

LVGL UI Generator v2

A project to generate a user interface using LVGL and capturing a screenshot alongside an annotation file with widget metadata (bounding box).

LVGL UI Generator version 2 is an updated version of the UI generator that uses micropython and corresponding LVGL bindings as a base. This version is more flexible, easier to use and more maintainable than the [original version](#).

It has two modes of operation:

- **Random mode:** Generates a random UI with a specified number of widgets placed on a white background. It requires a provided list of widget types to randomly choose from.
- **Design mode:** Generates a UI based on a provided JSON design file. The design file describes the whole window, including styles, widgets and certain properties. There is a special `random` widget, which can be used to randomize widget creation in certain areas of the design. This mode is useful in creating more realistic looking user interfaces, as the random mode does not accomodate for styles regarding the containers.

 [Documentation](#)

Prerequisites & Installation

In order to run the UI generator, you need to compile the micropython binary with the LVGL bindings. To make this process easier, the project has a `tasks.py` file, which already contains necessary routines via the usage of `invoke`.

To use the `invoke` package, you will need to setup a virtual environment and install the dependencies using the provided [poetry project file \(pyproject.toml\)](#).

Since `lv_micropython` is included as a submodule, you will need to initialize the submodules **before** running the build task.

⚠ Be aware, that initializing this submodule can take quite a while to complete, due to all the additional source dependencies being downloaded. (including unnecessary sources for various MCUs, ports and architectures)

As of yet, there is no way to speed this up, but it is generally a one-time operation.

Initializing the micropython submodule

Run the following command to initialize the submodule:

```
1 | git submodule update --init --recursive
```

Make sure to grab a cup of coffee or tea ☕, as this operation can take quite a while to complete.

Setting up the virtual environment

1. Install `poetry` package manager. See corresponding [documentation](#) for more information.
2. Run `poetry install` to install the dependencies.

Compiling the micropython binary

Run `poetry run invoke build` to compile the micropython binary with the LVGL bindings, using the provided `lv_conf.h` file.

► Example build output

```
1 | $ poetry run inv build
2 | make: Entering directory '/home/rini-debian/git-stash/lvgl-ui-detector/lvgl-ui-generator_v2/lv_micropython/mpy-cross'
3 | Use make V=1 or set BUILD_VERBOSE in your environment to increase build
   | verbosity.
4 | GEN build/genhdr/mpversion.h
5 | CC ../py/modsys.c
6 | CC main.c
7 | LINK build/mpy-cross
8 |      text    data     bss      dec     hex filename
9 | 305806  13856     856  320518  4e406 build/mpy-cross
10 | make: Leaving directory '/home/rini-debian/git-stash/lvgl-ui-detector/lvgl-ui-generator_v2/lv_micropython/mpy-cross'
11 | make: Entering directory '/home/rini-debian/git-stash/lvgl-ui-detector/lvgl-ui-generator_v2/lv_micropython/ports/unix'
```

```
12 Use make V=1 or set BUILD_VERBOSE in your environment to increase build
    verbosity.
13 Updating submodules: lib/mbedtls lib/berkeley-db-1.xx lib/micropython-lib
14 Synchronizing submodule url for '../lib/berkeley-db-1.xx'
15 Synchronizing submodule url for '../lib/mbedtls'
16 Synchronizing submodule url for '../lib/micropython-lib'
17 make: Leaving directory '/home/rini-debian/git-stash/lvgl-ui-
    detector/lvgl-ui-generator_v2/lv_micropython/ports/unix'
18 make: Entering directory '/home/rini-debian/git-stash/lvgl-ui-
    detector/lvgl-ui-generator_v2/lv_micropython/ports/unix'
19 Use make V=1 or set BUILD_VERBOSE in your environment to increase build
    verbosity.
20 LVGL-GEN build-standard/lvgl/lv_mpy.c
21 GEN build-standard/genhdr/mpversion.h
22 GEN build-standard/genhdr/qstr.i.last
23 GEN build-standard/genhdr/qstr.split
24 GEN build-standard/genhdr/moduledefs.split
25 GEN build-standard/genhdr/root_pointers.split
26 GEN build-standard/genhdr/compressed.split
27 GEN build-standard/genhdr/root_pointers.collected
28 GEN build-standard/genhdr/qstrdefs.collected.h
29 GEN build-standard/genhdr/moduledefs.collected
30 Root pointer registrations not updated
31 GEN build-standard/genhdr/compressed.collected
32 Module registrations not updated
33 QSTR not updated
34 Compressed data not updated
35 CC ../../py/modsys.c
36 CC ../../extmod/moduplatform.c
37 CC build-standard/lvgl/lv_mpy.c
38 CC ../../lib/lv_bindings/lvgl/src/drivers/evdev/lv_evdev.c
39 CC ../../lib/lv_bindings/lvgl/src/drivers/windows/lv_windows_input.c
40 CC ../../lib/lv_bindings/lvgl/src/drivers/windows/lv_windows_display.c
41 CC ../../lib/lv_bindings/lvgl/src/drivers/windows/lv_windows_context.c
42 CC ../../lib/lv_bindings/lvgl/src/drivers/display/st7735/lv_st7735.c
43 CC ../../lib/lv_bindings/lvgl/src/drivers/display/fb/lv_linux_fbdev.c
44 CC ../../lib/lv_bindings/lvgl/src/drivers/display/ili9341/lv_ili9341.c
45 CC ../../lib/lv_bindings/lvgl/src/drivers/display/drm/lv_linux_drm.c
46 CC ../../lib/lv_bindings/lvgl/src/drivers/display/st7796/lv_st7796.c
47 CC ../../lib/lv_bindings/lvgl/src/drivers/display/st7789/lv_st7789.c
48 CC ../../lib/lv_bindings/lvgl/src/drivers/display/lcd/lv_lcd_generic_mipi.c
49 CC ../../lib/lv_bindings/lvgl/src/drivers/nuttx/lv_nuttx_lcd.c
50 CC ../../lib/lv_bindings/lvgl/src/drivers/nuttx/lv_nuttx_libuv.c
51 CC ../../lib/lv_bindings/lvgl/src/drivers/nuttx/lv_nuttx_fbdev.c
52 CC ../../lib/lv_bindings/lvgl/src/drivers/nuttx/lv_nuttx_entry.c
53 CC ../../lib/lv_bindings/lvgl/src/drivers/nuttx/lv_nuttx_profiler.c
54 CC ../../lib/lv_bindings/lvgl/src/drivers/nuttx/lv_nuttx_touchscreen.c
55 CC ../../lib/lv_bindings/lvgl/src/drivers/nuttx/lv_nuttx_cache.c
56 CC ../../lib/lv_bindings/lvgl/src/drivers/x11/lv_x11_display.c
57 CC ../../lib/lv_bindings/lvgl/src/drivers/x11/lv_x11_input.c
58 CC ../../lib/lv_bindings/lvgl/src/drivers/sdl/lv_sdl_window.c
59 CC ../../lib/lv_bindings/lvgl/src/drivers/sdl/lv_sdl_mouse.c
60 CC ../../lib/lv_bindings/lvgl/src/drivers/sdl/lv_sdl_keyboard.c
61 CC ../../lib/lv_bindings/lvgl/src/drivers/sdl/lv_sdl_mousewheel.c
62 CC ../../lib/lv_bindings/lvgl/src/themes/default/lv_theme_default.c
63 CC ../../lib/lv_bindings/lvgl/src/themes/lv_theme.c
```

