

libg15render Reference Manual

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Chapter 1

libg15render Data Structure Index

1.1 libg15render Data Structures

Here are the data structures with brief descriptions:

g15canvas (This structure holds the data need to render objects to the LCD screen) . 5

Chapter 2

libg15render File Index

2.1 libg15render File List

Here is a list of all files with brief descriptions:

config.h	7
libg15render.h	10
pixel.c	32
screen.c	45
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Chapter 3

libg15render Data Structure Documentation

3.1 g15canvas Struct Reference

This structure holds the data need to render objects to the LCD screen.

```
#include <libg15render.h>
```

Data Fields

- unsigned char **buffer** [G15_BUFFER_LEN]
- FT_Library **ftLib**
- int **mode_cache**
- int **mode_reverse**
- int **mode_xor**
- FT_Face **ttf_face** [G15_MAX_FACE][sizeof(FT_Face)]
- int **ttf_fontsize** [G15_MAX_FACE]

3.1.1 Detailed Description

This structure holds the data need to render objects to the LCD screen.

Definition at line 36 of file libg15render.h.

3.1.2 Field Documentation

3.1.2.1 unsigned char g15canvas::buffer[G15_BUFFER_LEN]

g15canvas::buffer (p. 5)[] is a buffer holding the pixel data to be sent to the LCD.

Definition at line 39 of file libg15render.h.

Referenced by g15r_clearScreen(), g15r_getPixel(), g15r_initCanvas(), g15r_loadWbmpSplash(), and g15r_setPixel().

3.1.2.2 FT_Library g15canvas::ftLib

Definition at line 47 of file libg15render.h.

Referenced by draw_ttf_char(), g15r_initCanvas(), and g15r_ttfLoad().

3.1.2.3 int g15canvas::mode_cache

g15canvas::mode_cache (p. 6) can be used to determine whether caching should be used in an application.

Definition at line 43 of file libg15render.h.

Referenced by g15r_initCanvas().

3.1.2.4 int g15canvas::mode_reverse

g15canvas::mode_reverse (p. 6) determines whether color values passed to g15r_setPixel are reversed.

Definition at line 45 of file libg15render.h.

Referenced by g15r_initCanvas(), and g15r_setPixel().

3.1.2.5 int g15canvas::mode_xor

g15canvas::mode_xor (p. 6) determines whether xor processing is used in g15r_setPixel.

Definition at line 41 of file libg15render.h.

Referenced by g15r_initCanvas(), and g15r_setPixel().

3.1.2.6 FT_Face g15canvas::ttf_face[G15_MAX_FACE][sizeof(FT_Face)]

Definition at line 48 of file libg15render.h.

Referenced by g15r_ttfLoad(), and g15r_ttfPrint().

3.1.2.7 int g15canvas::ttf_fontsize[G15_MAX_FACE]

Definition at line 49 of file libg15render.h.

Referenced by g15r_ttfLoad(), and g15r_ttfPrint().

The documentation for this struct was generated from the following file:

- libg15render.h

Chapter 4

libg15render File Documentation

4.1 config.h File Reference

Defines

- `#define HAVE_DLFCN_H 1`
- `#define HAVE_FT2BUILD_H 1`
- `#define HAVE_INTTYPES_H 1`
- `#define HAVE_LIBG15 1`
- `#define HAVE_LIBM 1`
- `#define HAVE_MEMORY_H 1`
- `#define HAVE_MEMSET 1`
- `#define HAVE_STDINT_H 1`
- `#define HAVE_STDLIB_H 1`
- `#define HAVE_STRING_H 1`
- `#define HAVE_STRINGS_H 1`
- `#define HAVE_SYS_STAT_H 1`
- `#define HAVE_SYS_TYPES_H 1`
- `#define HAVE_UNISTD_H 1`
- `#define PACKAGE "libg15render"`
- `#define PACKAGE_BUGREPORT "mirabeaj@gmail.com"`
- `#define PACKAGE_NAME "libg15render"`
- `#define PACKAGE_STRING "libg15render 1.2"`
- `#define PACKAGE_TARNAME "libg15render"`
- `#define PACKAGE_VERSION "1.2"`
- `#define STDC_HEADERS 1`
- `#define TTF_SUPPORT 1`
- `#define VERSION "1.2"`

4.1.1 Define Documentation

4.1.1.1 `#define HAVE_DLFCN_H 1`

Definition at line 5 of file config.h.

4.1.1.2 #define HAVE_FT2BUILD_H 1

Definition at line 8 of file config.h.

4.1.1.3 #define HAVE_INTTYPES_H 1

Definition at line 11 of file config.h.

4.1.1.4 #define HAVE_LIBG15 1

Definition at line 14 of file config.h.

4.1.1.5 #define HAVE_LIBM 1

Definition at line 17 of file config.h.

4.1.1.6 #define HAVE_MEMORY_H 1

Definition at line 20 of file config.h.

4.1.1.7 #define HAVE_MEMSET 1

Definition at line 23 of file config.h.

4.1.1.8 #define HAVE_STDINT_H 1

Definition at line 26 of file config.h.

4.1.1.9 #define HAVE_STDLIB_H 1

Definition at line 29 of file config.h.

4.1.1.10 #define HAVE_STRING_H 1

Definition at line 35 of file config.h.

