Set a style of a check box

Parameters

- `cb`: pointer to check box object
- `type`: which style should be set
- `style`: pointer to a style

const char ***lv_cb_get_text**(**const** *lv_obj_t *cb*)
Get the text of a check box

Return pointer to the text of the check box

Parameters

- `cb`: pointer to check box object

static bool **lv_cb_is_checked**(**const** *lv_obj_t *cb*)
Get the current state of the check box

Return true: checked; false: not checked

Parameters

- `cb`: pointer to a check box object

static bool **lv_cb_is_inactive**(**const** *lv_obj_t *cb*)
Get whether the check box is inactive or not.

Return true: inactive; false: not inactive

Parameters

- `cb`: pointer to a check box object

const lv_style_t *__lv_cb_get_style__(**const** *lv_obj_t *cb*, *lv_cb_style_t type*)
Get a style of a button

Return style pointer to the style

Parameters

- `cb`: pointer to check box object
- `type`: which style should be get

struct lv_cb_ext_t

Public Members

lv_btn_ext_t **bg_btn**

lv_obj_t ***bullet**

lv_obj_t ***label**

Chart (lv_chart)

Overview

Charts consist of the following:

- A background
- Horizontal and vertical division lines
- Data series, which can be represented with points, lines, columns, or filled areas.

Data series

You can add any number of series to the charts by `lv_chart_add_series(chart, color)`. It allocates data for a `lv_chart_series_t` structure which contains the chosen `color` and an array for the data points.

Series' type

The following **data display types** exist:

- **LV_CHART_TYPE_NONE** - Do not display any data. It can be used to hide a series.
- **LV_CHART_TYPE_LINE** - Draw lines between the points.
- **LV_CHART_TYPE_COL** - Draw columns.
- **LV_CHART_TYPE_POINT** - Draw points.
- **LV_CHART_TYPE_AREA** - Draw areas (fill the area below the lines).
- **LV_CHART_TYPE_VERTICAL_LINE** - Draw only vertical lines to connect the points. Useful if the chart width is equal to the number of points, because it can redraw much faster than the `LV_CHART_TYPE_AREA`.

You can specify the display type with `lv_chart_set_type(chart, LV_CHART_TYPE_...)`. The types can be 'OR'ed (like `LV_CHART_TYPE_LINE | LV_CHART_TYPE_POINT`).

Modify the data

You have several options to set the data of series:

1. Set the values manually in the array like `ser1->points[3] = 7` and refresh the chart with `lv_chart_refresh(chart)`.
2. Use the `lv_chart_set_next(chart, ser, value)`.
3. Initialize all points to a given value with: `lv_chart_init_points(chart, ser, value)`.
4. Set all points from an array with: `lv_chart_set_points(chart, ser, value_array)`.

Use `LV_CHART_POINT_DEF` as value to make the library skip drawing that point, column, or line segment.

Update modes

`lv_chart_set_next` can behave in two ways depending on *update mode*:

- **LV_CHART_UPDATE_MODE_SHIFT** - Shift old data to the left and add the new one o the right.
- **LV_CHART_UPDATE_MODE_CIRCULAR** - Circularly add the new data (Like an ECG diagram).

The update mode can be changed with `lv_chart_set_update_mode(chart, LV_CHART_UPDATE_MODE_...)`.

Number of points

The number of points in the series can be modified by `lv_chart_set_point_count(chart, point_num)`. The default value is 10.

Vertical range

You can specify the minimum and maximum values in y-direction with `lv_chart_set_range(chart, y_min, y_max)`. The value of the points will be scaled proportionally. The default range is: 0..100.

Division lines

The number of horizontal and vertical division lines can be modified by `lv_chart_set_div_line_count(chart, hdiv_num, vdiv_num)`. The default settings are 3 horizontal and 5 vertical division lines.

Series' appearance

To set the **line width** and **point radius** of the series, use the `lv_chart_set_series_width(chart, size)` function. The default value is 2.

The **opacity of the data lines** can be specified by `lv_chart_set_series_opa(chart, opa)`. The default value is `LV_OPA_COVER`.

You can apply a **dark color fade** on the bottom of columns and points by `lv_chart_set_series_darking(chart, effect)` function. The default dark level is `LV_OPA_50`.

Tick marks and labels

Ticks and labels beside them can be added.

`lv_chart_set_margin(chart, 20)` needs to be used to add some extra space around the chart for the ticks and texts. Otherwise, you will not see them at all. You may need to adjust the number 20 depending on your requirements.

`lv_chart_set_x_tick_text(chart, list_of_values, num_tick_marks, LV_CHART_AXIS_...)` set the ticks and texts on x axis. `list_of_values` is a string with `'\n'` terminated text (expect the last) with text for the ticks. E.g. `const char * list_of_values = "first\nseco\nthird"`. `list_of_values` can be `NULL`. If `list_of_values` is set then `num_tick_marks` tells the number of ticks between two labels. If `list_of_values` is `NULL` then it specifies the total number of ticks.

Major tick lines are drawn where text is placed, and *minor tick lines* are drawn elsewhere. `lv_chart_set_x_tick_length(chart, major_tick_len, minor_tick_len)` sets the length of tick lines on the x-axis.

The same functions exists for the y axis too: `lv_chart_set_y_tick_text` and `lv_chart_set_y_tick_length`.

Styles

You can set the styles with `lv_chart_set_style(btn, LV_CHART_STYLE_MAIN, &style)`.

- **style.body** - properties set the background's appearance.
- **style.line** - properties set the division lines' appearance.
- **style.text** - properties set the axis labels' appearance.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

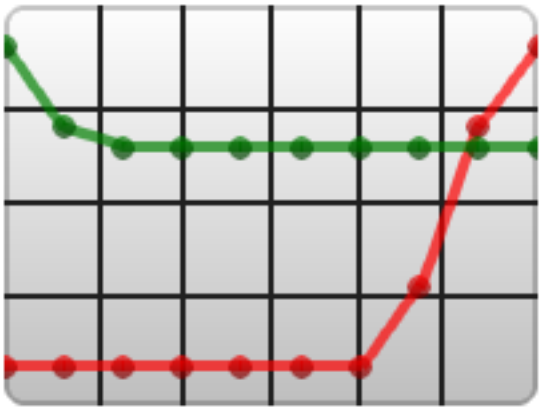
No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Line Chart



code

```
#include "lvgl/lvgl.h"

void lv_ex_chart_1(void)
{
    /*Create a chart*/
    lv_obj_t * chart;
    chart = lv_chart_create(lv_scr_act(), NULL);
    lv_obj_set_size(chart, 200, 150);
    lv_obj_align(chart, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_chart_set_type(chart, LV_CHART_TYPE_POINT | LV_CHART_TYPE_LINE);   /*Show␣
↪lines and points too*/
    lv_chart_set_series_opa(chart, LV_OPA_70);                            /*Opacity␣
↪of the data series*/
    lv_chart_set_series_width(chart, 4);                                  /*Line␣
↪width and point radious*/

    lv_chart_set_range(chart, 0, 100);

    /*Add two data series*/
    lv_chart_series_t * ser1 = lv_chart_add_series(chart, LV_COLOR_RED);
    lv_chart_series_t * ser2 = lv_chart_add_series(chart, LV_COLOR_GREEN);

    /*Set the next points on 'dl1'*/
    lv_chart_set_next(chart, ser1, 10);
    lv_chart_set_next(chart, ser1, 10);
    lv_chart_set_next(chart, ser1, 10);
    lv_chart_set_next(chart, ser1, 10);
    lv_chart_set_next(chart, ser1, 10);
    lv_chart_set_next(chart, ser1, 10);
    lv_chart_set_next(chart, ser1, 10);
    lv_chart_set_next(chart, ser1, 30);
```

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```
    lv_chart_set_next(chart, ser1, 70);
    lv_chart_set_next(chart, ser1, 90);

    /*Directly set points on 'dl2'*/
    ser2->points[0] = 90;
    ser2->points[1] = 70;
    ser2->points[2] = 65;
    ser2->points[3] = 65;
    ser2->points[4] = 65;
    ser2->points[5] = 65;
    ser2->points[6] = 65;
    ser2->points[7] = 65;
    ser2->points[8] = 65;
    ser2->points[9] = 65;

    lv_chart_refresh(chart); /*Required after direct set*/
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_chart_type_t**

typedef uint8_t **lv_chart_update_mode_t**

typedef uint8_t **lv_chart_axis_options_t**

typedef uint8_t **lv_chart_style_t**

Enums

enum [**anonymous**]

Chart types

Values:

LV_CHART_TYPE_NONE = 0x00

Don't draw the series

LV_CHART_TYPE_LINE = 0x01

Connect the points with lines

LV_CHART_TYPE_COLUMN = 0x02

Draw columns

LV_CHART_TYPE_POINT = 0x04

Draw circles on the points

LV_CHART_TYPE_VERTICAL_LINE = 0x08

Draw vertical lines on points (useful when chart width == point count)

LV_CHART_TYPE_AREA = 0x10
Draw area chart

enum [anonymous]
Chart update mode for `lv_chart_set_next`

Values:

LV_CHART_UPDATE_MODE_SHIFT
Shift old data to the left and add the new one o the right

LV_CHART_UPDATE_MODE_CIRCULAR
Add the new data in a circular way

enum [anonymous]
Data of axis

Values:

LV_CHART_AXIS_SKIP_LAST_TICK = 0x00
don't draw the last tick

LV_CHART_AXIS_DRAW_LAST_TICK = 0x01
draw the last tick

enum [anonymous]
Values:

LV_CHART_STYLE_MAIN

Functions

lv_obj_t ***lv_chart_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a chart background objects

Return pointer to the created chart background

Parameters

- `par`: pointer to an object, it will be the parent of the new chart background
- `copy`: pointer to a chart background object, if not NULL then the new object will be copied from it

lv_chart_series_t ***lv_chart_add_series**(*lv_obj_t *chart*, *lv_color_t color*)
Allocate and add a data series to the chart

Return pointer to the allocated data series

Parameters

- `chart`: pointer to a chart object
- `color`: color of the data series

void **lv_chart_clear_serie**(*lv_obj_t *chart*, *lv_chart_series_t *serie*)
Clear the point of a serie

Parameters

- `chart`: pointer to a chart object
- `serie`: pointer to the chart's serie to clear

void **lv_chart_set_div_line_count**(*lv_obj_t *chart*, uint8_t *hdiv*, uint8_t *vdiv*)
Set the number of horizontal and vertical division lines

Parameters

- `chart`: pointer to a graph background object
- `hdiv`: number of horizontal division lines
- `vdiv`: number of vertical division lines

void **lv_chart_set_range**(*lv_obj_t *chart*, lv_coord_t *ymin*, lv_coord_t *ymax*)
Set the minimal and maximal y values

Parameters

- `chart`: pointer to a graph background object
- `ymin`: y minimum value
- `ymax`: y maximum value

void **lv_chart_set_type**(*lv_obj_t *chart*, *lv_chart_type_t type*)
Set a new type for a chart

Parameters

- `chart`: pointer to a chart object
- `type`: new type of the chart (from 'lv_chart_type_t' enum)

void **lv_chart_set_point_count**(*lv_obj_t *chart*, uint16_t *point_cnt*)
Set the number of points on a data line on a chart

Parameters

- `chart`: pointer r to chart object
- `point_cnt`: new number of points on the data lines

void **lv_chart_set_series_opa**(*lv_obj_t *chart*, *lv_opa_t opa*)
Set the opacity of the data series

Parameters

- `chart`: pointer to a chart object
- `opa`: opacity of the data series

void **lv_chart_set_series_width**(*lv_obj_t *chart*, lv_coord_t *width*)
Set the line width or point radius of the data series

Parameters

- `chart`: pointer to a chart object
- `width`: the new width

void **lv_chart_set_series_darking**(*lv_obj_t *chart*, *lv_opa_t dark_eff*)
Set the dark effect on the bottom of the points or columns

Parameters

- `chart`: pointer to a chart object
- `dark_eff`: dark effect level (LV_OPA_TRANSP to turn off)

void **lv_chart_init_points**(*lv_obj_t *chart*, *lv_chart_series_t *ser*, lv_coord_t *y*)
Initialize all data points with a value

Parameters

- `chart`: pointer to chart object
- `ser`: pointer to a data series on 'chart'
- `y`: the new value for all points

void **lv_chart_set_points**(*lv_obj_t *chart*, *lv_chart_series_t *ser*, lv_coord_t *y_array*[])
Set the value of points from an array

Parameters

- `chart`: pointer to chart object
- `ser`: pointer to a data series on 'chart'
- `y_array`: array of 'lv_coord_t' points (with 'points count' elements)

void **lv_chart_set_next**(*lv_obj_t *chart*, *lv_chart_series_t *ser*, lv_coord_t *y*)
Shift all data right and set the most right data on a data line

Parameters

- `chart`: pointer to chart object
- `ser`: pointer to a data series on 'chart'
- `y`: the new value of the most right data

void **lv_chart_set_update_mode**(*lv_obj_t *chart*, *lv_chart_update_mode_t update_mode*)
Set update mode of the chart object.

Parameters

- `chart`: pointer to a chart object
- `update`: mode

static void **lv_chart_set_style**(*lv_obj_t *chart*, *lv_chart_style_t type*, **const** lv_style_t *style*)
Set the style of a chart

Parameters

- `chart`: pointer to a chart object
- `type`: which style should be set (can be only `LV_CHART_STYLE_MAIN`)
- `style`: pointer to a style

void **lv_chart_set_x_tick_length**(*lv_obj_t *chart*, uint8_t *major_tick_len*, uint8_t *minor_tick_len*)
Set the length of the tick marks on the x axis

Parameters

- `chart`: pointer to the chart
- `major_tick_len`: the length of the major tick or `LV_CHART_TICK_LENGTH_AUTO` to set automatically (where labels are added)
- `minor_tick_len`: the length of the minor tick, `LV_CHART_TICK_LENGTH_AUTO` to set automatically (where no labels are added)

void **lv_chart_set_y_tick_length**(*lv_obj_t *chart*, uint8_t *major_tick_len*, uint8_t *minor_tick_len*)
Set the length of the tick marks on the y axis

Parameters

- `chart`: pointer to the chart
- `major_tick_len`: the length of the major tick or `LV_CHART_TICK_LENGTH_AUTO` to set automatically (where labels are added)
- `minor_tick_len`: the length of the minor tick, `LV_CHART_TICK_LENGTH_AUTO` to set automatically (where no labels are added)

void **lv_chart_set_x_tick_texts**(*lv_obj_t *chart*, **const** char **list_of_values*, uint8_t *num_tick_marks*, *lv_chart_axis_options_t options*)

Set the x-axis tick count and labels of a chart

Parameters

- `chart`: pointer to a chart object
- `list_of_values`: list of string values, terminated with , except the last
- `num_tick_marks`: if list_of_values is NULL: total number of ticks per axis else number of ticks between two value labels
- `options`: extra options

void **lv_chart_set_y_tick_texts**(*lv_obj_t *chart*, **const** char **list_of_values*, uint8_t *num_tick_marks*, *lv_chart_axis_options_t options*)

Set the y-axis tick count and labels of a chart

Parameters

- `chart`: pointer to a chart object
- `list_of_values`: list of string values, terminated with , except the last
- `num_tick_marks`: if list_of_values is NULL: total number of ticks per axis else number of ticks between two value labels
- `options`: extra options

void **lv_chart_set_margin**(*lv_obj_t *chart*, uint16_t *margin*)

Set the margin around the chart, used for axes value and ticks

Parameters

- `chart`: pointer to an chart object
- `margin`: value of the margin [px]

lv_chart_type_t **lv_chart_get_type**(**const** *lv_obj_t *chart*)

Get the type of a chart

Return type of the chart (from 'lv_chart_t' enum)

Parameters

- `chart`: pointer to chart object

uint16_t **lv_chart_get_point_cnt**(**const** *lv_obj_t *chart*)

Get the data point number per data line on chart

Return point number on each data line

Parameters

- `chart`: pointer to chart object

lv_opa_t **lv_chart_get_series_opa**(**const** *lv_obj_t* *chart)
Get the opacity of the data series

Return the opacity of the data series

Parameters

- chart: pointer to chart object

lv_coord_t **lv_chart_get_series_width**(**const** *lv_obj_t* *chart)
Get the data series width

Return the width the data series (lines or points)

Parameters

- chart: pointer to chart object

lv_opa_t **lv_chart_get_series_darking**(**const** *lv_obj_t* *chart)
Get the dark effect level on the bottom of the points or columns

Return dark effect level (LV_OPA_TRANSP to turn off)

Parameters

- chart: pointer to chart object

static const lv_style_t ***lv_chart_get_style**(**const** *lv_obj_t* *chart, *lv_chart_style_t* type)
Get the style of an chart object

Return pointer to the chart's style

Parameters

- chart: pointer to an chart object
- type: which style should be get (can be only LV_CHART_STYLE_MAIN)

uint16_t **lv_chart_get_margin**(*lv_obj_t* *chart)
Get the margin around the chart, used for axes value and labels

Parameters

- chart: pointer to an chart object
- return: value of the margin

void **lv_chart_refresh**(*lv_obj_t* *chart)
Refresh a chart if its data line has changed

Parameters

- chart: pointer to chart object

struct lv_chart_series_t

Public Members

lv_coord_t ***points**

lv_color_t **color**

uint16_t **start_point**

struct lv_chart_axis_cfg_t

Public Members

const char ***list_of_values**

lv_chart_axis_options_t **options**

uint8_t **num_tick_marks**

uint8_t **major_tick_len**

uint8_t **minor_tick_len**

struct lv_chart_ext_t

Public Members

lv_ll_t **series_ll**

lv_coord_t **ymin**

lv_coord_t **ymax**

uint8_t **hdiv_cnt**

uint8_t **vdiv_cnt**

uint16_t **point_cnt**

lv_chart_type_t **type**

lv_chart_axis_cfg_t **y_axis**

lv_chart_axis_cfg_t **x_axis**

uint16_t **margin**

uint8_t **update_mode**

lv_coord_t **width**

uint8_t **num**

lv_opa_t **opa**

lv_opa_t **dark**

struct *lv_chart_ext_t*::[**anonymous**] **series**

Container (lv_cont)

Overview

The containers are **rectangle-like object** with some special features.

Layout

You can apply a layout on the containers to automatically order their children. The layout spacing comes from `style.body.padding. ...` properties. The possible layout options:

- **LV_LAYOUT_OFF** Do not align the children

- **LV_LAYOUT_CENTER** Align children to the center in column and keep `padding.inner` space between them
- **LV_LAYOUT_COL_**: Align children in a left justified column. Keep `padding.left` space on the left, `pad.top` space on the top and `padding.inner` space between the children.
- **LV_LAYOUT_COL_M** Align children in centered column. Keep `padding.top` space on the top and `padding.inner` space between the children.
- **LV_LAYOUT_COL_R** Align children in a right justified column. Keep `padding.right` space on the right, `padding.top` space on the top and `padding.inner` space between the children.
- **LV_LAYOUT_ROW_T** Align children in a top justified row. Keep `padding.left` space on the left, `padding.top` space on the top and `padding.inner` space between the children.
- **LV_LAYOUT_ROW_M** Align children in centered row. Keep `padding.left` space on the left and `padding.inner` space between the children.
- **LV_LAYOUT_ROW_B** Align children in a bottom justified row. Keep `padding.left` space on the left, `padding.bottom` space on the bottom and `padding.inner` space between the children.
- **LV_LAYOUT_PRETTY** Put as may objects as possible in a row (with at least `padding.inner` space and `padding.left/right` space on the sides). Divide the space in each line equally between the children. Keep `padding.top` space on the top and `pad.inner` space between the lines.
- **LV_LAYOUT_GRID** Similar to `LV_LAYOUT_PRETTY` but not divide horizontal space equally just let `padding.left/right` on the edges and `padding.inner` space betweenthe elemnts.

Auto fit

Container have an auto fit features whcih can automaticall change the size of the Container accoring to its children and/or parent. The following optionas are exist:

- **LV_FIT_NONE** Do not change the size automatically
- **LV_FIT_TIGHT** Set the size to involve all children by keeping `padding.top/bottom/left/right` space on the edges.
- **LV_FIT_FLOOD** Set the size to the parents size by keeping `padding.top/bottom/left/right` (from the parent's style) space.
- **LV_FIT_FILL** Use `LV_FIT_FLOOD` while smaller than the parent and `LV_FIT_TIGHT` when larger.

To set the auto fit use `lv_cont_set_fit(cont, LV_FIT_...)`. It will set the same auto fit in every directions. To use different auto fit horizontally and vertically use `lv_cont_set_fit2(cont, hor_fit_type, ver_fit_type)`. To use different auto fit in all 4 directions use `lv_cont_set_fit4(cont, left_fit_type, right_fit_type, top_fit_type, bottom_fit_type)`.

Styles

You can set the styles with `lv_cont_set_style(btn, LV_CONT_STYLE_MAIN, &style)`.

- **style.body** properties are used.

Events

Only the Genreric events are sent by the object type.

Learn more about *Events*.

Keys

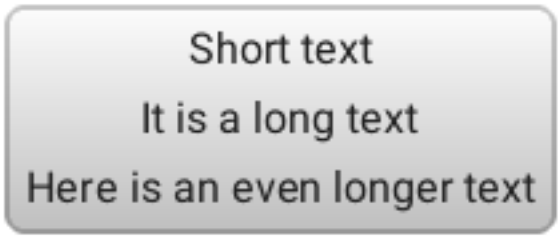
No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Container with auto-fit



code

```
#include "lvgl/lvgl.h"

void lv_ex_cont_1(void)
{
    lv_obj_t * cont;

    cont = lv_cont_create(lv_scr_act(), NULL);
    lv_obj_set_auto_realign(cont, true);                    /*Auto realign when the␣
↪size changes*/
    lv_obj_align_origo(cont, NULL, LV_ALIGN_CENTER, 0, 0);  /*This parametrs will be␣
↪sued when realigned*/
    lv_cont_set_fit(cont, LV_FIT_TIGHT);
    lv_cont_set_layout(cont, LV_LAYOUT_COL_M);
```

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```
    lv_obj_t * label;
    label = lv_label_create(cont, NULL);
    lv_label_set_text(label, "Short text");

    label = lv_label_create(cont, NULL);
    lv_label_set_text(label, "It is a long text");

    label = lv_label_create(cont, NULL);
    lv_label_set_text(label, "Here is an even longer text");
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_layout_t**

typedef uint8_t **lv_fit_t**

typedef uint8_t **lv_cont_style_t**

Enums

enum [**anonymous**]

Container layout options

Values:

LV_LAYOUT_OFF = 0

No layout

LV_LAYOUT_CENTER

Center objects

LV_LAYOUT_COL_L

Column left align

LV_LAYOUT_COL_M

Column middle align

LV_LAYOUT_COL_R

Column right align

LV_LAYOUT_ROW_T

Row top align

LV_LAYOUT_ROW_M

Row middle align

LV_LAYOUT_ROW_B

Row bottom align

LV_LAYOUT_PRETTY
Put as many object as possible in row and begin a new row

LV_LAYOUT_GRID
Align same-sized object into a grid

_LV_LAYOUT_NUM

enum [anonymous]
How to resize the container around the children.

Values:

LV_FIT_NONE
Do not change the size automatically

LV_FIT_TIGHT
Shrink wrap around the children

LV_FIT_FLOOD
Align the size to the parent's edge

LV_FIT_FILL
Align the size to the parent's edge first but if there is an object out of it then get larger

_LV_FIT_NUM

enum [anonymous]
Values:

LV_CONT_STYLE_MAIN

Functions

lv_obj_t ***lv_cont_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a container objects

Return pointer to the created container

Parameters

- `par`: pointer to an object, it will be the parent of the new container
- `copy`: pointer to a container object, if not NULL then the new object will be copied from it

void **lv_cont_set_layout**(*lv_obj_t *cont*, *lv_layout_t layout*)
Set a layout on a container

Parameters

- `cont`: pointer to a container object
- `layout`: a layout from 'lv_cont_layout_t'

void **lv_cont_set_fit4**(*lv_obj_t *cont*, *lv_fit_t left*, *lv_fit_t right*, *lv_fit_t top*, *lv_fit_t bottom*)
Set the fit policy in all 4 directions separately. It tell how to change the container's size automatically.

Parameters

- `cont`: pointer to a container object
- `left`: left fit policy from `lv_fit_t`
- `right`: right fit policy from `lv_fit_t`
- `top`: top fit policy from `lv_fit_t`

- `bottom`: bottom fit policy from `lv_fit_t`

static void **lv_cont_set_fit2**(*lv_obj_t *cont*, *lv_fit_t hor*, *lv_fit_t ver*)
Set the fit policy horizontally and vertically separately. It tells how to change the container's size automatically.

Parameters

- `cont`: pointer to a container object
- `hor`: horizontal fit policy from `lv_fit_t`
- `ver`: vertical fit policy from `lv_fit_t`

static void **lv_cont_set_fit**(*lv_obj_t *cont*, *lv_fit_t fit*)
Set the fit policy in all 4 direction at once. It tells how to change the container's size automatically.

Parameters

- `cont`: pointer to a container object
- `fit`: fit policy from `lv_fit_t`

static void **lv_cont_set_style**(*lv_obj_t *cont*, *lv_cont_style_t type*, **const** lv_style_t *style*)
Set the style of a container

Parameters

- `cont`: pointer to a container object
- `type`: which style should be set (can be only `LV_CONT_STYLE_MAIN`)
- `style`: pointer to the new style

lv_layout_t **lv_cont_get_layout**(**const** *lv_obj_t *cont*)
Get the layout of a container

Return the layout from 'lv_cont_layout_t'

Parameters

- `cont`: pointer to container object

lv_fit_t **lv_cont_get_fit_left**(**const** *lv_obj_t *cont*)
Get left fit mode of a container

Return an element of `lv_fit_t`

Parameters

- `cont`: pointer to a container object

lv_fit_t **lv_cont_get_fit_right**(**const** *lv_obj_t *cont*)
Get right fit mode of a container

Return an element of `lv_fit_t`

Parameters

- `cont`: pointer to a container object

lv_fit_t **lv_cont_get_fit_top**(**const** *lv_obj_t *cont*)
Get top fit mode of a container

Return an element of `lv_fit_t`

Parameters

- `cont`: pointer to a container object

lv_fit_t **lv_cont_get_fit_bottom(const** *lv_obj_t *cont*)
Get bottom fit mode of a container

Return an element of `lv_fit_t`

Parameters

- `cont`: pointer to a container object

static const lv_style_t ***lv_cont_get_style(const** *lv_obj_t *cont*, *lv_cont_style_t type*)
Get the style of a container

Return pointer to the container's style

Parameters

- `cont`: pointer to a container object
- `type`: which style should be get (can be only `LV_CONT_STYLE_MAIN`)

struct lv_cont_ext_t

Public Members

uint8_t **layout**

uint8_t **fit_left**

uint8_t **fit_right**

uint8_t **fit_top**

uint8_t **fit_bottom**

Drop down list (lv_ddlist)

Overview

Drop Down Lists allow you to simply select one option from more. The Drop Down List is closed by default an show the currently selected text. If you click on it the list opens and all the options are shown.

Set options

The options are passed to the Drop Down List as a string with `lv_ddlist_set_options(ddlist, options)`. The options should be separated by `\n`. For example: `"First\nSecond\nThird"`.

You can select an option manually with `lv_ddlist_set_selected(ddlist, id)`, where *id* is the index of an option.

Get selected option

The get the currently selected option use `lv_ddlist_get_selected(ddlist)` it will return the *index* of the selected option.

`lv_ddlist_get_selected_str(ddlist, buf, buf_size)` copies the name of the selected option to `buf`.

Align the options

To align the label horizontally use `lv_ddlist_set_align(ddlist, LV_LABEL_ALIGN_LEFT/CENTER/RIGHT)`.

Height and width

By default, the list's height is adjusted automatically to show all options. The `lv_ddlist_set_fix_height(ddlist, height)` sets a fixed height for the opened list. `0` means to use auto height.

The width is also adjusted automatically. To prevent this apply `lv_ddlist_set_fix_width(ddlist, width)`. `0` means to use auto width.

Scrollbars

Similarly to *Page* with fix height the Drop Down List supports various scrollbar display modes. It can be set by `lv_ddlist_set_sb_mode(ddlist, LV_SB_MODE_...)`.

Animation time

The Drop Down List open/close animation time is adjusted by `lv_ddlist_set_anim_time(ddlist, anim_time)`. Zero animation time means no animation.

Decoration arrow

A down arrow can be added to the left side of the Drop down list with `lv_ddlist_set_draw_arrow(ddlist, true)`.

Stay open

You can force the Drop down list to **stay opened** when an option is selected with `lv_ddlist_set_stay_open(ddlist, true)`.

Styles

The `lv_ddlist_set_style(ddlist, LV_DDLIST_STYLE_..., &style)` set the styles of a Drop Down List.

- **LV_DDLIST_STYLE_BG** Style of the background. All `style.body` properties are used. `style.text` is used for the option's label. Default: `lv_style_pretty`
- **LV_DDLIST_STYLE_SEL** Style of the selected option. The `style.body` properties are used. The selected option will be recolored with `text.color`. Default: `lv_style_plain_color`
- **LV_DDLIST_STYLE_SB** Style of the scrollbar. The `style.body` properties are used. Default: `lv_style_plain_color`

Events

Besides the Generic events the following Special events are sent by the Drop down lists:

- **LV_EVENT_VALUE_CHANGED** sent when the a new option is selected

Learn more about *Events*.