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64 CC ../../lib/lv_bindings/lvgl/src/themes/simple/lv_theme_simple.c
65 CC ../../lib/lv_bindings/lvgl/src/themes/mono/lv_theme_mono.c
66 CC ../../lib/lv_bindings/lvgl/src/tick/lv_tick.c
67 CC ../../lib/lv_bindings/lvgl/src/lv_init.c
68 CC ../../lib/lv_bindings/lvgl/src/osal/lv_pthread.c
69 CC ../../lib/lv_bindings/lvgl/src/osal/lv_cmsis_rtos2.c
70 CC ../../lib/lv_bindings/lvgl/src/osal/lv_windows.c
71 CC ../../lib/lv_bindings/lvgl/src/osal/lv_os_none.c
72 CC ../../lib/lv_bindings/lvgl/src/osal/lv_rtthread.c
73 CC ../../lib/lv_bindings/lvgl/src/osal/lv_freertos.c
74 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_class.c
75 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_id_builtin.c
76 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj.c
77 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_scroll.c
78 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_style.c
79 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_event.c
80 CC ../../lib/lv_bindings/lvgl/src/core/lv_refr.c
81 CC ../../lib/lv_bindings/lvgl/src/core/lv_group.c
82 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_pos.c
83 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_style_gen.c
84 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_tree.c
85 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_property.c
86 CC ../../lib/lv_bindings/lvgl/src/core/lv_obj_draw.c
87 CC ../../lib/lv_bindings/lvgl/src/others/sysmon/lv_sysmon.c
88 CC ../../lib/lv_bindings/lvgl/src/others/imgfont/lv_imgfont.c
89 CC ../../lib/lv_bindings/lvgl/src/others/file_explorer/lv_file_explorer.c
90 CC ../../lib/lv_bindings/lvgl/src/others/observer/lv_observer.c
91 CC ../../lib/lv_bindings/lvgl/src/others/snapshot/lv_snapshot.c
92 CC ../../lib/lv_bindings/lvgl/src/others/monkey/lv_monkey.c
93 CC ../../lib/lv_bindings/lvgl/src/others/fragment/lv_fragment.c
94 CC ../../lib/lv_bindings/lvgl/src/others/fragment/lv_fragment_manager.c
95 CC ../../lib/lv_bindings/lvgl/src/others/gridnav/lv_gridnav.c
96 CC ../../lib/lv_bindings/lvgl/src/others/ime/lv_ime_pinyin.c
97 CC ../../lib/lv_bindings/lvgl/src/others/vg_lite_tv/vg_lite_matrix.c
98 CC ../../lib/lv_bindings/lvgl/src/stdlib/rtthread/lv_string_rtthread.c
99 CC ../../lib/lv_bindings/lvgl/src/stdlib/rtthread/lv_sprintf_rtthread.c
100 CC ../../lib/lv_bindings/lvgl/src/stdlib/rtthread/lv_mem_core_rtthread.c
101 CC ../../lib/lv_bindings/lvgl/src/stdlib/lv_mem.c
102 CC ../../lib/lv_bindings/lvgl/src/stdlib/clib/lv_string_clib.c
103 CC ../../lib/lv_bindings/lvgl/src/stdlib/clib/lv_mem_core_clib.c
104 CC ../../lib/lv_bindings/lvgl/src/stdlib/clib/lv_sprintf_clib.c
105 CC
    ../../lib/lv_bindings/lvgl/src/stdlib/micropython/lv_mem_core_micropython.c
106 CC ../../lib/lv_bindings/lvgl/src/stdlib/builtin/lv_sprintf_builtin.c
107 CC ../../lib/lv_bindings/lvgl/src/stdlib/builtin/lv_tlsf.c
108 CC ../../lib/lv_bindings/lvgl/src/stdlib/builtin/lv_mem_core_builtin.c
109 CC ../../lib/lv_bindings/lvgl/src/stdlib/builtin/lv_string_builtin.c
110 CC ../../lib/lv_bindings/lvgl/src/misc/cache/lv_cache_entry.c
111 CC ../../lib/lv_bindings/lvgl/src/misc/cache/lv_image_cache.c
112 CC ../../lib/lv_bindings/lvgl/src/misc/cache/_lv_cache_lru_rb.c
113 CC ../../lib/lv_bindings/lvgl/src/misc/cache/lv_cache.c
114 CC ../../lib/lv_bindings/lvgl/src/misc/lv_profiler_builtin.c
115 CC ../../lib/lv_bindings/lvgl/src/misc/lv_color_op.c
116 CC ../../lib/lv_bindings/lvgl/src/misc/lv_color.c
117 CC ../../lib/lv_bindings/lvgl/src/misc/lv_text.c
118 CC ../../lib/lv_bindings/lvgl/src/misc/lv_bidi.c
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119 CC ../../lib/lv_bindings/lvgl/src/misc/lv_style_gen.c
120 CC ../../lib/lv_bindings/lvgl/src/misc/lv_async.c
121 CC ../../lib/lv_bindings/lvgl/src/misc/lv_palette.c
122 CC ../../lib/lv_bindings/lvgl/src/misc/lv_style.c
123 CC ../../lib/lv_bindings/lvgl/src/misc/lv_text_ap.c
124 CC ../../lib/lv_bindings/lvgl/src/misc/lv_array.c
125 CC ../../lib/lv_bindings/lvgl/src/misc/lv_lru.c
126 CC ../../lib/lv_bindings/lvgl/src/misc/lv_anim.c
127 CC ../../lib/lv_bindings/lvgl/src/misc/lv_rb.c
128 CC ../../lib/lv_bindings/lvgl/src/misc/lv_math.c
129 CC ../../lib/lv_bindings/lvgl/src/misc/lv_fs.c
130 CC ../../lib/lv_bindings/lvgl/src/misc/lv_timer.c
131 CC ../../lib/lv_bindings/lvgl/src/misc/lv_log.c
132 CC ../../lib/lv_bindings/lvgl/src/misc/lv_event.c
133 CC ../../lib/lv_bindings/lvgl/src/misc/lv_ll.c
134 CC ../../lib/lv_bindings/lvgl/src/misc/lv_area.c
135 CC ../../lib/lv_bindings/lvgl/src/misc/lv_anim_timeline.c
136 CC ../../lib/lv_bindings/lvgl/src/layouts/flex/lv_flex.c
137 CC ../../lib/lv_bindings/lvgl/src/layouts/grid/lv_grid.c
138 CC ../../lib/lv_bindings/lvgl/src/layouts/lv_layout.c
139 CC ../../lib/lv_bindings/lvgl/src/libs/fsdrv/lv_fs_stdio.c
140 CC ../../lib/lv_bindings/lvgl/src/libs/fsdrv/lv_fs_memfs.c
141 CC ../../lib/lv_bindings/lvgl/src/libs/fsdrv/lv_fs_fatfs.c
142 CC ../../lib/lv_bindings/lvgl/src/libs/fsdrv/lv_fs_posix.c
143 CC ../../lib/lv_bindings/lvgl/src/libs/fsdrv/lv_fs_win32.c
144 CC ../../lib/lv_bindings/lvgl/src/libs/bin_decoder/lv_bin_decoder.c
145 CC ../../lib/lv_bindings/lvgl/src/libs/rlottie/lv_rlottie.c
146 CC ../../lib/lv_bindings/lvgl/src/libs/libpng/lv_libpng.c
147 CC ../../lib/lv_bindings/lvgl/src/libs/tiny_ttf/lv_tiny_ttf.c
148 CC ../../lib/lv_bindings/lvgl/src/libs/barcode/code128.c
149 CC ../../lib/lv_bindings/lvgl/src/libs/barcode/lv_barcode.c
150 CC ../../lib/lv_bindings/lvgl/src/libs/rle/lv_rle.c
151 CC ../../lib/lv_bindings/lvgl/src/libs/lz4/lz4.c
152 CC ../../lib/lv_bindings/lvgl/src/libs/bmp/lv_bmp.c
153 CC ../../lib/lv_bindings/lvgl/src/libs/lodepng/lv_lodepng.c
154 CC ../../lib/lv_bindings/lvgl/src/libs/lodepng/lodepng.c
155 CC ../../lib/lv_bindings/lvgl/src/libs/tjpgd/lv_tjpgd.c