4.1.1.11 #define HAVE_STRINGS_H 1

Definition at line 32 of file config.h.

4.1.1.12 #define HAVE_SYS_STAT_H 1

Definition at line 38 of file config.h.

4.1.1.13 #define HAVE_SYS_TYPES_H 1

Definition at line 41 of file config.h.

4.1.1.14 #define HAVE_UNISTD_H 1

Definition at line 44 of file config.h.

4.1.1.15 #define PACKAGE "libg15render"

Definition at line 47 of file config.h.

4.1.1.16 #define PACKAGE_BUGREPORT "mirabeaj@gmail.com"

Definition at line 50 of file config.h.

4.1.1.17 #define PACKAGE_NAME "libg15render"

Definition at line 53 of file config.h.

4.1.1.18 #define PACKAGE_STRING "libg15render 1.2"

Definition at line 56 of file config.h.

4.1.1.19 #define PACKAGE_TARNAME "libg15render"

Definition at line 59 of file config.h.

4.1.1.20 #define PACKAGE_VERSION "1.2"

Definition at line 62 of file config.h.

4.1.1.21 #define STDC_HEADERS 1

Definition at line 65 of file config.h.

4.1.1.22 #define TTF_SUPPORT 1

Definition at line 68 of file config.h.

4.1.1.23 #define VERSION "1.2"

Definition at line 71 of file config.h.

4.2 libg15render.h File Reference

```
#include <string.h>
#include <ft2build.h>
```

Data Structures

- struct **g15canvas**

This structure holds the data need to render objects to the LCD screen.

Defines

- #define **BYTE_SIZE** 8
- #define **G15_BUFFER_LEN** 1048
- #define **G15_COLOR_BLACK** 1
- #define **G15_COLOR_WHITE** 0
- #define **G15_LCD_HEIGHT** 43
- #define **G15_LCD_OFFSET** 32
- #define **G15_LCD_WIDTH** 160
- #define **G15_MAX_FACE** 5
- #define **G15_PIXEL_FILL** 1
- #define **G15_PIXEL_NOFILL** 0
- #define **G15_TEXT_LARGE** 2
- #define **G15_TEXT_MED** 1
- #define **G15_TEXT_SMALL** 0

Functions

- void **g15r_clearScreen** (**g15canvas** *canvas, int color)
Fills the screen with pixels of color.
- void **g15r_drawBar** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int color, int num, int max, int type)
Draws a completion bar.
- void **g15r_drawBigNum** (**g15canvas** *canvas, unsigned int x1, unsigned int y1, unsigned int x2, unsigned int y2, int color, int num)
Draw a large number.
- void **g15r_drawCircle** (**g15canvas** *canvas, int x, int y, int r, int fill, int color)
Draws a circle centered at (x, y) with a radius of r.
- void **g15r_drawIcon** (**g15canvas** *canvas, char *buf, int my_x, int my_y, int width, int height)
Draw an icon to the screen from a wbmp buffer.
- void **g15r_drawLine** (**g15canvas** *canvas, int px1, int py1, int px2, int py2, const int color)

Draws a line from (px1, py1) to (px2, py2).

- void **g15r_drawRoundBox** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int fill, int color)

Draws a box with rounded corners bounded by (x1, y1) and (x2, y2).

- void **g15r_drawSprite** (**g15canvas** *canvas, char *buf, int my_x, int my_y, int width, int height, int start_x, int start_y, int total_width)

Draw a sprite to the screen from a wbmp buffer.

- int **g15r_getPixel** (**g15canvas** *canvas, unsigned int x, unsigned int y)

Gets the value of the pixel at (x, y).

- void **g15r_initCanvas** (**g15canvas** *canvas)

Clears the canvas and resets the mode switches.

- int **g15r_loadWbmpSplash** (**g15canvas** *canvas, char *filename)

Draw a splash screen from 160x43 wbmp file.

- char * **g15r_loadWbmpToBuf** (char *filename, int *img_width, int *img_height)

Load a wbmp file into a buffer.

- void **g15r_pixelBox** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int color, int thick, int fill)

Draws a box bounded by (x1, y1) and (x2, y2).

- void **g15r_pixelOverlay** (**g15canvas** *canvas, int x1, int y1, int width, int height, short colormap[])

Overlays a bitmap of size width x height starting at (x1, y1).

- void **g15r_pixelReverseFill** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int fill, int color)

Fills an area bounded by (x1, y1) and (x2, y2).

- void **g15r_renderCharacterLarge** (**g15canvas** *canvas, int x, int y, unsigned char character, unsigned int sx, unsigned int sy)

Renders a character in the large font at (x, y).

- void **g15r_renderCharacterMedium** (**g15canvas** *canvas, int x, int y, unsigned char character, unsigned int sx, unsigned int sy)

Renders a character in the medium font at (x, y).

- void **g15r_renderCharacterSmall** (**g15canvas** *canvas, int x, int y, unsigned char character, unsigned int sx, unsigned int sy)

Renders a character in the small font at (x, y).

- void **g15r_renderString** (**g15canvas** *canvas, unsigned char stringOut[], int row, int size, unsigned int sx, unsigned int sy)

Renders a string with font size in row.