Keys

The following *Keys* are processed by the Buttons:

- **LV_KEY_RIGHT/DOWN** Select the next option
- **LV_KEY_LEFT/UP** Select the previous option
- **LY_KEY_ENTER** Apply the selected option (Send `LV_EVENT_VALUE_CHANGED` event and close the Drop down list)

Example

C

Simple Drop down list

code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        char buf[32];
```

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```
        lv_ddlist_get_selected_str(obj, buf, sizeof(buf));
        printf("Option: %s\n", buf);
    }
}

void lv_ex_ddlist_1(void)
{

    /*Create a drop down list*/
    lv_obj_t * ddlist = lv_ddlist_create(lv_scr_act(), NULL);
    lv_ddlist_set_options(ddlist, "Apple\n"
            "Banana\n"
            "Orange\n"
            "Melon\n"
            "Grape\n"
            "Raspberry");

    lv_ddlist_set_fix_width(ddlist, 150);
    lv_ddlist_set_draw_arrow(ddlist, true);
    lv_obj_align(ddlist, NULL, LV_ALIGN_IN_TOP_MID, 0, 20);
    lv_obj_set_event_cb(ddlist, event_handler);
}
```

Drop “up” list

code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

/**
 * Create a drop UP list by applying auto realign
```

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```
 */
void lv_ex_ddlist_2(void)
{

    /*Create a drop down list*/
    lv_obj_t * ddlist = lv_ddlist_create(lv_scr_act(), NULL);
    lv_ddlist_set_options(ddlist, "Apple\n"
            "Banana\n"
            "Orange\n"
            "Melon\n"
            "Grape\n"
            "Raspberry");

    lv_ddlist_set_fix_width(ddlist, 150);
    lv_ddlist_set_fix_height(ddlist, 150);
    lv_ddlist_set_draw_arrow(ddlist, true);

    /* Enable auto-realign when the size changes.
     * It will keep the bottom of the ddlist fixed*/
    lv_obj_set_auto_realign(ddlist, true);

    /*It will be called automatically when the size changes*/
    lv_obj_align(ddlist, NULL, LV_ALIGN_IN_BOTTOM_MID, 0, -20);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_ddlist_style_t**

Enums

enum [anonymous]

Values:

LV_DDLIST_STYLE_BG

LV_DDLIST_STYLE_SEL

LV_DDLIST_STYLE_SB

Functions

lv_obj_t ***lv_ddlist_create**(*lv_obj_t* **par*, **const** *lv_obj_t* **copy*)

Create a drop down list objects

Return pointer to the created drop down list

Parameters

- `par`: pointer to an object, it will be the parent of the new drop down list
- `copy`: pointer to a drop down list object, if not NULL then the new object will be copied from it

void **lv_ddlist_set_options**(*lv_obj_t *ddlist*, **const** char **options*)
Set the options in a drop down list from a string

Parameters

- `ddlist`: pointer to drop down list object
- `options`: a string with ' ' separated options. E.g. "One\nTwo\nThree"

void **lv_ddlist_set_selected**(*lv_obj_t *ddlist*, uint16_t *sel_opt*)
Set the selected option

Parameters

- `ddlist`: pointer to drop down list object
- `sel_opt`: id of the selected option (0 ... number of option - 1);

void **lv_ddlist_set_fix_height**(*lv_obj_t *ddlist*, lv_coord_t *h*)
Set a fix height for the drop down list If 0 then the opened ddlist will be auto. sized else the set height will be applied.

Parameters

- `ddlist`: pointer to a drop down list
- `h`: the height when the list is opened (0: auto size)

void **lv_ddlist_set_fix_width**(*lv_obj_t *ddlist*, lv_coord_t *w*)
Set a fix width for the drop down list

Parameters

- `ddlist`: pointer to a drop down list
- `w`: the width when the list is opened (0: auto size)

void **lv_ddlist_set_draw_arrow**(*lv_obj_t *ddlist*, bool *en*)
Set arrow draw in a drop down list

Parameters

- `ddlist`: pointer to drop down list object
- `en`: enable/disable a arrow draw. E.g. "true" for draw.

void **lv_ddlist_set_stay_open**(*lv_obj_t *ddlist*, bool *en*)
Leave the list opened when a new value is selected

Parameters

- `ddlist`: pointer to drop down list object
- `en`: enable/disable "stay open" feature

static void **lv_ddlist_set_sb_mode**(*lv_obj_t *ddlist*, *lv_sb_mode_t mode*)
Set the scroll bar mode of a drop down list

Parameters

- `ddlist`: pointer to a drop down list object

- `sb_mode`: the new mode from 'lv_page_sb_mode_t' enum

static void **lv_ddlist_set_anim_time**(*lv_obj_t *ddlist*, uint16_t *anim_time*)
Set the open/close animation time.

Parameters

- `ddlist`: pointer to a drop down list
- `anim_time`: open/close animation time [ms]

void **lv_ddlist_set_style**(*lv_obj_t *ddlist*, *lv_ddlist_style_t type*, **const** lv_style_t *style)
Set a style of a drop down list

Parameters

- `ddlist`: pointer to a drop down list object
- `type`: which style should be set
- `style`: pointer to a style

void **lv_ddlist_set_align**(*lv_obj_t *ddlist*, *lv_label_align_t align*)
Set the alignment of the labels in a drop down list

Parameters

- `ddlist`: pointer to a drop down list object
- `align`: alignment of labels

const char ***lv_ddlist_get_options**(**const** *lv_obj_t *ddlist*)
Get the options of a drop down list

Return the options separated by ' '-s (E.g. "Option1\nOption2\nOption3")

Parameters

- `ddlist`: pointer to drop down list object

uint16_t **lv_ddlist_get_selected**(**const** *lv_obj_t *ddlist*)
Get the selected option

Return id of the selected option (0 ... number of option - 1);

Parameters

- `ddlist`: pointer to drop down list object

void **lv_ddlist_get_selected_str**(**const** *lv_obj_t *ddlist*, char *buf, uint16_t *buf_size*)
Get the current selected option as a string

Parameters

- `ddlist`: pointer to ddlist object
- `buf`: pointer to an array to store the string
- `buf_size`: size of `buf` in bytes. 0: to ignore it.

lv_coord_t **lv_ddlist_get_fix_height**(**const** *lv_obj_t *ddlist*)
Get the fix height value.

Return the height if the ddlist is opened (0: auto size)

Parameters

- `ddlist`: pointer to a drop down list object

bool **lv_ddlist_get_draw_arrow**(*lv_obj_t *ddlist*)
Get arrow draw in a drop down list

Parameters

- `ddlist`: pointer to drop down list object

bool **lv_ddlist_get_stay_open**(*lv_obj_t *ddlist*)
Get whether the drop down list stay open after selecting a value or not

Parameters

- `ddlist`: pointer to drop down list object

static *lv_sb_mode_t* **lv_ddlist_get_sb_mode**(**const** *lv_obj_t *ddlist*)
Get the scroll bar mode of a drop down list

Return scrollbar mode from 'lv_page_sb_mode_t' enum

Parameters

- `ddlist`: pointer to a drop down list object

static uint16_t **lv_ddlist_get_anim_time**(**const** *lv_obj_t *ddlist*)
Get the open/close animation time.

Return open/close animation time [ms]

Parameters

- `ddlist`: pointer to a drop down list

const lv_style_t ***lv_ddlist_get_style**(**const** *lv_obj_t *ddlist*, *lv_ddlist_style_t type*)
Get a style of a drop down list

Return style pointer to a style

Parameters

- `ddlist`: pointer to a drop down list object
- `type`: which style should be get

lv_label_align_t **lv_ddlist_get_align**(**const** *lv_obj_t *ddlist*)
Get the alignment of the labels in a drop down list

Return alignment of labels

Parameters

- `ddlist`: pointer to a drop down list object

void **lv_ddlist_open**(*lv_obj_t *ddlist*, *lv_anim_enable_t anim*)
Open the drop down list with or without animation

Parameters

- `ddlist`: pointer to drop down list object
- `anim_en`: LV_ANIM_ON: use animation; LV_ANOM_OFF: not use animations

void **lv_ddlist_close**(*lv_obj_t *ddlist*, *lv_anim_enable_t anim*)
Close (Collapse) the drop down list

Parameters

- `ddlist`: pointer to drop down list object
- `anim_en`: LV_ANIM_ON: use animation; LV_ANOM_OFF: not use animations

struct lv_ddlist_ext_t

Public Members

lv_page_ext_t **page**

lv_obj_t ***label**

const lv_style_t ***sel_style**

uint16_t **option_cnt**

uint16_t **sel_opt_id**

uint16_t **sel_opt_id_ori**

uint8_t **opened**

uint8_t **force_sel**

uint8_t **draw_arrow**

uint8_t **stay_open**

lv_coord_t **fix_height**

Gauge (lv_gauge)

Overview

The gauge is a meter with scale labels and needles.

Scale

You can use the `lv_gauge_set_scale(gauge, angle, line_num, label_cnt)` function to adjust the scale angle and the number of the scale lines and labels. The default settings are 220 degrees, 6 scale labels, and 21 lines.

Needles

The gauge can show more than one needle. Use the `lv_gauge_set_needle_count(gauge, needle_num, color_array)` function to set the number of needles and an array with colors for each needle. The array must be static or global variable because only its pointer is stored.

You can use `lv_gauge_set_value(gauge, needle_id, value)` to set the value of a needle.

Range

The range of the gauge can be specified by `lv_gauge_set_range(gauge, min, max)`. The default range is 0..100.

Critical value

To set a critical value use `lv_gauge_set_critical_value(gauge, value)`. The scale color will be changed to `line.color` after this value. (default: 80)

Styles

The gauge uses one style which can be set by `lv_gauge_set_style(gauge, LV_GAUGE_STYLE_MAIN, &style)`. The gauge's properties are derived from the following style attributes:

- **body.main_color** line's color at the beginning of the scale
- **body.grad_color** line's color at the end of the scale (gradient with main color)
- **body.padding.left** line length
- **body.padding.inner** label distance from the scale lines
- **body.radius** radius of needle origin circle
- **line.width** line width
- **line.color** line's color after the critical value
- **text.font/color/letter_space** label attributes

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Simple Gauge

code

```
#include "lvgl/lvgl.h"

void lv_ex_gauge_1(void)
{
    /*Create a style*/
    static lv_style_t style;
    lv_style_copy(&style, &lv_style_pretty_color);
    style.body.main_color = lv_color_hex3(0x666);     /*Line color at the beginning*/
    style.body.grad_color =  lv_color_hex3(0x666);    /*Line color at the end*/
    style.body.padding.left = 10;                      /*Scale line length*/
    style.body.padding.inner = 8 ;                     /*Scale label padding*/
    style.body.border.color = lv_color_hex3(0x333);   /*Needle middle circle color*/
    style.line.width = 3;
    style.text.color = lv_color_hex3(0x333);
    style.line.color = LV_COLOR_RED;                   /*Line color after the critical␣
↪value*/

    /*Describe the color for the needles*/
    static lv_color_t needle_colors[] = {LV_COLOR_BLUE, LV_COLOR_ORANGE, LV_COLOR_
↪PURPLE};

    /*Create a gauge*/
    lv_obj_t * gauge1 = lv_gauge_create(lv_scr_act(), NULL);
    lv_gauge_set_style(gauge1, LV_GAUGE_STYLE_MAIN, &style);
    lv_gauge_set_needle_count(gauge1, 3, needle_colors);
    lv_obj_set_size(gauge1, 150, 150);
    lv_obj_align(gauge1, NULL, LV_ALIGN_CENTER, 0, 20);

    /*Set the values*/
    lv_gauge_set_value(gauge1, 0, 10);
    lv_gauge_set_value(gauge1, 1, 20);
```

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```
    lv_gauge_set_value(gauge1, 2, 30);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_gauge_style_t**

Enums

enum [anonymous]

Values:

LV_GAUGE_STYLE_MAIN

Functions

lv_obj_t ***lv_gauge_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a gauge objects

Return pointer to the created gauge

Parameters

- `par`: pointer to an object, it will be the parent of the new gauge
- `copy`: pointer to a gauge object, if not NULL then the new object will be copied from it

void **lv_gauge_set_needle_count**(*lv_obj_t *gauge*, uint8_t *needle_cnt*, **const** *lv_color_t colors*[])

Set the number of needles

Parameters

- `gauge`: pointer to gauge object
- `needle_cnt`: new count of needles
- `colors`: an array of colors for needles (with 'num' elements)

void **lv_gauge_set_value**(*lv_obj_t *gauge*, uint8_t *needle_id*, int16_t *value*)

Set the value of a needle

Parameters

- `gauge`: pointer to a gauge
- `needle_id`: the id of the needle
- `value`: the new value

static void **lv_gauge_set_range**(*lv_obj_t *gauge*, int16_t *min*, int16_t *max*)
Set minimum and the maximum values of a gauge

Parameters

- `gauge`: pointer to he gauge object
- `min`: minimum value
- `max`: maximum value

static void **lv_gauge_set_critical_value**(*lv_obj_t *gauge*, int16_t *value*)
Set a critical value on the scale. After this value 'line.color' scale lines will be drawn

Parameters

- `gauge`: pointer to a gauge object
- `value`: the critical value

void **lv_gauge_set_scale**(*lv_obj_t *gauge*, uint16_t *angle*, uint8_t *line_cnt*, uint8_t *label_cnt*)
Set the scale settings of a gauge

Parameters

- `gauge`: pointer to a gauge object
- `angle`: angle of the scale (0..360)
- `line_cnt`: count of scale lines. The get a given "subdivision" lines between label, `line_cnt` = (sub_div + 1) * (label_cnt - 1) + 1
- `label_cnt`: count of scale labels.

static void **lv_gauge_set_style**(*lv_obj_t *gauge*, *lv_gauge_style_t type*, lv_style_t *style*)
Set the styles of a gauge

Parameters

- `gauge`: pointer to a gauge object
- `type`: which style should be set (can be only `LV_GAUGE_STYLE_MAIN`)
- `style`: set the style of the gauge

int16_t **lv_gauge_get_value**(**const** *lv_obj_t *gauge*, uint8_t *needle*)
Get the value of a needle

Return the value of the needle [min,max]

Parameters

- `gauge`: pointer to gauge object
- `needle`: the id of the needle

uint8_t **lv_gauge_get_needle_count**(**const** *lv_obj_t *gauge*)
Get the count of needles on a gauge

Return count of needles

Parameters

- `gauge`: pointer to gauge

static int16_t **lv_gauge_get_min_value**(**const** *lv_obj_t *lmeter*)
Get the minimum value of a gauge

Return the minimum value of the gauge

Parameters

- gauge: pointer to a gauge object

static int16_t **lv_gauge_get_max_value(const** *lv_obj_t *lmeter***)**
Get the maximum value of a gauge

Return the maximum value of the gauge

Parameters

- gauge: pointer to a gauge object

static int16_t **lv_gauge_get_critical_value(const** *lv_obj_t *gauge***)**
Get a critical value on the scale.

Return the critical value

Parameters

- gauge: pointer to a gauge object

uint8_t **lv_gauge_get_label_count(const** *lv_obj_t *gauge***)**
Set the number of labels (and the thicker lines too)

Return count of labels

Parameters

- gauge: pointer to a gauge object

static uint8_t **lv_gauge_get_line_count(const** *lv_obj_t *gauge***)**
Get the scale number of a gauge

Return number of the scale units

Parameters

- gauge: pointer to a gauge object

static uint16_t **lv_gauge_get_scale_angle(const** *lv_obj_t *gauge***)**
Get the scale angle of a gauge

Return angle of the scale

Parameters

- gauge: pointer to a gauge object

static const lv_style_t ***lv_gauge_get_style(const** *lv_obj_t *gauge*, *lv_gauge_style_t type***)**
Get the style of a gauge

Return pointer to the gauge's style

Parameters

- gauge: pointer to a gauge object
- type: which style should be get (can be only LV_GAUGE_STYLE_MAIN)

struct lv_gauge_ext_t

Public Members

lv_lmeter_ext_t **lmeter**

int16_t ***values**

const *lv_color_t* ***needle_colors**

uint8_t **needle_count**

uint8_t **label_count**

Image (lv_img)

Overview

The Images are the basic object to display images.

Image source

To provide maximum flexibility the source of the image can be:

- a variable in the code (a C array with the pixels)
- a file stored externally (like on an SD card)
- a text with *Symbols*

To set the source of an image use `lv_img_set_src(img, src)`

To generate a **pixel array** from a PNG, JPG or BMP image use the Online image converter tool and set the converted image with its pointer: `lv_img_set_src(img1, &converted_img_var);` To make the variable visible in the C file you need to declare it with `LV_IMG_DECLARE(converted_img_var)`

To use **external files** you also need to convert the image files using the online converter tool but now you should select the binary Output format. You also need to use LittlevGL's file system module and register a driver with some functions for the basic file operation. Got to the *File system* to learn more. To set an image source form a file use `lv_img_set_src(img, "S:folder1/my_img.bin")`

You can set a **symbol** similarly to *Labels*. In this case, the image will be rendered as text according to the *font* specified in the style. It enables to use of light weighted mono-color "letters" instead of real images. You can set symbol like `lv_img_set_src(img1, LV_SYMBOL_OK)`

Label as an image

Images and labels are sometimes for the same thing. E.g.to describe what a button does. Therefore Images and Labels are somewhat interchangeable. To handle these images can even display texts by using `LV_SYMBOL_DUMMY` as the prefix of the text. For example `lv_img_set_src(img, LV_SYMBOL_DUMMY "Some text")`

Transparency

The internal (variable) and external images support 2 transparency handling methods:

- **Chrome keying** pixels with `LV_COLOR_TRANSP` (*lv_conf.h*) color will be transparent

- **Alpha byte** An alpha byte is added to every pixel

Palette and Alpha index

Besides *True color* (RGB) color format the following formats are also supported:

- **Indexed** image has a palette
- **Alpha indexed** only alpha values are stored

These options can be selected in the font converter. To learn more about the color formats read the *Images* section.

Recolor

The images can be re-colored in run-time to any color according to the brightness of the pixels. It is very useful to show different states (selected, inactive, pressed etc) of an image without storing more versions of the same image. This feature can be enabled in the style by setting `img.intense` between `LV_OPA_TRANSP` (no recolor, value: 0) and `LV_OPA_COVER` (full recolor, value: 255). The default value is `LV_OPA_TRANSP` so this feature is disabled.

Auto-size

It is possible to automatically set the size of the image object to the image source's width and height if enabled by the `lv_img_set_auto_size(image, true)` function. If *auto size* is enabled then when a new file is set the object size is automatically changed. Later you can modify the size manually. The *auto size* is enabled by default if the image is not a screen

Mosaic

If the object size is greater then the image size in any directions then the image will be repeated like a mosaic. It's a very useful feature to create a large image from only a very narrow source. For example, you can have a *300 x 1* image with a special gradient and set it as a wallpaper using the mosaic feature.

Offset

With `lv_img_set_offset_x(img, x_ofs)` and `lv_img_set_offset_y(img, y_ofs)` you can add some offset to the displayed image. It is useful if the object size is smaller than the image source size. Using the offset parameter a Texture atlas or a "running image" effect can be created by *Animating* the x or y offset.

Styles

The images uses one style which can be set by `lv_img_set_style(lmeter, LV_IMG_STYLE_MAIN, &style)`. All the `style.image` properties are used:

- **image.intense** intensity of recoloring (0..255 or *LV_OPA_...*)
- **image.color** color for recoloring or color of the alpha indexed images
- **image.opa** overall opacity of image

When the Image object displays a text then `style.text` properties are used. See *Label* for more information.

The images' default style is *NULL* so they **inherit the parent's style**.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Image from variable and symbol

code

```
#include "lvgl/lvgl.h"

LV_IMG_DECLARE(cogwheel);

void lv_ex_img_1(void)
{
```

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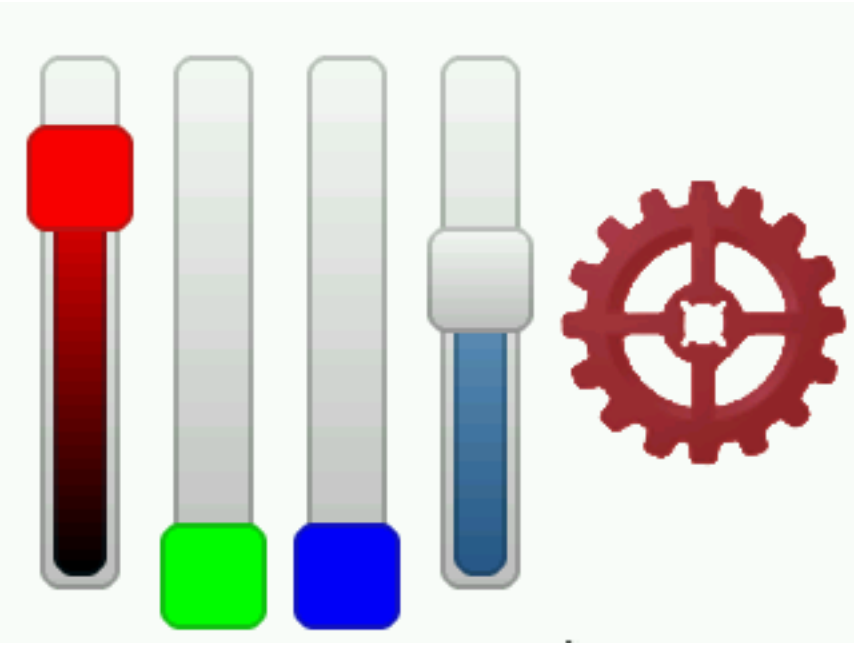
```
    lv_obj_t * img1 = lv_img_create(lv_scr_act(), NULL);
    lv_img_set_src(img1, &cogwheel);
    lv_obj_align(img1, NULL, LV_ALIGN_CENTER, 0, -20);

    lv_obj_t * img2 = lv_img_create(lv_scr_act(), NULL);
    lv_img_set_src(img2, LV_SYMBOL_OK "Accept");
    lv_obj_align(img2, img1, LV_ALIGN_OUT_BOTTOM_MID, 0, 20);
}
```

Image reoloring



code

```
/**
 * @file lv_ex_img_2.c
 *
 */

/*********************
 *      INCLUDES
 *********************/

#include "lvgl/lvgl.h"

/*********************
 *      DEFINES
 *********************/
#define SLIDER_WIDTH 40

/**********************
 *      TYPEDEFS
 **********************/
```

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```
/**********************
 *  STATIC PROTOTYPES
 **********************/
static void create_sliders(void);
static void slider_event_cb(lv_obj_t * slider, lv_event_t event);

/**********************
 *  STATIC VARIABLES
 **********************/
static lv_obj_t * red_slider, * green_slider, * blue_slider, * intense_slider;
static lv_obj_t * img1;
static lv_style_t img_style;
LV_IMG_DECLARE(cogwheel);

/**********************
 *      MACROS
 **********************/

/**********************
 *   GLOBAL FUNCTIONS
 **********************/

void lv_ex_img_2(void)
{
    /*Create 4 sliders to adjust RGB color and re-color intensity*/
    create_sliders();

    /* Now create the actual image */
    img1 = lv_img_create(lv_scr_act(), NULL);
    lv_img_set_src(img1, &cogwheel);
    lv_obj_align(img1, intense_slider, LV_ALIGN_OUT_RIGHT_MID, 10, 0);

    /* Create a message box for information */
    static const char * btns[] ={"OK", ""};

    lv_obj_t * mbox = lv_mbox_create(lv_scr_act(), NULL);

    lv_mbox_set_text(mbox, "Welcome to the image recoloring demo!\nThe first three␣
↪sliders control the RGB value of the recoloring.\nThe last slider controls the␣
↪intensity.");
    lv_mbox_add_btns(mbox, btns);
    lv_obj_align(mbox, NULL, LV_ALIGN_CENTER, 0, 0);

    /* Save the image's style so the sliders can modify it */
    lv_style_copy(&img_style, lv_img_get_style(img1, LV_IMG_STYLE_MAIN));
}

/**********************
 *   STATIC FUNCTIONS
 **********************/

static void slider_event_cb(lv_obj_t * slider, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        /* Recolor the image based on the sliders' values */
```

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```
        img_style.image.color = lv_color_make(lv_slider_get_value(red_slider), lv_
↪slider_get_value(green_slider), lv_slider_get_value(blue_slider));
        img_style.image.intense = lv_slider_get_value(intense_slider);
        lv_img_set_style(img1, LV_IMG_STYLE_MAIN, &img_style);
    }
}

static void create_sliders(void)
{
    /* Create a set of RGB sliders */
    /* Use the red one as a base for all the settings */
    red_slider = lv_slider_create(lv_scr_act(), NULL);
    lv_slider_set_range(red_slider, 0, 255);
    lv_obj_set_size(red_slider, SLIDER_WIDTH, 200); /* Be sure it's a vertical slider␣
↪*/

    lv_obj_set_event_cb(red_slider, slider_event_cb);

    /* Create the intensity slider first, as it does not use any custom styles */
    intense_slider = lv_slider_create(lv_scr_act(), red_slider);
    lv_slider_set_range(intense_slider, LV_OPA_TRANSP, LV_OPA_COVER);

    /* Create the slider knob and fill styles */
    /* Fill styles are initialized with a gradient between black and the slider's␣
↪respective color. */
    /* Knob styles are simply filled with the slider's respective color. */
    static lv_style_t slider_red_fill_style, slider_red_knob_style;

    lv_style_copy(&slider_red_fill_style, lv_slider_get_style(red_slider, LV_SLIDER_
↪STYLE_INDIC));
    lv_style_copy(&slider_red_knob_style, lv_slider_get_style(red_slider, LV_SLIDER_
↪STYLE_KNOB));

    slider_red_fill_style.body.main_color = lv_color_make(255, 0, 0);
    slider_red_fill_style.body.grad_color = LV_COLOR_BLACK;

    slider_red_knob_style.body.main_color = slider_red_knob_style.body.grad_color =␣
↪slider_red_fill_style.body.main_color;

    static lv_style_t slider_green_fill_style, slider_green_knob_style;
    lv_style_copy(&slider_green_fill_style, &slider_red_fill_style);
    lv_style_copy(&slider_green_knob_style, &slider_red_knob_style);

    slider_green_fill_style.body.main_color = lv_color_make(0, 255, 0);

    slider_green_knob_style.body.main_color = slider_green_knob_style.body.grad_color␣
↪= slider_green_fill_style.body.main_color;

    static lv_style_t slider_blue_fill_style, slider_blue_knob_style;
    lv_style_copy(&slider_blue_fill_style, &slider_red_fill_style);
    lv_style_copy(&slider_blue_knob_style, &slider_red_knob_style);

    slider_blue_fill_style.body.main_color = lv_color_make(0, 0, 255);

    slider_blue_knob_style.body.main_color = slider_blue_knob_style.body.grad_color =␣
↪slider_blue_fill_style.body.main_color;
```

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```
    /* Setup the red slider */
    lv_slider_set_style(red_slider, LV_SLIDER_STYLE_INDIC, &slider_red_fill_style);
    lv_slider_set_style(red_slider, LV_SLIDER_STYLE_KNOB, &slider_red_knob_style);

    /* Copy it for the other two sliders */
    green_slider = lv_slider_create(lv_scr_act(), red_slider);
    lv_slider_set_style(green_slider, LV_SLIDER_STYLE_INDIC, &slider_green_fill_
↪style);
    lv_slider_set_style(green_slider, LV_SLIDER_STYLE_KNOB, &slider_green_knob_style);

    blue_slider = lv_slider_create(lv_scr_act(), red_slider);
    lv_slider_set_style(blue_slider, LV_SLIDER_STYLE_INDIC, &slider_blue_fill_style);
    lv_slider_set_style(blue_slider, LV_SLIDER_STYLE_KNOB, &slider_blue_knob_style);

    lv_obj_align(red_slider, NULL, LV_ALIGN_IN_LEFT_MID, 10, 0);

    lv_obj_align(green_slider, red_slider, LV_ALIGN_OUT_RIGHT_MID, 10, 0);

    lv_obj_align(blue_slider, green_slider, LV_ALIGN_OUT_RIGHT_MID, 10, 0);

    lv_obj_align(intense_slider, blue_slider, LV_ALIGN_OUT_RIGHT_MID, 10, 0);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_img_style_t**

Enums

enum [anonymous]

Values:

LV_IMG_STYLE_MAIN

Functions

lv_obj_t ***lv_img_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create an image objects

Return pointer to the created image

Parameters

- `par`: pointer to an object, it will be the parent of the new button
- `copy`: pointer to a image object, if not NULL then the new object will be copied from it

void **lv_img_set_src**(*lv_obj_t *img*, **const** void **src_img*)
Set the pixel map to display by the image

Parameters

- `img`: pointer to an image object
- `data`: the image data

void **lv_img_set_auto_size**(*lv_obj_t *img*, bool *autosize_en*)
Enable the auto size feature. If enabled the object size will be same as the picture size.

Parameters

- `img`: pointer to an image
- `en`: true: auto size enable, false: auto size disable

void **lv_img_set_offset_x**(*lv_obj_t *img*, lv_coord_t *x*)
Set an offset for the source of an image. so the image will be displayed from the new origin.

Parameters

- `img`: pointer to an image
- `x`: the new offset along x axis.

void **lv_img_set_offset_y**(*lv_obj_t *img*, lv_coord_t *y*)
Set an offset for the source of an image. so the image will be displayed from the new origin.

Parameters

- `img`: pointer to an image
- `y`: the new offset along y axis.

static void **lv_img_set_style**(*lv_obj_t *img*, *lv_img_style_t type*, **const** lv_style_t **style*)
Set the style of an image

Parameters

- `img`: pointer to an image object
- `type`: which style should be set (can be only `LV_IMG_STYLE_MAIN`)
- `style`: pointer to a style

const void ***lv_img_get_src**(*lv_obj_t *img*)
Get the source of the image

Return the image source (symbol, file name or C array)

Parameters

- `img`: pointer to an image object

const char ***lv_img_get_file_name**(**const** *lv_obj_t *img*)
Get the name of the file set for an image

Return file name

Parameters

- `img`: pointer to an image

bool **lv_img_get_auto_size**(**const** *lv_obj_t *img*)
Get the auto size enable attribute

Return true: auto size is enabled, false: auto size is disabled

Parameters

- `img`: pointer to an image

lv_coord_t **lv_img_get_offset_x**(*lv_obj_t *img*)
Get the offset.x attribute of the img object.

Return offset.x value.

Parameters

- `img`: pointer to an image

lv_coord_t **lv_img_get_offset_y**(*lv_obj_t *img*)
Get the offset.y attribute of the img object.

Return offset.y value.

Parameters

- `img`: pointer to an image

static const lv_style_t ***lv_img_get_style**(**const** *lv_obj_t *img, lv_img_style_t type*)
Get the style of an image object

Return pointer to the image's style

Parameters

- `img`: pointer to an image object
- `type`: which style should be get (can be only `LV_IMG_STYLE_MAIN`)

struct lv_img_ext_t

Public Members

const void ***src**

lv_point_t **offset**

lv_coord_t **w**

lv_coord_t **h**

uint8_t **src_type**

uint8_t **auto_size**

uint8_t **cf**

Image button (lv_imgbtn)

Overview

The Image button is very similar to the simple Button object. The only difference is it displays user-defined images in each state instead of drawing a button. Before reading this please read the *Button* section too.

Image sources

To set the image in a state the `lv_imgbtn_set_src(imgbtn, LV_BTN_STATE_..., &img_src)` The image sources works the same as described in the *Image object* except that "Symbols" are not supported by the Image button.

If `LV_IMGBTN_TILED` is enabled in *lv_conf.h* three sources can be set for each state:

- left
- center
- right

The *center* image will be repeated to fill the width of the object. Therefore with `LV_IMGBTN_TILED` you can set the width of the Image button while without it the width will be always the same as the image source's width.

States

The states also work like with Button object. It can be set with `lv_imgbtn_set_state(imgbtn, LV_BTN_STATE_...)`.

Toggle

The toggle feature can be enabled with `lv_imgbtn_set_toggle(imgbtn, true)`

Style usage

Similarly to normal Buttons, Image buttons also have 5 independent styles for the 5 state. You can set them via: `lv_imgbtn_set_style(btn, LV_IMGBTN_STYLE_..., &style)`. The styles use the `style.image` properties.

- **LV_IMGBTN_STYLE_REL** style of the released state. Default: `lv_style_btn_rel`
- **LV_IMGBTN_STYLE_PR** style of the pressed state. Default: `lv_style_btn_pr`
- **LV_IMGBTN_STYLE_TGL_REL** style of the toggled released state. Default: `lv_style_btn_tgl_rel`
- **LV_IMGBTN_STYLE_TGL_PR** style of the toggled pressed state. Default: `lv_style_btn_tgl_pr`
- **LV_IMGBTN_STYLE_INA** style of the inactive state. Default: `lv_style_btn_ina`

When labels are created on a button, it's a good practice to set the image button's `style.text` properties too. Because labels have `style = NULL` by default they inherit the parent's (image button) style. Hence you don't need to create a new style for the label.

Events

Besided the Genreric events the following Special events are sent by the buttons:

- **LV_EVENT_VALUE_CHANGED** sent when the button is toggled.

Note that the generic input device related events (like `LV_EVENT_PRESSED`) are sent in the inactive state too. You need to check the state with `lv_btn_get_state(btn)` to ignore the events from inactive buttons.

Learn more about *Events*.

Keys

The following *Keys* are processed by the Buttons:

- **LV_KEY_RIGHT/UP** Go to toggled state if toggling is enabled
- **LV_KEY_LEFT/DOWN** Go to non-toggled state if toggling is enabled

Note that, as usual, the state of `LV_KEY_ENTER` is translated to `LV_EVENT_PRESSED/PRESSING/RELEASED` etc.

Learn more about *Keys*.

Example

C

Simple Image button

code