156 CC ../../lib/lv_bindings/lvgl/src/libs/gif/gifdec.c
157 CC ../../lib/lv_bindings/lvgl/src/libs/gif/lv_gif.c
158 CC ../../lib/lv_bindings/lvgl/src/libs/qrcode/qrcodegen.c
159 CC ../../lib/lv_bindings/lvgl/src/libs/qrcode/lv_qrcode.c
160 CC ../../lib/lv_bindings/lvgl/src/libs/freetype/lv_freetype_glyph.c
161 CC ../../lib/lv_bindings/lvgl/src/libs/freetype/lv_freetype_image.c
162 CC ../../lib/lv_bindings/lvgl/src/libs/freetype/lv_ftsystem.c
163 CC ../../lib/lv_bindings/lvgl/src/libs/freetype/lv_freetype_outline.c
164 CC ../../lib/lv_bindings/lvgl/src/libs/freetype/lv_freetype.c
165 CC ../../lib/lv_bindings/lvgl/src/libs/libjpeg_turbo/lv_libjpeg_turbo.c
166 CC ../../lib/lv_bindings/lvgl/src/libs/ffmpeg/lv_ffmpeg.c
167 CC ../../lib/lv_bindings/lvgl/src/display/lv_display.c
168 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_8.c
169 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_20.c
170 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_30.c
171 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_44.c
172 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_18.c
173 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_unscii_8.c
174 CC ../../lib/lv_bindings/lvgl/src/font/lv_font.c
```

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175 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_simsun_16_cjk.c
176 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_38.c
177 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_22.c
178 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_fmt_txt.c
179 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_32.c
180 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_dejavu_16_persian_hebrew.c
181 CC ../../lib/lv_bindings/lvgl/src/font/lv_binfont_loader.c
182 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_28.c
183 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_42.c
184 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_unscii_16.c
185 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_28_compressed.c
186 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_36.c
187 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_40.c
188 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_26.c
189 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_34.c
190 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_16.c
191 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_24.c
192 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_48.c
193 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_46.c
194 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_12.c
195 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_14.c
196 CC ../../lib/lv_bindings/lvgl/src/font/lv_font_montserrat_10.c
197 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_image.c
198 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_triangle.c
199 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_line.c
200 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_label.c
201 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_mask_rect.c
202 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_box_shadow.c
203 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_gradient.c
204 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_mask.c
205 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_triangle.c
206 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_transform.c
207 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_letter.c
208 CC
    ../../lib/lv_bindings/lvgl/src/draw/sw/blend/lv_draw_sw_blend_to_argb8888.c
209 CC ../../lib/lv_bindings/lvgl/src/draw/sw/blend/lv_draw_sw_blend.c
210 CC ../../lib/lv_bindings/lvgl/src/draw/sw/blend/lv_draw_sw_blend_to_rgb888.c
211 CC ../../lib/lv_bindings/lvgl/src/draw/sw/blend/lv_draw_sw_blend_to_rgb565.c
212 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_arc.c
213 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_vector.c
214 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_border.c
215 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw.c
216 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_fill.c
217 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_line.c
218 CC ../../lib/lv_bindings/lvgl/src/draw/sw/lv_draw_sw_img.c
219 CC ../../lib/lv_bindings/lvgl/src/draw/lv_image_decoder.c
220 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_vector.c
221 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_rect.c
222 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_arc.c
223 CC ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_line.c
224 CC
    ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_border.c
225 CC ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_arc.c
226 CC ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d.c
227 CC ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_label.c
228 CC ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_fill.c
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229 CC
    ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_triangle.c
230 CC
    ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_mask_recta
ngle.c
231 CC ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_utils.c
232 CC ../../lib/lv_bindings/lvgl/src/draw/renesas/dave2d/lv_draw_dave2d_image.c
233 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_mask.c
234 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_draw_pxp_img.c
235 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_draw_pxp_layer.c
236 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_pxp_osa.c
237 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_pxp_cfg.c
238 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_draw_buf_pxp.c
239 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_draw_pxp.c
240 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_draw_pxp_fill.c