- void **g15r_setPixel** (**g15canvas** *canvas, unsigned int x, unsigned int y, int val)

Sets the value of the pixel at (x, y).

- void **g15r_ttfLoad** (**g15canvas** *canvas, char *fontname, int fontsize, int face_num)
Loads a font through the FreeType2 library.
- void **g15r_ttfPrint** (**g15canvas** *canvas, int x, int y, int fontsize, int face_num, int color, int center, char *print_string)
Prints a string in a given font.

Variables

- unsigned char **fontdata_6x4** []
Font data for the small (6x4) font.
- unsigned char **fontdata_7x5** []
Font data for the medium (7x5) font.
- unsigned char **fontdata_8x8** []
Font data for the large (8x8) font.

4.2.1 Define Documentation

4.2.1.1 #define BYTE_SIZE 8

Definition at line 21 of file libg15render.h.

Referenced by g15r_drawIcon(), g15r_drawSprite(), g15r_getPixel(), g15r_loadWbmpToBuf(), and g15r_setPixel().

4.2.1.2 #define G15_BUFFER_LEN 1048

Definition at line 22 of file libg15render.h.

Referenced by g15r_clearScreen(), g15r_initCanvas(), and g15r_loadWbmpSplash().

4.2.1.3 #define G15_COLOR_BLACK 1

Definition at line 27 of file libg15render.h.

Referenced by g15r_drawRoundBox(), g15r_pixelOverlay(), g15r_renderCharacterLarge(), g15r_renderCharacterMedium(), and g15r_renderCharacterSmall().

4.2.1.4 #define G15_COLOR_WHITE 0

Definition at line 26 of file libg15render.h.

Referenced by g15r_drawRoundBox(), g15r_pixelOverlay(), g15r_renderCharacterLarge(), g15r_renderCharacterMedium(), and g15r_renderCharacterSmall().

4.2.1.5 #define G15_LCD_HEIGHT 43

Definition at line 24 of file libg15render.h.

Referenced by g15r_getPixel(), and g15r_setPixel().

4.2.1.6 #define G15_LCD_OFFSET 32

Definition at line 23 of file libg15render.h.

4.2.1.7 #define G15_LCD_WIDTH 160

Definition at line 25 of file libg15render.h.

Referenced by g15r_getPixel(), and g15r_setPixel().

4.2.1.8 #define G15_MAX_FACE 5

Definition at line 33 of file libg15render.h.

Referenced by g15r_ttfLoad().

4.2.1.9 #define G15_PIXEL_FILL 1

Definition at line 32 of file libg15render.h.

4.2.1.10 #define G15_PIXEL_NOFILL 0

Definition at line 31 of file libg15render.h.

4.2.1.11 #define G15_TEXT_LARGE 2

Definition at line 30 of file libg15render.h.

Referenced by g15r_renderString().

4.2.1.12 #define G15_TEXT_MED 1

Definition at line 29 of file libg15render.h.

Referenced by g15r_renderString().

4.2.1.13 #define G15_TEXT_SMALL 0

Definition at line 28 of file libg15render.h.

Referenced by g15r_renderString().

4.2.2 Function Documentation

4.2.2.1 void g15r_clearScreen (g15canvas * *canvas*, int *color*)

Fills the screen with pixels of color.

Clears the screen and fills it with pixels of color

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

color Screen will be filled with this color.

Definition at line 80 of file screen.c.

References g15canvas::buffer, and G15_BUFFER_LEN.

```
81 {
82     memset (canvas->buffer, (color ? 0xFF : 0), G15_BUFFER_LEN);
83 }
```

4.2.2.2 void g15r_drawBar (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *color*, int *num*, int *max*, int *type*)

Draws a completion bar.

Given a maximum value, and a value between 0 and that maximum value, calculate and draw a bar showing that percentage.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the bar.

y1 Defines uppermost bound of the bar.

x2 Defines rightmost bound of the bar.

y2 Defines bottommost bound of the bar.

color The bar will be drawn this color.

num Number of units relative to max filled.

max Number of units equal to 100% filled.

type Type of bar. 1=solid bar, 2=solid bar with border, 3 = solid bar with I-frame.

Definition at line 337 of file pixel.c.

References g15r_drawLine(), and g15r_pixelBox().

```
339 {
340     float len, length;
341     int x;
342     if (max == 0)
343         return;
344     if (num > max)
345         num = max;
346
347     if (type == 2)
```

```

348     {
349         y1 += 2;
350         y2 -= 2;
351         x1 += 2;
352         x2 -= 2;
353     }
354
355     len = ((float) max / (float) num);
356     length = (x2 - x1) / len;
357
358     if (type == 1)
359     {
360         g15r_pixelBox (canvas, x1, y1 - type, x2, y2 + type, color ^ 1, 1, 1);
361         g15r_pixelBox (canvas, x1, y1 - type, x2, y2 + type, color, 1, 0);
362     }
363     else if (type == 2)
364     {
365         g15r_pixelBox (canvas, x1 - 2, y1 - type, x2 + 2, y2 + type, color ^ 1,
366                        1, 1);
367         g15r_pixelBox (canvas, x1 - 2, y1 - type, x2 + 2, y2 + type, color, 1,
368                        0);
369     }
370     else if (type == 3)
371     {
372         g15r_drawLine (canvas, x1, y1 - type, x1, y2 + type, color);
373         g15r_drawLine (canvas, x2, y1 - type, x2, y2 + type, color);
374         g15r_drawLine (canvas, x1, y1 + ((y2 - y1) / 2), x2,
375                        y1 + ((y2 - y1) / 2), color);
376     }
377     g15r_pixelBox (canvas, x1, y1, (int) ceil (x1 + length), y2, color, 1, 1);
378 }

```

4.2.2.3 void g15r_drawBigNum (g15canvas * *canvas*, unsigned int *x1*, unsigned int *y1*, unsigned int *x2*, unsigned int *y2*, int *color*, int *num*)

Draw a large number.