```
#include "lvgl/lvgl.h"

void lv_ex_imgbtn_1(void)
{
    lv_style_t style_pr;
    lv_style_copy(&style_pr, &lv_style_plain);
    style_pr.image.color = LV_COLOR_BLACK;
```

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```
    style_pr.image.intense = LV_OPA_50;
    style_pr.text.color = lv_color_hex3(0xaaa);

    LV_IMG_DECLARE(imgbtn_green);
    LV_IMG_DECLARE(imgbtn_blue);

    /*Create an Image button*/
    lv_obj_t * imgbtn1 = lv_imgbtn_create(lv_scr_act(), NULL);
    lv_imgbtn_set_src(imgbtn1, LV_BTN_STATE_REL, &imgbtn_green);
    lv_imgbtn_set_src(imgbtn1, LV_BTN_STATE_PR, &imgbtn_green);
    lv_imgbtn_set_src(imgbtn1, LV_BTN_STATE_TGL_REL, &imgbtn_blue);
    lv_imgbtn_set_src(imgbtn1, LV_BTN_STATE_TGL_PR, &imgbtn_blue);
    lv_imgbtn_set_style(imgbtn1, LV_BTN_STATE_PR, &style_pr);        /*Use the darker␣
↪style in the pressed state*/
    lv_imgbtn_set_style(imgbtn1, LV_BTN_STATE_TGL_PR, &style_pr);
    lv_imgbtn_set_toggle(imgbtn1, true);
    lv_obj_align(imgbtn1, NULL, LV_ALIGN_CENTER, 0, -40);

    /*Create a label on the Image button*/
    lv_obj_t * label = lv_label_create(imgbtn1, NULL);
    lv_label_set_text(label, "Button");
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_imgbtn_style_t**

Enums

enum [**anonymous**]

Values:

LV_IMGBTN_STYLE_REL

Same meaning as ordinary button styles.

LV_IMGBTN_STYLE_PR

LV_IMGBTN_STYLE_TGL_REL

LV_IMGBTN_STYLE_TGL_PR

LV_IMGBTN_STYLE_INA

Functions

lv_obj_t ***lv_imgbtn_create**(*lv_obj_t* **par*, **const** *lv_obj_t* **copy*)

Create a image button objects

Return pointer to the created image button

Parameters

- `par`: pointer to an object, it will be the parent of the new image button
- `copy`: pointer to a image button object, if not NULL then the new object will be copied from it

void **lv_imgbtn_set_src**(*lv_obj_t *imgbtn*, *lv_btn_state_t state*, **const** void **src*)
Set images for a state of the image button

Parameters

- `imgbtn`: pointer to an image button object
- `state`: for which state set the new image (from `lv_btn_state_t`) ‘
- `src`: pointer to an image source (a C array or path to a file)

void **lv_imgbtn_set_src**(*lv_obj_t *imgbtn*, *lv_btn_state_t state*, **const** void **src_left*, **const** void **src_mid*, **const** void **src_right*)
Set images for a state of the image button

Parameters

- `imgbtn`: pointer to an image button object
- `state`: for which state set the new image (from `lv_btn_state_t`) ‘
- `src_left`: pointer to an image source for the left side of the button (a C array or path to a file)
- `src_mid`: pointer to an image source for the middle of the button (ideally 1px wide) (a C array or path to a file)
- `src_right`: pointer to an image source for the right side of the button (a C array or path to a file)

static void **lv_imgbtn_set_toggle**(*lv_obj_t *imgbtn*, bool *tgl*)
Enable the toggled states. On release the button will change from/to toggled state.

Parameters

- `imgbtn`: pointer to an image button object
- `tgl`: true: enable toggled states, false: disable

static void **lv_imgbtn_set_state**(*lv_obj_t *imgbtn*, *lv_btn_state_t state*)
Set the state of the image button

Parameters

- `imgbtn`: pointer to an image button object
- `state`: the new state of the button (from lv_btn_state_t enum)

static void **lv_imgbtn_toggle**(*lv_obj_t *imgbtn*)
Toggle the state of the image button (ON->OFF, OFF->ON)

Parameters

- `imgbtn`: pointer to a image button object

void **lv_imgbtn_set_style**(*lv_obj_t *imgbtn*, *lv_imgbtn_style_t type*, **const** lv_style_t **style*)
Set a style of a image button.

Parameters

- `imgbtn`: pointer to image button object
- `type`: which style should be set
- `style`: pointer to a style

const void ***lv_imgbtn_get_src**(*lv_obj_t *imgbtn*, *lv_btn_state_t state*)*
Get the images in a given state

Return pointer to an image source (a C array or path to a file)

Parameters

- `imgbtn`: pointer to an image button object
- `state`: the state where to get the image (from `lv_btn_state_t`) ‘

const void ***lv_imgbtn_get_src_left**(*lv_obj_t *imgbtn*, *lv_btn_state_t state*)*
Get the left image in a given state

Return pointer to the left image source (a C array or path to a file)

Parameters

- `imgbtn`: pointer to an image button object
- `state`: the state where to get the image (from `lv_btn_state_t`) ‘

const void ***lv_imgbtn_get_src_middle**(*lv_obj_t *imgbtn*, *lv_btn_state_t state*)*
Get the middle image in a given state

Return pointer to the middle image source (a C array or path to a file)

Parameters

- `imgbtn`: pointer to an image button object
- `state`: the state where to get the image (from `lv_btn_state_t`) ‘

const void ***lv_imgbtn_get_src_right**(*lv_obj_t *imgbtn*, *lv_btn_state_t state*)*
Get the right image in a given state

Return pointer to the left image source (a C array or path to a file)

Parameters

- `imgbtn`: pointer to an image button object
- `state`: the state where to get the image (from `lv_btn_state_t`) ‘

static *lv_btn_state_t* **lv_imgbtn_get_state**(**const** *lv_obj_t *imgbtn*)
Get the current state of the image button

Return the state of the button (from lv_btn_state_t enum)

Parameters

- `imgbtn`: pointer to a image button object

static bool **lv_imgbtn_get_toggle**(**const** *lv_obj_t *imgbtn*)
Get the toggle enable attribute of the image button

Return ture: toggle enabled, false: disabled

Parameters

- `imgbtn`: pointer to a image button object

const lv_style_t *__lv_imgbtn_get_style__(**const** *lv_obj_t *imgbtn*, *lv_imgbtn_style_t type*)
Get style of a image button.

Return style pointer to the style

Parameters

- `imgbtn`: pointer to image button object
- `type`: which style should be get

struct lv_imgbtn_ext_t

Public Members

lv_btn_ext_t **btn**

const void ***img_src**[**_LV_BTN_STATE_NUM**]

const void ***img_src_left**[**_LV_BTN_STATE_NUM**]

const void ***img_src_mid**[**_LV_BTN_STATE_NUM**]

const void ***img_src_right**[**_LV_BTN_STATE_NUM**]

lv_img_cf_t **act_cf**

Keyboard (lv_kb)

Overview

The Keyboard object is a special *Button matrix* with predefined keymaps and other features to realize a virtual keyboard to write text.

Modes

The Keyboards have two modes:

- **LV_KB_MODE_TEXT** display letters, number, and special characters
- **LV_KB_MODE_NUM** display numbers, +/- sign and decimal dot

To set the mode use `lv_kb_set_mode(kb, mode)`. The default is *LV_KB_MODE_TEXT*

Assign Text area

You can assign a *Text area* to the Keyboard to automatically put the clicked characters there. To assign the Text area use `lv_kb_set_ta(kb, ta)`.

The assigned Text area's **cursor can be managed** by the keyboard: when the keyboard is assigned the previous Text area's cursor will be hidden an the new's will be shown. When the keyboard is closed by the *Ok* or *Close* buttons the cursor also will be hidden. The cursor manager feature is enabled by `lv_kb_set_cursor_manage(kb, true)`. The default is not managed.

New key map

You can specify a new map (layout) for the keyboard with `lv_kb_set_map(kb, map)`. and `lv_kb_set_ctrl_map(kb, ctrl_map)`. Learn more about in the *Button matrix* object. Keep in mind using following keywords will have the same effect as with the original map:

- *LV_SYMBOL_OK* Apply
- *SYMBOL_CLOSE* Close
- *LV_SYMBOL_LEFT* Move the cursor left
- *LV_SYMBOL_RIGHT* Move the cursor right
- *"ABC"* load the uppercase map
- *"abc"* load the lower case map
- *"Enter"* new line
- *"Bkps"* Delete on the left

Styles

The Keyboards work with 6 styles: a background and 5 button styles for each state. You can set the styles with `lv_kb_set_style(btn, LV_KB_STYLE_..., &style)`. The background and the buttons use the `style.body` properties. The labels use the `style.text` properties of the buttons' styles.

- **LV_KB_STYLE_BG** Background style. Uses all `style.body` properties including `padding` Default: `lv_style_pretty`
- **LV_KB_STYLE_BTN_REL** style of the released buttons. Default: `lv_style_btn_rel`
- **LV_KB_STYLE_BTN_PR** style of the pressed buttons. Default: `lv_style_btn_pr`
- **LV_KB_STYLE_BTN_TGL_REL** style of the toggled released buttons. Default: `lv_style_btn_tgl_rel`
- **LV_KB_STYLE_BTN_TGL_PR** style of the toggled pressed buttons. Default: `lv_style_btn_tgl_pr`
- **LV_KB_STYLE_BTN_INA** style of the inactive buttons. Default: `lv_style_btn_ina`

Events

Besides the Generic events the following Special events are sent by the keyboards:

- **LV_EVENT_VALUE_CHANGED** sent when the button is pressed/released or repeated after long press. The event data is set to ID of the pressed/released button.
- **LV_EVENT_APPLY** the *Ok* button is clicked
- **LV_EVENT_CANCEL** the *Close* button is clicked

The keyboard has a **default event handler** callback called `lv_kb_def_event_cb`. It handles the button pressing, map changing, the assigned Text area, etc. You can completely replace it with your custom event handler but you can call `lv_kb_def_event_cb` at the beginning of your event handler to handle the same things as before.

Learn more about *Events*.

Keys

The following *Keys* are processed by the Buttons:

- **LV_KEY_RIGHT/UP/LEFT/RIGHT** To navigate among the buttons and elect one
- **LV_KEY_ENTER** To press/release the selected button

Learn more about *Keys*.

Examples

C

Keyboard with text area

code

```
#include "lvgl/lvgl.h"

void lv_ex_kb_1(void)
{
    /*Create styles for the keyboard*/
    static lv_style_t rel_style, pr_style;

    lv_style_copy(&rel_style, &lv_style_btn_rel);
    rel_style.body.radius = 0;
    rel_style.body.border.width = 1;

    lv_style_copy(&pr_style, &lv_style_btn_pr);
    pr_style.body.radius = 0;
    pr_style.body.border.width = 1;

    /*Create a keyboard and apply the styles*/
```

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```
    lv_obj_t *kb = lv_kb_create(lv_scr_act(), NULL);
    lv_kb_set_cursor_manage(kb, true);
    lv_kb_set_style(kb, LV_KB_STYLE_BG, &lv_style_transp_tight);
    lv_kb_set_style(kb, LV_KB_STYLE_BTN_REL, &rel_style);
    lv_kb_set_style(kb, LV_KB_STYLE_BTN_PR, &pr_style);

    /*Create a text area. The keyboard will write here*/
    lv_obj_t *ta = lv_ta_create(lv_scr_act(), NULL);
    lv_obj_align(ta, NULL, LV_ALIGN_IN_TOP_MID, 0, 10);
    lv_ta_set_text(ta, "");

    /*Assign the text area to the keyboard*/
    lv_kb_set_ta(kb, ta);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_kb_mode_t**

typedef uint8_t **lv_kb_style_t**

Enums

enum [anonymous]

Current keyboard mode.

Values:

LV_KB_MODE_TEXT

LV_KB_MODE_NUM

enum [anonymous]

Values:

LV_KB_STYLE_BG

LV_KB_STYLE_BTN_REL

LV_KB_STYLE_BTN_PR

LV_KB_STYLE_BTN_TGL_REL

LV_KB_STYLE_BTN_TGL_PR

LV_KB_STYLE_BTN_INA

Functions

lv_obj_t ***lv_kb_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a keyboard objects

Return pointer to the created keyboard

Parameters

- `par`: pointer to an object, it will be the parent of the new keyboard
- `copy`: pointer to a keyboard object, if not NULL then the new object will be copied from it

void **lv_kb_set_ta**(*lv_obj_t *kb*, *lv_obj_t *ta*)
Assign a Text Area to the Keyboard. The pressed characters will be put there.

Parameters

- `kb`: pointer to a Keyboard object
- `ta`: pointer to a Text Area object to write there

void **lv_kb_set_mode**(*lv_obj_t *kb*, *lv_kb_mode_t mode*)
Set a new a mode (text or number map)

Parameters

- `kb`: pointer to a Keyboard object
- `mode`: the mode from 'lv_kb_mode_t'

void **lv_kb_set_cursor_manage**(*lv_obj_t *kb*, bool *en*)
Automatically hide or show the cursor of the current Text Area

Parameters

- `kb`: pointer to a Keyboard object
- `en`: true: show cursor on the current text area, false: hide cursor

static void **lv_kb_set_map**(*lv_obj_t *kb*, **const** char **map*[])
Set a new map for the keyboard

Parameters

- `kb`: pointer to a Keyboard object
- `map`: pointer to a string array to describe the map. See '*lv_btnm_set_map()*' for more info.

static void **lv_kb_set_ctrl_map**(*lv_obj_t *kb*, **const** *lv_btnm_ctrl_t ctrl_map*[])
Set the button control map (hidden, disabled etc.) for the keyboard. The control map array will be copied and so may be deallocated after this function returns.

Parameters

- `kb`: pointer to a keyboard object
- `ctrl_map`: pointer to an array of `lv_btn_ctrl_t` control bytes. See: `lv_btnm_set_ctrl_map` for more details.

void **lv_kb_set_style**(*lv_obj_t *kb*, *lv_kb_style_t type*, **const** lv_style_t **style*)
Set a style of a keyboard

Parameters

- `kb`: pointer to a keyboard object
- `type`: which style should be set

- `style`: pointer to a style

lv_obj_t ***lv_kb_get_ta**(**const** *lv_obj_t *kb*)
Assign a Text Area to the Keyboard. The pressed characters will be put there.

Return pointer to the assigned Text Area object

Parameters

- `kb`: pointer to a Keyboard object

lv_kb_mode_t **lv_kb_get_mode**(**const** *lv_obj_t *kb*)
Set a new a mode (text or number map)

Return the current mode from 'lv_kb_mode_t'

Parameters

- `kb`: pointer to a Keyboard object

bool **lv_kb_get_cursor_manage**(**const** *lv_obj_t *kb*)
Get the current cursor manage mode.

Return true: show cursor on the current text area, false: hide cursor

Parameters

- `kb`: pointer to a Keyboard object

static const char ****lv_kb_get_map_array**(**const** *lv_obj_t *kb*)
Get the current map of a keyboard

Return the current map

Parameters

- `kb`: pointer to a keyboard object

const lv_style_t ***lv_kb_get_style**(**const** *lv_obj_t *kb*, *lv_kb_style_t type*)
Get a style of a keyboard

Return style pointer to a style

Parameters

- `kb`: pointer to a keyboard object
- `type`: which style should be get

void **lv_kb_def_event_cb**(*lv_obj_t *kb*, *lv_event_t event*)
Default keyboard event to add characters to the Text area and change the map. If a custom `event_cb` is added to the keyboard this function be called from it to handle the button clicks

Parameters

- `kb`: pointer to a keyboard
- `event`: the triggering event

struct lv_kb_ext_t

Public Members

lv_btnm_ext_t **btnm**

lv_obj_t ***ta**

lv_kb_mode_t **mode**

uint8_t **cursor_mng**

Label (lv_label)

Overview

The Labels are the basic objects to display text.

Set text

You can modify the text in run-time at any time with `lv_label_set_text(label, "New text")`. It will allocate the text dynamically.

Labels are able to show text from a **static array**. Use: `lv_label_set_static_text(label, char_array)`. In this case, the text is not stored in the dynamic memory but the given array is used directly instead. Keep in my the array can't be a local variable which destroys when the function exits.

You can also use a **raw character array** as label text. The array doesn't have to be `\0` terminated. In this case, the text will be saved to the dynamic memory. To set a raw character array use the `lv_label_set_array_text(label, char_array)` function.

Line break

You can use `\n` to make line break. For example: `"line1\nline2\n\nline4"`

Long modes

The size of the label object can be automatically expanded to the text size or the text can be manipulated according to several long mode policies:

- **LV_LABEL_LONG_EXPAND** Expand the object size to the text size (Default)
- **LV_LABEL_LONG_BREAK** Keep the object width, break (wrap) the too long lines and expand the object height
- **LV_LABEL_LONG_DOTS** Keep the object size, break the text and write dots in the last line
- **LV_LABEL_LONG_SROLL** Keep the size and scroll the label back and forth
- **LV_LABEL_LONG_SROLL_CIRC** Keep the size and scroll the label circularly
- **LV_LABEL_LONG_CROP** Keep the size and crop the text out of it.

You can specify the long mode with: `lv_label_set_long_mode(label, LV_LABEL_LONG_...)`

It's important to note that when a label is created and its test is set the label's size already expanded to the text size. In addition with the default `LV_LABEL_LONG_EXPAND` *long mode* `lv_obj_set_width/height/size()` has no effect. So you need to change the *long mode* first and then set the size with `lv_obj_set_width/height/size()` .

Text align

The label's text can be aligned to the left, right or middle with `lv_label_set_align(label, LV_LABEL_ALIGN_LEFT/RIGHT/CENTER)`

Draw background

You can enable to draw a background for the label with `lv_label_set_body_draw(label, draw)`

The background will be larger in every direction with `body.padding.top/bottom/left/right` values. However, the background is drawn only "virtually" and doesn't make the label really larger. There for when the label is positioned the label's coordinates will be taken into account and not background's.

Text recolor

In the text, you can use commands to re-color parts of the text. For example: `"Write a #ff0000 red# word"`. This feature can be enabled individually for each label by `lv_label_set_recolor()` function.

Note that, recoloring work only in a single line. I.e. there can't be `\n` in a recolored text or it can be wrapped by `LV_LABEL_LONG_BREAK` else the text in the new line won't be recolored.

Very long texts

LittlevGL can effectively handle very long (> 40k characters) by saving some extra data (~12 bytes) to speed up drawing. To enable this feature set `LV_LABEL_LONG_TXT_HINT 1` in *lv_conf.h*.

Symbols

The labels can display symbols besides letters. Read the *Font* section to learn more about the symbols.

Styles

The Label uses one style which can be set by `lv_label_set_style(label, LV_LABEL_STYLE_MAIN, &style)`. Form the style the following properties are used:

- all properties from `style.text`
- for background drawing `style.body` properties. `padding` will increase the size only visually, the real object's size won't be changed.

The labels' default style is `NULL` so they inherit the parent's style.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

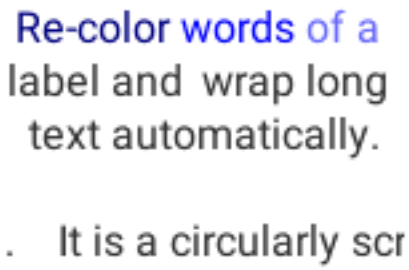
No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Label recoloring and scrolling



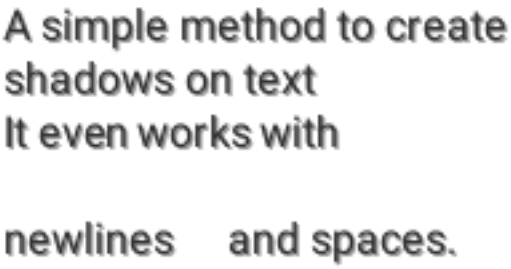
code

```
#include "lvgl/lvgl.h"

void lv_ex_label_1(void)
{
    lv_obj_t * label1 = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_long_mode(label1, LV_LABEL_LONG_BREAK);     /*Break the long lines*/
    lv_label_set_recolor(label1, true);                      /*Enable re-coloring by␣
↪commands in the text*/
    lv_label_set_align(label1, LV_LABEL_ALIGN_CENTER);       /*Center aligned lines*/
    lv_label_set_text(label1, "#000080 Re-color# #0000ff words# #6666ff of a# label "
                              "and  wrap long text automatically.");
    lv_obj_set_width(label1, 150);
    lv_obj_align(label1, NULL, LV_ALIGN_CENTER, 0, -30);

    lv_obj_t * label2 = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_long_mode(label2, LV_LABEL_LONG_SROLL_CIRC);     /*Circular scroll*/
    lv_obj_set_width(label2, 150);
    lv_label_set_text(label2, "It is a circularly scrolling text. ");
    lv_obj_align(label2, NULL, LV_ALIGN_CENTER, 0, 30);
}
```

Text shadow



code

```
#include "lvgl/lvgl.h"

void lv_ex_label_2(void)
{
    /* Create a style for the shadow*/
    static lv_style_t label_style;
    lv_style_copy(&label_style, &lv_style_plain);
    label_style.text.opa = LV_OPA_50;

    /*Create a label for the shadow first (it's in the background) */
    lv_obj_t * shadow_label = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_style(shadow_label, LV_LABEL_STYLE_MAIN, &label_style);

    /* Create the main label */
    lv_obj_t * main_label = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_text(main_label, "A simple method to create\n"
                                  "shadows on text\n"
                                  "It even works with\n\n"
                                  "newlines     and spaces.");

    /*Set the same text for the shadow label*/
    lv_label_set_text(shadow_label, lv_label_get_text(main_label));

    /* Position the main label */
    lv_obj_align(main_label, NULL, LV_ALIGN_CENTER, 0, 0);

    /* Shift the second label down and to the right by 1 pixel */
    lv_obj_align(shadow_label, main_label, LV_ALIGN_IN_TOP_LEFT, 1, 1);
}
```

Align labels

code

```
#include "lvgl/lvgl.h"

static void text_changer(lv_task_t * t);

lv_obj_t * labels[3];

/**
 * Create three labels to demonstrate the alignments.
 */
void lv_ex_label_3(void)
{
    /*`lv_label_set_align` is not required to align the object itslef.
     * It's used only when the text has multiple lines*/

    /* Create a label on the top.
     * No additional alignment so it will be the reference*/
    labels[0] = lv_label_create(lv_scr_act(), NULL);
    lv_obj_align(labels[0], NULL, LV_ALIGN_IN_TOP_MID, 0, 5);
    lv_label_set_align(labels[0], LV_LABEL_ALIGN_CENTER);

    /* Create a label in the middle.
     * `lv_obj_align` will be called every time the text changes
     * to keep the middle position */
    labels[1] = lv_label_create(lv_scr_act(), NULL);
    lv_obj_align(labels[1], NULL, LV_ALIGN_CENTER, 0, 0);
    lv_label_set_align(labels[1], LV_LABEL_ALIGN_CENTER);

    /* Create a label in the bottom.
     * Enable auto realign. */
    labels[2] = lv_label_create(lv_scr_act(), NULL);
    lv_obj_set_auto_realign(labels[2], true);
```

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```
    lv_obj_align(labels[2], NULL, LV_ALIGN_IN_BOTTOM_MID, 0, -5);
    lv_label_set_align(labels[2], LV_LABEL_ALIGN_CENTER);

    lv_task_t * t = lv_task_create(text_changer, 1000, LV_TASK_PRIO_MID, NULL);
    lv_task_ready(t);
}

static void text_changer(lv_task_t * t)
{
    const char * texts[] = {"Text", "A very long text", "A text with\nmultiple\nlines
↪", NULL};
    static uint8_t i = 0;

    lv_label_set_text(labels[0], texts[i]);
    lv_label_set_text(labels[1], texts[i]);
    lv_label_set_text(labels[2], texts[i]);

    /*Manually realaign `labels[1]`*/
    lv_obj_align(labels[1], NULL, LV_ALIGN_CENTER, 0, 0);

    i++;
    if(texts[i] == NULL) i = 0;

}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_label_long_mode_t**

typedef uint8_t **lv_label_align_t**

typedef uint8_t **lv_label_style_t**

Enums

enum [anonymous]

Long mode behaviors. Used in '*lv_label_ext_t*'

Values:

LV_LABEL_LONG_EXPAND

Expand the object size to the text size

LV_LABEL_LONG_BREAK

Keep the object width, break the too long lines and expand the object height

LV_LABEL_LONG_DOT

Keep the size and write dots at the end if the text is too long

LV_LABEL_LONG_SROLL
Keep the size and roll the text back and forth

LV_LABEL_LONG_SROLL_CIRC
Keep the size and roll the text circularly

LV_LABEL_LONG_CROP
Keep the size and crop the text out of it

enum [anonymous]
Label align policy

Values:

LV_LABEL_ALIGN_LEFT
Align text to left

LV_LABEL_ALIGN_CENTER
Align text to center

LV_LABEL_ALIGN_RIGHT
Align text to right

enum [anonymous]
Label styles

Values:

LV_LABEL_STYLE_MAIN

Functions

lv_obj_t ***lv_label_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a label objects

Return pointer to the created button

Parameters

- `par`: pointer to an object, it will be the parent of the new label
- `copy`: pointer to a button object, if not NULL then the new object will be copied from it

void **lv_label_set_text**(*lv_obj_t *label*, **const** char **text*)
Set a new text for a label. Memory will be allocated to store the text by the label.

Parameters

- `label`: pointer to a label object
- `text`: '\0' terminated character string. NULL to refresh with the current text.

void **lv_label_set_array_text**(*lv_obj_t *label*, **const** char **array*, uint16_t *size*)
Set a new text for a label from a character array. The array don't has to be '\0' terminated. Memory will be allocated to store the array by the label.

Parameters

- `label`: pointer to a label object
- `array`: array of characters or NULL to refresh the label
- `size`: the size of 'array' in bytes

void **lv_label_set_static_text**(*lv_obj_t *label*, **const** char **text*)
Set a static text. It will not be saved by the label so the 'text' variable has to be 'alive' while the label exist.

Parameters

- `label`: pointer to a label object
- `text`: pointer to a text. NULL to refresh with the current text.

void **lv_label_set_long_mode**(*lv_obj_t *label*, *lv_label_long_mode_t long_mode*)
Set the behavior of the label with longer text then the object size

Parameters

- `label`: pointer to a label object
- `long_mode`: the new mode from 'lv_label_long_mode' enum. In LV_LONG_BREAK/LONG/ROLL the size of the label should be set AFTER this function

void **lv_label_set_align**(*lv_obj_t *label*, *lv_label_align_t align*)
Set the align of the label (left or center)

Parameters

- `label`: pointer to a label object
- `align`: 'LV_LABEL_ALIGN_LEFT' or 'LV_LABEL_ALIGN_LEFT'

void **lv_label_set_recolor**(*lv_obj_t *label*, bool *en*)
Enable the recoloring by in-line commands

Parameters

- `label`: pointer to a label object
- `en`: true: enable recoloring, false: disable

void **lv_label_set_body_draw**(*lv_obj_t *label*, bool *en*)
Set the label to draw (or not draw) background specified in its style's body

Parameters

- `label`: pointer to a label object
- `en`: true: draw body; false: don't draw body

void **lv_label_set_anim_speed**(*lv_obj_t *label*, uint16_t *anim_speed*)
Set the label's animation speed in LV_LABEL_LONG_SROLL/SCROLL_CIRC modes

Parameters

- `label`: pointer to a label object
- `anim_speed`: speed of animation in px/sec unit

static void **lv_label_set_style**(*lv_obj_t *label*, *lv_label_style_t type*, **const** lv_style_t **style*)
Set the style of an label

Parameters

- `label`: pointer to an label object
- `type`: which style should be get (can be only `LV_LABEL_STYLE_MAIN`)
- `style`: pointer to a style

void **lv_label_set_text_sel_start**(*lv_obj_t *label*, uint16_t *index*)
Set the selection start index.

Parameters

- `label`: pointer to a label object.
- `index`: index to set. `LV_LABEL_TXT_SEL_OFF` to select nothing.

void **lv_label_set_text_sel_end**(*lv_obj_t *label*, uint16_t *index*)
Set the selection end index.

Parameters

- `label`: pointer to a label object.
- `index`: index to set. `LV_LABEL_TXT_SEL_OFF` to select nothing.

char ***lv_label_get_text**(**const** *lv_obj_t *label*)
Get the text of a label

Return the text of the label

Parameters

- `label`: pointer to a label object

lv_label_long_mode_t **lv_label_get_long_mode**(**const** *lv_obj_t *label*)
Get the long mode of a label

Return the long mode

Parameters

- `label`: pointer to a label object

lv_label_align_t **lv_label_get_align**(**const** *lv_obj_t *label*)
Get the align attribute

Return LV_LABEL_ALIGN_LEFT or LV_LABEL_ALIGN_CENTER

Parameters

- `label`: pointer to a label object

bool **lv_label_get_recolor**(**const** *lv_obj_t *label*)
Get the recoloring attribute

Return true: recoloring is enabled, false: disable

Parameters

- `label`: pointer to a label object

bool **lv_label_get_body_draw**(**const** *lv_obj_t *label*)
Get the body draw attribute

Return true: draw body; false: don't draw body

Parameters

- `label`: pointer to a label object

uint16_t **lv_label_get_anim_speed**(**const** *lv_obj_t *label*)
Get the label's animation speed in LV_LABEL_LONG_ROLL and SCROLL modes

Return speed of animation in px/sec unit

Parameters

- `label`: pointer to a label object

void **lv_label_get_letter_pos(const** *lv_obj_t *label*, uint16_t *index*, lv_point_t *pos***)**
Get the relative x and y coordinates of a letter

Parameters

- `label`: pointer to a label object
- `index`: index of the letter [0 … text length]. Expressed in character index, not byte index (different in UTF-8)
- `pos`: store the result here (E.g. index = 0 gives 0;0 coordinates)

uint16_t **lv_label_get_letter_on(const** *lv_obj_t *label*, lv_point_t *pos***)**
Get the index of letter on a relative point of a label

Return the index of the letter on the 'pos_p' point (E.g. on 0;0 is the 0. letter) Expressed in character index and not byte index (different in UTF-8)

Parameters

- `label`: pointer to label object
- `pos`: pointer to point with coordinates on a the label

bool **lv_label_is_char_under_pos(const** *lv_obj_t *label*, lv_point_t *pos***)**
Check if a character is drawn under a point.

Return whether a character is drawn under the point

Parameters

- `label`: Label object
- `pos`: Point to check for characte under

static const lv_style_t ***lv_label_get_style(const** *lv_obj_t *label*, *lv_label_style_t type***)**
Get the style of an label object

Return pointer to the label's style

Parameters

- `label`: pointer to an label object
- `type`: which style should be get (can be only `LV_LABEL_STYLE_MAIN`)

uint16_t **lv_label_get_text_sel_start(const** *lv_obj_t *label***)**
Get the selection start index.

Return selection start index. `LV_LABEL_TXT_SEL_OFF` if nothing is selected.

Parameters

- `label`: pointer to a label object.

uint16_t **lv_label_get_text_sel_end(const** *lv_obj_t *label***)**
Get the selection end index.

Return selection end index. `LV_LABEL_TXT_SEL_OFF` if nothing is selected.

Parameters

- `label`: pointer to a label object.

void **lv_label_ins_text**(*lv_obj_t *label*, uint32_t *pos*, **const** char **txt*)
Insert a text to the label. The label text can not be static.

Parameters

- `label`: pointer to a label object
- `pos`: character index to insert. Expressed in character index and not byte index (Different in UTF-8) 0: before first char. LV_LABEL_POS_LAST: after last char.
- `txt`: pointer to the text to insert

void **lv_label_cut_text**(*lv_obj_t *label*, uint32_t *pos*, uint32_t *cnt*)
Delete characters from a label. The label text can not be static.

Parameters

- `label`: pointer to a label object
- `pos`: character index to insert. Expressed in character index and not byte index (Different in UTF-8) 0: before first char.
- `cnt`: number of characters to cut

struct lv_label_ext_t
#include <lv_label.h> Data of label

Public Members

char ***text**

char ***tmp_ptr**

char **tmp**[sizeof(char *)]

union *lv_label_ext_t*::[**anonymous**] **dot**

uint16_t **dot_end**

lv_point_t **offset**

lv_draw_label_hint_t **hint**

uint16_t **anim_speed**

uint16_t **txt_sel_start**

uint16_t **txt_sel_end**

lv_label_long_mode_t **long_mode**

uint8_t **static_txt**

uint8_t **align**

uint8_t **recolor**

uint8_t **expand**

uint8_t **body_draw**

uint8_t **dot_tmp_alloc**

LED (lv_led)

Overview

The LEDs are rectangle-like (or circle) object.

Brightness

You can set their brightness with `lv_led_set_bright(led, bright)`. The brightness should be between 0 (darkest) and 255 (lightest).

Toggle

Use `lv_led_on(led)` and `lv_led_off(led)` to set the brightness to a predefined ON or OFF value. The `lv_led_toggle(led)` toggles between the ON and OFF state.

Styles

The LED uses one style which can be set by `lv_led_set_style(led, LV_LED_STYLE_MAIN, &style)`. To determine the appearance the `style.body` properties are used.

The colors are darkened and shadow width is reduced at a lower brightness and gains its original value at brightness 255 to show a lighting effect.

The default style is: `lv_style_pretty_color`. Not that, the LED doesn't really look like a LED with the default style so you should create your own style. See the example below.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

LED with custom style

code