241 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/pxp/lv_pxp_utils.c
242 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_fill.c
243 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_vglite_path.c
244 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_border.c
245 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_buf_vglite.c
246 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_img.c
247 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_layer.c
248 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_line.c
249 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_arc.c
250 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_vglite_utils.c
251 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_vglite_matrix.c
252 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_vglite_buf.c
253 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_triangle.c
254 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite.c
255 CC ../../lib/lv_bindings/lvgl/src/draw/nxp/vglite/lv_draw_vglite_label.c
256 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw_buf.c
257 CC ../../lib/lv_bindings/lvgl/src/draw/lv_image_buf.c
258 CC ../../lib/lv_bindings/lvgl/src/draw/sdl/lv_draw_sdl.c
259 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_vg_lite_utils.c
260 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_mask_rect.c
261 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_arc.c
262 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_layer.c
263 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_border.c
264 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_buf_vg_lite.c
265 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_img.c
266 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite.c
267 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_vg_lite_path.c
268 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_line.c
269 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_label.c
270 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_vg_lite_decoder.c
271 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_box_shadow.c
272 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_fill.c
273 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_vector.c
274 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_draw_vg_lite_triangle.c
275 CC ../../lib/lv_bindings/lvgl/src/draw/vg_lite/lv_vg_lite_math.c
276 CC ../../lib/lv_bindings/lvgl/src/draw/lv_draw.c
277 CC ../../lib/lv_bindings/lvgl/src/indev/lv_indev.c
278 CC ../../lib/lv_bindings/lvgl/src/indev/lv_indev_scroll.c
279 CC ../../lib/lv_bindings/lvgl/src/widgets/dropdown/lv_dropdown.c
280 CC ../../lib/lv_bindings/lvgl/src/widgets/arc/lv_arc.c
281 CC ../../lib/lv_bindings/lvgl/src/widgets/keyboard/lv_keyboard.c
```



```
282 CC ../../lib/lv_bindings/lvgl/src/widgets/line/lv_line.c
283 CC ../../lib/lv_bindings/lvgl/src/widgets/scale/lv_scale.c
284 CC ../../lib/lv_bindings/lvgl/src/widgets/switch/lv_switch.c
285 CC ../../lib/lv_bindings/lvgl/src/widgets/animimage/lv_animimage.c
286 CC ../../lib/lv_bindings/lvgl/src/widgets/slider/lv_slider.c
287 CC ../../lib/lv_bindings/lvgl/src/widgets/canvas/lv_canvas.c
288 CC ../../lib/lv_bindings/lvgl/src/widgets/button/lv_button.c
289 CC ../../lib/lv_bindings/lvgl/src/widgets/checkbox/lv_checkbox.c
290 CC ../../lib/lv_bindings/lvgl/src/widgets/span/lv_span.c
291 CC ../../lib/lv_bindings/lvgl/src/widgets/spinner/lv_spinner.c
292 CC ../../lib/lv_bindings/lvgl/src/widgets/imagebutton/lv_imagebutton.c
293 CC ../../lib/lv_bindings/lvgl/src/widgets/roller/lv_roller.c
294 CC ../../lib/lv_bindings/lvgl/src/widgets/tabview/lv_tabview.c
295 CC ../../lib/lv_bindings/lvgl/src/widgets/label/lv_label.c
296 CC ../../lib/lv_bindings/lvgl/src/widgets/menu/lv_menu.c
297 CC ../../lib/lv_bindings/lvgl/src/widgets/textarea/lv_textarea.c
298 CC ../../lib/lv_bindings/lvgl/src/widgets/tileview/lv_tileview.c
299 CC ../../lib/lv_bindings/lvgl/src/widgets/image/lv_image.c
300 CC ../../lib/lv_bindings/lvgl/src/widgets/bar/lv_bar.c
301 CC ../../lib/lv_bindings/lvgl/src/widgets/buttonmatrix/lv_buttonmatrix.c
302 CC ../../lib/lv_bindings/lvgl/src/widgets/chart/lv_chart.c
303 CC ../../lib/lv_bindings/lvgl/src/widgets/msgbox/lv_msgbox.c
304 CC ../../lib/lv_bindings/lvgl/src/widgets/list/lv_list.c
305 CC ../../lib/lv_bindings/lvgl/src/widgets/spinbox/lv_spinbox.c
306 CC ../../lib/lv_bindings/lvgl/src/widgets/win/lv_win.c
307 CC
    ../../lib/lv_bindings/lvgl/src/widgets/calendar/lv_calendar_header_arrow.c
308 CC
    ../../lib/lv_bindings/lvgl/src/widgets/calendar/lv_calendar_header_dropdown.
    c
309 CC ../../lib/lv_bindings/lvgl/src/widgets/calendar/lv_calendar.c
310 CC ../../lib/lv_bindings/lvgl/src/widgets/led/lv_led.c
311 CC ../../lib/lv_bindings/lvgl/src/widgets/table/lv_table.c
312 CC ../../lib/lv_bindings/lvgl/examples/anim/lv_example_anim_2.c
313 CC ../../lib/lv_bindings/lvgl/examples/anim/lv_example_anim_1.c
314 CC ../../lib/lv_bindings/lvgl/examples/anim/lv_example_anim_timeline_1.c
315 CC ../../lib/lv_bindings/lvgl/examples/anim/lv_example_anim_3.c
316 CC ../../lib/lv_bindings/lvgl/examples/others/imgfont/lv_example_imgfont_1.c
317 CC
    ../../lib/lv_bindings/lvgl/examples/others/file_explorer/lv_example_file_exp
    lorer_3.c
318 CC
    ../../lib/lv_bindings/lvgl/examples/others/file_explorer/lv_example_file_exp
    lorer_1.c
319 CC
    ../../lib/lv_bindings/lvgl/examples/others/file_explorer/lv_example_file_exp
    lorer_2.c
320 CC
    ../../lib/lv_bindings/lvgl/examples/others/observer/lv_example_observer_2.c
321 CC
    ../../lib/lv_bindings/lvgl/examples/others/observer/lv_example_observer_5.c
322 CC
    ../../lib/lv_bindings/lvgl/examples/others/observer/lv_example_observer_3.c
323 CC
    ../../lib/lv_bindings/lvgl/examples/others/observer/lv_example_observer_4.c
```