Draw a large number to a canvas

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the number.

y1 Defines uppermost bound of the number.

x2 Defines rightmost bound of the number.

y2 Defines bottommost bound of the number.

num The number to be drawn.

Definition at line 545 of file pixel.c.

References g15r_pixelBox().

```

546 {
547     x1 += 2;
548     x2 -= 2;
549
550     switch(num){
551         case 0:
552             g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
553             g15r_pixelBox (canvas, x1 +5, y1 +5, x2 -5, y2 - 6, 1 - color, 1, 1);

```

```

554         break;
555     case 1:
556         g15r_pixelBox (canvas, x2-5, y1, x2, y2 , color, 1, 1);
557         g15r_pixelBox (canvas, x1, y1, x2 -5, y2, 1 - color, 1, 1);
558         break;
559     case 2:
560         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
561         g15r_pixelBox (canvas, x1, y1+5, x2 -5, y1+((y2/2)-3), 1 - color, 1, 1);
562         g15r_pixelBox (canvas, x1+5, y1+((y2/2)+3), x2 , y2-6, 1 - color, 1, 1);
563         break;
564     case 3:
565         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
566         g15r_pixelBox (canvas, x1, y1+5, x2 -5, y1+((y2/2)-3), 1 - color, 1, 1);
567         g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
568         break;
569     case 4:
570         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
571         g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2 -5, y2, 1 - color, 1, 1);
572         g15r_pixelBox (canvas, x1+5, y1, x2-5 , y1+((y2/2)-3), 1 - color, 1, 1);
573         break;
574     case 5:
575         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
576         g15r_pixelBox (canvas, x1+5, y1+5, x2 , y1+((y2/2)-3), 1 - color, 1, 1);
577         g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
578         break;
579     case 6:
580         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
581         g15r_pixelBox (canvas, x1+5, y1+5, x2 , y1+((y2/2)-3), 1 - color, 1, 1);
582         g15r_pixelBox (canvas, x1+5, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
583         break;
584     case 7:
585         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
586         g15r_pixelBox (canvas, x1, y1+5, x2 -5, y2, 1 - color, 1, 1);
587         break;
588     case 8:
589         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
590         g15r_pixelBox (canvas, x1+5, y1+5, x2-5 , y1+((y2/2)-3), 1 - color, 1, 1);
591         g15r_pixelBox (canvas, x1+5, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
592         break;
593     case 9:
594         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
595         g15r_pixelBox (canvas, x1+5, y1+5, x2-5 , y1+((y2/2)-3), 1 - color, 1, 1);
596         g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2-5 , y2, 1 - color, 1, 1);
597         break;
598     case 10:
599         g15r_pixelBox (canvas, x2-5, y1+5, x2, y1+10 , color, 1, 1);
600         g15r_pixelBox (canvas, x2-5, y2-10, x2, y2-5 , color, 1, 1);
601         break;
602     case 11:
603         g15r_pixelBox (canvas, x1, y1+((y2/2)-2), x2, y1+((y2/2)+2), color, 1, 1);
604         break;
605     case 12:
606         g15r_pixelBox (canvas, x2-5, y2-5, x2, y2 , color, 1, 1);
607         break;
608 }
609 }

```

4.2.2.4 void g15r_drawCircle (g15canvas * canvas, int x, int y, int r, int fill, int color)

Draws a circle centered at (x, y) with a radius of r.

Draws a circle centered at (x, y) with a radius of r.

The circle will be filled if fill != 0.

Parameters:

- canvas*** A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.
- x*** Defines horizontal center of the circle.
- y*** Defines vertical center of circle.
- r*** Defines radius of circle.
- fill*** The circle will be filled with color if `fill != 0`.
- color*** Lines defining the circle will be drawn this color.

Definition at line 203 of file pixel.c.

References `g15r_drawLine()`, and `g15r_setPixel()`.

```

204 {
205     int xx, yy, dd;
206
207     xx = 0;
208     yy = r;
209     dd = 2 * (1 - r);
210
211     while (yy >= 0)
212     {
213         if (!fill)
214         {
215             g15r_setPixel (canvas, x + xx, y - yy, color);
216             g15r_setPixel (canvas, x + xx, y + yy, color);
217             g15r_setPixel (canvas, x - xx, y - yy, color);
218             g15r_setPixel (canvas, x - xx, y + yy, color);
219         }
220         else
221         {
222             g15r_drawLine (canvas, x - xx, y - yy, x + xx, y - yy, color);
223             g15r_drawLine (canvas, x - xx, y + yy, x + xx, y + yy, color);
224         }
225         if (dd + yy > 0)
226         {
227             yy--;
228             dd = dd - (2 * yy + 1);
229         }
230         if (xx > dd)
231         {
232             xx++;
233             dd = dd + (2 * xx + 1);
234         }
235     }
236 }
```

4.2.2.5 void g15r_drawIcon (g15canvas * *canvas*, char * *buf*, int *my_x*, int *my_y*, int *width*, int *height*)

Draw an icon to the screen from a wbmp buffer.