```
#include "lvgl/lvgl.h"

void lv_ex_led_1(void)
{
    /*Create a style for the LED*/
    static lv_style_t style_led;
    lv_style_copy(&style_led, &lv_style_pretty_color);
    style_led.body.radius = LV_RADIUS_CIRCLE;
    style_led.body.main_color = LV_COLOR_MAKE(0xb5, 0x0f, 0x04);
    style_led.body.grad_color = LV_COLOR_MAKE(0x50, 0x07, 0x02);
    style_led.body.border.color = LV_COLOR_MAKE(0xfa, 0x0f, 0x00);
    style_led.body.border.width = 3;
    style_led.body.border.opa = LV_OPA_30;
    style_led.body.shadow.color = LV_COLOR_MAKE(0xb5, 0x0f, 0x04);
    style_led.body.shadow.width = 5;

    /*Create a LED and switch it ON*/
    lv_obj_t * led1  = lv_led_create(lv_scr_act(), NULL);
    lv_obj_set_style(led1, &style_led);
    lv_obj_align(led1, NULL, LV_ALIGN_CENTER, -80, 0);
    lv_led_off(led1);

    /*Copy the previous LED and set a brightness*/
    lv_obj_t * led2  = lv_led_create(lv_scr_act(), led1);
    lv_obj_align(led2, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_led_set_bright(led2, 190);

    /*Copy the previous LED and switch it OFF*/
    lv_obj_t * led3  = lv_led_create(lv_scr_act(), led1);
    lv_obj_align(led3, NULL, LV_ALIGN_CENTER, 80, 0);
    lv_led_on(led3);
```

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```
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_led_style_t**

Enums

enum [anonymous]

Values:

LV_LED_STYLE_MAIN

Functions

lv_obj_t ***lv_led_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a led objects

Return pointer to the created led

Parameters

- `par`: pointer to an object, it will be the parent of the new led
- `copy`: pointer to a led object, if not NULL then the new object will be copied from it

void **lv_led_set_bright**(*lv_obj_t *led*, uint8_t *bright*)

Set the brightness of a LED object

Parameters

- `led`: pointer to a LED object
- `bright`: 0 (max. dark) … 255 (max. light)

void **lv_led_on**(*lv_obj_t *led*)

Light on a LED

Parameters

- `led`: pointer to a LED object

void **lv_led_off**(*lv_obj_t *led*)

Light off a LED

Parameters

- `led`: pointer to a LED object

void **lv_led_toggle**(*lv_obj_t *led*)

Toggle the state of a LED

Parameters

- `led`: pointer to a LED object

static void **lv_led_set_style**(*lv_obj_t *led*, *lv_led_style_t type*, **const** lv_style_t *style*)
Set the style of a led

Parameters

- `led`: pointer to a led object
- `type`: which style should be set (can be only `LV_LED_STYLE_MAIN`)
- `style`: pointer to a style

uint8_t **lv_led_get_bright**(**const** *lv_obj_t *led*)
Get the brightness of a LEd object

Return bright 0 (max. dark) … 255 (max. light)

Parameters

- `led`: pointer to LED object

static const lv_style_t ***lv_led_get_style**(**const** *lv_obj_t *led*, *lv_led_style_t type*)
Get the style of an led object

Return pointer to the led's style

Parameters

- `led`: pointer to an led object
- `type`: which style should be get (can be only `LV_CHART_STYLE_MAIN`)

struct lv_led_ext_t

Public Members

uint8_t **bright**

Line (lv_line)

Overview

The Line object is capable of drawing straight lines between a set of points.

Set points

The points has to be stored in an `lv_point_t` array and passed to the object by the `lv_line_set_points(lines, point_array, point_cnt)` function.

Auto-size

It is possible to automatically set the size of the line object according to its points. You can enable it with the `lv_line_set_auto_size(line, true)` function. If enabled then when the points are set the object's width and height will be changed according to the maximal x and y coordinates among the points. The *auto size* is enabled by default.

Invert y

By deafult, the *y == 0* point is in the top of the object but you can invert the y coordinates with `lv_line_set_y_invert(line, true)`. The *y invert* is disabled by default.

Styles

The Line uses one style which can be set by `lv_line_set_style(led, LV_LINE_STYLE_MAIN, &style)` and it uses all `style.line` properties.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Simple Line

code

```
#include "lvgl/lvgl.h"

void lv_ex_line_1(void)
{
    /*Create an array for the points of the line*/
    static lv_point_t line_points[] = { {5, 5}, {70, 70}, {120, 10}, {180, 60}, {240,␣
↪10} };

    /*Create new style (thick dark blue)*/
    static lv_style_t style_line;
    lv_style_copy(&style_line, &lv_style_plain);
    style_line.line.color = LV_COLOR_MAKE(0x00, 0x3b, 0x75);
    style_line.line.width = 3;
    style_line.line.rounded = 1;

    /*Copy the previous line and apply the new style*/
    lv_obj_t * line1;
    line1 = lv_line_create(lv_scr_act(), NULL);
    lv_line_set_points(line1, line_points, 5);     /*Set the points*/
    lv_line_set_style(line1, LV_LINE_STYLE_MAIN, &style_line);
    lv_obj_align(line1, NULL, LV_ALIGN_CENTER, 0, 0);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_line_style_t**

Enums

enum [anonymous]

Values:

LV_LINE_STYLE_MAIN

Functions

lv_obj_t ***lv_line_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a line objects

Return pointer to the created line

Parameters

- `par`: pointer to an object, it will be the parent of the new line

void **lv_line_set_points**(*lv_obj_t *line*, **const** lv_point_t *point_a*[], uint16_t *point_num*)

Set an array of points. The line object will connect these points.

Parameters

- `line`: pointer to a line object
- `point_a`: an array of points. Only the address is saved, so the array can NOT be a local variable which will be destroyed
- `point_num`: number of points in 'point_a'

void **lv_line_set_auto_size**(*lv_obj_t *line*, bool *en*)
Enable (or disable) the auto-size option. The size of the object will fit to its points. (set width to x max and height to y max)

Parameters

- `line`: pointer to a line object
- `en`: true: auto size is enabled, false: auto size is disabled

void **lv_line_set_y_invert**(*lv_obj_t *line*, bool *en*)
Enable (or disable) the y coordinate inversion. If enabled then y will be subtracted from the height of the object, therefore the y=0 coordinate will be on the bottom.

Parameters

- `line`: pointer to a line object
- `en`: true: enable the y inversion, false:disable the y inversion

static void **lv_line_set_style**(*lv_obj_t *line*, *lv_line_style_t type*, **const** lv_style_t **style*)
Set the style of a line

Parameters

- `line`: pointer to a line object
- `type`: which style should be set (can be only `LV_LINE_STYLE_MAIN`)
- `style`: pointer to a style

bool **lv_line_get_auto_size**(**const** *lv_obj_t *line*)
Get the auto size attribute

Return true: auto size is enabled, false: disabled

Parameters

- `line`: pointer to a line object

bool **lv_line_get_y_invert**(**const** *lv_obj_t *line*)
Get the y inversion attribute

Return true: y inversion is enabled, false: disabled

Parameters

- `line`: pointer to a line object

static const lv_style_t ***lv_line_get_style**(**const** *lv_obj_t *line*, *lv_line_style_t type*)
Get the style of an line object

Return pointer to the line's style

Parameters

- `line`: pointer to an line object
- `type`: which style should be get (can be only `LV_LINE_STYLE_MAIN`)

struct lv_line_ext_t

Public Members

const lv_point_t ***point_array**

uint16_t **point_num**

uint8_t **auto_size**

uint8_t **y_inv**

List (lv_list)

Overview

The Lists are built from a background *Page* and *Buttons* on it. The Buttons contain an optional icon-like *Image* (which can be a symbol too) and a *Label*. When the list becomes long enough it can be scrolled.

Add buttons

You can add new list elements with `lv_list_add_btn(list, &icon_img, "Text")` or with symbol `lv_list_add_btn(list, SYMBOL_EDIT, "Edit text")`. If you do not want to add image use `NULL` as image source. The function returns with a pointer to the created button to allow further configurations.

The width of the buttons is set to maximum according to the object width. The height of the buttons are adjusted automatically according to the content. (*content height* + *padding.top* + *padding.bottom*).

The labels are created with `LV_LABEL_LONG_SROLL_CIRC` long mode to automatically scroll the long labels circularly.

You can use `lv_list_get_btn_label(list_btn)` and `lv_list_get_btn_img(list_btn)` to get the label and the image of a list button. You can get the text directly with `lv_list_get_btn_text(list_btn)`.

Delete buttons

To delete a list element just use `lv_obj_del(btn)` on the return value of `lv_list_add_btn()`.

To clean the list (remove all buttons) use `lv_list_clean(list)`

Manual navigation

You can navigate manually in the list with `lv_list_up(list)` and `lv_list_down(list)`.

You can focus on a button directly using `lv_list_focus(btn, LV_ANIM_ON/OFF)`.

The **animation time** of up/down/focus movements can be set via: `lv_list_set_anim_time(list, anim_time)`. Zero animation time means not animations.

Edge flash

A circle-like effect can be shown when the list reaches the most top or bottom position. `lv_list_set_edge_flash(list, en)` enables this feature.

Scroll propagation

If the list is created on an other scrollable element (like a *Page*) and the list can't be scrolled further the **scrolling can be propagated to the parent**. This way the scroll will be continued on the parent. It can be enabled with `lv_list_set_scroll_propagation(list, true)`

If the buttons have `lv_btn_set_toggle` enabled then `lv_list_set_single_mode(list, true)` can be used to ensure that only one button can be in toggled state at the same time.

Style usage

The `lv_list_set_style(list, LV_LIST_STYLE_..., &style)` function sets the style of a list.

- **LV_LIST_STYLE_BG** list background style. Default: `lv_style_transp_fit`
- **LV_LIST_STYLE_SCRL** scrollable part's style. Default: `lv_style_pretty`
- **LV_LIST_STYLE_SB** scrollbars' style. Default: `lv_style_pretty_color`. For details see *Page*
- **LV_LIST_STYLE_BTN_REL** button released style. Default: `lv_style_btn_rel`
- **LV_LIST_STYLE_BTN_PR** button pressed style. Default: `lv_style_btn_pr`
- **LV_LIST_STYLE_BTN_TGL_REL** button toggled released style. Default: `lv_style_btn_tgl_rel`
- **LV_LIST_STYLE_BTN_TGL_PR** button toggled pressed style. Default: `lv_style_btn_tgl_pr`
- **LV_LIST_STYLE_BTN_INA** button inactive style. Default: `lv_style_btn_ina`

Because *BG* has a transparent style by default if there is only a few buttons the list will look shorter but become scrollable when more list elements are added.

To modify the height of the buttons adjust the `body.padding.top/bottom` fields of the corresponding styles (`LV_LIST_STYLE_BTN_REL/PR/...`)

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

The following *Keys* are processed by the Lists:

- **LV_KEY_RIGHT/DOWN** Select the next button
- **LV_KEY_LEFT/UP** Select the previous button

Note that, as usual, the state of `LV_KEY_ENTER` is translated to `LV_EVENT_PRESSED/PRESSING/RELEASED` etc.

The Selected buttons are in `LV_BTN_STATE_PR/TG_PR` state.

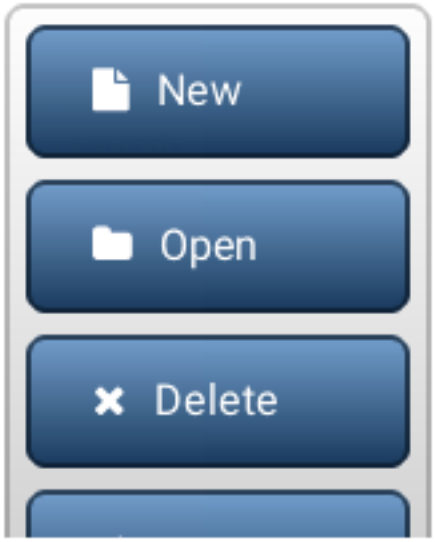
To manually select a button use `lv_list_set_btn_selected(list, btn)`. When the list is defocused and focused again it will restore the last selected button.

Learn more about *Keys*.

Example

C

Simple List



code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_CLICKED) {
        printf("Clicked: %s\n", lv_list_get_btn_text(obj));
    }
}

void lv_ex_list_1(void)
{
    /*Create a list*/
    lv_obj_t * list1 = lv_list_create(lv_scr_act(), NULL);
    lv_obj_set_size(list1, 160, 200);
```

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```
    lv_obj_align(list1, NULL, LV_ALIGN_CENTER, 0, 0);

    /*Add buttons to the list*/

    lv_obj_t * list_btn;

    list_btn = lv_list_add_btn(list1, LV_SYMBOL_FILE, "New");
    lv_obj_set_event_cb(list_btn, event_handler);

    list_btn = lv_list_add_btn(list1, LV_SYMBOL_DIRECTORY, "Open");
    lv_obj_set_event_cb(list_btn, event_handler);

    list_btn = lv_list_add_btn(list1, LV_SYMBOL_CLOSE, "Delete");
    lv_obj_set_event_cb(list_btn, event_handler);

    list_btn = lv_list_add_btn(list1, LV_SYMBOL_EDIT, "Edit");
    lv_obj_set_event_cb(list_btn, event_handler);

    list_btn = lv_list_add_btn(list1, LV_SYMBOL_SAVE, "Save");
    lv_obj_set_event_cb(list_btn, event_handler);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_list_style_t**

Enums

enum [anonymous]

List styles.

Values:

LV_LIST_STYLE_BG
List background style

LV_LIST_STYLE_SCRL
List scrollable area style.

LV_LIST_STYLE_SB
List scrollbar style.

LV_LIST_STYLE_EDGE_FLASH
List edge flash style.

LV_LIST_STYLE_BTN_REL
Same meaning as the ordinary button styles.

LV_LIST_STYLE_BTN_PR

LV_LIST_STYLE_BTN_TGL_REL

LV_LIST_STYLE_BTN_TGL_PR

LV_LIST_STYLE_BTN_INA

Functions

lv_obj_t ***lv_list_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a list objects

Return pointer to the created list

Parameters

- `par`: pointer to an object, it will be the parent of the new list
- `copy`: pointer to a list object, if not NULL then the new object will be copied from it

void **lv_list_clean**(*lv_obj_t *obj*)
Delete all children of the scrl object, without deleting scrl child.

Parameters

- `obj`: pointer to an object

lv_obj_t ***lv_list_add_btn**(*lv_obj_t *list*, **const** void **img_src*, **const** char **txt*)
Add a list element to the list

Return pointer to the new list element which can be customized (a button)

Parameters

- `list`: pointer to list object
- `img_fn`: file name of an image before the text (NULL if unused)
- `txt`: text of the list element (NULL if unused)

bool **lv_list_remove**(**const** *lv_obj_t *list*, uint16_t *index*)
Remove the index of the button in the list

Return true: successfully deleted

Parameters

- `list`: pointer to a list object
- `index`: pointer to a the button's index in the list, index must be 0 <= index < lv_list_ext_t.size

void **lv_list_set_single_mode**(*lv_obj_t *list*, bool *mode*)
Set single button selected mode, only one button will be selected if enabled.

Parameters

- `list`: pointer to the currently pressed list object
- `mode`: enable(true)/disable(false) single selected mode.

void **lv_list_set_btn_selected**(*lv_obj_t *list*, *lv_obj_t *btn*)
Make a button selected

Parameters

- `list`: pointer to a list object

- `btn`: pointer to a button to select NULL to not select any buttons

static void **lv_list_set_sb_mode(***lv_obj_t *list*, *lv_sb_mode_t mode***)**
Set the scroll bar mode of a list

Parameters

- `list`: pointer to a list object
- `sb_mode`: the new mode from 'lv_page_sb_mode_t' enum

static void **lv_list_set_scroll_propagation(***lv_obj_t *list*, bool *en***)**
Enable the scroll propagation feature. If enabled then the List will move its parent if there is no more space to scroll.

Parameters

- `list`: pointer to a List
- `en`: true or false to enable/disable scroll propagation

static void **lv_list_set_edge_flash(***lv_obj_t *list*, bool *en***)**
Enable the edge flash effect. (Show an arc when the an edge is reached)

Parameters

- `list`: pointer to a List
- `en`: true or false to enable/disable end flash

static void **lv_list_set_anim_time(***lv_obj_t *list*, uint16_t *anim_time***)**
Set scroll animation duration on 'list_up()' 'list_down()' 'list_focus()'

Parameters

- `list`: pointer to a list object
- `anim_time`: duration of animation [ms]

void **lv_list_set_style(***lv_obj_t *list*, *lv_list_style_t type*, **const** lv_style_t **style***)**
Set a style of a list

Parameters

- `list`: pointer to a list object
- `type`: which style should be set
- `style`: pointer to a style

bool **lv_list_get_single_mode(***lv_obj_t *list***)**
Get single button selected mode.

Parameters

- `list`: pointer to the currently pressed list object.

const char ***lv_list_get_btn_text(const** *lv_obj_t *btn***)**
Get the text of a list element

Return pointer to the text

Parameters

- `btn`: pointer to list element

lv_obj_t ***lv_list_get_btn_label(const** *lv_obj_t *btn***)**
Get the label object from a list element

Return pointer to the label from the list element or NULL if not found

Parameters

- `btn`: pointer to a list element (button)

lv_obj_t ***lv_list_get_btn_img**(**const** *lv_obj_t *btn*)
Get the image object from a list element

Return pointer to the image from the list element or NULL if not found

Parameters

- `btn`: pointer to a list element (button)

lv_obj_t ***lv_list_get_prev_btn**(**const** *lv_obj_t *list*, *lv_obj_t *prev_btn*)
Get the next button from list. (Starts from the bottom button)

Return pointer to the next button or NULL when no more buttons

Parameters

- `list`: pointer to a list object
- `prev_btn`: pointer to button. Search the next after it.

lv_obj_t ***lv_list_get_next_btn**(**const** *lv_obj_t *list*, *lv_obj_t *prev_btn*)
Get the previous button from list. (Starts from the top button)

Return pointer to the previous button or NULL when no more buttons

Parameters

- `list`: pointer to a list object
- `prev_btn`: pointer to button. Search the previous before it.

int32_t **lv_list_get_btn_index**(**const** *lv_obj_t *list*, **const** *lv_obj_t *btn*)
Get the index of the button in the list

Return the index of the button in the list, or -1 of the button not in this list

Parameters

- `list`: pointer to a list object. If NULL, assumes btn is part of a list.
- `btn`: pointer to a list element (button)

uint16_t **lv_list_get_size**(**const** *lv_obj_t *list*)
Get the number of buttons in the list

Return the number of buttons in the list

Parameters

- `list`: pointer to a list object

lv_obj_t ***lv_list_get_btn_selected**(**const** *lv_obj_t *list*)
Get the currently selected button. Can be used while navigating in the list with a keypad.

Return pointer to the selected button

Parameters

- `list`: pointer to a list object

static *lv_sb_mode_t* **lv_list_get_sb_mode**(**const** *lv_obj_t *list*)
Get the scroll bar mode of a list

Return scrollbar mode from 'lv_page_sb_mode_t' enum

Parameters

- `list`: pointer to a list object

static bool **lv_list_get_scroll_propagation**(*lv_obj_t *list*)
Get the scroll propagation property

Return true or false

Parameters

- `list`: pointer to a List

static bool **lv_list_get_edge_flash**(*lv_obj_t *list*)
Get the scroll propagation property

Return true or false

Parameters

- `list`: pointer to a List

static uint16_t **lv_list_get_anim_time**(**const** *lv_obj_t *list*)
Get scroll animation duration

Return duration of animation [ms]

Parameters

- `list`: pointer to a list object

const lv_style_t ***lv_list_get_style**(**const** *lv_obj_t *list*, *lv_list_style_t type*)
Get a style of a list

Return style pointer to a style

Parameters

- `list`: pointer to a list object
- `type`: which style should be get

void **lv_list_up**(**const** *lv_obj_t *list*)
Move the list elements up by one

Parameters

- `list`: pointer a to list object

void **lv_list_down**(**const** *lv_obj_t *list*)
Move the list elements down by one

Parameters

- `list`: pointer to a list object

void **lv_list_focus**(**const** *lv_obj_t *btn*, *lv_anim_enable_t anim*)
Focus on a list button. It ensures that the button will be visible on the list.

Parameters

- `btn`: pointer to a list button to focus
- `anim`: LV_ANOM_ON: scroll with animation, LV_ANIM_OFF: without animation

struct lv_list_ext_t

Public Members

lv_page_ext_t **page**

const lv_style_t ***styles_btn**[**_LV_BTN_STATE_NUM**]

const lv_style_t ***style_img**

uint16_t **size**

uint8_t **single_mode**

lv_obj_t ***last_sel**

lv_obj_t ***selected_btn**

Line meter (lv_lmeter)

Overview

The Line Meter object consists of some radial lines which draw a scale.

Set value

When setting a new value with `lv_lmeter_set_value(lmeter, new_value)` the proportional part of the scale will be recolored.

Range and Angles

The `lv_lmeter_set_range(lmeter, min, max)` function sets the range of the line meter.

You can set the angle of the scale and the number of the lines by: `lv_lmeter_set_scale(lmeter, angle, line_num)`. The default angle is 240 and the default line number is 31.

Styles

The line meter uses one style which can be set by `lv_lmeter_set_style(lmeter, LV_LMETER_STYLE_MAIN, &style)`. The line meter's properties are derived from the following style attributes:

- **line.color** "inactive line's" color which are greater then the current value
- **body.main_color** "active line's" color at the beginning of the scale
- **body.grad_color** "active line's" color at the end of the scale (gradient with main color)
- **body.padding.hor** line length
- **line.width** line width

The default style is `lv_style_pretty_color`.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Simple Line meter

code

```
#include "lvgl/lvgl.h"

void lv_ex_lmeter_1(void)
{
    /*Create a style for the line meter*/
    static lv_style_t style_lmeter;
    lv_style_copy(&style_lmeter, &lv_style_pretty_color);
    style_lmeter.line.width = 2;
    style_lmeter.line.color = LV_COLOR_SILVER;
    style_lmeter.body.main_color = lv_color_hex(0x91bfed);          /*Light blue*/
    style_lmeter.body.grad_color = lv_color_hex(0x04386c);          /*Dark blue*/
```

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```
    style_lmeter.body.padding.left = 16;                        /*Line length*/

    /*Create a line meter */
    lv_obj_t * lmeter;
    lmeter = lv_lmeter_create(lv_scr_act(), NULL);
    lv_lmeter_set_range(lmeter, 0, 100);                    /*Set the range*/
    lv_lmeter_set_value(lmeter, 80);                        /*Set the current value*/
    lv_lmeter_set_scale(lmeter, 240, 31);                   /*Set the angle and number␣
↪of lines*/
    lv_lmeter_set_style(lmeter, LV_LMETER_STYLE_MAIN, &style_lmeter);          /
↪*Apply the new style*/
    lv_obj_set_size(lmeter, 150, 150);
    lv_obj_align(lmeter, NULL, LV_ALIGN_CENTER, 0, 0);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_lmeter_style_t**

Enums

enum [anonymous]

Values:

LV_LMETER_STYLE_MAIN

Functions

lv_obj_t ***lv_lmeter_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a line meter objects

Return pointer to the created line meter

Parameters

- `par`: pointer to an object, it will be the parent of the new line meter
- `copy`: pointer to a line meter object, if not NULL then the new object will be copied from it

void **lv_lmeter_set_value**(*lv_obj_t *lmeter*, int16_t *value*)

Set a new value on the line meter

Parameters

- `lmeter`: pointer to a line meter object
- `value`: new value

void **lv_lmeter_set_range**(*lv_obj_t *lmeter*, int16_t *min*, int16_t *max*)
Set minimum and the maximum values of a line meter

Parameters

- `lmeter`: pointer to he line meter object
- `min`: minimum value
- `max`: maximum value

void **lv_lmeter_set_scale**(*lv_obj_t *lmeter*, uint16_t *angle*, uint8_t *line_cnt*)
Set the scale settings of a line meter

Parameters

- `lmeter`: pointer to a line meter object
- `angle`: angle of the scale (0..360)
- `line_cnt`: number of lines

static void **lv_lmeter_set_style**(*lv_obj_t *lmeter*, *lv_lmeter_style_t type*, lv_style_t *style*)
Set the styles of a line meter

Parameters

- `lmeter`: pointer to a line meter object
- `type`: which style should be set (can be only `LV_LMETER_STYLE_MAIN`)
- `style`: set the style of the line meter

int16_t **lv_lmeter_get_value**(**const** *lv_obj_t *lmeter*)
Get the value of a line meter

Return the value of the line meter

Parameters

- `lmeter`: pointer to a line meter object

int16_t **lv_lmeter_get_min_value**(**const** *lv_obj_t *lmeter*)
Get the minimum value of a line meter

Return the minimum value of the line meter

Parameters

- `lmeter`: pointer to a line meter object

int16_t **lv_lmeter_get_max_value**(**const** *lv_obj_t *lmeter*)
Get the maximum value of a line meter

Return the maximum value of the line meter

Parameters

- `lmeter`: pointer to a line meter object

uint8_t **lv_lmeter_get_line_count**(**const** *lv_obj_t *lmeter*)
Get the scale number of a line meter

Return number of the scale units

Parameters

- `lmeter`: pointer to a line meter object

uint16_t **lv_lmeter_get_scale_angle**(**const** *lv_obj_t *lmeter*)
Get the scale angle of a line meter

Return angle of the scale

Parameters

- `lmeter`: pointer to a line meter object

static const lv_style_t ***lv_lmeter_get_style**(**const** *lv_obj_t *lmeter*, *lv_lmeter_style_t type*)
Get the style of a line meter

Return pointer to the line meter's style

Parameters

- `lmeter`: pointer to a line meter object
- `type`: which style should be get (can be only `LV_LMETER_STYLE_MAIN`)

struct lv_lmeter_ext_t

Public Members

uint16_t **scale_angle**

uint8_t **line_cnt**

int16_t **cur_value**

int16_t **min_value**

int16_t **max_value**

Message box (lv_mbox)

Overview

The Message boxes act as pop-ups. They are built from a background *Container*, a *Label* and a *Button matrix* for buttons.

The text will be broken into multiple lines automatically (has `LV_LABEL_LONG_MODE_BREAK`) and the height will be set automatically to involve the text and the buttons (`LV_FIT_TIGHT` auto fit vertically)-

Set text

To set the text use the `lv_mbox_set_text(mbox, "My text")` function.

Add buttons

To add buttons use the `lv_mbox_add_btns(mbox, btn_str)` function. You need specify the button's text like `const char * btn_str[] = {"Apply", "Close", ""}`. For more information visit the *Button matrix* documentation.

Auto-close

With `lv_mbox_start_auto_close(mbox, delay)` the message box can be closed automatically after `delay` milliseconds with an animation. The `lv_mbox_stop_auto_close(mbox)` function stops a started auto close.

The duration of the close animation can be set by `lv_mbox_set_anim_time(mbox, anim_time)`.

Styles

Use `lv_mbox_set_style(mbox, LV_MBOX_STYLE_..., &style)` to set a new style for an element of the Message box:

- **LV_MBOX_STYLE_BG** specifies the background container's style. `style.body` sets the background and `_style.label` sets the text appearance. Default: `lv_style_pretty`
- **LV_MBOX_STYLE_BTN_BG** style of the Button matrix background. Default: `lv_style_trans`
- **LV_MBOX_STYLE_BTN_REL** style of the released buttons. Default: `lv_style_btn_rel`
- **LV_MBOX_STYLE_BTN_PR** style of the pressed buttons. Default: `lv_style_btn_pr`
- **LV_MBOX_STYLE_BTN_TGL_REL** style of the toggled released buttons. Default: `lv_style_btn_tgl_rel`
- **LV_MBOX_STYLE_BTN_TGL_PR** style of the toggled pressed buttons. Default: `lv_style_btn_tgl_pr`
- **LV_MBOX_STYLE_BTN_INA** style of the inactive buttons. Default: `lv_style_btn_ina`

The height of the button area comes from *font height + padding.top + padding.bottom* of `LV_MBOX_STYLE_BTN_REL`.

Events

Besides the Generic events the following Special events are sent by the Message boxes:

- **LV_EVENT_VALUE_CHANGED** sent when the button is clicked. The event data is set to ID of the clicked button.

The Message box has a default event callback which closes itself when a button is clicked.

Learn more about *Events*.

##Keys

The following *Keys* are processed by the Buttons:

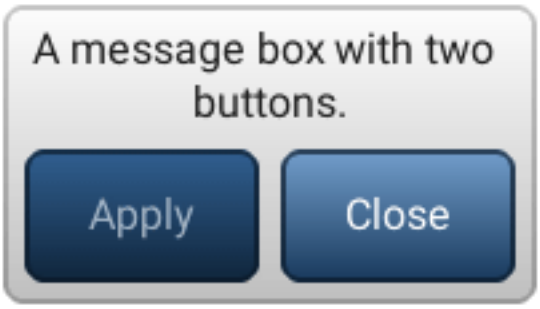
- **LV_KEY_RIGHT/DOWN** Select the next button
- **LV_KEY_LEFT/TOP** Select the previous button
- **LV_KEY_ENTER** Clicks the selected button

Learn more about *Keys*.

Example

C

Simple Message box



code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        printf("Button: %s\n", lv_mbox_get_active_btn_text(obj));
    }
}

void lv_ex_mbox_1(void)
{
    static const char * btns[] ={"Apply", "Close", ""};

    lv_obj_t * mbox1 = lv_mbox_create(lv_scr_act(), NULL);
    lv_mbox_set_text(mbox1, "A message box with two buttons.");
    lv_mbox_add_btns(mbox1, btns);
    lv_obj_set_width(mbox1, 200);
    lv_obj_set_event_cb(mbox1, event_handler);
    lv_obj_align(mbox1, NULL, LV_ALIGN_CENTER, 0, 0); /*Align to the corner*/
}
```

Modal

code

```
/**
 * @file lv_ex_mbox_2.c
 *
 */

/*********************
 *      INCLUDES
 *********************/

#include "lvgl/lvgl.h"


/**********************
 *  STATIC PROTOTYPES
 **********************/

static void mbox_event_cb(lv_obj_t *obj, lv_event_t evt);
static void btn_event_cb(lv_obj_t *btn, lv_event_t evt);

/**********************
 *  STATIC VARIABLES
 **********************/

static lv_obj_t *mbox, *info;

static const char welcome_info[] = "Welcome to the modal message box demo!\n"
                                   "Press the button to display a message box.";

static const char in_msg_info[] = "Notice that you cannot touch "
                                  "the button again while the message box is open.";
```

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```
/**********************
 *   GLOBAL FUNCTIONS
 **********************/

void lv_ex_mbox_2(void)
{
        /* Create a button, then set its position and event callback */
        lv_obj_t *btn = lv_btn_create(lv_scr_act(), NULL);
        lv_obj_set_size(btn, 200, 60);
        lv_obj_set_event_cb(btn, btn_event_cb);
        lv_obj_align(btn, NULL, LV_ALIGN_IN_TOP_LEFT, 20, 20);

        /* Create a label on the button */
        lv_obj_t *label = lv_label_create(btn, NULL);
        lv_label_set_text(label, "Display a message box!");

        /* Create an informative label on the screen */
        info = lv_label_create(lv_scr_act(), NULL);
        lv_label_set_text(info, welcome_info);
        lv_label_set_long_mode(info, LV_LABEL_LONG_BREAK); /* Make sure text will␣
↪wrap */
        lv_obj_set_width(info, LV_HOR_RES - 10);
        lv_obj_align(info, NULL, LV_ALIGN_IN_BOTTOM_LEFT, 5, -5);