324 CC
../lib/lv_bindings/lvgl/examples/others/observer/lv_example_observer_6.c
325 CC
../lib/lv_bindings/lvgl/examples/others/observer/lv_example_observer_1.c
326 CC
../lib/lv_bindings/lvgl/examples/others/snapshot/lv_example_snapshot_1.c
327 CC ../lib/lv_bindings/lvgl/examples/others/monkey/lv_example_monkey_1.c
328 CC ../lib/lv_bindings/lvgl/examples/others/monkey/lv_example_monkey_2.c
329 CC ../lib/lv_bindings/lvgl/examples/others/monkey/lv_example_monkey_3.c
330 CC
../lib/lv_bindings/lvgl/examples/others/fragment/lv_example_fragment_1.c
331 CC
../lib/lv_bindings/lvgl/examples/others/fragment/lv_example_fragment_2.c
332 CC ../lib/lv_bindings/lvgl/examples/others/gridnav/lv_example_gridnav_1.c
333 CC ../lib/lv_bindings/lvgl/examples/others/gridnav/lv_example_gridnav_4.c
334 CC ../lib/lv_bindings/lvgl/examples/others/gridnav/lv_example_gridnav_3.c
335 CC ../lib/lv_bindings/lvgl/examples/others/gridnav/lv_example_gridnav_2.c
336 CC ../lib/lv_bindings/lvgl/examples/others/ime/lv_example_ime_pinyin_2.c
337 CC ../lib/lv_bindings/lvgl/examples/others/ime/lv_example_ime_pinyin_1.c
338 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_8.c
339 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_11.c
340 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_9.c
341 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_1.c
342 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_13.c
343 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_5.c
344 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_3.c
345 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_6.c
346 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_12.c
347 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_10.c
348 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_14.c
349 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_15.c
350 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_7.c
351 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_2.c
352 CC ../lib/lv_bindings/lvgl/examples/styles/lv_example_style_4.c
353 CC ../lib/lv_bindings/lvgl/examples/assets/img_star.c
354 CC ../lib/lv_bindings/lvgl/examples/assets/imgbtn_mid.c
355 CC ../lib/lv_bindings/lvgl/examples/assets/img_hand.c
356 CC ../lib/lv_bindings/lvgl/examples/assets/img_caret_down.c
357 CC ../lib/lv_bindings/lvgl/examples/assets/animimg002.c
358 CC ../lib/lv_bindings/lvgl/examples/assets/img_skew_strip.c
359 CC ../lib/lv_bindings/lvgl/examples/assets/img_cogwheel_rgb.c
360 CC ../lib/lv_bindings/lvgl/examples/assets/animimg001.c
361 CC ../lib/lv_bindings/lvgl/examples/assets/imgbtn_right.c
362 CC ../lib/lv_bindings/lvgl/examples/assets/animimg003.c
363 CC ../lib/lv_bindings/lvgl/examples/assets/imgbtn_left.c
364 CC ../lib/lv_bindings/lvgl/examples/assets/emoji/img_emoji_F617.c
365 CC ../lib/lv_bindings/lvgl/examples/assets/img_cogwheel_indexed16.c
366 CC ../lib/lv_bindings/lvgl/examples/assets/img_cogwheel_argb.c
367 CC ../lib/lv_bindings/lvgl/examples/scroll/lv_example_scroll_2.c
368 CC ../lib/lv_bindings/lvgl/examples/scroll/lv_example_scroll_4.c
369 CC ../lib/lv_bindings/lvgl/examples/scroll/lv_example_scroll_3.c
370 CC ../lib/lv_bindings/lvgl/examples/scroll/lv_example_scroll_6.c
371 CC ../lib/lv_bindings/lvgl/examples/scroll/lv_example_scroll_1.c
372 CC ../lib/lv_bindings/lvgl/examples/scroll/lv_example_scroll_5.c
373 CC ../lib/lv_bindings/lvgl/examples/layouts/flex/lv_example_flex_3.c
374 CC ../lib/lv_bindings/lvgl/examples/layouts/flex/lv_example_flex_1.c

```
375 CC ../../lib/lv_bindings/lvgl/examples/layouts/flex/lv_example_flex_4.c
376 CC ../../lib/lv_bindings/lvgl/examples/layouts/flex/lv_example_flex_2.c
377 CC ../../lib/lv_bindings/lvgl/examples/layouts/flex/lv_example_flex_6.c
378 CC ../../lib/lv_bindings/lvgl/examples/layouts/flex/lv_example_flex_5.c
379 CC ../../lib/lv_bindings/lvgl/examples/layouts/grid/lv_example_grid_5.c
380 CC ../../lib/lv_bindings/lvgl/examples/layouts/grid/lv_example_grid_2.c
381 CC ../../lib/lv_bindings/lvgl/examples/layouts/grid/lv_example_grid_1.c
382 CC ../../lib/lv_bindings/lvgl/examples/layouts/grid/lv_example_grid_4.c
383 CC ../../lib/lv_bindings/lvgl/examples/layouts/grid/lv_example_grid_6.c
384 CC ../../lib/lv_bindings/lvgl/examples/layouts/grid/lv_example_grid_3.c
385 CC ../../lib/lv_bindings/lvgl/examples/libs/rlottie/lv_example_rlottie_2.c
386 CC ../../lib/lv_bindings/lvgl/examples/libs/rlottie/lv_example_rlottie_1.c
387 CC
    ../../lib/lv_bindings/lvgl/examples/libs/rlottie/lv_example_rlottie_approve.
    c
388 CC ../../lib/lv_bindings/lvgl/examples/libs/libpng/lv_example_libpng_1.c
389 CC ../../lib/lv_bindings/lvgl/examples/libs/tiny_ttf/lv_example_tiny_ttf_3.c
390 CC ../../lib/lv_bindings/lvgl/examples/libs/tiny_ttf/lv_example_tiny_ttf_2.c
391 CC ../../lib/lv_bindings/lvgl/examples/libs/tiny_ttf/ubuntu_font.c
392 CC ../../lib/lv_bindings/lvgl/examples/libs/tiny_ttf/lv_example_tiny_ttf_1.c
393 CC ../../lib/lv_bindings/lvgl/examples/libs/barcode/lv_example_barcode_1.c
394 CC ../../lib/lv_bindings/lvgl/examples/libs/bmp/lv_example_bmp_1.c
395 CC ../../lib/lv_bindings/lvgl/examples/libs/lodepng/lv_example_lodepng_1.c
396 CC ../../lib/lv_bindings/lvgl/examples/libs/lodepng/img_wink_png.c
397 CC ../../lib/lv_bindings/lvgl/examples/libs/tjpgd/lv_example_tjpgd_1.c
398 CC ../../lib/lv_bindings/lvgl/examples/libs/gif/img_bulb_gif.c
399 CC ../../lib/lv_bindings/lvgl/examples/libs/gif/lv_example_gif_1.c
400 CC ../../lib/lv_bindings/lvgl/examples/libs/qrcode/lv_example_qrcode_1.c
401 CC ../../lib/lv_bindings/lvgl/examples/libs/freetype/lv_example_freetype_1.c
402 CC
    ../../lib/lv_bindings/lvgl/examples/libs/libjpeg_turbo/lv_example_libjpeg_tu
    rbo_1.c
403 CC ../../lib/lv_bindings/lvgl/examples/libs/ffmpeg/lv_example_ffmpeg_1.c
404 CC ../../lib/lv_bindings/lvgl/examples/libs/ffmpeg/lv_example_ffmpeg_2.c
405 CC
    ../../lib/lv_bindings/lvgl/examples/get_started/lv_example_get_started_1.c
406 CC
    ../../lib/lv_bindings/lvgl/examples/get_started/lv_example_get_started_3.c
407 CC
    ../../lib/lv_bindings/lvgl/examples/get_started/lv_example_get_started_4.c
408 CC
    ../../lib/lv_bindings/lvgl/examples/get_started/lv_example_get_started_2.c
409 CC ../../lib/lv_bindings/lvgl/examples/event/lv_example_event_1.c
410 CC ../../lib/lv_bindings/lvgl/examples/event/lv_example_event_2.c
411 CC ../../lib/lv_bindings/lvgl/examples/event/lv_example_event_4.c
412 CC ../../lib/lv_bindings/lvgl/examples/event/lv_example_event_3.c
413 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/dropdown/lv_example_dropdown_3.c
414 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/dropdown/lv_example_dropdown_1.c
415 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/dropdown/lv_example_dropdown_2.c
416 CC ../../lib/lv_bindings/lvgl/examples/widgets/arc/lv_example_arc_2.c