Draw an icon to a canvas

Parameters:

- canvas*** A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated in is found.
- buf*** A pointer to the buffer holding the icon to be displayed.
- my_x*** Leftmost boundary of image.

my_y Topmost boundary of image.

width Width of the image in buf.

height Height of the image in buf.

Definition at line 411 of file pixel.c.

References BYTE_SIZE, and g15r_setPixel().

```

412 {
413     int y,x,val;
414     unsigned int pixel_offset = 0;
415     unsigned int byte_offset, bit_offset;
416
417     for (y=0; y < height - 1; y++)
418         for (x=0; x < width - 1; x++)
419             {
420                 pixel_offset = y * width + x;
421                 byte_offset = pixel_offset / BYTE_SIZE;
422                 bit_offset = 7 - (pixel_offset % BYTE_SIZE);
423
424                 val = (buf[byte_offset] & (1 << bit_offset)) >> bit_offset;
425                 g15r_setPixel (canvas, x + my_x, y + my_y, val);
426             }
427 }
```

4.2.2.6 void g15r_drawLine (g15canvas * *canvas*, int *px1*, int *py1*, int *px2*, int *py2*, const int *color*)

Draws a line from (px1, py1) to (px2, py2).

A line of color is drawn from (px1, py1) to (px2, py2).

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

px1 X component of point 1.

py1 Y component of point 1.

px2 X component of point 2.

py2 Y component of point 2.

color Line will be drawn this color.

Definition at line 99 of file pixel.c.

References g15r_setPixel(), and swap().

Referenced by g15r_drawBar(), g15r_drawCircle(), g15r_drawRoundBox(), and g15r_pixelBox().

```

101 {
102     /*
103      * Bresenham's Line Algorithm
104      * http://en.wikipedia.org/wiki/Bresenham's_algorithm
105      */
106
107     int steep = 0;
108
109     if (abs (py2 - py1) > abs (px2 - px1))
```

```

110     steep = 1;
111
112     if (steep)
113     {
114         swap (&px1, &py1);
115         swap (&px2, &py2);
116     }
117
118     if (px1 > px2)
119     {
120         swap (&px1, &px2);
121         swap (&py1, &py2);
122     }
123
124     int dx = px2 - px1;
125     int dy = abs (py2 - py1);
126
127     int error = 0;
128     int y = py1;
129     int ystep = (py1 < py2) ? 1 : -1;
130     int x = 0;
131
132     for (x = px1; x <= px2; ++x)
133     {
134         if (steep)
135             g15r_setPixel (canvas, y, x, color);
136         else
137             g15r_setPixel (canvas, x, y, color);
138
139         error += dy;
140         if (2 * error >= dx)
141         {
142             y += ystep;
143             error -= dx;
144         }
145     }
146 }

```

4.2.2.7 void g15r_drawRoundBox (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *fill*, int *color*)

Draws a box with rounded corners bounded by (x1, y1) and (x2, y2).

Draws a rounded box around the area bounded by (x1, y1) and (x2, y2).

The box will be filled if fill != 0.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the box.

y1 Defines uppermost bound of the box.

x2 Defines rightmost bound of the box.

y2 Defines bottommost bound of the box.

fill The box will be filled with color if fill != 0.

color Lines defining the box will be drawn this color.

Definition at line 252 of file pixel.c.