}

/**********************
 *   STATIC FUNCTIONS
 **********************/

static void mbox_event_cb(lv_obj_t *obj, lv_event_t evt)
{
        if(evt == LV_EVENT_DELETE && obj == mbox) {
                /* Delete the parent modal background */
                lv_obj_del_async(lv_obj_get_parent(mbox));
                mbox = NULL; /* happens before object is actually deleted! */
                lv_label_set_text(info, welcome_info);
        } else if(evt == LV_EVENT_VALUE_CHANGED) {
                /* A button was clicked */
                lv_mbox_start_auto_close(mbox, 0);
        }
}

static void btn_event_cb(lv_obj_t *btn, lv_event_t evt)
{
        if(evt == LV_EVENT_CLICKED) {
                static lv_style_t modal_style;
                /* Create a full-screen background */
                lv_style_copy(&modal_style, &lv_style_plain_color);

                /* Set the background's style */
                modal_style.body.main_color = modal_style.body.grad_color = LV_COLOR_
↪BLACK;
                modal_style.body.opa = LV_OPA_50;

                /* Create a base object for the modal background */
```

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```
                lv_obj_t *obj = lv_obj_create(lv_scr_act(), NULL);
                lv_obj_set_style(obj, &modal_style);
                lv_obj_set_pos(obj, 0, 0);
                lv_obj_set_size(obj, LV_HOR_RES, LV_VER_RES);
                lv_obj_set_opa_scale_enable(obj, true); /* Enable opacity scaling for␣
↪the animation */

                static const char * btns2[] = {"Ok", "Cancel", ""};

                /* Create the message box as a child of the modal background */
                mbox = lv_mbox_create(obj, NULL);
                lv_mbox_add_btns(mbox, btns2);
                lv_mbox_set_text(mbox, "Hello world!");
                lv_obj_align(mbox, NULL, LV_ALIGN_CENTER, 0, 0);
                lv_obj_set_event_cb(mbox, mbox_event_cb);

                /* Fade the message box in with an animation */
                lv_anim_t a;
                lv_anim_init(&a);
                lv_anim_set_time(&a, 500, 0);
                lv_anim_set_values(&a, LV_OPA_TRANSP, LV_OPA_COVER);
                lv_anim_set_exec_cb(&a, obj, (lv_anim_exec_xcb_t)lv_obj_set_opa_
↪scale);
                lv_anim_create(&a);

                lv_label_set_text(info, in_msg_info);
            lv_obj_align(info, NULL, LV_ALIGN_IN_BOTTOM_LEFT, 5, -5);
        }
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_mbox_style_t**

Enums

enum [anonymous]

Message box styles.

Values:

LV_MBOX_STYLE_BG

LV_MBOX_STYLE_BTN_BG

Same meaning as ordinary button styles.

LV_MBOX_STYLE_BTN_REL

LV_MBOX_STYLE_BTN_PR

LV_MBOX_STYLE_BTN_TGL_REL

LV_MBOX_STYLE_BTN_TGL_PR

LV_MBOX_STYLE_BTN_INA

Functions

lv_obj_t ***lv_mbox_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a message box objects

Return pointer to the created message box

Parameters

- `par`: pointer to an object, it will be the parent of the new message box
- `copy`: pointer to a message box object, if not NULL then the new object will be copied from it

void **lv_mbox_add_btns**(*lv_obj_t *mbox*, **const** char ***btn_mapaction*)
Add button to the message box

Parameters

- `mbox`: pointer to message box object
- `btn_map`: button descriptor (button matrix map). E.g. a const char *txt[] = {“ok”, “close”, “”} (Can not be local variable)

void **lv_mbox_set_text**(*lv_obj_t *mbox*, **const** char **txt*)
Set the text of the message box

Parameters

- `mbox`: pointer to a message box
- `txt`: a ‘\0’ terminated character string which will be the message box text

void **lv_mbox_set_anim_time**(*lv_obj_t *mbox*, uint16_t *anim_time*)
Set animation duration

Parameters

- `mbox`: pointer to a message box object
- `anim_time`: animation length in milliseconds (0: no animation)

void **lv_mbox_start_auto_close**(*lv_obj_t *mbox*, uint16_t *delay*)
Automatically delete the message box after a given time

Parameters

- `mbox`: pointer to a message box object
- `delay`: a time (in milliseconds) to wait before delete the message box

void **lv_mbox_stop_auto_close**(*lv_obj_t *mbox*)
Stop the auto. closing of message box

Parameters

- `mbox`: pointer to a message box object

void **lv_mbox_set_style**(*lv_obj_t *mbox*, *lv_mbox_style_t type*, **const** lv_style_t *style*)
Set a style of a message box

Parameters

- mbox: pointer to a message box object
- type: which style should be set
- style: pointer to a style

void **lv_mbox_set_recolor**(*lv_obj_t *mbox*, bool *en*)
Set whether recoloring is enabled. Must be called after lv_mbox_add_btns.

Parameters

- btnm: pointer to button matrix object
- en: whether recoloring is enabled

const char ***lv_mbox_get_text**(**const** *lv_obj_t *mbox*)
Get the text of the message box

Return pointer to the text of the message box

Parameters

- mbox: pointer to a message box object

uint16_t **lv_mbox_get_active_btn**(*lv_obj_t *mbox*)
Get the index of the lastly "activated" button by the user (pressed, released etc) Useful in the the event_cb.

Return index of the last released button (LV_BTNM_BTN_NONE: if unset)

Parameters

- btnm: pointer to button matrix object

const char ***lv_mbox_get_active_btn_text**(*lv_obj_t *mbox*)
Get the text of the lastly "activated" button by the user (pressed, released etc) Useful in the the event_cb.

Return text of the last released button (NULL: if unset)

Parameters

- btnm: pointer to button matrix object

uint16_t **lv_mbox_get_anim_time**(**const** *lv_obj_t *mbox*)
Get the animation duration (close animation time)

Return animation length in milliseconds (0: no animation)

Parameters

- mbox: pointer to a message box object

const lv_style_t ***lv_mbox_get_style**(**const** *lv_obj_t *mbox*, *lv_mbox_style_t type*)
Get a style of a message box

Return style pointer to a style

Parameters

- mbox: pointer to a message box object
- type: which style should be get

bool **lv_mbox_get_recolor**(**const** *lv_obj_t* *mbox)
Get whether recoloring is enabled

Return whether recoloring is enabled

Parameters

- `mbox`: pointer to a message box object

lv_obj_t ***lv_mbox_get_btnm**(*lv_obj_t* *mbox)
Get message box button matrix

Return pointer to button matrix object

Remark return value will be NULL unless `lv_mbox_add_btns` has been already called

Parameters

- `mbox`: pointer to a message box object

struct lv_mbox_ext_t

Public Members

lv_cont_ext_t **bg**

lv_obj_t ***text**

lv_obj_t ***btnm**

uint16_t **anim_time**

Page (lv_page)

Overview

The Page consist of two *Containers* on each other:

- a **background** (or base)
- a top which is **scrollable**.

The background object can be referenced as the page itself like: `lv_obj_set_width(page, 100)`.

If you create a child on the page it will be automatically moved to the scrollable container. If the scrollable container becomes larger then the background it can be *scrolled by dragging (like the lists on smartphones).

By default, the scrollable's has `LV_FIT_FILL`auto fit in all directions. It means the scrollable size will be the same as the background's size (minus the paddings) while the children are in the background. But when an object is positioned out of the background the scrollable size will be increased to involve it.

Scrollbars

Scrollbars can be shown according to four policies:

- **LV_SB_MODE_OFF** Never show scrollbars
- **LV_SB_MODE_ON** Always show scrollbars
- **LV_SB_MODE_DRAG** Show scrollbars when the page is being dragged
- **LV_SB_MODE_AUTO** Show scrollbars when the scrollable container is large enough to be scrolled

You can set scroll bar show policy by: `lv_page_set_sb_mode(page, SB_MODE)`. The default value is `LV_SB_MODE_AUTO`.

Glue object

You can glue children to the page. In this case, you can scroll the page by dragging the child object. It can be enabled by the `lv_page_glue_obj(child, true)`.

Focus object

You can focus on an object on a page with `lv_page_focus(page, child, LV_ANIM_ONO/FF)`. It will move the scrollable container to show a child. The time of the animation can be set by `lv_page_set_anim_time(page, anim_time)` in milliseconds.

Manual navigation

You can move the scrollable object manually using `lv_page_scroll_hor(page, dist)` and `lv_page_scroll_ver(page, dist)`

Edge flash

A circle-like effect can be shown if the list reached the most top/bottom/left/right position. `lv_page_set_edge_flash(list, en)` enables this feature.

Scroll propagation

If the list is created on an other scrollable element (like an other page) and the Page can't be scrolled further the scrolling can be propagated to the parent to continue the scrolling on the parent. It can be enabled with `lv_page_set_scroll_propagation(list, true)`

Scrollable API

There are functions to directly set/get the scrollable's attributes:

- `lv_page_get_scrl()`
- `lv_page_set_scrl_fit/fint2/fit4()`
- `lv_page_set_scrl_width()`
- `lv_page_set_scrl_height()`
- `lv_page_set_scrl_layout()`

Notes

The background draws its border when the scrollable is drawn. It ensures that the page always will have a closed shape even if the scrollable has the same color as the Page's parent.

Styles

Use `lv_page_set_style(page, LV_PAGE_STYLE_..., &style)` to set a new style for an element of the page:

- **LV_PAGE_STYLE_BG** background's style which uses all `style.body` properties (default: `lv_style_pretty_color`)
- **LV_PAGE_STYLE_SCRL** scrollable's style which uses all `style.body` properties (default: `lv_style_pretty`)
- **LV_PAGE_STYLE_SB** scrollbar's style which uses all `style.body` properties. `padding.right/bottom` sets horizontal and vertical the scrollbars' padding respectively and the `padding.inner` sets the scrollbar's width. (default: `lv_style_pretty_color`)

Events

Only the Generic events are sent by the object type.

The scrollable object has a default event callback which propagates the following events to the background object: `LV_EVENT_PRESSED`, `LV_EVENT_PRESSING`, `LV_EVENT_PRESS_LOST`,`LV_EVENT_RELEASED`, `LV_EVENT_SHORT_CLICKED`, `LV_EVENT_CLICKED`, `LV_EVENT_LONG_PRESSED`, `LV_EVENT_LONG_PRESSED_REPEAT`

Learn more about *Events*.

##Keys

The following *Keys* are processed by the Page:

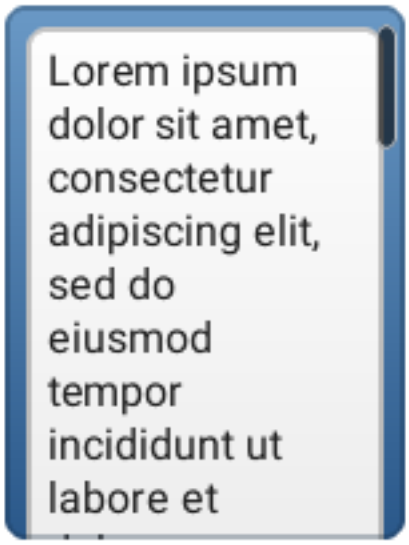
- **LV_KEY_RIGHT/LEFT/UP/DOWN** Scroll the page

Learn more about *Keys*.

Example

C

Page with scrollbar



code

```
#include "lvgl/lvgl.h"

void lv_ex_page_1(void)
{
    /*Create a scroll bar style*/
    static lv_style_t style_sb;
    lv_style_copy(&style_sb, &lv_style_plain);
    style_sb.body.main_color = LV_COLOR_BLACK;
    style_sb.body.grad_color = LV_COLOR_BLACK;
    style_sb.body.border.color = LV_COLOR_WHITE;
    style_sb.body.border.width = 1;
    style_sb.body.border.opa = LV_OPA_70;
    style_sb.body.radius = LV_RADIUS_CIRCLE;
    style_sb.body.opa = LV_OPA_60;
    style_sb.body.padding.right = 3;
    style_sb.body.padding.bottom = 3;
    style_sb.body.padding.inner = 8;        /*Scrollbar width*/

    /*Create a page*/
    lv_obj_t * page = lv_page_create(lv_scr_act(), NULL);
    lv_obj_set_size(page, 150, 200);
    lv_obj_align(page, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_page_set_style(page, LV_PAGE_STYLE_SB, &style_sb);          /*Set the␣
↪scrollbar style*/

    /*Create a label on the page*/
    lv_obj_t * label = lv_label_create(page, NULL);
    lv_label_set_long_mode(label, LV_LABEL_LONG_BREAK);           /*Automatically␣
↪break long lines*/
    lv_obj_set_width(label, lv_page_get_fit_width(page));         /*Set the label␣
↪width to max value to not show hor. scroll bars*/
```

(continues on next page)

(continued from previous page)

```
    lv_label_set_text(label, "Lorem ipsum dolor sit amet, consectetur adipiscing elit,
↪\n"
                             "sed do eiusmod tempor incididunt ut labore et dolore␣
↪magna aliqua.\n"
                             "Ut enim ad minim veniam, quis nostrud exercitation␣
↪ullamco\n"
                             "laboris nisi ut aliquip ex ea commodo consequat. Duis␣
↪aute irure\n"
                             "dolor in reprehenderit in voluptate velit esse cillum␣
↪dolore\n"
                             "eu fugiat nulla pariatur.\n"
                             "Excepteur sint occaecat cupidatat non proident, sunt in␣
↪culpa\n"
                             "qui officia deserunt mollit anim id est laborum.");
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_sb_mode_t**

typedef uint8_t **lv_page_edge_t**

typedef uint8_t **lv_page_style_t**

Enums

enum [**anonymous**]

Scrollbar modes: shows when should the scrollbars be visible

Values:

LV_SB_MODE_OFF = 0x0
Never show scrollbars

LV_SB_MODE_ON = 0x1
Always show scrollbars

LV_SB_MODE_DRAG = 0x2
Show scrollbars when page is being dragged

LV_SB_MODE_AUTO = 0x3
Show scrollbars when the scrollable container is large enough to be scrolled

LV_SB_MODE_HIDE = 0x4
Hide the scroll bar temporally

LV_SB_MODE_UNHIDE = 0x5
Unhide the previously hidden scrollbar. Recover it's type too

enum [anonymous]
Edges: describes the four edges of the page

Values:

LV_PAGE_EDGE_LEFT = 0x1

LV_PAGE_EDGE_TOP = 0x2

LV_PAGE_EDGE_RIGHT = 0x4

LV_PAGE_EDGE_BOTTOM = 0x8

enum [anonymous]
Values:

LV_PAGE_STYLE_BG

LV_PAGE_STYLE_SCRL

LV_PAGE_STYLE_SB

LV_PAGE_STYLE_EDGE_FLASH

Functions

lv_obj_t ***lv_page_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a page objects

Return pointer to the created page

Parameters

- `par`: pointer to an object, it will be the parent of the new page
- `copy`: pointer to a page object, if not NULL then the new object will be copied from it

void **lv_page_clean**(*lv_obj_t *obj*)
Delete all children of the scrl object, without deleting scrl child.

Parameters

- `obj`: pointer to an object

lv_obj_t ***lv_page_get_scrl**(**const** *lv_obj_t *page*)
Get the scrollable object of a page

Return pointer to a container which is the scrollable part of the page

Parameters

- `page`: pointer to a page object

uint16_t **lv_page_get_anim_time**(**const** *lv_obj_t *page*)
Get the animation time

Return the animation time in milliseconds

Parameters

- `page`: pointer to a page object

void **lv_page_set_sb_mode**(*lv_obj_t *page*, *lv_sb_mode_t sb_mode*)
Set the scroll bar mode on a page

Parameters

- `page`: pointer to a page object
- `sb_mode`: the new mode from 'lv_page_sb.mode_t' enum

void **lv_page_set_anim_time**(*lv_obj_t *page*, uint16_t *anim_time*)
Set the animation time for the page

Parameters

- `page`: pointer to a page object
- `anim_time`: animation time in milliseconds

void **lv_page_set_scroll_propagation**(*lv_obj_t *page*, bool *en*)
Enable the scroll propagation feature. If enabled then the page will move its parent if there is no more space to scroll.

Parameters

- `page`: pointer to a Page
- `en`: true or false to enable/disable scroll propagation

void **lv_page_set_edge_flash**(*lv_obj_t *page*, bool *en*)
Enable the edge flash effect. (Show an arc when the an edge is reached)

Parameters

- `page`: pointer to a Page
- `en`: true or false to enable/disable end flash

static void **lv_page_set_scrl_fit4**(*lv_obj_t *page*, *lv_fit_t left*, *lv_fit_t right*, *lv_fit_t top*, *lv_fit_t bottom*)
Set the fit policy in all 4 directions separately. It tell how to change the page size automatically.

Parameters

- `page`: pointer to a page object
- `left`: left fit policy from `lv_fit_t`
- `right`: right fit policy from `lv_fit_t`
- `top`: bottom fit policy from `lv_fit_t`
- `bottom`: bottom fit policy from `lv_fit_t`

static void **lv_page_set_scrl_fit2**(*lv_obj_t *page*, *lv_fit_t hor*, *lv_fit_t ver*)
Set the fit policy horizontally and vertically separately. It tell how to change the page size automatically.

Parameters

- `page`: pointer to a page object
- `hot`: horizontal fit policy from `lv_fit_t`
- `ver`: vertical fit policy from `lv_fit_t`

static void **lv_page_set_scrl_fit**(*lv_obj_t *page*, *lv_fit_t fit*)
Set the fit policyin all 4 direction at once. It tell how to change the page size automatically.

Parameters

- `page`: pointer to a button object
- `fit`: fit policy from `lv_fit_t`

static void **lv_page_set_scrl_width**(*lv_obj_t *page*, lv_coord_t *w*)
Set width of the scrollable part of a page

Parameters

- page: pointer to a page object
- w: the new width of the scrollable (it ha no effect is horizontal fit is enabled)

static void **lv_page_set_scrl_height**(*lv_obj_t *page*, lv_coord_t *h*)
Set height of the scrollable part of a page

Parameters

- page: pointer to a page object
- h: the new height of the scrollable (it ha no effect is vertical fit is enabled)

static void **lv_page_set_scrl_layout**(*lv_obj_t *page*, *lv_layout_t layout*)
Set the layout of the scrollable part of the page

Parameters

- page: pointer to a page object
- layout: a layout from 'lv_cont_layout_t'

void **lv_page_set_style**(*lv_obj_t *page*, *lv_page_style_t type*, **const** lv_style_t *style*)
Set a style of a page

Parameters

- page: pointer to a page object
- type: which style should be set
- style: pointer to a style

lv_sb_mode_t **lv_page_get_sb_mode**(**const** *lv_obj_t *page*)
Set the scroll bar mode on a page

Return the mode from 'lv_page_sb.mode_t' enum

Parameters

- page: pointer to a page object

bool **lv_page_get_scroll_propagation**(*lv_obj_t *page*)
Get the scroll propagation property

Return true or false

Parameters

- page: pointer to a Page

bool **lv_page_get_edge_flash**(*lv_obj_t *page*)
Get the edge flash effect property.

Parameters

- page: pointer to a Page return true or false

lv_coord_t **lv_page_get_fit_width**(*lv_obj_t *page*)
Get that width which can be set to the children to still not cause overflow (show scrollbars)

Return the width which still fits into the page

Parameters

- `page`: pointer to a page object

lv_coord_t **lv_page_get_fit_height**(*lv_obj_t *page*)
Get that height which can be set to the children to still not cause overflow (show scrollbars)

Return the height which still fits into the page

Parameters

- `page`: pointer to a page object

static lv_coord_t **lv_page_get_scrl_width**(**const** *lv_obj_t *page*)
Get width of the scrollable part of a page

Return the width of the scrollable

Parameters

- `page`: pointer to a page object

static lv_coord_t **lv_page_get_scrl_height**(**const** *lv_obj_t *page*)
Get height of the scrollable part of a page

Return the height of the scrollable

Parameters

- `page`: pointer to a page object

static *lv_layout_t* **lv_page_get_scrl_layout**(**const** *lv_obj_t *page*)
Get the layout of the scrollable part of a page

Return the layout from 'lv_cont_layout_t'

Parameters

- `page`: pointer to page object

static *lv_fit_t* **lv_page_get_scrl_fit_left**(**const** *lv_obj_t *page*)
Get the left fit mode

Return an element of `lv_fit_t`

Parameters

- `page`: pointer to a page object

static *lv_fit_t* **lv_page_get_scrl_fit_right**(**const** *lv_obj_t *page*)
Get the right fit mode

Return an element of `lv_fit_t`

Parameters

- `page`: pointer to a page object

static *lv_fit_t* **lv_page_get_scrl_fit_top**(**const** *lv_obj_t *page*)
Get the top fit mode

Return an element of `lv_fit_t`

Parameters

- `page`: pointer to a page object

static *lv_fit_t* **lv_page_get_scrl_fit_bottom**(**const** *lv_obj_t *page*)
Get the bottom fit mode

Return an element of `lv_fit_t`

Parameters

- `page`: pointer to a page object

const lv_style_t ***lv_page_get_style(const** *lv_obj_t *page*, *lv_page_style_t type*)
Get a style of a page

Return style pointer to a style

Parameters

- `page`: pointer to page object
- `type`: which style should be get

bool **lv_page_on_edge(***lv_obj_t *page*, *lv_page_edge_t edge*)
Find whether the page has been scrolled to a certain edge.

Return true if the page is on the specified edge

Parameters

- `page`: Page object
- `edge`: Edge to check

void **lv_page_glue_obj(***lv_obj_t *obj*, bool *glue*)
Glue the object to the page. After it the page can be moved (dragged) with this object too.

Parameters

- `obj`: pointer to an object on a page
- `glue`: true: enable glue, false: disable glue

void **lv_page_focus(***lv_obj_t *page*, **const** *lv_obj_t *obj*, *lv_anim_enable_t anim_en*)
Focus on an object. It ensures that the object will be visible on the page.

Parameters

- `page`: pointer to a page object
- `obj`: pointer to an object to focus (must be on the page)
- `anim_en`: LV_ANIM_ON to focus with animation; LV_ANIM_OFF to focus without animation

void **lv_page_scroll_hor(***lv_obj_t *page*, lv_coord_t *dist*)
Scroll the page horizontally

Parameters

- `page`: pointer to a page object
- `dist`: the distance to scroll (< 0: scroll left; > 0 scroll right)

void **lv_page_scroll_ver(***lv_obj_t *page*, lv_coord_t *dist*)
Scroll the page vertically

Parameters

- `page`: pointer to a page object
- `dist`: the distance to scroll (< 0: scroll down; > 0 scroll up)

void **lv_page_start_edge_flash(***lv_obj_t *page*)
Not intended to use directly by the user but by other object types internally. Start an edge flash animation. Exactly one `ext->edge_flash.xxx_ip` should be set

Parameters

- page:

struct lv_page_ext_t

Public Members

lv_cont_ext_t **bg**

lv_obj_t ***scrl**

const lv_style_t ***style**

lv_area_t **hor_area**

lv_area_t **ver_area**

uint8_t **hor_draw**

uint8_t **ver_draw**

lv_sb_mode_t **mode**

struct *lv_page_ext_t*::[**anonymous**] **sb**

lv_anim_value_t **state**

uint8_t **enabled**

uint8_t **top_ip**

uint8_t **bottom_ip**

uint8_t **right_ip**

uint8_t **left_ip**

struct *lv_page_ext_t*::[**anonymous**] **edge_flash**

uint16_t **anim_time**

uint8_t **scroll_prop**

uint8_t **scroll_prop_ip**

Preloader (lv_preload)

Overview

The preloader object is a spinning arc over a border.

Arc length

The length of the arc can be adjusted by `lv_preload_set_arc_length(preload, deg)`.

Spinning speed

The speed of the spinning can be adjusted by `lv_preload_set_spin_time(preload, time_ms)`.

Spin types

You can choose from more spin types:

- **LV_PRELOAD_TYPE_SPINNING_ARC** spin the arc, slow down on the top
- **LV_PRELOAD_TYPE_FILLSPIN_ARC** spin the arc, slow down on the top but also stretch the arc

To apply one if them use `lv_preload_set_type(preload, LV_PRELOAD_TYPE_...)`

Spin direction

The direction of spinning can be changed with `lv_preload_set_dir(preload, LV_PRELOAD_DIR_FORWARD/BACKWARD)`.

Styles

You can set the styles with `lv_preload_set_style(btn, LV_PRELOAD_STYLE_MAIN, &style)`. It describes both the arc and the border style:

- **arc** is described by the `line` properties
- **border** is described by the `body.border` properties including `body.padding.left/top` (the smaller is used) to give a smaller radius for the border.

Events

Only the Generic events are sent by the object type.

Keys

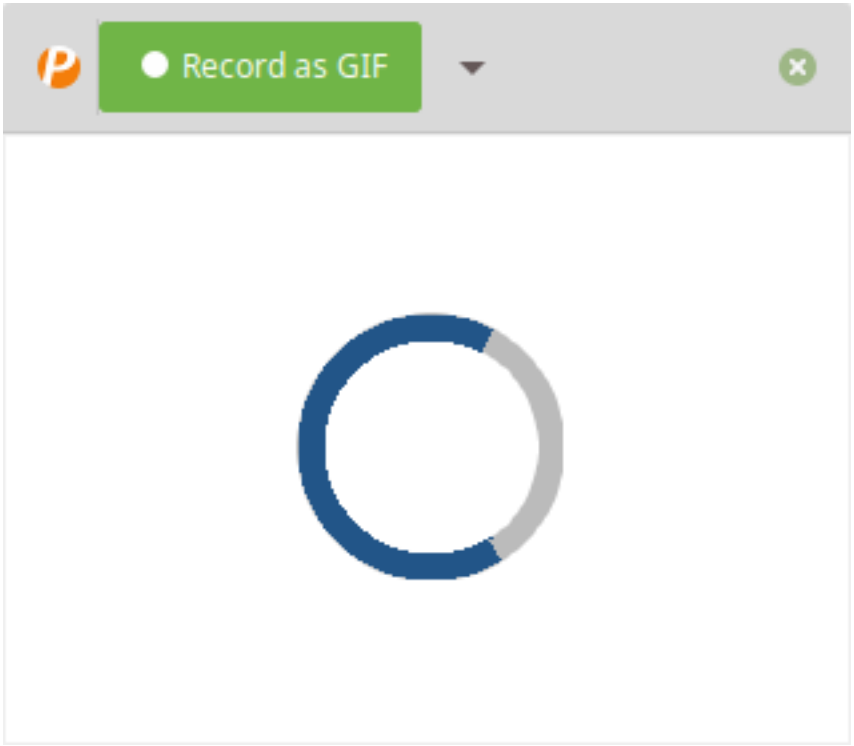
No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Preloader with custom style



code

```
#include "lvgl/lvgl.h"

void lv_ex_preload_1(void)
{
    /*Create a style for the Preloader*/
    static lv_style_t style;
    lv_style_copy(&style, &lv_style_plain);
    style.line.width = 10;                          /*10 px thick arc*/
    style.line.color = lv_color_hex3(0x258);        /*Blueish arc color*/

    style.body.border.color = lv_color_hex3(0xBBB); /*Gray background color*/
    style.body.border.width = 10;
    style.body.padding.left = 0;

    /*Create a Preloader object*/
    lv_obj_t * preload = lv_preload_create(lv_scr_act(), NULL);
    lv_obj_set_size(preload, 100, 100);
    lv_obj_align(preload, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_preload_set_style(preload, LV_PRELOAD_STYLE_MAIN, &style);
}
```

MicroPython

No examples yet.

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_preload_type_t**

typedef uint8_t **lv_preload_dir_t**

typedef uint8_t **lv_preload_style_t**

Enums

enum [**anonymous**]
Type of preloader.

Values:

LV_PRELOAD_TYPE_SPINNING_ARC

LV_PRELOAD_TYPE_FILLSPIN_ARC

enum [**anonymous**]
Direction the preloader should spin.

Values:

LV_PRELOAD_DIR_FORWARD

LV_PRELOAD_DIR_BACKWARD

enum [**anonymous**]
Values:

LV_PRELOAD_STYLE_MAIN

Functions

lv_obj_t ***lv_preload_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a pre loader objects

Return pointer to the created pre loader

Parameters

- `par`: pointer to an object, it will be the parent of the new pre loader
- `copy`: pointer to a pre loader object, if not NULL then the new object will be copied from it

void **lv_preload_set_arc_length**(*lv_obj_t *preload*, *lv_anim_value_t deg*)
Set the length of the spinning arc in degrees

Parameters

- `preload`: pointer to a preload object
- `deg`: length of the arc

void **lv_preload_set_spin_time**(*lv_obj_t *preload*, uint16_t *time*)
Set the spin time of the arc

Parameters

- `preload`: pointer to a preload object
- `time`: time of one round in milliseconds

void **lv_preload_set_style**(*lv_obj_t *preload*, *lv_preload_style_t type*, **const** lv_style_t **style*)
Set a style of a pre loader.

Parameters

- `preload`: pointer to pre loader object
- `type`: which style should be set
- `style`: pointer to a style

void **lv_preload_set_type**(*lv_obj_t *preload*, *lv_preload_type_t type*)
Set the animation type of a preloader.

Parameters

- `preload`: pointer to pre loader object
- `type`: animation type of the preload

void **lv_preload_set_dir**(*lv_obj_t *preload*, *lv_preload_dir_t dir*)
Set the animation direction of a preloader

Parameters

- `preload`: pointer to pre loader object
- `direction`: animation direction of the preload

lv_anim_value_t **lv_preload_get_arc_length**(**const** *lv_obj_t *preload*)
Get the arc length [degree] of the a pre loader

Parameters

- `preload`: pointer to a pre loader object

uint16_t **lv_preload_get_spin_time**(**const** *lv_obj_t *preload*)
Get the spin time of the arc

Parameters

- `preload`: pointer to a pre loader object [milliseconds]

const lv_style_t *__lv_preload_get_style__(**const** *lv_obj_t *preload*, *lv_preload_style_t type*)
Get style of a pre loader.

Return style pointer to the style

Parameters

- `preload`: pointer to pre loader object
- `type`: which style should be get

lv_preload_type_t **lv_preload_get_type**(*lv_obj_t *preload*)
Get the animation type of a preloader.

Return animation type

Parameters

- `preload`: pointer to pre loader object

lv_preload_dir_t **lv_preload_get_dir**(*lv_obj_t *preload*)
Get the animation direction of a preloader

Return animation direction

Parameters

- `preload`: pointer to pre loader object

void **lv_preload_spinner_anim**(void *ptr, *lv_anim_value_t val*)
Animator function (exec_cb) to rotate the arc of spinner.

Parameters

- `ptr`: pointer to preloader
- `val`: the current desired value [0..360]

struct lv_preload_ext_t

Public Members

lv_arc_ext_t **arc**

lv_anim_value_t **arc_length**

uint16_t **time**

lv_preload_type_t **anim_type**

lv_preload_dir_t **anim_dir**

Roller (lv_roller)

Overview

Roller allows you to simply select one option from more with scrolling. Its functionalities are similar to *Drop down list*.

Set options

The options are passed to the Roller as a string with `lv_roller_set_options(roller, options, LV_ROLLER_MODE_NORMAL/INFINITE)`. The options should be separated by `\n`. For example: `"First\nSecond\nThird"`.

`LV_ROLLER_MODE_INIFINITE` make the roller circular.

You can select an option manually with `lv_roller_set_selected(roller, id)`, where *id* is the index of an option.

Get selected option

The get the currently selected option use `lv_roller_get_selected(roller)` it will return the *index* of the selected option.

`lv_roller_get_selected_str(roller, buf, buf_size)` copy the name of the selected option to `buf`.

Align the options

To align the label horizontally use `lv_roller_set_align(roller, LV_LABEL_ALIGN_LEFT/CENTER/RIGHT)`.

Height and width

You can set the number of visible rows with `lv_roller_set_visible_row_count(roller, num)`

The width is adjusted automatically according to the width of the options. To prevent this apply `lv_roller_set_fix_width(roller, width)`. `0` means to use auto width.