417 CC ../../lib/lv_bindings/lvgl/examples/widgets/arc/lv_example_arc_1.c
418 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/keyboard/lv_example_keyboard_1.c
```

```
419 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/keyboard/lv_example_keyboard_2.c
420 CC ../../lib/lv_bindings/lvgl/examples/widgets/line/lv_example_line_1.c
421 CC ../../lib/lv_bindings/lvgl/examples/widgets/scale/lv_example_scale_5.c
422 CC ../../lib/lv_bindings/lvgl/examples/widgets/scale/lv_example_scale_2.c
423 CC ../../lib/lv_bindings/lvgl/examples/widgets/scale/lv_example_scale_1.c
424 CC ../../lib/lv_bindings/lvgl/examples/widgets/scale/lv_example_scale_4.c
425 CC ../../lib/lv_bindings/lvgl/examples/widgets/scale/lv_example_scale_3.c
426 CC ../../lib/lv_bindings/lvgl/examples/widgets/switch/lv_example_switch_1.c
427 CC ../../lib/lv_bindings/lvgl/examples/widgets/slider/lv_example_slider_4.c
428 CC ../../lib/lv_bindings/lvgl/examples/widgets/slider/lv_example_slider_1.c
429 CC ../../lib/lv_bindings/lvgl/examples/widgets/slider/lv_example_slider_2.c
430 CC ../../lib/lv_bindings/lvgl/examples/widgets/slider/lv_example_slider_3.c
431 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_5.c
432 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_1.c
433 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_3.c
434 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_2.c
435 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_7.c
436 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_4.c
437 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_8.c
438 CC ../../lib/lv_bindings/lvgl/examples/widgets/canvas/lv_example_canvas_6.c
439 CC ../../lib/lv_bindings/lvgl/examples/widgets/button/lv_example_button_2.c
440 CC ../../lib/lv_bindings/lvgl/examples/widgets/button/lv_example_button_3.c
441 CC ../../lib/lv_bindings/lvgl/examples/widgets/button/lv_example_button_1.c
442 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/checkbox/lv_example_checkbox_2.c
443 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/checkbox/lv_example_checkbox_1.c
444 CC ../../lib/lv_bindings/lvgl/examples/widgets/span/lv_example_span_1.c
445 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/spinner/lv_example_spinner_1.c
446 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/imagebutton/lv_example_imagebutt
on_1.c
447 CC ../../lib/lv_bindings/lvgl/examples/widgets/roller/lv_example_roller_3.c
448 CC ../../lib/lv_bindings/lvgl/examples/widgets/roller/lv_example_roller_2.c
449 CC ../../lib/lv_bindings/lvgl/examples/widgets/roller/lv_example_roller_1.c
450 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/tabview/lv_example_tabview_2.c
451 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/tabview/lv_example_tabview_1.c
452 CC ../../lib/lv_bindings/lvgl/examples/widgets/label/lv_example_label_3.c
453 CC ../../lib/lv_bindings/lvgl/examples/widgets/label/lv_example_label_4.c
454 CC ../../lib/lv_bindings/lvgl/examples/widgets/label/lv_example_label_5.c
455 CC ../../lib/lv_bindings/lvgl/examples/widgets/label/lv_example_label_2.c
456 CC ../../lib/lv_bindings/lvgl/examples/widgets/label/lv_example_label_1.c
457 CC ../../lib/lv_bindings/lvgl/examples/widgets/menu/lv_example_menu_4.c
458 CC ../../lib/lv_bindings/lvgl/examples/widgets/menu/lv_example_menu_5.c
459 CC ../../lib/lv_bindings/lvgl/examples/widgets/menu/lv_example_menu_2.c
460 CC ../../lib/lv_bindings/lvgl/examples/widgets/menu/lv_example_menu_3.c
461 CC ../../lib/lv_bindings/lvgl/examples/widgets/menu/lv_example_menu_1.c
462 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/textarea/lv_example_textarea_2.c
463 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/textarea/lv_example_textarea_3.c
```

```

464 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/textarea/lv_example_textarea_1.c
465 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/animimg/lv_example_animimg_1.c
466 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/tileview/lv_example_tileview_1.c
467 CC ../../lib/lv_bindings/lvgl/examples/widgets/image/lv_example_image_2.c
468 CC ../../lib/lv_bindings/lvgl/examples/widgets/image/lv_example_image_1.c
469 CC ../../lib/lv_bindings/lvgl/examples/widgets/image/lv_example_image_4.c
470 CC ../../lib/lv_bindings/lvgl/examples/widgets/image/lv_example_image_3.c
471 CC ../../lib/lv_bindings/lvgl/examples/widgets/obj/lv_example_obj_2.c
472 CC ../../lib/lv_bindings/lvgl/examples/widgets/obj/lv_example_obj_1.c
473 CC ../../lib/lv_bindings/lvgl/examples/widgets/bar/lv_example_bar_4.c
474 CC ../../lib/lv_bindings/lvgl/examples/widgets/bar/lv_example_bar_3.c
475 CC ../../lib/lv_bindings/lvgl/examples/widgets/bar/lv_example_bar_6.c
476 CC ../../lib/lv_bindings/lvgl/examples/widgets/bar/lv_example_bar_5.c
477 CC ../../lib/lv_bindings/lvgl/examples/widgets/bar/lv_example_bar_1.c
478 CC ../../lib/lv_bindings/lvgl/examples/widgets/bar/lv_example_bar_2.c
479 CC ../../lib/lv_bindings/lvgl/examples/widgets/bar/lv_example_bar_7.c
480 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/buttonmatrix/lv_example_buttonma
trix_2.c
481 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/buttonmatrix/lv_example_buttonma
trix_1.c
482 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/buttonmatrix/lv_example_buttonma
trix_3.c
483 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_6.c
484 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_3.c
485 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_5.c
486 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_2.c
487 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_4.c
488 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_7.c
489 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_1.c
490 CC ../../lib/lv_bindings/lvgl/examples/widgets/chart/lv_example_chart_8.c
491 CC ../../lib/lv_bindings/lvgl/examples/widgets/msgbox/lv_example_msgbox_1.c
492 CC ../../lib/lv_bindings/lvgl/examples/widgets/list/lv_example_list_1.c
493 CC ../../lib/lv_bindings/lvgl/examples/widgets/list/lv_example_list_2.c
494 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/spinbox/lv_example_spinbox_1.c
495 CC ../../lib/lv_bindings/lvgl/examples/widgets/win/lv_example_win_1.c
496 CC
    ../../lib/lv_bindings/lvgl/examples/widgets/calendar/lv_example_calendar_1.c
497 CC ../../lib/lv_bindings/lvgl/examples/widgets/led/lv_example_led_1.c
498 CC ../../lib/lv_bindings/lvgl/examples/widgets/table/lv_example_table_1.c
499 CC ../../lib/lv_bindings/lvgl/examples/widgets/table/lv_example_table_2.c
500 CC main.c
501 LINK build-standard/micropython
502      text      data      bss      dec      hex filename
503 1741466 225840 7472 1974778 1e21fa build-standard/micropython
504 make: Leaving directory '/home/rini-debian/git-stash/lvgl-ui-
detector/lvgl_ui_generator_v2/lv_micropython/ports/unix'