References G15_COLOR_BLACK, G15_COLOR_WHITE, g15r_drawLine(), and g15r_setPixel().

```

254 {
255     int y, shave = 3;
256
257     if (shave > (x2 - x1) / 2)
258         shave = (x2 - x1) / 2;
259     if (shave > (y2 - y1) / 2)
260         shave = (y2 - y1) / 2;
261
262     if ((x1 != x2) && (y1 != y2))
263     {
264         if (fill)
265         {
266             g15r_drawLine (canvas, x1 + shave, y1, x2 - shave, y1, color);
267             for (y = y1 + 1; y < y1 + shave; y++)
268                 g15r_drawLine (canvas, x1 + 1, y, x2 - 1, y, color);
269             for (y = y1 + shave; y <= y2 - shave; y++)
270                 g15r_drawLine (canvas, x1, y, x2, y, color);
271             for (y = y2 - shave + 1; y < y2; y++)
272                 g15r_drawLine (canvas, x1 + 1, y, x2 - 1, y, color);
273             g15r_drawLine (canvas, x1 + shave, y2, x2 - shave, y2, color);
274             if (shave == 4)
275             {
276                 g15r_setPixel (canvas, x1 + 1, y1 + 1,
277                               color ==
278                               G15_COLOR_WHITE ? G15_COLOR_BLACK :
279                               G15_COLOR_WHITE);
280                 g15r_setPixel (canvas, x1 + 1, y2 - 1,
281                               color ==
282                               G15_COLOR_WHITE ? G15_COLOR_BLACK :
283                               G15_COLOR_WHITE);
284                 g15r_setPixel (canvas, x2 - 1, y1 + 1,
285                               color ==
286                               G15_COLOR_WHITE ? G15_COLOR_BLACK :
287                               G15_COLOR_WHITE);
288                 g15r_setPixel (canvas, x2 - 1, y2 - 1,
289                               color ==
290                               G15_COLOR_WHITE ? G15_COLOR_BLACK :
291                               G15_COLOR_WHITE);
292             }
293         }
294         else
295         {
296             g15r_drawLine (canvas, x1 + shave, y1, x2 - shave, y1, color);
297             g15r_drawLine (canvas, x1, y1 + shave, x1, y2 - shave, color);
298             g15r_drawLine (canvas, x2, y1 + shave, x2, y2 - shave, color);
299             g15r_drawLine (canvas, x1 + shave, y2, x2 - shave, y2, color);
300             if (shave > 1)
301             {
302                 g15r_drawLine (canvas, x1 + 1, y1 + 1, x1 + shave - 1, y1 + 1,
303                               color);
304                 g15r_drawLine (canvas, x2 - shave + 1, y1 + 1, x2 - 1, y1 + 1,
305                               color);
306                 g15r_drawLine (canvas, x1 + 1, y2 - 1, x1 + shave - 1, y2 - 1,
307                               color);
308                 g15r_drawLine (canvas, x2 - shave + 1, y2 - 1, x2 - 1, y2 - 1,
309                               color);
310                 g15r_drawLine (canvas, x1 + 1, y1 + 1, x1 + 1, y1 + shave - 1,
311                               color);
312                 g15r_drawLine (canvas, x1 + 1, y2 - 1, x1 + 1, y2 - shave + 1,
313                               color);
314                 g15r_drawLine (canvas, x2 - 1, y1 + 1, x2 - 1, y1 + shave - 1,
315                               color);
316                 g15r_drawLine (canvas, x2 - 1, y2 - 1, x2 - 1, y2 - shave + 1,
317                               color);
318             }
319         }
320     }

```


321 }

4.2.2.8 `void g15r_drawSprite (g15canvas * canvas, char * buf, int my_x, int my_y, int width, int height, int start_x, int start_y, int total_width)`

Draw a sprite to the screen from a wbmp buffer.

Draw a sprite to a canvas

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated in is found.

buf A pointer to the buffer holding a set of sprites.

my_x Leftmost boundary of image.

my_y Topmost boundary of image.

width Width of the sprite.

height Height of the sprite.

start_x X offset for reading sprite from buf.

start_y Y offset for reading sprite from buf.

total_width Width of the set of sprites held in buf.

Definition at line 443 of file pixel.c.

References `BYTE_SIZE`, and `g15r_setPixel()`.

```

444 {
445     int y,x,val;
446     unsigned int pixel_offset = 0;
447     unsigned int byte_offset, bit_offset;
448
449     for (y=0; y < height - 1; y++)
450         for (x=0; x < width - 1; x++)
451             {
452                 pixel_offset = (y + start_y) * total_width + (x + start_x);
453                 byte_offset = pixel_offset / BYTE_SIZE;
454                 bit_offset = 7 - (pixel_offset % BYTE_SIZE);
455
456                 val = (buf[byte_offset] & (1 << bit_offset)) >> bit_offset;
457                 g15r_setPixel (canvas, x + my_x, y + my_y, val);
458             }
459 }
```

4.2.2.9 `int g15r_getPixel (g15canvas * canvas, unsigned int x, unsigned int y)`

Gets the value of the pixel at (x, y).

Retrieves the value of the pixel at (x, y)

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x X offset for pixel to be retrieved.

y Y offset for pixel to be retrieved.

Definition at line 29 of file screen.c.

References g15canvas::buffer, BYTE_SIZE, G15_LCD_HEIGHT, and G15_LCD_WIDTH.

Referenced by g15r_pixelReverseFill(), and g15r_setPixel().

```

30 {
31     if (x >= G15_LCD_WIDTH || y >= G15_LCD_HEIGHT)
32         return 0;
33
34     unsigned int pixel_offset = y * G15_LCD_WIDTH + x;
35     unsigned int byte_offset = pixel_offset / BYTE_SIZE;
36     unsigned int bit_offset = 7 - (pixel_offset % BYTE_SIZE);
37
38     return (canvas->buffer[byte_offset] & (1 << bit_offset)) >> bit_offset;
39 }
```

4.2.2.10 void g15r_initCanvas (g15canvas * *canvas*)

Clears the canvas and resets the mode switches.

Clears the screen and resets the mode values for a canvas

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct

Definition at line 91 of file screen.c.

References g15canvas::buffer, g15canvas::ftLib, G15_BUFFER_LEN, g15canvas::mode_cache, g15canvas::mode_reverse, and g15canvas::mode_xor.

```

92 {
93     memset (canvas->buffer, 0, G15_BUFFER_LEN);
94     canvas->mode_cache = 0;
95     canvas->mode_reverse = 0;
96     canvas->mode_xor = 0;
97 #ifdef TTF_SUPPORT
98     if (FT_Init_FreeType (&canvas->ftLib))
99         printf ("Freetype couldnt initialise\n");
100 #endif
101 }
```

4.2.2.11 int g15r_loadWbmpSplash (g15canvas * *canvas*, char * *filename*)

Draw a splash screen from 160x43 wbmp file.

wbmp splash screen loader - assumes image is 160x43

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

filename A string holding the path to the wbmp to be displayed.