Animation time

When the Roller is scrolled and doesn't stop exactly on an option it will scroll to the nearest valid option automatically. The time of this scroll animation can be changed by `lv_roller_set_anim_time(roller, anim_time)`. Zero animation time means no animation.

Styles

The `lv_roller_set_style(roller, LV_ROLLER_STYLE_..., &style)` set the styles of a Roller.

- **LV_ROLLER_STYLE_BG** Style of the background. All `style.body` properties are used. `style.text` is used for the option's label. Default: `lv_style_pretty`
- **LV_ROLLER_STYLE_SEL** Style of the selected option. The `style.body` properties are used. The selected option will be recolored with `text.color`. Default: `lv_style_plain_color`

Events

Besides, the Generic events the following Special events are sent by the Drop down lists:

- **LV_EVENT_VALUE_CHANGED** sent when a new option is selected

Learn more about *Events*.

Keys

The following *Keys* are processed by the Buttons:

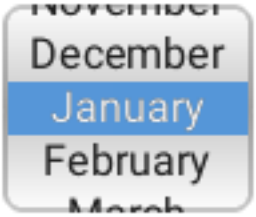
- **LV_KEY_RIGHT/DOWN** Select the next option
- **LV_KEY_LEFT/UP** Select the previous option

- **LY_KEY_ENTER** Apply the selected option (Send LV_EVENT_VALUE_CHANGED event)

Example

C

Simple Roller



code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        char buf[32];
        lv_roller_get_selected_str(obj, buf, sizeof(buf));
        printf("Selected month: %s\n", buf);
    }
}


void lv_ex_roller_1(void)
{
    lv_obj_t *roller1 = lv_roller_create(lv_scr_act(), NULL);
    lv_roller_set_options(roller1,
                          "January\n"
                          "February\n"
                          "March\n"
                          "April\n"
                          "May\n"
                          "June\n"
```

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```
                        "July\n"
                        "August\n"
                        "September\n"
                        "October\n"
                        "November\n"
                        "December",
                        LV_ROLLER_MODE_INIFINITE);

    lv_roller_set_visible_row_count(roller1, 4);
    lv_obj_align(roller1, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_obj_set_event_cb(roller1, event_handler);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_roller_mode_t**

typedef uint8_t **lv_roller_style_t**

Enums

enum [anonymous]

Roller mode.

Values:

LV_ROLLER_MODE_NORMAL

Normal mode (roller ends at the end of the options).

LV_ROLLER_MODE_INIFINITE

Infinite mode (roller can be scrolled forever).

enum [anonymous]

Values:

LV_ROLLER_STYLE_BG

LV_ROLLER_STYLE_SEL

Functions

lv_obj_t ***lv_roller_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a roller object

Return pointer to the created roller

Parameters

- `par`: pointer to an object, it will be the parent of the new roller

- `copy`: pointer to a roller object, if not NULL then the new object will be copied from it

void **lv_roller_set_options**(*lv_obj_t *roller*, **const** char **options*, *lv_roller_mode_t mode*)
Set the options on a roller

Parameters

- `roller`: pointer to roller object
- `options`: a string with ' ' separated options. E.g. "One\nTwo\nThree"
- `mode`: `LV_ROLLER_MODE_NORMAL` or `LV_ROLLER_MODE_INFINITE`

void **lv_roller_set_align**(*lv_obj_t *roller*, *lv_label_align_t align*)
Set the align of the roller's options (left, right or center[default])

Parameters

- `roller`: - pointer to a roller object
- `align`: - one of lv_label_align_t values (left, right, center)

void **lv_roller_set_selected**(*lv_obj_t *roller*, uint16_t *sel_opt*, *lv_anim_enable_t anim*)
Set the selected option

Parameters

- `roller`: pointer to a roller object
- `sel_opt`: id of the selected option (0 ... number of option - 1);
- `anim`: LV_ANOM_ON: set with animation; LV_ANIM_OFF set immediately

void **lv_roller_set_visible_row_count**(*lv_obj_t *roller*, uint8_t *row_cnt*)
Set the height to show the given number of rows (options)

Parameters

- `roller`: pointer to a roller object
- `row_cnt`: number of desired visible rows

static void **lv_roller_set_fix_width**(*lv_obj_t *roller*, lv_coord_t *w*)
Set a fix width for the drop down list

Parameters

- `roller`: pointer to a roller obejct
- `w`: the width when the list is opened (0: auto size)

static void **lv_roller_set_anim_time**(*lv_obj_t *roller*, uint16_t *anim_time*)
Set the open/close animation time.

Parameters

- `roller`: pointer to a roller object
- `anim_time`: open/close animation time [ms]

void **lv_roller_set_style**(*lv_obj_t *roller*, *lv_roller_style_t type*, **const** lv_style_t **style*)
Set a style of a roller

Parameters

- `roller`: pointer to a roller object
- `type`: which style should be set

- `style`: pointer to a style

uint16_t **lv_roller_get_selected(const** *lv_obj_t *roller*)
Get the id of the selected option

Return id of the selected option (0 … number of option - 1);

Parameters

- `roller`: pointer to a roller object

static void **lv_roller_get_selected_str(const** *lv_obj_t *roller*, char *buf, uint16_t *buf_size*)
Get the current selected option as a string

Parameters

- `roller`: pointer to roller object
- `buf`: pointer to an array to store the string
- `buf_size`: size of `buf` in bytes. 0: to ignore it.

lv_label_align_t **lv_roller_get_align(const** *lv_obj_t *roller*)
Get the align attribute. Default alignment after _create is LV_LABEL_ALIGN_CENTER

Return LV_LABEL_ALIGN_LEFT, LV_LABEL_ALIGN_RIGHT or LV_LABEL_ALIGN_CENTER

Parameters

- `roller`: pointer to a roller object

static const char ***lv_roller_get_options(const** *lv_obj_t *roller*)
Get the options of a roller

Return the options separated by ‘ ’-s (E.g. “Option1\nOption2\nOption3”)

Parameters

- `roller`: pointer to roller object

static uint16_t **lv_roller_get_anim_time(const** *lv_obj_t *roller*)
Get the open/close animation time.

Return open/close animation time [ms]

Parameters

- `roller`: pointer to a roller

bool **lv_roller_get_hor_fit(const** *lv_obj_t *roller*)
Get the auto width set attribute

Return true: auto size enabled; false: manual width settings enabled

Parameters

- `roller`: pointer to a roller object

const lv_style_t ***lv_roller_get_style(const** *lv_obj_t *roller*, *lv_roller_style_t type*)
Get a style of a roller

Return style pointer to a style

Parameters

- `roller`: pointer to a roller object

- `type`: which style should be get

struct lv_roller_ext_t

Public Members

lv_ddlist_ext_t **ddlist**

lv_roller_mode_t **mode**

Slider (lv_slider)

Overview

The Slider object looks like a *Bar* supplemented with a knob. The knob can be dragged to set a value. The Slider also can be vertical or horizontal.

Value and range

To set an initial value use `lv_slider_set_value(slider, new_value, LV_ANIM_ON/OFF)`. `lv_slider_set_anim_time(slider, anim_time)` sets the animation time in milliseconds.

To specify the **range** (min, max values) the `lv_slider_set_range(slider, min , max)` can be used.

Knob placement

The knob can be placed in two ways:

- inside the background
- on the edges on min/max values

Use the `lv_slider_set_knob_in(slider, true/false)` to choose between the modes. (*knob_in = false* is the default)

Styles

You can modify the slider's styles with `lv_slider_set_style(slider, LV_SLIDER_STYLE_..., &style)`.

- **LV_SLIDER_STYLE_BG** Style of the background. All `style.body` properties are used. The `padding` values make the knob larger than the background. (negative value makes is larger)
- **LV_SLIDER_STYLE_INDIC** Style of the indicator. All `style.body` properties are used. The `padding` values make the indicator smaller than the background.
- **LV_SLIDER_STYLE_KNOB** Style of the knob. All `style.body` properties are used except `padding`.

Events

Besides the Generic events the following Special events are sent by the Slider:

- **LV_EVENT_VALUE_CHANGED** Sent while the slider is being dragged or changed with keys.

Keys

- **LV_KEY_UP**, **LV_KEY_RIGHT** Increment the slider's value by 1
- **LV_KEY_DOWN**, **LV_KEY_LEFT** Decrement the slider's value by 1

Learn more about *Keys*.

Example

C

Slider with custo mstyle

code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        printf("Value: %d\n", lv_slider_get_value(obj));
    }
}
```

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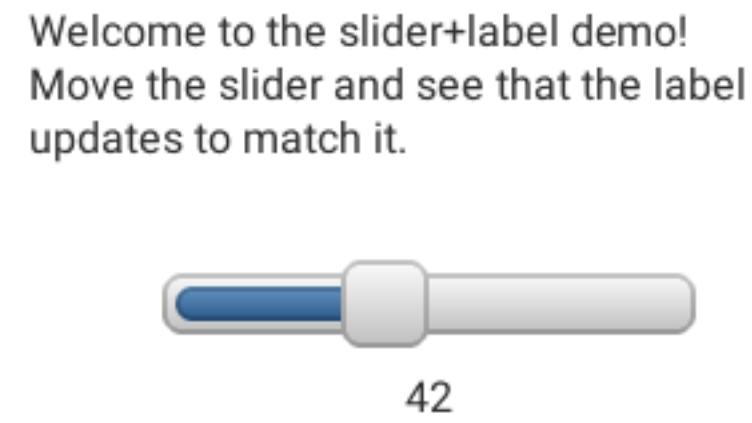
```
void lv_ex_slider_1(void)
{
    /*Create styles*/
    static lv_style_t style_bg;
    static lv_style_t style_indic;
    static lv_style_t style_knob;

    lv_style_copy(&style_bg, &lv_style_pretty);
    style_bg.body.main_color =  LV_COLOR_BLACK;
    style_bg.body.grad_color =  LV_COLOR_GRAY;
    style_bg.body.radius = LV_RADIUS_CIRCLE;
    style_bg.body.border.color = LV_COLOR_WHITE;

    lv_style_copy(&style_indic, &lv_style_pretty_color);
    style_indic.body.radius = LV_RADIUS_CIRCLE;
    style_indic.body.shadow.width = 8;
    style_indic.body.shadow.color = style_indic.body.main_color;
    style_indic.body.padding.left = 3;
    style_indic.body.padding.right = 3;
    style_indic.body.padding.top = 3;
    style_indic.body.padding.bottom = 3;

    lv_style_copy(&style_knob, &lv_style_pretty);
    style_knob.body.radius = LV_RADIUS_CIRCLE;
    style_knob.body.opa = LV_OPA_70;
    style_knob.body.padding.top = 10 ;
    style_knob.body.padding.bottom = 10 ;

    /*Create a slider*/
    lv_obj_t * slider = lv_slider_create(lv_scr_act(), NULL);
    lv_slider_set_style(slider, LV_SLIDER_STYLE_BG, &style_bg);
    lv_slider_set_style(slider, LV_SLIDER_STYLE_INDIC,&style_indic);
    lv_slider_set_style(slider, LV_SLIDER_STYLE_KNOB, &style_knob);
    lv_obj_align(slider, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_obj_set_event_cb(slider, event_handler);
}
```

Set value with slider



code

```
/**
 * @file lv_ex_slider_2.c
 *
 */

/*********************
 *      INCLUDES
 *********************/

#include "lvgl/lvgl.h"
#include <stdio.h>

/*********************
 *      DEFINES
 *********************/

/**********************
 *      TYPEDEFS
 **********************/

/**********************
 *  STATIC PROTOTYPES
 **********************/

static void slider_event_cb(lv_obj_t * slider, lv_event_t event);

/**********************
 *  STATIC VARIABLES
 **********************/

static lv_obj_t * slider_label;
```

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```
/**********************
 *      MACROS
 **********************/

/**********************
 *   GLOBAL FUNCTIONS
 **********************/

void lv_ex_slider_2(void)
{
    /* Create a slider in the center of the display */
    lv_obj_t * slider = lv_slider_create(lv_scr_act(), NULL);
    lv_obj_set_width(slider, LV_DPI * 2);
    lv_obj_align(slider, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_obj_set_event_cb(slider, slider_event_cb);
    lv_slider_set_range(slider, 0, 100);

    /* Create a label below the slider */
    slider_label = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_text(slider_label, "0");
    lv_obj_set_auto_realign(slider_label, true);
    lv_obj_align(slider_label, slider, LV_ALIGN_OUT_BOTTOM_MID, 0, 10);

    /* Create an informative label */
    lv_obj_t * info = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_text(info, "Welcome to the slider+label demo!\n"
                            "Move the slider and see that the label\n"
                            "updates to match it.");
    lv_obj_align(info, NULL, LV_ALIGN_IN_TOP_LEFT, 10, 10);
}

/**********************
 *   STATIC FUNCTIONS
 **********************/

static void slider_event_cb(lv_obj_t * slider, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        static char buf[4]; /* max 3 bytes for number plus 1 null terminating byte */
        snprintf(buf, 4, "%u", lv_slider_get_value(slider));
        lv_label_set_text(slider_label, buf);
    }
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_slider_style_t**

Enums

enum [anonymous]
Built-in styles of slider

Values:

LV_SLIDER_STYLE_BG

LV_SLIDER_STYLE_INDIC
Slider background style.

LV_SLIDER_STYLE_KNOB
Slider indicator (filled area) style.

Functions

lv_obj_t ***lv_slider_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a slider objects

Return pointer to the created slider

Parameters

- `par`: pointer to an object, it will be the parent of the new slider
- `copy`: pointer to a slider object, if not NULL then the new object will be copied from it

static void **lv_slider_set_value**(*lv_obj_t *slider*, int16_t *value*, *lv_anim_enable_t anim*)
Set a new value on the slider

Parameters

- `slider`: pointer to a slider object
- `value`: new value
- `anim`: LV_ANIM_ON: set the value with an animation; LV_ANIM_OFF: change the value immediately

static void **lv_slider_set_range**(*lv_obj_t *slider*, int16_t *min*, int16_t *max*)
Set minimum and the maximum values of a bar

Parameters

- `slider`: pointer to the slider object
- `min`: minimum value
- `max`: maximum value

static void **lv_slider_set_anim_time**(*lv_obj_t *slider*, uint16_t *anim_time*)
Set the animation time of the slider

Parameters

- `slider`: pointer to a bar object
- `anim_time`: the animation time in milliseconds.

void **lv_slider_set_knob_in**(*lv_obj_t *slider*, bool *in*)
Set the 'knob in' attribute of a slider

Parameters

- `slider`: pointer to slider object

- `in`: true: the knob is drawn always in the slider; false: the knob can be out on the edges

void **lv_slider_set_style**(*lv_obj_t *slider*, *lv_slider_style_t type*, **const** lv_style_t *style*)
Set a style of a slider

Parameters

- `slider`: pointer to a slider object
- `type`: which style should be set
- `style`: pointer to a style

int16_t **lv_slider_get_value**(**const** *lv_obj_t *slider*)
Get the value of a slider

Return the value of the slider

Parameters

- `slider`: pointer to a slider object

static int16_t **lv_slider_get_min_value**(**const** *lv_obj_t *slider*)
Get the minimum value of a slider

Return the minimum value of the slider

Parameters

- `slider`: pointer to a slider object

static int16_t **lv_slider_get_max_value**(**const** *lv_obj_t *slider*)
Get the maximum value of a slider

Return the maximum value of the slider

Parameters

- `slider`: pointer to a slider object

bool **lv_slider_is_dragged**(**const** *lv_obj_t *slider*)
Give the slider is being dragged or not

Return true: drag in progress false: not dragged

Parameters

- `slider`: pointer to a slider object

bool **lv_slider_get_knob_in**(**const** *lv_obj_t *slider*)
Get the 'knob in' attribute of a slider

Return true: the knob is drawn always in the slider; false: the knob can be out on the edges

Parameters

- `slider`: pointer to slider object

const lv_style_t ***lv_slider_get_style**(**const** *lv_obj_t *slider*, *lv_slider_style_t type*)
Get a style of a slider

Return style pointer to a style

Parameters

- `slider`: pointer to a slider object
- `type`: which style should be get

struct lv_slider_ext_t

Public Members

lv_bar_ext_t **bar**

const lv_style_t ***style_knob**

int16_t **drag_value**

uint8_t **knob_in**

Spinbox (lv_spinbox)

Overview

The Spinbox contains a number as text which can be increased or decreased by *Keys* or API functions. The Spinbox is a modified *Text area*.

Set format

`lv_spinbox_set_digit_format(spinbox, digit_count, separator_position)` set the format of the number. `digit_count` sets the number of digits. Leading zeros are added to fill the space on the left. `separator_position` sets the number of digit before the decimal point. `0` means no decimal point.

`lv_spinbox_set_padding_left(spinbox, cnt)` add `cnt` "space" characters between the sign an the most left digit.

Value and ranges

`lv_spinbox_set_range(spinbox, min, max)` sets the range of the Spinbox.

`lv_spinbox_set_value(spinbox, num)` sets the Spinbox's value manually.

`lv_spinbox_increment(spinbox)` and `lv_spinbox_decrement(spinbox)` increments/decrements the value of the Spinbox.

`lv_spinbox_set_step(spinbox, step)` sets the amount to increment decrement.

Style usage

The `lv_spinbox_set_style(roller, LV_SPINBOX_STYLE_..., &style)` set the styles of a Spinbox.

- **LV_SPINBOX_STYLE_BG** Style of the background. All `style.body` properties are used. `style.text` is used for label. Default: `lv_style_pretty`
- **LV_SPINBOX_STYLE_SB** Scrollbar's style which uses all `style.body` properties. `padding.right/bottom` sets horizontal and vertical the scrollbars' padding respectively and the `padding.inner` sets the scrollbar's width. (default: `lv_style_pretty_color`)
- **LV_SPINBOX_STYLE_CURSOR** Style of the cursor which uses all `style.body` properties including `padding` to make the cursor larger then the digits.

Events

Besides the Generic events the following Special events are sent by the Drop down lists:

- **LV_EVENT_VALUE_CHANGED** sent when the value has changed. (the value is set as event data as `int32_t`)
- **LV_EVENT_INSERT** sent by the ancestor Text area but shouldn't be used.

Learn more about *Events*.

Keys

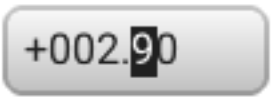
The following *Keys* are processed by the Buttons:

- **LV_KEY_LEFT/RIGHT** With *Keypad* move the cursor left/right. With *Encoder* decrement/increment the selected digit.
- **LY_KEY_ENTER** Apply the selected option (Send `LV_EVENT_VALUE_CHANGED` event and close the Drop down list)
- **LV_KEY_ENTER** With *Encoder* got the net digit. Jump to the first after the last.

Example

C

Simple Spinbox



code

```c
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        printf("Value: %d\n", lv_spinbox_get_value(obj));
    }
    else if(event == LV_EVENT_CLICKED) {
        /*For simple test: Click the spinbox to increment its value*/
        lv_spinbox_increment(obj);
    }
}

void lv_ex_spinbox_1(void)
{
    lv_obj_t * spinbox;
    spinbox = lv_spinbox_create(lv_scr_act(), NULL);
    lv_spinbox_set_digit_format(spinbox, 5, 3);
    lv_spinbox_step_prev(spinbox);
    lv_obj_set_width(spinbox, 100);
    lv_obj_align(spinbox, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_obj_set_event_cb(spinbox, event_handler);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_spinbox_style_t**

Enums

enum [anonymous]

Values:

LV_SPINBOX_STYLE_BG

LV_SPINBOX_STYLE_SB

LV_SPINBOX_STYLE_CURSOR

Functions

lv_obj_t ***lv_spinbox_create**(*lv_obj_t* *par*, **const** *lv_obj_t* *copy*)

Create a spinbox objects

Return pointer to the created spinbox

Parameters

- `par`: pointer to an object, it will be the parent of the new spinbox
- `copy`: pointer to a spinbox object, if not NULL then the new object will be copied from it

static void **lv_spinbox_set_style**(*lv_obj_t* **spinbox*, *lv_spinbox_style_t type*, lv_style_t **style*)

Set a style of a spinbox.

Parameters

- `templ`: pointer to template object
- `type`: which style should be set
- `style`: pointer to a style

void **lv_spinbox_set_value**(*lv_obj_t* **spinbox*, int32_t *i*)

Set spinbox value

Parameters

- `spinbox`: pointer to spinbox
- `i`: value to be set

void **lv_spinbox_set_digit_format**(*lv_obj_t* **spinbox*, uint8_t *digit_count*, uint8_t *separator_position*)

Set spinbox digit format (digit count and decimal format)

Parameters

- `spinbox`: pointer to spinbox
- `digit_count`: number of digit excluding the decimal separator and the sign
- `separator_position`: number of digit before the decimal point. If 0, decimal point is not shown

void **lv_spinbox_set_step**(*lv_obj_t* **spinbox*, uint32_t *step*)

Set spinbox step

Parameters

- `spinbox`: pointer to spinbox
- `step`: steps on increment/decrement

void **lv_spinbox_set_range**(*lv_obj_t* **spinbox*, int32_t *range_min*, int32_t *range_max*)

Set spinbox value range

Parameters

- `spinbox`: pointer to spinbox
- `range_min`: maximum value, inclusive
- `range_max`: minimum value, inclusive

void **lv_spinbox_set_padding_left**(*lv_obj_t* **spinbox*, uint8_t *padding*)

Set spinbox left padding in digits count (added between sign and first digit)

Parameters

- `spinbox`: pointer to spinbox
- `cb`: Callback function called on value change event

static const lv_style_t ***lv_spinbox_get_style**(*lv_obj_t *spinbox*, *lv_spinbox_style_t type*)

Get style of a spinbox.

Return style pointer to the style

Parameters

- `templ`: pointer to template object
- `type`: which style should be get

int32_t **lv_spinbox_get_value**(*lv_obj_t *spinbox*)

Get the spinbox numeral value (user has to convert to float according to its digit format)

Return value integer value of the spinbox

Parameters

- `spinbox`: pointer to spinbox

void **lv_spinbox_step_next**(*lv_obj_t *spinbox*)

Select next lower digit for edition by dividing the step by 10

Parameters

- `spinbox`: pointer to spinbox

void **lv_spinbox_step_prev**(*lv_obj_t *spinbox*)

Select next higher digit for edition by multiplying the step by 10

Parameters

- `spinbox`: pointer to spinbox

void **lv_spinbox_increment**(*lv_obj_t *spinbox*)

Increment spinbox value by one step

Parameters

- `spinbox`: pointer to spinbox

void **lv_spinbox_decrement**(*lv_obj_t *spinbox*)

Decrement spinbox value by one step

Parameters

- `spinbox`: pointer to spinbox

struct lv_spinbox_ext_t

Public Members

lv_ta_ext_t **ta**

int32_t **value**

int32_t **range_max**

int32_t **range_min**

int32_t **step**

uint16_t **digit_count**

uint16_t **dec_point_pos**

uint16_t **digit_padding_left**

Example

Switch (lv_sw)

Overview

The Switch can be used to turn on/off something. The look like a little slider.

Change state

The state of the switch can be changed by

- Clicking on it
- Sliding it
- Using `lv_sw_on(sw, LV_ANIM_ON/OFF)`, `lv_sw_off(sw, LV_ANIM_ON/OFF)` or `lv_sw_toggle(sw, LV_ANOM_ON/OFF)` functions

Animation time

The time of animations, when the switch changes state, can be adjusted with `lv_sw_set_anim_time(sw, anim_time)`.

Styles

You can modify the Switch's styles with `lv_sw_set_style(sw, LV_SW_STYLE_..., &style)`.

- **LV_SW_STYLE_BG** Style of the background. All `style.body` properties are used. The `padding` values make the Switch smaller than the knob. (negative value makes is larger)
- **LV_SW_STYLE_INDIC** Style of the indicator. All `style.body` properties are used. The `padding` values make the indicator smaller than the background.
- **LV_SW_STYLE_KNOB_OFF** Style of the knob when the switch is off. The `style.body` properties are used except padding.
- **LV_SW_STYLE_KNOB_ON** Style of the knob when the switch is on. The `style.body` properties are used except padding.

Events

Besides the Generic events the following Special events are sent by the Switch:

- **LV_EVENT_VALUE_CHANGED** Sent when the switch changes state.

Keys

- **LV_KEY_UP**, **LV_KEY_RIGHT** Turn on the slider
- **LV_KEY_DOWN**, **LV_KEY_LEFT** Turn off the slider

Learn more about *Keys*.

Example

C

Simple Switch

code

```
#include "lvgl/lvgl.h"
#include <stdio.h>

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        printf("State: %s\n", lv_sw_get_state(obj) ? "On" : "Off");
    }
}

void lv_ex_sw_1(void)
{
    /*Create styles for the switch*/
    static lv_style_t bg_style;
    static lv_style_t indic_style;
    static lv_style_t knob_on_style;
    static lv_style_t knob_off_style;
```

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```
    lv_style_copy(&bg_style, &lv_style_pretty);
    bg_style.body.radius = LV_RADIUS_CIRCLE;
    bg_style.body.padding.top = 6;
    bg_style.body.padding.bottom = 6;

    lv_style_copy(&indic_style, &lv_style_pretty_color);
    indic_style.body.radius = LV_RADIUS_CIRCLE;
    indic_style.body.main_color = lv_color_hex(0x9fc8ef);
    indic_style.body.grad_color = lv_color_hex(0x9fc8ef);
    indic_style.body.padding.left = 0;
    indic_style.body.padding.right = 0;
    indic_style.body.padding.top = 0;
    indic_style.body.padding.bottom = 0;

    lv_style_copy(&knob_off_style, &lv_style_pretty);
    knob_off_style.body.radius = LV_RADIUS_CIRCLE;
    knob_off_style.body.shadow.width = 4;
    knob_off_style.body.shadow.type = LV_SHADOW_BOTTOM;

    lv_style_copy(&knob_on_style, &lv_style_pretty_color);
    knob_on_style.body.radius = LV_RADIUS_CIRCLE;
    knob_on_style.body.shadow.width = 4;
    knob_on_style.body.shadow.type = LV_SHADOW_BOTTOM;

    /*Create a switch and apply the styles*/
    lv_obj_t *sw1 = lv_sw_create(lv_scr_act(), NULL);
    lv_sw_set_style(sw1, LV_SW_STYLE_BG, &bg_style);
    lv_sw_set_style(sw1, LV_SW_STYLE_INDIC, &indic_style);
    lv_sw_set_style(sw1, LV_SW_STYLE_KNOB_ON, &knob_on_style);
    lv_sw_set_style(sw1, LV_SW_STYLE_KNOB_OFF, &knob_off_style);
    lv_obj_align(sw1, NULL, LV_ALIGN_CENTER, 0, -50);
    lv_obj_set_event_cb(sw1, event_handler);

    /*Copy the first switch and turn it ON*/
    lv_obj_t *sw2 = lv_sw_create(lv_scr_act(), sw1);
    lv_sw_on(sw2, LV_ANIM_ON);
    lv_obj_align(sw2, NULL, LV_ALIGN_CENTER, 0, 50);
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_sw_style_t**

Enums

enum [anonymous]
Switch styles.

Values:

LV_SW_STYLE_BG
Switch background.

LV_SW_STYLE_INDIC
Switch fill area.

LV_SW_STYLE_KNOB_OFF
Switch knob (when off).

LV_SW_STYLE_KNOB_ON
Switch knob (when on).

Functions

lv_obj_t ***lv_sw_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a switch objects

Return pointer to the created switch

Parameters

- `par`: pointer to an object, it will be the parent of the new switch
- `copy`: pointer to a switch object, if not NULL then the new object will be copied from it

void **lv_sw_on**(*lv_obj_t *sw*, *lv_anim_enable_t anim*)
Turn ON the switch

Parameters

- `sw`: pointer to a switch object
- `anim`: LV_ANIM_ON: set the value with an animation; LV_ANIM_OFF: change the value immediately

void **lv_sw_off**(*lv_obj_t *sw*, *lv_anim_enable_t anim*)
Turn OFF the switch

Parameters

- `sw`: pointer to a switch object
- `anim`: LV_ANIM_ON: set the value with an animation; LV_ANIM_OFF: change the value immediately

bool **lv_sw_toggle**(*lv_obj_t *sw*, *lv_anim_enable_t anim*)
Toggle the position of the switch

Return resulting state of the switch.

Parameters

- `sw`: pointer to a switch object
- `anim`: LV_ANIM_ON: set the value with an animation; LV_ANIM_OFF: change the value immediately

void **lv_sw_set_style**(*lv_obj_t *sw*, *lv_sw_style_t type*, **const** lv_style_t *style*)
Set a style of a switch

Parameters

- sw: pointer to a switch object
- type: which style should be set
- style: pointer to a style

void **lv_sw_set_anim_time**(*lv_obj_t *sw*, uint16_t *anim_time*)
Set the animation time of the switch

Return style pointer to a style

Parameters

- sw: pointer to a switch object
- anim_time: animation time

static bool **lv_sw_get_state**(**const** *lv_obj_t *sw*)
Get the state of a switch

Return false: OFF; true: ON

Parameters

- sw: pointer to a switch object

const lv_style_t ***lv_sw_get_style**(**const** *lv_obj_t *sw*, *lv_sw_style_t type*)
Get a style of a switch

Return style pointer to a style

Parameters

- sw: pointer to a switch object
- type: which style should be get

uint16_t **lv_sw_get_anim_time**(**const** *lv_obj_t *sw*)
Get the animation time of the switch

Return style pointer to a style

Parameters

- sw: pointer to a switch object

struct lv_sw_ext_t

Public Members

lv_slider_ext_t **slider**

const lv_style_t ***style_knob_off**
Style of the knob when the switch is OFF

const lv_style_t ***style_knob_on**
Style of the knob when the switch is ON (NULL to use the same as OFF)

lv_coord_t **start_x**

uint8_t **changed**

uint8_t **slided**

uint16_t **anim_time**

Table (lv_table)

Overview

Tables, as usual, are built from rows, columns, and cells containing texts.

The Table object is very light weighted because only the texts are stored. No real objects are created for cells but they are just drawn on the fly.

Rows and Columns

To set number of rows and columns use `lv_table_set_row_cnt(table, row_cnt)` and `lv_table_set_col_cnt(table, col_cnt)`

Width and Height

The width of the columns can be set with `lv_table_set_col_width(table, col_id, width)`. The overall width of the Table object will be set to the sum of columns widths.

The height is calculated automatically from the cell styles (font, padding etc) and the number of rows.

Set cell value

The cells can store on texts so need to convert numbers to text before displaying them in a table.

`lv_table_set_cell_value(table, row, col, "Content")`. The text is saved by the table so it can be even a local variable.

Line break can be used in the text like `"Value\n60.3"`.

Align

The text alignment in cells can be adjusted individually with `lv_table_set_cell_align(table, row, col, LV_LABEL_ALIGN_LEFT/CENTER/RIGHT)`.

Cell type

You can use 4 different cell types. Each has its own style.

Cell types can be used to add different style for example to:

- table header
- first column
- highlight a cell
- etc

The type can be selected with `lv_table_set_cell_type(table, row, col, type)` `type` can be 1, 2, 3 or 4.

Merge cells

Cells can be merged horizontally with `lv_table_set_cell_merge_right(table, col, row, true)`. To merge more adjacent cells apply this function for each cell.

Crop text

By default, the texts are word-wrapped to fit into the width of the cell and the height of the cell is set automatically. To disable this and keep the text as it is enable `lv_table_set_cell_crop(table, row, col, true)`.

Scroll

The make the Table scrollable place it on a *Page*

Styles

Use `lv_table_set_style(page, LV_TABLE_STYLE_..., &style)` to set a new style for an element of the page:

- **LV_PAGE_STYLE_BG** background's style which uses all `style.body` properties (default: `lv_style_plain_color`)
- **LV_PAGE_STYLE_CELL1/2/3/4** 4 for styles for the 4 cell types. All `style.body` properties are used. (default: `lv_style_plain`)

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

No *Keys* are processed by the object type.

Learn more about *Keys*.

Example

C

Simple table

Name	Price
Apple	$7
Banana	$4
Citron	$6

code

```
#include "lvgl/lvgl.h"

void lv_ex_table_1(void)
{
    /*Create a normal cell style*/
    static lv_style_t style_cell1;
    lv_style_copy(&style_cell1, &lv_style_plain);
    style_cell1.body.border.width = 1;
    style_cell1.body.border.color = LV_COLOR_BLACK;

    /*Crealte a header cell style*/
    static lv_style_t style_cell2;
    lv_style_copy(&style_cell2, &lv_style_plain);
    style_cell2.body.border.width = 1;
    style_cell2.body.border.color = LV_COLOR_BLACK;
    style_cell2.body.main_color = LV_COLOR_SILVER;
    style_cell2.body.grad_color = LV_COLOR_SILVER;

    lv_obj_t * table = lv_table_create(lv_scr_act(), NULL);
    lv_table_set_style(table, LV_TABLE_STYLE_CELL1, &style_cell1);
    lv_table_set_style(table, LV_TABLE_STYLE_CELL2, &style_cell2);
    lv_table_set_style(table, LV_TABLE_STYLE_BG, &lv_style_transp_tight);
    lv_table_set_col_cnt(table, 2);
    lv_table_set_row_cnt(table, 4);
    lv_obj_align(table, NULL, LV_ALIGN_CENTER, 0, 0);

    /*Make the cells of the first row center aligned */
    lv_table_set_cell_align(table, 0, 0, LV_LABEL_ALIGN_CENTER);
    lv_table_set_cell_align(table, 0, 1, LV_LABEL_ALIGN_CENTER);

    /*Make the cells of the first row TYPE = 2 (use `style_cell2`) */
```

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```
    lv_table_set_cell_type(table, 0, 0, 2);
    lv_table_set_cell_type(table, 0, 1, 2);

    /*Fill the first column*/
    lv_table_set_cell_value(table, 0, 0, "Name");
    lv_table_set_cell_value(table, 1, 0, "Apple");
    lv_table_set_cell_value(table, 2, 0, "Banana");
    lv_table_set_cell_value(table, 3, 0, "Citron");

    /*Fill the second column*/
    lv_table_set_cell_value(table, 0, 1, "Price");
    lv_table_set_cell_value(table, 1, 1, "$7");
    lv_table_set_cell_value(table, 2, 1, "$4");
    lv_table_set_cell_value(table, 3, 1, "$6");
}
```

MicroPython

No examples yet.