```

Usage

```
1 usage: src/main.py [-h] [-m, --mode mode] [-?, --usage] [-n, --normalize] [-o, --output_file output_file]
2
3 Process CLI arguments for the UI generator.
4
5 optional args:
6   -h, --help                show this message and exit
7   -m, --mode mode           the mode to run the program in
8   -?, --usage               Print usage information for that mode.
9   -n, --normalize           normalize the bounding boxes
10  -o, --output_file output_file The output file (screenshot)
```

TL;DR

To quickly generate a user interface without prior knowledge of the CLI, use the following commands to copy & paste:

Random mode

Run via `invoke`:

```
1 poetry run invoke generate-random
```

or via `poetry`:

```
1 poetry run micropython src/main.py -m random --normalize -o screenshot.jpg -W 640 -H 640 -c 4 -l none --random-state -t arc bar button buttonmatrix calendar checkbox dropdown label roller scale slider spinbox switch table textarea
```

or directly:

```
1 ./lv_micropython/ports/unix/build-standard/micropython src/main.py -m random --normalize -o screenshot.jpg -W 640 -H 640 -c 4 -l none --random-state -t arc bar button buttonmatrix calendar checkbox dropdown label roller scale slider spinbox switch table textarea
```

Design mode

Run via `invoke`:

```
1 poetry run invoke generate-design
```

or via `poetry`:

```
1 poetry run micropython src/main.py -m design --normalize -f ./designs/widgets_showcase.json -o screenshot.jpg
```

or directly:

```
1 | ./lv_micropython/ports/unix/build-standard/micropython src/main.py -m design -  
-normalize -f ./designs/widgets_showcase.json -o screenshot.jpg
```

Usage of random mode

```
1 | usage: src/main.py [-h] [-m, --mode mode] [-?, --usage] [-n, --normalize] [-o, --output_file output_file] [-w, --width width] [-H, --height height] [-c, --widget_count widget_count] [-t, --widget_types widget_types+] [-l, --layout layout] [--random-state]
2
3 | Process CLI arguments for the UI generator.
4
5 | optional args:
6 |   -h, --help                show this message and exit
7 |   -m, --mode                mode the mode to run the program in
8 |   -?, --usage               Print usage information for that mode.
9 |   -n, --normalize           normalize the bounding boxes
10 |  -o, --output_file output_file The output file (screenshot)
11 |  -w, --width width          the width of the UI
12 |  -H, --height height        the height of the UI
13 |  -c, --widget_count widget_count the count of widgets
14 |  -t, --widget_types widget_types+ A list of widget types
15 |  -l, --layout layout        the layout option
16 |  --random-state             Use a random state for each created
                             widget (experimental)
```

Widget types

Not all widget types of LittlevGL are implemented yet. You may use non-implemented widget types, but they probably will not be displayed properly or simply exist in their default state, if they have one.

The names of widget types are the lowercase names of the classes in the LittlevGL library, e.g. `lv_arc` is `arc`.

► Details

Implemented types

- Arc
- Bar
- Button
- Buttonmatrix
- Calendar
- Checkbox
- Dropdown
- Label
- Roller
- Scale
- Slider

- Spinbox
- Switch
- Table
- Textarea

Layouts

The generator supports different layouts to structure the widgets inside the container. The following layouts are available:

- `none`: No layout, widgets are placed using absolute positioning. This is the default layout and recommended to use. To avoid overlapping widgets, the generator will try to find a free spot using a approximated spatial map of the UI.
- `flex`: A layout, which will align widgets in either row or column, fitting as needed. The flex mode used is hardcoded to `ROW_WRAP`, which means that the widgets will be placed in a row, and if the row is full, the next widget will be placed in the next row.
- `grid`: A layout, which will align widgets in a grid. The grid layout is not yet implemented, since it is very error-prone in the way widgets are randomly created and placed.

Style randomization

The generator will always randomize the style of each widget upon creation.

It does so by randomly choosing multiple properties from a list of hardcoded properties and setting a random value for each of them. The hardcoded list can be found in the `randomize_style()` function of `src/random_ui.py`, but for convenience is also provided below.

The generator will randomize at least 3 properties, up to the length of the hardcoded property list.

The properties are applied to the widget by first creating a style object, then setting the properties on the style object and finally applying the style to the widget. This should avoid issues with properties not being available or applicable for certain widget types.

► Details

List of style properties used for randomization

- `set_bg_color` -> `lv.color_hex(random.randint(0, 0xFFFFFF))`
- `set_bg_opa` -> `random.randint(0, 100)`
- `set_border_color` -> `lv.color_hex(random.randint(0, 0xFFFFFF))`
- `set_border_opa` -> `random.randint(0, 100)`
- `set_border_width` -> `random.randint(0, 10)`
- `set_outline_width` -> `random.randint(0, 10)`
- `set_outline_color` -> `lv.color_hex(random.randint(0, 0xFFFFFF))`
- `set_outline_opa` -> `random.randint(0, 100)`
- `set_shadow_width` -> `random.randint(0, 15)`
- `set_shadow_offset_x` -> `random.randint(0, 10)`
- `set_shadow_offset_y` -> `random.randint(0, 10)`
- `set_shadow_color` -> `lv.color_hex(random.randint(0, 0xFFFFFF))`

- `set_shadow_opa` -> `random.randint(0, 100)`
- `set_line_width` -> `random.randint(0, 10)`
- `set_line_dash_width` -> `random.randint(0, 10)`
- `set_line_dash_gap` -> `random.randint(0, 10)`
- `set_line_rounded` -> `random.choice([True, False])`
- `set_line_color` -> `lv.color_hex(random.randint(0, 0xFFFFFF))`
- `set_line_opa` -> `random.randint(0, 100)`
- `set_text_color` -> `lv.color_hex(random.randint(0, 0xFFFFFF))`
- `set_text_opa` -> `random.randint(0, 100)`
- `set_text_letter_space` -> `random.randint(0, 10)`
- `set_text_line_space` -> `random.randint(0, 10)`
- `set_opa` -> `random.randint(0, 100)`
- `set_align` -> `random.choice([lv.ALIGN.CENTER, lv.ALIGN.TOP_LEFT, lv.ALIGN.TOP_RIGHT, lv.ALIGN.TOP_MID, lv.ALIGN.BOTTOM_LEFT, lv.ALIGN.BOTTOM_RIGHT, lv.ALIGN.BOTTOM_MID, lv.ALIGN.LEFT_MID, lv.ALIGN.RIGHT_MID, lv.ALIGN.DEFAULT])`
- `set_pad_all` -> `random.randint(0, 10)`
- `set_pad_hor` -> `random.randint(0, 10)`
- `set_pad_ver` -> `random.randint(0, 10)`
- `set_pad_gap` -> `random.randint(0, 10)`
- `set_pad_top` -> `random.randint(0, 10)`
- `set_pad_bottom` -> `random.randint(0, 10)`
- `set_pad_left` -> `random.randint(0, 10)`
- `set_pad_right` -> `random.randint(0, 10)`
- `set_pad_row` -> `random.randint(0, 10)`
- `set_pad_column` -> `random.randint(0, 10)`
- `set_margin_top` -> `random.randint(0, 10)`
- `set_margin_bottom` -> `random.randint(0, 10)`
- `set_margin_left` -> `random.randint(0, 10)`
- `set_margin_right` -> `random.randint(0, 10)`

State randomization

The `--random-state` flag will randomize the state of each widget upon creation.