Definition at line 387 of file pixel.c.

References g15canvas::buffer, G15_BUFFER_LEN, and g15r_loadWbmpToBuf().

```

388 {
389     int width=0, height=0;
390     char *buf;
391
392     buf = g15r_loadWbmpToBuf(filename,
393                               &width,
394                               &height);
395
396     memcpy (canvas->buffer, buf, G15_BUFFER_LEN);
397     return 0;
398 }

```

4.2.2.12 char* g15r_loadWbmpToBuf (char * *filename*, int * *img_width*, int * *img_height*)

Load a wbmp file into a buffer.

basic wbmp loader - loads a wbmp image into a buffer.

Parameters:

filename A string holding the path to the wbmp to be loaded.

img_width A pointer to an int that will hold the image width on return.

img_height A pointer to an int that will hold the image height on return.

Definition at line 469 of file pixel.c.

References BYTE_SIZE.

Referenced by g15r_loadWbmpSplash().

```

470 {
471     int wbmp_fd;
472     int retval;
473     int x,y,val;
474     char *buf;
475     unsigned int buflen,header=4;
476     unsigned char headerbytes[5];
477     unsigned int pixel_offset = 0;
478     unsigned int byte_offset, bit_offset;
479
480     wbmp_fd=open(filename,O_RDONLY);
481     if(!wbmp_fd){
482         return NULL;
483     }
484
485     retval=read(wbmp_fd,headerbytes,5);
486
487     if(retval){
488         if (headerbytes[2] & 1) {
489             *img_width = ((unsigned char)headerbytes[2] ^ 1) | (unsigned char)headerbytes[3];
490             *img_height = headerbytes[4];
491             header = 5;
492         } else {
493             *img_width = headerbytes[2];
494             *img_height = headerbytes[3];
495         }
496
497         int byte_width = *img_width / 8;
498         if (*img_width %8)
499             byte_width++;
500

```

```

501         buflen = byte_width * (*img_height);
502
503         buf = (char *)malloc (buflen);
504         if (buf == NULL)
505             return NULL;
506
507         if (header == 4)
508             buf[0]=headerbytes[4];
509
510         retval=read(wbmp_fd,buf+(5-header),buflen);
511
512         close(wbmp_fd);
513     }
514
515     /* now invert the image */
516     for (y = 0; y < *img_height; y++)
517         for (x = 0; x < *img_width; x++)
518             {
519                 pixel_offset = y * (*img_width) + x;
520                 byte_offset = pixel_offset / BYTE_SIZE;
521                 bit_offset = 7 - (pixel_offset % BYTE_SIZE);
522
523                 val = (buf[byte_offset] & (1 << bit_offset)) >> bit_offset;
524
525                 if (!val)
526                     buf[byte_offset] = buf[byte_offset] | 1 << bit_offset;
527                 else
528                     buf[byte_offset] = buf[byte_offset] & ~(1 << bit_offset);
529             }
530
531     return buf;
532 }

```

4.2.2.13 void g15r_pixelBox (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *color*, int *thick*, int *fill*)

Draws a box bounded by (x1, y1) and (x2, y2).

Draws a box around the area bounded by (x1, y1) and (x2, y2).

The box will be filled if fill != 0 and the sides will be thick pixels wide.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the box.

y1 Defines uppermost bound of the box.

x2 Defines rightmost bound of the box.

y2 Defines bottommost bound of the box.

color Lines defining the box will be drawn this color.

thick Lines defining the box will be this many pixels thick.

fill The box will be filled with color if fill != 0.

Definition at line 163 of file pixel.c.

References g15r_drawLine(), and g15r_setPixel().

Referenced by g15r_drawBar(), and g15r_drawBigNum().

```

165 {
166     int i = 0;
167     for (i = 0; i < thick; ++i)
168     {
169         g15r_drawLine (canvas, x1, y1, x2, y1, color);    /* Top */
170         g15r_drawLine (canvas, x1, y1, x1, y2, color);    /* Left */
171         g15r_drawLine (canvas, x2, y1, x2, y2, color);    /* Right */
172         g15r_drawLine (canvas, x1, y2, x2, y2, color);    /* Bottom */
173         x1++;
174         y1++;
175         x2--;
176         y2--;
177     }
178
179     int x = 0, y = 0;
180
181     if (fill)
182     {
183         for (x = x1; x <= x2; ++x)
184             for (y = y1; y <= y2; ++y)
185                 g15r_setPixel (canvas, x, y, color);
186     }
187
188 }

```

4.2.2.14 void g15r_pixelOverlay (g15canvas * *canvas*, int *x1*, int *y1*, int *width*, int *height*, short *colormap*[])

Overlays a bitmap of size width x height starting at (x1, y1).

A 1-bit bitmap defined in colormap[] is drawn to the canvas with an upper left corner at (x1, y1) and a lower right corner at (x1+width, y1+height).