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_table_style_t**

Enums

enum [anonymous]

Values:

LV_TABLE_STYLE_BG

LV_TABLE_STYLE_CELL1

LV_TABLE_STYLE_CELL2

LV_TABLE_STYLE_CELL3

LV_TABLE_STYLE_CELL4

Functions

lv_obj_t ***lv_table_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)

Create a table object

Return pointer to the created table

Parameters

- `par`: pointer to an object, it will be the parent of the new table
- `copy`: pointer to a table object, if not NULL then the new object will be copied from it

void **lv_table_set_cell_value**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*, **const** char **txt*)
Set the value of a cell.

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]
- `txt`: text to display in the cell. It will be copied and saved so this variable is not required after this function call.

void **lv_table_set_row_cnt**(*lv_obj_t *table*, uint16_t *row_cnt*)
Set the number of rows

Parameters

- `table`: table pointer to a Table object
- `row_cnt`: number of rows

void **lv_table_set_col_cnt**(*lv_obj_t *table*, uint16_t *col_cnt*)
Set the number of columns

Parameters

- `table`: table pointer to a Table object
- `col_cnt`: number of columns. Must be < LV_TABLE_COL_MAX

void **lv_table_set_col_width**(*lv_obj_t *table*, uint16_t *col_id*, lv_coord_t *w*)
Set the width of a column

Parameters

- `table`: table pointer to a Table object
- `col_id`: id of the column [0 .. LV_TABLE_COL_MAX -1]
- `w`: width of the column

void **lv_table_set_cell_align**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*, *lv_label_align_t align*)
Set the text align in a cell

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]
- `align`: LV_LABEL_ALIGN_LEFT or LV_LABEL_ALIGN_CENTER or LV_LABEL_ALIGN_RIGHT

void **lv_table_set_cell_type**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*, uint8_t *type*)
Set the type of a cell.

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]
- `type`: 1,2,3 or 4. The cell style will be chosen accordingly.

void **lv_table_set_cell_crop**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*, bool *crop*)
Set the cell crop. (Don't adjust the height of the cell according to its content)

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]
- `crop`: true: crop the cell content; false: set the cell height to the content.

void **lv_table_set_cell_merge_right**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*, bool *en*)
Merge a cell with the right neighbor. The value of the cell to the right won't be displayed.

Parameters

- `table`: table pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]
- `en`: true: merge right; false: don't merge right

void **lv_table_set_style**(*lv_obj_t *table*, *lv_table_style_t type*, **const** lv_style_t *style*)
Set a style of a table.

Parameters

- `table`: pointer to table object
- `type`: which style should be set
- `style`: pointer to a style

const char ***lv_table_get_cell_value**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*)
Get the value of a cell.

Return text in the cell

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]

uint16_t **lv_table_get_row_cnt**(*lv_obj_t *table*)
Get the number of rows.

Return number of rows.

Parameters

- `table`: table pointer to a Table object

uint16_t **lv_table_get_col_cnt**(*lv_obj_t *table*)
Get the number of columns.

Return number of columns.

Parameters

- `table`: table pointer to a Table object

lv_coord_t **lv_table_get_col_width**(*lv_obj_t *table*, uint16_t *col_id*)
Get the width of a column

Return width of the column

Parameters

- `table`: table pointer to a Table object
- `col_id`: id of the column [0 .. LV_TABLE_COL_MAX -1]

lv_label_align_t **lv_table_get_cell_align**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*)
Get the text align of a cell

Return LV_LABEL_ALIGN_LEFT (default in case of error) or LV_LABEL_ALIGN_CENTER or LV_LABEL_ALIGN_RIGHT

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]

lv_label_align_t **lv_table_get_cell_type**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*)
Get the type of a cell

Return 1,2,3 or 4

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]

lv_label_align_t **lv_table_get_cell_crop**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*)
Get the crop property of a cell

Return true: text crop enabled; false: disabled

Parameters

- `table`: pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]

bool **lv_table_get_cell_merge_right**(*lv_obj_t *table*, uint16_t *row*, uint16_t *col*)
Get the cell merge attribute.

Return true: merge right; false: don't merge right

Parameters

- `table`: table pointer to a Table object
- `row`: id of the row [0 .. row_cnt -1]
- `col`: id of the column [0 .. col_cnt -1]

const lv_style_t ***lv_table_get_style(const** *lv_obj_t *table, lv_table_style_t type*)
Get style of a table.

Return style pointer to the style

Parameters

- `table`: pointer to table object
- `type`: which style should be get

union lv_table_cell_format_t
#include <lv_table.h> Internal table cell format structure.

Use the `lv_table` APIs instead.

Public Members

uint8_t **align**

uint8_t **right_merge**

uint8_t **type**

uint8_t **crop**

struct *lv_table_cell_format_t*::[**anonymous**] **s**

uint8_t **format_byte**

struct lv_table_ext_t

Public Members

uint16_t **col_cnt**

uint16_t **row_cnt**

char ****cell_data**

const lv_style_t ***cell_style**[**LV_TABLE_CELL_STYLE_CNT**]

lv_coord_t **col_w**[**LV_TABLE_COL_MAX**]

Tabview (lv_tabview)

Overview

The Tab view object can be used to organize content in tabs.

Adding tab

You can add a new tabs with `lv_tabview_add_tab(tabview, "Tab name")`. It will return with a pointer to a *Page* object where you can add the tab's content.

Change tab

To select a new tab you can:

- Click on it on the header part
- Slide horizontally
- Use `lv_tabview_set_tab_act(tabview, id, LV_ANIM_ON/OFF)` function

The manual sliding can be disabled with `lv_tabview_set_sliding(tabview, false)`.

Tab button's position

By default, the tab selector buttons are placed on the top of the Tabview. It can be changed with `lv_tabview_set_btns_pos(tabview, LV_TABVIEW_BTNS_POS_TOP/BOTTOM/LEFT/RIGHT)`

Note that, you can't change the tab position from top or bottom to left or right when tabs are already added.

Hide the tabs

The tab buttons can be hidden by `lv_tabview_set_btns_hidden(tabview, true)`

Animation time

The animation time is adjusted by `lv_tabview_set_anim_time(tabview, anim_time_ms)`. It is used when the new tab is loaded.

Style usage

Use `lv_tabview_set_style(tabview, LV_TABVIEW_STYLE_..., &style)` to set a new style for an element of the Tabview:

- **LV_TABVIEW_STYLE_BG** main background which uses all `style.body` properties (default: `lv_style_plain`)
- **LV_TABVIEW_STYLE_INDIC** a thin rectangle on indicating the current tab. Uses all `style.body` properties. Its height comes from `body.padding.inner` (default: `lv_style_plain_color`)
- **LV_TABVIEW_STYLE_BTN_BG** style of the tab buttons' background. Uses all `style.body` properties. The header height will be set automatically considering `body.padding.top/bottom` (default: `lv_style_transp`)
- **LV_TABVIEW_STYLE_BTN_REL** style of released tab buttons. Uses all `style.body` properties. (default: `lv_style_tbn_rel`)
- **LV_TABVIEW_STYLE_BTN_PR** style of released tab buttons. Uses all `style.body` properties except `padding`. (default: `lv_style_tbn_rel`)
- **LV_TABVIEW_STYLE_BTN_TGL_REL** style of selected released tab buttons. Uses all `style.body` properties except `padding`. (default: `lv_style_tbn_rel`)
- **LV_TABVIEW_STYLE_BTN_TGL_PR** style of selected pressed tab buttons. Uses all `style.body` properties except `padding`. (default: `lv_style_btn_tgl_pr`)

The height of the header is calculated like: *font height and padding.top and padding.bottom from LV_TABVIEW_STYLE_BTN_REL + padding.top and padding bottom from LV_TABVIEW_STYLE_BTN_BG*

Events

Besides the Generic events the following Special events are sent by the Slider:

- **LV_EVENT_VALUE_CHANGED** Sent when a new tab is selected by sliding or clicking the tab button

Learn more about *Events*.

Keys

The following *Keys* are processed by the Tabview:

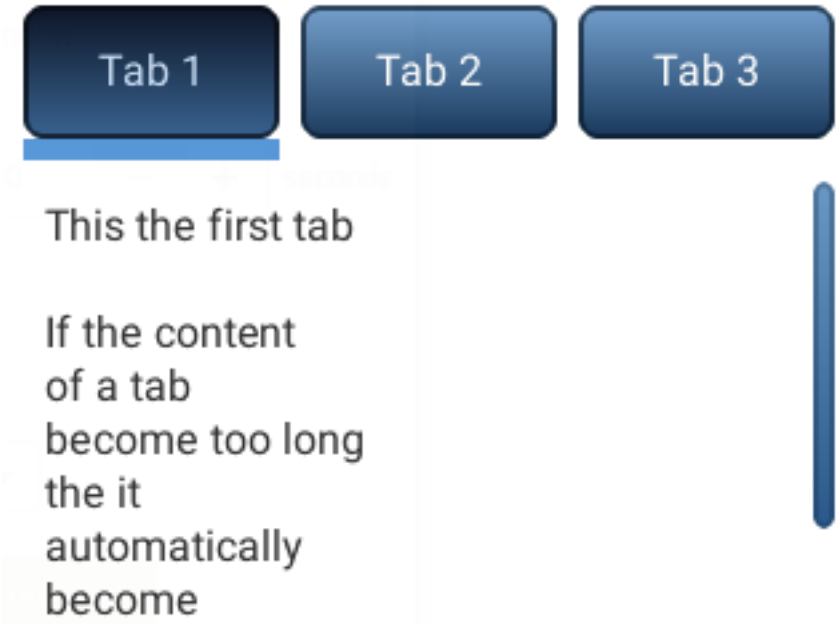
- **LV_KEY_RIGHT/LEFT** Select a tab
- **LV_KEY_ENTER** Change to the selected tab

Learn more about *Keys*.

Example

C

Simple Tabview



code

```
#include "lvgl/lvgl.h"

void lv_ex_tabview_1(void)
{
    /*Create a Tab view object*/
    lv_obj_t *tabview;
    tabview = lv_tabview_create(lv_scr_act(), NULL);

    /*Add 3 tabs (the tabs are page (lv_page) and can be scrolled*/
    lv_obj_t *tab1 = lv_tabview_add_tab(tabview, "Tab 1");
    lv_obj_t *tab2 = lv_tabview_add_tab(tabview, "Tab 2");
    lv_obj_t *tab3 = lv_tabview_add_tab(tabview, "Tab 3");


    /*Add content to the tabs*/
    lv_obj_t * label = lv_label_create(tab1, NULL);
    lv_label_set_text(label, "This the first tab\n\n"
                             "If the content\n"
                             "of a tab\n"
                             "become too long\n"
                             "the it \n"
                             "automatically\n"
                             "become\n"
                             "scrollable.");

    label = lv_label_create(tab2, NULL);
    lv_label_set_text(label, "Second tab");

    label = lv_label_create(tab3, NULL);
    lv_label_set_text(label, "Third tab");
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_tabview_btns_pos_t**

typedef uint8_t **lv_tabview_style_t**

Enums

enum [**anonymous**]

Position of tabview buttons.

Values:

LV_TABVIEW_BTNS_POS_TOP

LV_TABVIEW_BTNS_POS_BOTTOM

LV_TABVIEW_BTNS_POS_LEFT

LV_TABVIEW_BTNS_POS_RIGHT

enum [anonymous]
Values:

LV_TABVIEW_STYLE_BG

LV_TABVIEW_STYLE_INDIC

LV_TABVIEW_STYLE_BTN_BG

LV_TABVIEW_STYLE_BTN_REL

LV_TABVIEW_STYLE_BTN_PR

LV_TABVIEW_STYLE_BTN_TGL_REL

LV_TABVIEW_STYLE_BTN_TGL_PR

Functions

lv_obj_t ***lv_tabview_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a Tab view object

Return pointer to the created tab

Parameters

- `par`: pointer to an object, it will be the parent of the new tab
- `copy`: pointer to a tab object, if not NULL then the new object will be copied from it

void **lv_tabview_clean**(*lv_obj_t *obj*)
Delete all children of the scrl object, without deleting scrl child.

Parameters

- `obj`: pointer to an object

lv_obj_t ***lv_tabview_add_tab**(*lv_obj_t *tabview*, **const** char *name*)
Add a new tab with the given name

Return pointer to the created page object (lv_page). You can create your content here

Parameters

- `tabview`: pointer to Tab view object where to ass the new tab
- `name`: the text on the tab button

void **lv_tabview_set_tab_act**(*lv_obj_t *tabview*, uint16_t *id*, *lv_anim_enable_t anim*)
Set a new tab

Parameters

- `tabview`: pointer to Tab view object
- `id`: index of a tab to load
- `anim`: LV_ANIM_ON: set the value with an animation; LV_ANIM_OFF: change the value immediately

void **lv_tabview_set_sliding**(*lv_obj_t *tabview*, bool *en*)
Enable horizontal sliding with touch pad

Parameters

- `tabview`: pointer to Tab view object
- `en`: true: enable sliding; false: disable sliding

void **lv_tabview_set_anim_time**(*lv_obj_t *tabview*, uint16_t *anim_time*)
Set the animation time of tab view when a new tab is loaded

Parameters

- `tabview`: pointer to Tab view object
- `anim_time`: time of animation in milliseconds

void **lv_tabview_set_style**(*lv_obj_t *tabview*, *lv_tabview_style_t type*, **const** lv_style_t *style*)
Set the style of a tab view

Parameters

- `tabview`: pointer to a tan view object
- `type`: which style should be set
- `style`: pointer to the new style

void **lv_tabview_set_btns_pos**(*lv_obj_t *tabview*, *lv_tabview_btns_pos_t btns_pos*)
Set the position of tab select buttons

Parameters

- `tabview`: pointer to a tab view object
- `btns_pos`: which button position

void **lv_tabview_set_btns_hidden**(*lv_obj_t *tabview*, bool *en*)
Set whether tab buttons are hidden

Parameters

- `tabview`: pointer to a tab view object
- `en`: whether tab buttons are hidden

uint16_t **lv_tabview_get_tab_act**(**const** *lv_obj_t *tabview*)
Get the index of the currently active tab

Return the active tab index

Parameters

- `tabview`: pointer to Tab view object

uint16_t **lv_tabview_get_tab_count**(**const** *lv_obj_t *tabview*)
Get the number of tabs

Return tab count

Parameters

- `tabview`: pointer to Tab view object

lv_obj_t ***lv_tabview_get_tab**(**const** *lv_obj_t *tabview*, uint16_t *id*)
Get the page (content area) of a tab

Return pointer to page (lv_page) object

Parameters

- `tabview`: pointer to Tab view object
- `id`: index of the tab (>= 0)

bool **lv_tabview_get_sliding**(**const** *lv_obj_t *tabview*)
Get horizontal sliding is enabled or not

Return true: enable sliding; false: disable sliding

Parameters

- `tabview`: pointer to Tab view object

uint16_t **lv_tabview_get_anim_time**(**const** *lv_obj_t *tabview*)
Get the animation time of tab view when a new tab is loaded

Return time of animation in milliseconds

Parameters

- `tabview`: pointer to Tab view object

const lv_style_t ***lv_tabview_get_style**(**const** *lv_obj_t *tabview*, *lv_tabview_style_t type*)
Get a style of a tab view

Return style pointer to a style

Parameters

- `tabview`: pointer to a ab view object
- `type`: which style should be get

lv_tabview_btns_pos_t **lv_tabview_get_btns_pos**(**const** *lv_obj_t *tabview*)
Get position of tab select buttons

Parameters

- `tabview`: pointer to a ab view object

bool **lv_tabview_get_btns_hidden**(**const** *lv_obj_t *tabview*)
Get whether tab buttons are hidden

Return whether tab buttons are hidden

Parameters

- `tabview`: pointer to a tab view object

struct lv_tabview_ext_t

Public Members

lv_obj_t ***btns**

lv_obj_t ***indic**

lv_obj_t ***content**

const char ****tab_name_ptr**

lv_point_t **point_last**

uint16_t **tab_cur**

uint16_t **tab_cnt**

uint16_t **anim_time**

uint8_t **slide_enable**

uint8_t **draging**

uint8_t **drag_hor**

uint8_t **scroll_ver**

uint8_t **btns_hide**

lv_tabview_btns_pos_t **btns_pos**

Text area (lv_ta)

Overview

The Text Area is a *Page* with a *Label* and a cursor on it. Texts or characters can be added to it. Long lines are wrapped and when the text becomes long enough the Text area can be scrolled-

Add text

You can insert text or characters to the current cursor's position with:

- `lv_ta_add_char(ta, 'c')`
- `lv_ta_add_text(ta, "insert this text")`

To add wide characters like `'á'`, `'ß'` or CJK characters use `lv_ta_add_text(ta, "á")`.

`lv_ta_set_text(ta, "New text")` changes the whole text.

Placeholder

A placeholder text can be specified which is displayed when the Text area is empty with `lv_ta_set_placeholder_text(ta, "Placeholder text")`

Delete character

To delete a character from the left of the current cursor position use `lv_ta_del_char(ta)`. The delete from teh right use `lv_ta_del_char_forward(ta)`

Move the cursor

The cursor position can be modified directly with `lv_ta_set_cursor_pos(ta, 10)`. The `0` position means "before the first characters", `LV_TA_CURSOR_LAST` means "after the last character"

You can step the cursor with

- `lv_ta_cursor_right(ta)`
- `lv_ta_cursor_left(ta)`
- `lv_ta_cursor_up(ta)`
- `lv_ta_cursor_down(ta)`

If `lv_ta_set_cursor_click_pos(ta, true)` is called the cursor will jump to the position where the Text area was clicked.

Cursor types

There are several cursor types. You can set one of them with: `lv_ta_set_cursor_type(ta, LV_CURSOR_...)`

- **LV_CURSOR_NONE** No cursor
- **LV_CURSOR_LINE** A simple vertical line
- **LV_CURSOR_BLOCK** A filled rectangle on the current character
- **LV_CURSOR_OUTLINE** A rectangle border around the current character
- **LV_CURSOR_UNDERLINE** Underline the current character

You can 'OR' `LV_CURSOR_HIDDEN` to any type to temporarily hide the cursor.

The blink time of the cursor can be adjusted with `lv_ta_set_cursor_blink_time(ta, time_ms)`.

One line mode

The Text area can be configures to be one lined with `lv_ta_set_one_line(ta, true)`. In this mode the height is set automatically to show only one line, line break character are ignored, and word wrap is disabled.

Password mode

The text area supports password mode which can be enabled with `lv_ta_set_pwd_mode(ta, true)`. In password mode, the enters characters are converted to * after some time or when a new character is entered.

In password mode `lv_ta_get_text(ta)` gives the real text and not the asterisk characters

The visibility time can be adjusted with `lv_ta_set_pwd_show_time(ta, time_ms)`.

Text align

The text can be aligned to the left, center or right with `lv_ta_set_text_align(ta, LV_LABEL_ALIGN_LET/CENTER/RIGHT)`.

In one line mode, the text can be scrolled horizontally only if the text is left aligned.

Accepted characters

You can set a list of accepted characters with `lv_ta_set_accepted_chars(ta, "0123456789.+-")`. Other characters will be ignored.

Max text length

The maximum number of characters can be limited with `lv_ta_set_max_length(ta, max_char_num)`

Very long texts

If there is a very long text in the Text area (> 20k characters) its scrolling and drawing might be slow. However, by enabling `LV_LABEL_LONG_TXT_HINT 1` in *lv_conf.h* it can be hugely improved. It will save some info about the label to speed up its drawing. Using `LV_LABEL_LONG_TXT_HINT` the scrolling and drawing will as fast as with "normal" short texts.

Select text

A part of text can be selected if enabled with `lv_ta_set_text_sel(ta, true)`. It works like when you select a text on your PC with your mouse.

Scrollbars

The scrollbars can shown according to different policies set by `lv_ta_set_sb_mode(ta, LV_SB_MODE_...)`. Learn more at the *Page* object.

Scroll propagation

When the Text area is scrolled on an other scrollable object (like a Page) and the scrolling has reached the edge of the Text area, the scrolling can be propagated to the parent. In other words, when the Text area can be scrolled further, the parent will be scrolled instead.

It can be enabled with `lv_ta_set_scroll_propagation(ta, true)`.

Learn more at the *Page* object.

Edge flash

When the Text area is scrolled to edge a circle like flash animation can be shown if it is enabled with `lv_ta_set_edge_flash(ta, true)`

Style usage

Use `lv_ta_set_style(page, LV_TA_STYLE_..., &style)` to set a new style for an element of the text area:

- **LV_TA_STYLE_BG** background's style which uses all `style.body` properties. The label uses `style.label` from this style. (default: `lv_style_pretty`)
- **LV_TA_STYLE_SB** scrollbar's style which uses all `style.body` properties (default: `lv_style_pretty_color`)
- **LV_TA_STYLE_CURSOR** cursor style. If `NULL` then the library sets a style automatically according to the label's color and font

- *LV_CURSOR_LINE*: a `style.line.width` wide line but drawn as a rectangle as `style.body`. `padding.top/left` makes an offset on the cursor
- *LV_CURSOR_BLOCK*: a rectangle as `style.body` `padding` makes the rectangle larger
- *LV_CURSOR_OUTLINE*: an empty rectangle (just a border) as `style.body` `padding` makes the rectangle larger
- *LV_CURSOR_UNDERLINE*: a `style.line.width` wide line but drawn as a rectangle as `style.body`. `padding.top/left` makes an offset on the cursor

Events

Besides the Generic events the following Special events are sent by the Slider:

- **LV_EVENT_INSERT** Sent when a character before a character is inserted. The evnet data is the text planned to insert. `lv_ta_set_insert_replace(ta, "New text")` replaces the text to insert. The new text can't be in a local variable which is destroyed when the event callback exists. `""` means do not insert anything.
- **LV_EVENT_VALUE_CHANGED** When the content of the text area has been changed.

Keys

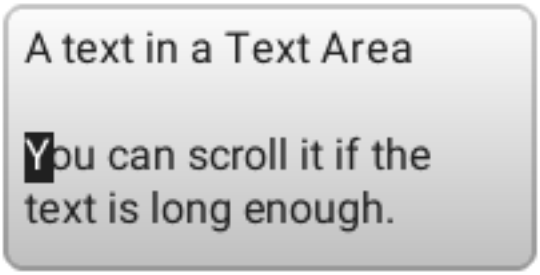
- **LV_KEY_UP/DOWN/LEFT/RIGHT** Move the cursor
- **Any character** Add the character to the current cursor position

Learn more about *Keys*.

Example

C

Simple Text area



code

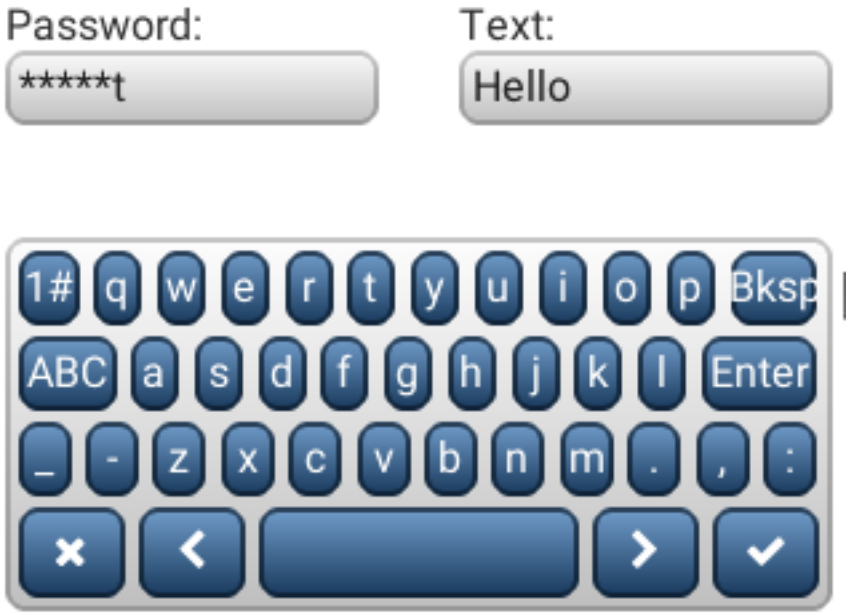
```
#include "lvgl/lvgl.h"
#include <stdio.h>

lv_obj_t * ta1;

static void event_handler(lv_obj_t * obj, lv_event_t event)
{
    if(event == LV_EVENT_VALUE_CHANGED) {
        printf("Value: %s\n", lv_ta_get_text(obj));
    }
    else if(event == LV_EVENT_LONG_PRESSED_REPEAT) {
        /*For simple test: Long press the Text are to add the text below*/
        const char  * txt = "\n\nYou can scroll it if the text is long enough.\n";
        static uint16_t i = 0;
        if(txt[i] != '\0') {
            lv_ta_add_char(ta1, txt[i]);
            i++;
        }
    }
}


void lv_ex_ta_1(void)
{
    ta1 = lv_ta_create(lv_scr_act(), NULL);
    lv_obj_set_size(ta1, 200, 100);
    lv_obj_align(ta1, NULL, LV_ALIGN_CENTER, 0, 0);
    lv_ta_set_cursor_type(ta1, LV_CURSOR_BLOCK);
    lv_ta_set_text(ta1, "A text in a Text Area");    /*Set an initial text*/
    lv_obj_set_event_cb(ta1, event_handler);
}
```

Text are with password field



code

```
/**
 * @file lv_ex_templ.c
 *
 */

/*********************
 *      INCLUDES
 *********************/
#include "lvgl/lvgl.h"
#include <stdio.h>

/*********************
 *      DEFINES
 *********************/

/*********************
 *      TYPEDEFS
 *********************/

/**********************
 *  STATIC PROTOTYPES
 **********************/
static void kb_event_cb(lv_obj_t * event_kb, lv_event_t event);
static void ta_event_cb(lv_obj_t * ta, lv_event_t event);

/**********************
 *  STATIC VARIABLES
 **********************/

static lv_obj_t * kb;
/**********************
```

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```
 *      MACROS
 **********************/

/**********************
 *   GLOBAL FUNCTIONS
 **********************/

void lv_ex_ta_2(void)
{
    /* Create the password box */
    lv_obj_t * pwd_ta = lv_ta_create(lv_scr_act(), NULL);
    lv_ta_set_text(pwd_ta, "");
    lv_ta_set_pwd_mode(pwd_ta, true);
    lv_ta_set_one_line(pwd_ta, true);
    lv_obj_set_width(pwd_ta, LV_HOR_RES / 2 - 20);
    lv_obj_set_pos(pwd_ta, 5, 20);
    lv_obj_set_event_cb(pwd_ta, ta_event_cb);

    /* Create a label and position it above the text box */
    lv_obj_t * pwd_label = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_text(pwd_label, "Password:");
    lv_obj_align(pwd_label, pwd_ta, LV_ALIGN_OUT_TOP_LEFT, 0, 0);


    /* Create the one-line mode text area */
    lv_obj_t * oneline_ta = lv_ta_create(lv_scr_act(), pwd_ta);
    lv_ta_set_pwd_mode(oneline_ta, false);
    lv_ta_set_cursor_type(oneline_ta, LV_CURSOR_LINE | LV_CURSOR_HIDDEN);
    lv_obj_align(oneline_ta, NULL, LV_ALIGN_IN_TOP_RIGHT, -5, 20);

    /* Create a label and position it above the text box */
    lv_obj_t * oneline_label = lv_label_create(lv_scr_act(), NULL);
    lv_label_set_text(oneline_label, "Text:");
    lv_obj_align(oneline_label, oneline_ta, LV_ALIGN_OUT_TOP_LEFT, 0, 0);

    /* Create a keyboard and make it fill the width of the above text areas */
    kb = lv_kb_create(lv_scr_act(), NULL);
    lv_obj_set_pos(kb, 5, 90);
    lv_obj_set_event_cb(kb, kb_event_cb); /* Setting a custom event handler stops the␣
↪keyboard from closing automatically */
    lv_obj_set_size(kb,  LV_HOR_RES - 10, 140);

    lv_kb_set_ta(kb, pwd_ta); /* Focus it on one of the text areas to start */
    lv_kb_set_cursor_manage(kb, true); /* Automatically show/hide cursors on text␣
↪areas */
}

/**********************
 *   STATIC FUNCTIONS
 **********************/

static void kb_event_cb(lv_obj_t * event_kb, lv_event_t event)
{
    /* Just call the regular event handler */
    lv_kb_def_event_cb(event_kb, event);
```

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```
}
static void ta_event_cb(lv_obj_t * ta, lv_event_t event)
{
    if(event == LV_EVENT_CLICKED) {
        /* Focus on the clicked text area */
        if(kb != NULL)
            lv_kb_set_ta(kb, ta);
    }

    else if(event == LV_EVENT_INSERT) {
        const char * str = lv_event_get_data();
        if(str[0] == '\n') {
            printf("Ready\n");
        }
    }
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_cursor_type_t**

typedef uint8_t **lv_ta_style_t**

Enums

enum [anonymous]

Style of text area's cursor.

Values:

LV_CURSOR_NONE
No cursor

LV_CURSOR_LINE
Vertical line

LV_CURSOR_BLOCK
Rectangle

LV_CURSOR_OUTLINE
Outline around character

LV_CURSOR_UNDERLINE
Horizontal line under character

LV_CURSOR_HIDDEN = 0x08
This flag can be ORed to any of the other values to temporarily hide the cursor

enum [anonymous]
Possible text areas tyles.