This is an experimental feature, as it is not always desired to be used. Additionally, randomizing the state of a widget may lead to a widget not being displayed, due to random choice of a state that is either not supported by the widget or the state hiding the widget in general.

It may also simply not affect the widget at all, which is another reason I have provided this as an optional flag.

► Details

List of widget states used for randomization

- `lv.STATE.CHECKED`
- `lv.STATE.DISABLED`
- `lv.STATE.FOCUSED`
- `lv.STATE.PRESSED`
- `lv.STATE.HOVERED`
- `lv.STATE.EDITED`

Design mode

```
1  usage: src/main.py [-h] [-m, --mode mode] [-?, --usage] [-n, --normalize] [-o, --output_file output_file] [-f, --file file]
2
3  Process CLI arguments for the UI generator.
4
5  optional args:
6      -h, --help                show this message and exit
7      -m, --mode mode           the mode to run the program in
8      -?, --usage               Print usage information for that
                                mode.
9      -n, --normalize           normalize the bounding boxes
10     -o, --output_file output_file The output file (screenshot)
11     -f, --file                file path to JSON design file
```

Design file specification

Design files need to be valid according to the [JSON schema \(design_file.schema.json\)](#).

If design files are invalid, the design parser will throw a `ValueError` whenever it encounters required objects that are missing or have the wrong type.

For widget definition, not all properties are required and if some are missing, the generator will make up for it by randomly choosing an appropriate value.

For example, if you create the `Label` widget and do not provide a `text` property, the generator will choose a random amount of symbols from the displayable ASCII table and set it as the text of the label.

The overall structure of the design file should look like this:

```
1  {
2      "$schema": "./schema/design_file.schema.json",
3      "ui": {
4          "window": {
5              "width": 640,
6              "height": 640,
7              "title": "Example design file"
8          },
9          "root": {
10             "id": "main_container",
11             "type": "container",
12             "options": {
```

```

13         "layout_type": "none"
14     },
15     "style": [
16         "main_container_style"
17     ],
18     "children": [
19         ...
20     ]
21 },
22 "styles": {
23     ...
24 }
25 }
26 }

```

Have a look at the [designs folder](#) for examples of design files. The [widgets_showcase.json](#) file is a good starting point to see usage of all implemented widget types.

General design file rules & notes

Writing a design parser is a bit complicated, so there are some rules to follow when creating a design file:

1. It is mandatory that the first widget object in `root` is a container, as the root widget is always a container (*in any UI framework as far as I am aware*). **Unexpected/error behavior will occur if this is not the case.**
2. The title of the window is not mandatory and also not used by the generator. It is only there for reference to the user possibly looking through dozens of design files.
3. The `styles` object is optional and can be omitted if no styles are defined.
4. Added styles are referenced by their name in the `style` array of each widget. If a style is not found, the generator will throw a `ValueError`.
5. A style defines a list of properties that are applied to widgets via the usage of a `lv.style_t` object. The possible properties are the same as documented in the [LittlevGL API for styles](#). Properties are verified by checking if the specified name has a corresponding `setter` attribute in the `lv.style_t` object. This is done by appending `set_` to the property name, thus you are required to use the property setter function names without the `set_` prefix. For example, to set the background color of a widget, you would use the property `bg_color`. The generator will then look for the `set_bg_color` attribute in the `lv.style_t` object and apply the converted value to it.
6. If a provided `property` inside a `style` object does not actually correspond to an available attribute in `lv.style_t`, the generator will ignore it and continue.
7. Values supplied to style properties are converted according to the required type of the property. Some properties taking in special objects, like colors, require a specific string to be supplied (e.g. `#AABBCC` for any color property or `top-left` for the `align` property). You can checkout the details of the value conversion in the function `convert_value()` of `design_parser.py`.
8. If value conversion fails, the property is ignored and the generator will ignore it and continue.
9. The `id` property is mandatory for widgets of type `container`, as it is required to reference the container inside the `children` array, when the special widget type `random` is used.

10. The special widget type `random` may be used to supply a list of widget types for the generator to randomly choose from and then create a random widget in similar fashion to the random mode. This is useful for randomizing widgets in certain areas of the UI, while keeping the rest of the UI static.

Validating design files

You can validate your design files against the available JSON schema in the repository by using the `jsonschema` package in python. Keep in mind, that `micropython` does not have this package and you will need to use the regular python interpreter to do this.

This is usually more descriptive than the error messages provided by the generator.

Here is a simple script to validate a design file:

► Details

validate_design.py

```
1 def load_json_file(filepath: str):
2     import json
3     with open(filepath, 'r') as f:
4         return json.load(f)
5
6 def verify_design_from_file(design_file: str, schema_file: str) ->
tuple[bool, Exception]:
7     from jsonschema import validate
8     from jsonschema.exceptions import ValidationError
9     design = load_json_file(design_file)
10    schema = load_json_file(schema_file)
11    try:
12        validate(instance=design, schema=schema)
13        print(f"Provided design file {design_file} is valid.")
14        return True, None
15    except ValidationError as e:
16        print(f"Provided design file {design_file} is invalid:\n{e}")
17        return False, e
18
19 if __name__ == '__main__':
20     verify_design_from_file('path/to/design_file.json',
'path/to/design_file.schema.json')
```

Development

Inside the `stubs` folder is the `lvgl.pyi` stubs file, which contains type hints for the [LVGL micropython bindings](#). This is useful for development in an IDE that supports type hinting, like VS Code with the Python extension.

The `settings.json` file in the `.vscode` folder contains the necessary settings to enable type hinting for the `lvgl.pyi` file in Visual Studio Code.

The stubs file was generated by [kdschlosser](#) and supplied to me during a [discussion on the LVGL forum](#).

The used stub generator for this file can be viewed [in this PR](#) and is generally not merged yet into LVGL, so it is not complete and may cause errors.

The created stubs file also may not cover all functions and classes of the LittlevGL bindings, but generally covers enough and linting errors are more of a nuisance than a real issue.

Known issues

- Creating a screenshot using the [snapshot API of LittlevGL](#) certainly causes memory leakage due to the manually added JPEG encoding mechanism in `screenshot.py` and dereferencing of the data buffer. It is hard to deal with this without a proper JPG encoder library built into micropython binary. The memory leakage is not too severe and I attempted to mitigate it by attempting to always free the snapshot buffer using `lv.snapshot_free()` but it is not fool-proof.
- The generator may sometimes cause a memory allocation error when attempting to create the JPG buffer for the screenshot. This is due to the fact that the JPG buffer is created in heap and knowingly it is limited in size. The generator will attempt to free the buffer after the screenshot is taken, but it is not guaranteed that the buffer is freed properly. This is a known issue and there is no solution as of yet. You can try to run the generator again and it might work again after the OS has cleared up some memory.
- The JPG output of the screenshot may sometimes be corrupted or the image data is heavily distorted. This is due to race conditions between creating the snapshot buffer and LVGL re-rendering the UI. It is currently not possible to mitigate this issue without writing a custom C library for LVGL which will handle the snapshot creation and JPEG encoding in a more controlled manner. The LVGL bindings do not have exposed APIs to handle this inside micropython as far as I know.

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