Values:

LV_TA_STYLE_BG
Text area background style

LV_TA_STYLE_SB
Scrollbar style

LV_TA_STYLE_CURSOR
Cursor style

LV_TA_STYLE_EDGE_FLASH
Edge flash style

LV_TA_STYLE_PLACEHOLDER
Placeholder style

Functions

lv_obj_t ***lv_ta_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a text area objects

Return pointer to the created text area

Parameters

- `par`: pointer to an object, it will be the parent of the new text area
- `copy`: pointer to a text area object, if not NULL then the new object will be copied from it

void **lv_ta_add_char**(*lv_obj_t *ta*, uint32_t *c*)
Insert a character to the current cursor position. To add a wide char, e.g. 'Á' use 'lv_txt_encoded_conv_wc('Á')'

Parameters

- `ta`: pointer to a text area object
- `c`: a character (e.g. 'a')

void **lv_ta_add_text**(*lv_obj_t *ta*, **const** char **txt*)
Insert a text to the current cursor position

Parameters

- `ta`: pointer to a text area object
- `txt`: a '\0' terminated string to insert

void **lv_ta_del_char**(*lv_obj_t *ta*)
Delete a the left character from the current cursor position

Parameters

- `ta`: pointer to a text area object

void **lv_ta_del_char_forward**(*lv_obj_t *ta*)
Delete the right character from the current cursor position

Parameters

- `ta`: pointer to a text area object

void **lv_ta_set_text**(*lv_obj_t *ta*, **const** char **txt*)
Set the text of a text area

Parameters

- ta: pointer to a text area
- txt: pointer to the text

void **lv_ta_set_placeholder_text**(*lv_obj_t *ta*, **const** char **txt*)
Set the placeholder text of a text area

Parameters

- ta: pointer to a text area
- txt: pointer to the text

void **lv_ta_set_cursor_pos**(*lv_obj_t *ta*, int16_t *pos*)
Set the cursor position

Parameters

- obj: pointer to a text area object
- pos: the new cursor position in character index < 0 : index from the end of the text LV_TA_CURSOR_LAST: go after the last character

void **lv_ta_set_cursor_type**(*lv_obj_t *ta*, *lv_cursor_type_t cur_type*)
Set the cursor type.

Parameters

- ta: pointer to a text area object
- cur_type: element of 'lv_cursor_type_t'

void **lv_ta_set_cursor_click_pos**(*lv_obj_t *ta*, bool *en*)
Enable/Disable the positioning of the the cursor by clicking the text on the text area.

Parameters

- ta: pointer to a text area object
- en: true: enable click positions; false: disable

void **lv_ta_set_pwd_mode**(*lv_obj_t *ta*, bool *en*)
Enable/Disable password mode

Parameters

- ta: pointer to a text area object
- en: true: enable, false: disable

void **lv_ta_set_one_line**(*lv_obj_t *ta*, bool *en*)
Configure the text area to one line or back to normal

Parameters

- ta: pointer to a Text area object
- en: true: one line, false: normal

void **lv_ta_set_text_align**(*lv_obj_t *ta*, *lv_label_align_t align*)
Set the alignment of the text area. In one line mode the text can be scrolled only with LV_LABEL_ALIGN_LEFT. This function should be called if the size of text area changes.

Parameters

- `ta`: pointer to a text are object
- `align`: the desired alignment from `lv_label_align_t`. (LV_LABEL_ALIGN_LEFT/CENTER/RIGHT)

void **lv_ta_set_accepted_chars**(*lv_obj_t *ta*, **const** char **list*)
Set a list of characters. Only these characters will be accepted by the text area

Parameters

- `ta`: pointer to Text Area
- `list`: list of characters. Only the pointer is saved. E.g. "+-.,0123456789"

void **lv_ta_set_max_length**(*lv_obj_t *ta*, uint16_t *num*)
Set max length of a Text Area.

Parameters

- `ta`: pointer to Text Area
- `num`: the maximal number of characters can be added (`lv_ta_set_text` ignores it)

void **lv_ta_set_insert_replace**(*lv_obj_t *ta*, **const** char **txt*)
In `LV_EVENT_INSERT` the text which planned to be inserted can be replaced by an other text. It can be used to add automatic formatting to the text area.

Parameters

- `ta`: pointer to a text area.
- `txt`: pointer to a new string to insert. If `""` no text will be added. The variable must be live after the `event_cb` exists. (Should be `global` or `static`)

static void **lv_ta_set_sb_mode**(*lv_obj_t *ta*, *lv_sb_mode_t mode*)
Set the scroll bar mode of a text area

Parameters

- `ta`: pointer to a text area object
- `sb_mode`: the new mode from 'lv_page_sb_mode_t' enum

static void **lv_ta_set_scroll_propagation**(*lv_obj_t *ta*, bool *en*)
Enable the scroll propagation feature. If enabled then the Text area will move its parent if there is no more space to scroll.

Parameters

- `ta`: pointer to a Text area
- `en`: true or false to enable/disable scroll propagation

static void **lv_ta_set_edge_flash**(*lv_obj_t *ta*, bool *en*)
Enable the edge flash effect. (Show an arc when the an edge is reached)

Parameters

- `page`: pointer to a Text Area
- `en`: true or false to enable/disable end flash

void **lv_ta_set_style**(*lv_obj_t *ta*, *lv_ta_style_t type*, **const** lv_style_t **style*)
Set a style of a text area

Parameters

- `ta`: pointer to a text area object
- `type`: which style should be set
- `style`: pointer to a style

void **lv_ta_set_text_sel**(*lv_obj_t *ta*, bool *en*)
Enable/disable selection mode.

Parameters

- `ta`: pointer to a text area object
- `en`: true or false to enable/disable selection mode

void **lv_ta_set_pwd_show_time**(*lv_obj_t *ta*, uint16_t *time*)
Set how long show the password before changing it to '*'

Parameters

- `ta`: pointer to Text area
- `time`: show time in milliseconds. 0: hide immediately.

void **lv_ta_set_cursor_blink_time**(*lv_obj_t *ta*, uint16_t *time*)
Set cursor blink animation time

Parameters

- `ta`: pointer to Text area
- `time`: blink period. 0: disable blinking

const char ***lv_ta_get_text**(**const** *lv_obj_t *ta*)
Get the text of a text area. In password mode it gives the real text (not '*'s).

Return pointer to the text

Parameters

- `ta`: pointer to a text area object

const char ***lv_ta_get_placeholder_text**(*lv_obj_t *ta*)
Get the placeholder text of a text area

Return pointer to the text

Parameters

- `ta`: pointer to a text area object

lv_obj_t ***lv_ta_get_label**(**const** *lv_obj_t *ta*)
Get the label of a text area

Return pointer to the label object

Parameters

- `ta`: pointer to a text area object

uint16_t **lv_ta_get_cursor_pos**(**const** *lv_obj_t *ta*)
Get the current cursor position in character index

Return the cursor position

Parameters

- `ta`: pointer to a text area object

lv_cursor_type_t **lv_ta_get_cursor_type**(**const** *lv_obj_t *ta*)
Get the current cursor type.

Return element of 'lv_cursor_type_t'

Parameters

- **ta**: pointer to a text area object

bool **lv_ta_get_cursor_click_pos**(*lv_obj_t *ta*)
Get whether the cursor click positioning is enabled or not.

Return true: enable click positions; false: disable

Parameters

- **ta**: pointer to a text area object

bool **lv_ta_get_pwd_mode**(**const** *lv_obj_t *ta*)
Get the password mode attribute

Return true: password mode is enabled, false: disabled

Parameters

- **ta**: pointer to a text area object

bool **lv_ta_get_one_line**(**const** *lv_obj_t *ta*)
Get the one line configuration attribute

Return true: one line configuration is enabled, false: disabled

Parameters

- **ta**: pointer to a text area object

const char ***lv_ta_get_accepted_chars**(*lv_obj_t *ta*)
Get a list of accepted characters.

Return list of accented characters.

Parameters

- **ta**: pointer to Text Area

uint16_t **lv_ta_get_max_length**(*lv_obj_t *ta*)
Set max length of a Text Area.

Return the maximal number of characters to be add

Parameters

- **ta**: pointer to Text Area

static *lv_sb_mode_t* **lv_ta_get_sb_mode**(**const** *lv_obj_t *ta*)
Get the scroll bar mode of a text area

Return scrollbar mode from 'lv_page_sb_mode_t' enum

Parameters

- **ta**: pointer to a text area object

static bool **lv_ta_get_scroll_propagation**(*lv_obj_t *ta*)
Get the scroll propagation property

Return true or false

Parameters

- `ta`: pointer to a Text area

static bool **lv_ta_get_edge_flash**(*lv_obj_t *ta*)
Get the scroll propagation property

Return true or false

Parameters

- `ta`: pointer to a Text area

const lv_style_t ***lv_ta_get_style**(**const** *lv_obj_t *ta*, *lv_ta_style_t type*)
Get a style of a text area

Return style pointer to a style

Parameters

- `ta`: pointer to a text area object
- `type`: which style should be get

bool **lv_ta_text_is_selected**(**const** *lv_obj_t *ta*)
Find whether text is selected or not.

Return whether text is selected or not

Parameters

- `ta`: Text area object

bool **lv_ta_get_text_sel_en**(*lv_obj_t *ta*)
Find whether selection mode is enabled.

Return true: selection mode is enabled, false: disabled

Parameters

- `ta`: pointer to a text area object

uint16_t **lv_ta_get_pwd_show_time**(*lv_obj_t *ta*)
Set how long show the password before changing it to '*'

Return show time in milliseconds. 0: hide immediately.

Parameters

- `ta`: pointer to Text area

uint16_t **lv_ta_get_cursor_blink_time**(*lv_obj_t *ta*)
Set cursor blink animation time

Return time blink period. 0: disable blinking

Parameters

- `ta`: pointer to Text area

void **lv_ta_clear_selection**(*lv_obj_t *ta*)
Clear the selection on the text area.

Parameters

- `ta`: Text area object

void **lv_ta_cursor_right**(*lv_obj_t *ta*)
Move the cursor one character right

Parameters

- `ta`: pointer to a text area object

void **lv_ta_cursor_left**(*lv_obj_t *ta*)
Move the cursor one character left

Parameters

- `ta`: pointer to a text area object

void **lv_ta_cursor_down**(*lv_obj_t *ta*)
Move the cursor one line down

Parameters

- `ta`: pointer to a text area object

void **lv_ta_cursor_up**(*lv_obj_t *ta*)
Move the cursor one line up

Parameters

- `ta`: pointer to a text area object

struct lv_ta_ext_t

Public Members

lv_page_ext_t **page**

lv_obj_t ***label**

lv_obj_t ***placeholder**

char ***pwd_tmp**

const char ***accepted_chars**

uint16_t **max_length**

uint16_t **pwd_show_time**

const lv_style_t ***style**

lv_coord_t **valid_x**

uint16_t **pos**

uint16_t **blink_time**

lv_area_t **area**

uint16_t **txt_byte_pos**

lv_cursor_type_t **type**

uint8_t **state**

uint8_t **click_pos**

struct *lv_ta_ext_t*::[anonymous] **cursor**

uint16_t **tmp_sel_start**

uint16_t **tmp_sel_end**

uint8_t **text_sel_in_prog**

uint8_t **text_sel_en**

uint8_t **pwd_mode**

uint8_t **one_line**

Tile view (lv_tileview)

Overview

The Tileview a container object where its elements (called *tiles*) can be arranged in a grid form. By swiping the user can navigate between the tiles.

If the Tileview is screen sized it gives a user interface you might have seen on the smartwatches.

Valid positions

The tiles don't have to form a full grid where every element exists. There can be holes in the grid but it has to be continuous, i.e. there can the be an empty row or column.

With `lv_tileview_set_valid_positions(tileview, valid_pos_array, array_len)` the valid positions can be set. Scrolling will be possible only to this positions. the `0,0` index means the top left tile. E.g. `lv_point_t valid_pos_array[] = {{0,0}, {0,1}, {1,1}, {{LV_COORD_MIN, LV_COORD_MIN}}` gives a Tile view with "L" shape. It indicates that there is no tile in `{1,1}` therefore the user can't scroll there.

In other words, the `valid_pos_array` tells where the tiles are. It can be changed on the fly to disable some positions on specific tiles. For example, there can be a 2x2 grid where all tiles are added but the first row (y = 0) as a "main row" and the second row (y = 1) contains options for the tile above it. Let's say horizontal scrolling is possible only in the main row and not possible between the options in the second row. In this case the `valid_pos_array` needs to changed when a new main tile is selected:

- for the first main tile: `{0,0}, {0,1}, {1,0}` to disable the `{1,1}` option tile
- for the second main tile `{0,0}, {1,0}, {1,1}` to disable the `{0,1}` option tile

Add element

To add elements just create an object on the Tileview and call `lv_tileview_add_element(tielview, element)`.

The element should have the same size than the Tile view and needs to be positioned manually to the desired position.

The scroll propagation feature of page-like objects (like *List*) can be used very well here. For example, there can be a full-sized List and when it reaches the top or bottom most position the user will scroll the tile view instead.

`lv_tileview_add_element(tielview, element)` should be used to make possible to scroll (drag) the Tileview by one its element.For example, if there is a button on a tile, the button needs to be explicitly added to the Tileview to enable the user to scroll the Tileview with the button too.

It true for the buttons on a *List* as well. Every list button and the list itself needs to be added with `lv_tileview_add_element`.

Set tile

To set the currently visible tile use `lv_tileview_set_tile_act(tileview, x_id, y_id, LV_ANIM_ON/OFF)`.

Animation time

The animation time when a tile

- is selected with `lv_tileview_set_tile_act`
- is scrolled a little and then released (revert the original title)
- is scrolled more than half size and then release (move to the next tile)

can be set with `lv_tileview_set_anim_time(tileview, anim_time)`.

Edge flash

An "edge flash" effect can be added when the tile view reached hits an invalid position or the end of tile view when scrolled.

Use `lv_tileview_set_edge_flash(tileview, true)` to enable this feature.

Styles

The Tileview has on one style which van be changes with `lv_tileview_set_style(slider, LV_TILEVIEW_STYLE_MAIN, &style)`.

- **LV_TILEVIEW_STYLE_MAIN** Style of the background. All `style.body` properties are used.

Events

Besides the Generic events the following Special events are sent by the Slider:

- **LV_EVENT_VALUE_CHANGED** Sent when a new tile loaded either with scrolling or `lv_tileview_set_act`. The event data is set ti the index of the new tile in `valid_pos_array` (It's type is `uint32_t *`)

Keys

- **LV_KEY_UP**, **LV_KEY_RIGHT** Increment the slider's value by 1
- **LV_KEY_DOWN**, **LV_KEY_LEFT** Decrement the slider's value by 1

Learn more about *Keys*.

Example

C

Tileview with content

code

```
#include "lvgl/lvgl.h"

void lv_ex_tileview_1(void)
{
    static lv_point_t valid_pos[] = {{0,0}, {0, 1}, {1,1}};
    lv_obj_t *tileview;
    tileview = lv_tileview_create(lv_scr_act(), NULL);
    lv_tileview_set_valid_positions(tileview, valid_pos, 3);
    lv_tileview_set_edge_flash(tileview, true);

    lv_obj_t * tile1 = lv_obj_create(tileview, NULL);
    lv_obj_set_size(tile1, LV_HOR_RES, LV_VER_RES);
    lv_obj_set_style(tile1, &lv_style_pretty);
    lv_tileview_add_element(tileview, tile1);

    /*Tile1: just a label*/
    lv_obj_t * label = lv_label_create(tile1, NULL);
    lv_label_set_text(label, "Tile 1");
    lv_obj_align(label, NULL, LV_ALIGN_CENTER, 0, 0);

    /*Tile2: a list*/
    lv_obj_t * list = lv_list_create(tileview, NULL);
    lv_obj_set_size(list, LV_HOR_RES, LV_VER_RES);
    lv_obj_set_pos(list, 0, LV_VER_RES);
    lv_list_set_scroll_propagation(list, true);
    lv_list_set_sb_mode(list, LV_SB_MODE_OFF);
    lv_tileview_add_element(list, list);

    lv_obj_t * list_btn;
    list_btn = lv_list_add_btn(list, NULL, "One");
    lv_tileview_add_element(tileview, list_btn);
```

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```
    list_btn = lv_list_add_btn(list, NULL, "Two");
    lv_tileview_add_element(tileview, list_btn);

    list_btn = lv_list_add_btn(list, NULL, "Three");
    lv_tileview_add_element(tileview, list_btn);

    list_btn = lv_list_add_btn(list, NULL, "Four");
    lv_tileview_add_element(tileview, list_btn);

    list_btn = lv_list_add_btn(list, NULL, "Five");
    lv_tileview_add_element(tileview, list_btn);

    list_btn = lv_list_add_btn(list, NULL, "Six");
    lv_tileview_add_element(tileview, list_btn);

    list_btn = lv_list_add_btn(list, NULL, "Seven");
    lv_tileview_add_element(tileview, list_btn);

    list_btn = lv_list_add_btn(list, NULL, "Eight");
    lv_tileview_add_element(tileview, list_btn);

    /*Tile3: a button*/
    lv_obj_t * tile3 = lv_obj_create(tileview, tile1);
    lv_obj_set_pos(tile3, LV_HOR_RES, LV_VER_RES);
    lv_tileview_add_element(tileview, tile3);

    lv_obj_t * btn = lv_btn_create(tile3, NULL);
    lv_obj_align(btn, NULL, LV_ALIGN_CENTER, 0, 0);

    label = lv_label_create(btn, NULL);
    lv_label_set_text(label, "Button");
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_tileview_style_t**

Enums

enum [anonymous]

Values:

LV_TILEVIEW_STYLE_MAIN

Functions

lv_obj_t ***lv_tileview_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a tileview objects

Return pointer to the created tileview

Parameters

- `par`: pointer to an object, it will be the parent of the new tileview
- `copy`: pointer to a tileview object, if not NULL then the new object will be copied from it

void **lv_tileview_add_element**(*lv_obj_t *tileview*, *lv_obj_t *element*)
Register an object on the tileview. The register object will able to slide the tileview

Parameters

- `tileview`: pointer to a Tileview object
- `element`: pointer to an object

void **lv_tileview_set_valid_positions**(*lv_obj_t *tileview*, **const** lv_point_t *valid_pos*, uint16_t *valid_pos_cnt*)
Set the valid position's indices. The scrolling will be possible only to these positions.

Parameters

- `tileview`: pointer to a Tileview object
- `valid_pos`: array width the indices. E.g. `lv_point_t p[] = {{0,0}, {1,0}, {1, 1}`. Only the pointer is saved so can't be a local variable.
- `valid_pos_cnt`: numner of elements in `valid_pos` array

void **lv_tileview_set_tile_act**(*lv_obj_t *tileview*, lv_coord_t *x*, lv_coord_t *y*, *lv_anim_enable_t anim*)
Set the tile to be shown

Parameters

- `tileview`: pointer to a tileview object
- `x`: column id (0, 1, 2...)
- `y`: line id (0, 1, 2...)
- `anim`: LV_ANIM_ON: set the value with an animation; LV_ANIM_OFF: change the value immediately

static void **lv_tileview_set_edge_flash**(*lv_obj_t *tileview*, bool *en*)
Enable the edge flash effect. (Show an arc when the an edge is reached)

Parameters

- `tileview`: pointer to a Tileview
- `en`: true or false to enable/disable end flash

static void **lv_tileview_set_anim_time**(*lv_obj_t *tileview*, uint16_t *anim_time*)
Set the animation time for the Tile view

Parameters

- `tileview`: pointer to a page object
- `anim_time`: animation time in milliseconds

void **lv_tileview_set_style**(*lv_obj_t *tileview*, *lv_tileview_style_t type*, **const** lv_style_t *style*)

Set a style of a tileview.

Parameters

- `tileview`: pointer to tileview object
- `type`: which style should be set
- `style`: pointer to a style

static bool **lv_tileview_get_edge_flash**(*lv_obj_t *tileview*)

Get the scroll propagation property

Return true or false

Parameters

- `tileview`: pointer to a Tileview

static uint16_t **lv_tileview_get_anim_time**(*lv_obj_t *tileview*)

Get the animation time for the Tile view

Return animation time in milliseconds

Parameters

- `tileview`: pointer to a page object

const lv_style_t *__lv_tileview_get_style__(**const** *lv_obj_t *tileview*, *lv_tileview_style_t type*)

Get style of a tileview.

Return style pointer to the style

Parameters

- `tileview`: pointer to tileview object
- `type`: which style should be get

struct lv_tileview_ext_t

Public Members

lv_page_ext_t **page**

const lv_point_t ***valid_pos**

uint16_t **valid_pos_cnt**

uint16_t **anim_time**

lv_point_t **act_id**

uint8_t **drag_top_en**

uint8_t **drag_bottom_en**

uint8_t **drag_left_en**

uint8_t **drag_right_en**

uint8_t **drag_hor**

uint8_t **drag_ver**

Window (lv_win)

Overview

The windows are one of the most complex container-like objects. They are built from two main parts:

1. a header *Container* on the top
2. a *Page* for the content below the header.

Title

On the header, there is a title which can be modified by: `lv_win_set_title(win, "New title")`. The title always inherits the style of the header.

Control buttons

You can add control buttons to the right side of the header with: `lv_win_add_btn(win, LV_SYMBOL_CLOSE)`. The second parameter is an *Image* source.

`lv_win_close_event_cb` can be used as an event callback to close the Window.

You can modify the size of the control buttons with the `lv_win_set_btn_size(win, new_size)` function.

Scrollbars

The scrollbar behavior can be set by `lv_win_set_sb_mode(win, LV_SB_MODE_...)`. See *Page* for details.

Manual scroll and focus

To scroll the Window directly you can use `lv_win_scroll_hor(win, dist_px)` or `lv_win_scroll_ver(win, dist_px)`.

To make the Window show an object on it use `lv_win_focus(win, child, LV_ANIM_ON/OFF)`.

The time of scroll and focus animations can be adjusted with `lv_win_set_anim_time(win, anim_time_ms)`

Layout

To set a layout for the content use `lv_win_set_layout(win, LV_LAYOUT_...)`. See *Container* for details.

Style usage

Use `lv_win_set_style(win, LV_WIN_STYLE_..., &style)` to set a new style for an element of the Window:

- **LV_WIN_STYE_BG** main background which uses all `style.body` properties (header and content page are placed on it) (default: `lv_style_plain`)
- **LV_WIN_STYLE_CONTENT** content page's scrollable part which uses all `style.body` properties (default: `lv_style_transp`)
- **LV_WIN_STYLE_SB** scroll bar's style which uses all `style.body` properties. `left/top` padding sets the scrollbars' padding respectively and the inner padding sets the scrollbar's width. (default: `lv_style_pretty_color`)
- **LV_WIN_STYLE_HEADER** header's style which uses all `style.body` properties (default: `lv_style_plain_color`)
- **LV_WIN_STYLE_BTN_REL** released button's style (on header) which uses all `style.body` properties (default: `lv_style_btn_rel`)
- **LV_WIN_STYLE_BTN_PR** released button's style (on header) which uses all `style.body` properties (default: `lv_style_btn_pr`)

The height of the header is set to the greater value from *buttons' height* (set by `lv_win_set_btn_size`) and *title height* (comes from `header_style.text.font`) plus the `body.padding.top` and `body.padding.bottom` of the header style.

Events

Only the Generic events are sent by the object type.

Learn more about *Events*.

Keys

The following *Keys* are processed by the Page:

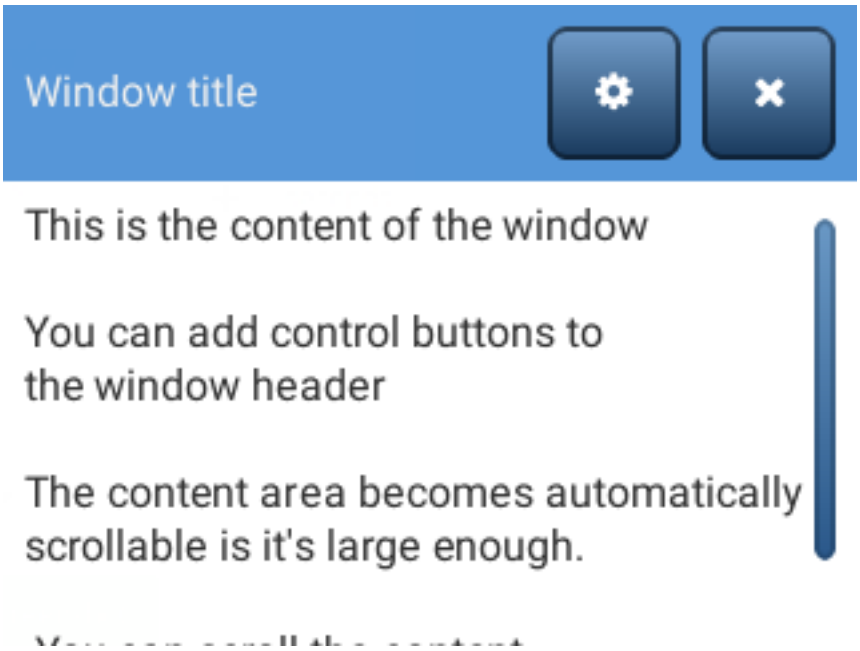
- **LV_KEY_RIGHT/LEFT/UP/DOWN** Scroll the page

Learn more about *Keys*.

Example

C

Simple window



code

```
#include "lvgl/lvgl.h"

void lv_ex_win_1(void)
{
    /*Create a window*/
    lv_obj_t * win = lv_win_create(lv_scr_act(), NULL);
    lv_win_set_title(win, "Window title");                        /*Set the title*/


    /*Add control button to the header*/
    lv_obj_t * close_btn = lv_win_add_btn(win, LV_SYMBOL_CLOSE);           /*Add␣
↪close button and use built-in close action*/
    lv_obj_set_event_cb(close_btn, lv_win_close_event_cb);
    lv_win_add_btn(win, LV_SYMBOL_SETTINGS);        /*Add a setup button*/

    /*Add some dummy content*/
    lv_obj_t * txt = lv_label_create(win, NULL);
    lv_label_set_text(txt, "This is the content of the window\n\n"
                           "You can add control buttons to\n"
                           "the window header\n\n"
                           "The content area becomes automatically\n"
                           "scrollable is it's large enough.\n\n"
                           " You can scroll the content\n"
                           "See the scroll bar on the right!");
}
```

MicroPython

No examples yet.

API

Typedefs

typedef uint8_t **lv_win_style_t**

Enums

enum [anonymous]
Window styles.

Values:

LV_WIN_STYLE_BG
Window object background style.

LV_WIN_STYLE_CONTENT
Window content style.

LV_WIN_STYLE_SB
Window scrollbar style.

LV_WIN_STYLE_HEADER
Window titlebar background style.

LV_WIN_STYLE_BTN_REL
Same meaning as ordinary button styles.

LV_WIN_STYLE_BTN_PR

Functions

lv_obj_t ***lv_win_create**(*lv_obj_t *par*, **const** *lv_obj_t *copy*)
Create a window objects

Return pointer to the created window

Parameters

- `par`: pointer to an object, it will be the parent of the new window
- `copy`: pointer to a window object, if not NULL then the new object will be copied from it

void **lv_win_clean**(*lv_obj_t *obj*)
Delete all children of the scrl object, without deleting scrl child.

Parameters

- `obj`: pointer to an object

lv_obj_t ***lv_win_add_btn**(*lv_obj_t *win*, **const** void **img_src*)
Add control button to the header of the window

Return pointer to the created button object

Parameters

- `win`: pointer to a window object
- `img_src`: an image source ('lv_img_t' variable, path to file or a symbol)

void **lv_win_close_event_cb**(*lv_obj_t *btn*, *lv_event_t event*)
Can be assigned to a window control button to close the window

Parameters

- `btn`: pointer to the control button on teh widows header
- `evet`: the event type

void **lv_win_set_title**(*lv_obj_t *win*, **const** char *title*)
Set the title of a window

Parameters

- `win`: pointer to a window object
- `title`: string of the new title

void **lv_win_set_btn_size**(*lv_obj_t *win*, lv_coord_t *size*)
Set the control button size of a window

Return control button size

Parameters

- `win`: pointer to a window object

void **lv_win_set_layout**(*lv_obj_t *win*, *lv_layout_t layout*)
Set the layout of the window

Parameters

- `win`: pointer to a window object
- `layout`: the layout from 'lv_layout_t'

void **lv_win_set_sb_mode**(*lv_obj_t *win*, *lv_sb_mode_t sb_mode*)
Set the scroll bar mode of a window

Parameters

- `win`: pointer to a window object
- `sb_mode`: the new scroll bar mode from 'lv_sb_mode_t'

void **lv_win_set_anim_time**(*lv_obj_t *win*, uint16_t *anim_time*)
Set focus animation duration on *`lv_win_focus()`*

Parameters

- `win`: pointer to a window object
- `anim_time`: duration of animation [ms]

void **lv_win_set_style**(*lv_obj_t *win*, *lv_win_style_t type*, **const** lv_style_t *style*)
Set a style of a window

Parameters

- `win`: pointer to a window object
- `type`: which style should be set
- `style`: pointer to a style

void **lv_win_set_drag**(*lv_obj_t *win*, bool *en*)
Set drag status of a window. If set to 'true' window can be dragged like on a PC.

Parameters

- `win`: pointer to a window object
- `en`: whether dragging is enabled

const char ***lv_win_get_title(const** *lv_obj_t *win*)
Get the title of a window

Return title string of the window

Parameters

- `win`: pointer to a window object

lv_obj_t ***lv_win_get_content(const** *lv_obj_t *win*)
Get the content holder object of window (`lv_page`) to allow additional customization

Return the Page object where the window's content is

Parameters

- `win`: pointer to a window object

lv_coord_t **lv_win_get_btn_size(const** *lv_obj_t *win*)
Get the control button size of a window

Return control button size

Parameters

- `win`: pointer to a window object

lv_obj_t ***lv_win_get_from_btn(const** *lv_obj_t *ctrl_btn*)
Get the pointer of a widow from one of its control button. It is useful in the action of the control buttons where only button is known.

Return pointer to the window of 'ctrl_btn'

Parameters

- `ctrl_btn`: pointer to a control button of a window

lv_layout_t **lv_win_get_layout(***lv_obj_t *win*)
Get the layout of a window

Return the layout of the window (from 'lv_layout_t')

Parameters

- `win`: pointer to a window object

lv_sb_mode_t **lv_win_get_sb_mode(***lv_obj_t *win*)
Get the scroll bar mode of a window

Return the scroll bar mode of the window (from 'lv_sb_mode_t')

Parameters

- `win`: pointer to a window object

uint16_t **lv_win_get_anim_time(const** *lv_obj_t *win*)
Get focus animation duration

Return duration of animation [ms]

Parameters

- `win`: pointer to a window object

lv_coord_t **lv_win_get_width**(*lv_obj_t *win*)
Get width of the content area (page scrollable) of the window

Return the width of the content area

Parameters

- `win`: pointer to a window object

const lv_style_t ***lv_win_get_style**(**const** *lv_obj_t *win*, *lv_win_style_t type*)
Get a style of a window

Return style pointer to a style

Parameters

- `win`: pointer to a button object
- `type`: which style window be get

static bool **lv_win_get_drag**(**const** *lv_obj_t *win*)
Get drag status of a window. If set to 'true' window can be dragged like on a PC.

Return whether window is draggable

Parameters

- `win`: pointer to a window object

void **lv_win_focus**(*lv_obj_t *win*, *lv_obj_t *obj*, *lv_anim_enable_t anim_en*)
Focus on an object. It ensures that the object will be visible in the window.

Parameters

- `win`: pointer to a window object
- `obj`: pointer to an object to focus (must be in the window)
- `anim_en`: LV_ANIM_ON focus with an animation; LV_ANIM_OFF focus without animation

static void **lv_win_scroll_hor**(*lv_obj_t *win*, lv_coord_t *dist*)
Scroll the window horizontally

Parameters

- `win`: pointer to a window object
- `dist`: the distance to scroll (< 0: scroll right; > 0 scroll left)

static void **lv_win_scroll_ver**(*lv_obj_t *win*, lv_coord_t *dist*)
Scroll the window vertically

Parameters

- `win`: pointer to a window object
- `dist`: the distance to scroll (< 0: scroll down; > 0 scroll up)

struct lv_win_ext_t

Public Members

lv_obj_t ***page**

lv_obj_t ***header**

lv_obj_t ***title**

const lv_style_t ***style_btn_rel**

const lv_style_t ***style_btn_pr**

lv_coord_t **btn_size**