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines the leftmost bound of the area to be drawn.

y1 Defines the uppermost bound of the area to be drawn.

width Defines the width of the bitmap to be drawn.

height Defines the height of the bitmap to be drawn.

colormap An array containing width*height entries of value 0 for pixel off or != 0 for pixel on.

Definition at line 74 of file pixel.c.

References G15_COLOR_BLACK, G15_COLOR_WHITE, and g15r_setPixel().

```

76 {
77     int i = 0;
78
79     for (i = 0; i < (width * height); ++i)
80     {
81         int color = (colormap[i] ? G15_COLOR_BLACK : G15_COLOR_WHITE);
82         int x = x1 + i % width;
83         int y = y1 + i / width;
84         g15r_setPixel (canvas, x, y, color);
85     }
86 }

```

4.2.2.15 void g15r_pixelReverseFill (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *fill*, int *color*)

Fills an area bounded by (x1, y1) and (x2, y2).

The area with an upper left corner at (x1, y1) and lower right corner at (x2, y2) will be filled with color if fill>0 or the current contents of the area will be reversed if fill==0.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of area to be filled.

y1 Defines uppermost bound of area to be filled.

x2 Defines rightmost bound of area to be filled.

y2 Defines bottommost bound of area to be filled.

fill Area will be filled with color if fill != 0, else contents of area will have color values reversed.

color If fill != 0, then area will be filled if color == 1 and emptied if color == 0.

Definition at line 45 of file pixel.c.

References g15r_getPixel(), and g15r_setPixel().

```

47 {
48     int x = 0;
49     int y = 0;
50
51     for (x = x1; x <= x2; ++x)
52     {
53         for (y = y1; y <= y2; ++y)
54         {
55             if (!fill)
56                 color = !g15r_getPixel (canvas, x, y);
57             g15r_setPixel (canvas, x, y, color);
58         }
59     }
60 }
```

4.2.2.16 void g15r_renderCharacterLarge (g15canvas * *canvas*, int *x*, int *y*, unsigned char *character*, unsigned int *sx*, unsigned int *sy*)

Renders a character in the large font at (x, y).

Definition at line 22 of file text.c.

References fontdata_8x8, G15_COLOR_BLACK, G15_COLOR_WHITE, and g15r_setPixel().

Referenced by g15r_renderString().

```

25 {
26     int helper = character * 8;    /* for our font which is 8x8 */
27
28     int top_left_pixel_x = sx + col * (8);    /* 1 pixel spacing */
29     int top_left_pixel_y = sy + row * (8);    /* once again 1 pixel spacing */
30
31     int x, y;
32     for (y = 0; y < 8; ++y)
33     {
34         for (x = 0; x < 8; ++x)
```

```

35     {
36         char font_entry = fontdata_8x8[helper + y];
37
38         if (font_entry & 1 << (7 - x))
39             g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
40                             G15_COLOR_BLACK);
41         else
42             g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
43                             G15_COLOR_WHITE);
44     }
45 }
46 }
47 }

```

4.2.2.17 void g15r_renderCharacterMedium (g15canvas * *canvas*, int *x*, int *y*, unsigned char *character*, unsigned int *sx*, unsigned int *sy*)

Renders a character in the meduim font at (x, y).

Definition at line 50 of file text.c.

References fontdata_7x5, G15_COLOR_BLACK, G15_COLOR_WHITE, and g15r_setPixel().

Referenced by g15r_renderString().

```

53 {
54     int helper = character * 7 * 5;          /* for our font which is 6x4 */
55
56     int top_left_pixel_x = sx + col * (5);    /* 1 pixel spacing */
57     int top_left_pixel_y = sy + row * (7);    /* once again 1 pixel spacing */
58
59     int x, y;
60     for (y = 0; y < 7; ++y)
61     {
62         for (x = 0; x < 5; ++x)
63         {
64             char font_entry = fontdata_7x5[helper + y * 5 + x];
65             if (font_entry)
66                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
67                                 G15_COLOR_BLACK);
68             else
69                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
70                                 G15_COLOR_WHITE);
71         }
72     }
73 }
74 }

```

4.2.2.18 void g15r_renderCharacterSmall (g15canvas * *canvas*, int *x*, int *y*, unsigned char *character*, unsigned int *sx*, unsigned int *sy*)

Renders a character in the small font at (x, y).

Definition at line 77 of file text.c.

References fontdata_6x4, G15_COLOR_BLACK, G15_COLOR_WHITE, and g15r_setPixel().

Referenced by g15r_renderString().

```

80 {
81     int helper = character * 6 * 4;          /* for our font which is 6x4 */

```

```

82
83 int top_left_pixel_x = sx + col * (4);          /* 1 pixel spacing */
84 int top_left_pixel_y = sy + row * (6);          /* once again 1 pixel spacing */
85
86 int x, y;
87 for (y = 0; y < 6; ++y)
88 {
89     for (x = 0; x < 4; ++x)
90     {
91         char font_entry = fontdata_6x4[helper + y * 4 + x];
92         if (font_entry)
93             g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
94                             G15_COLOR_BLACK);
95         else
96             g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
97                             G15_COLOR_WHITE);
98     }
99 }
100 }
101 }

```

4.2.2.19 void g15r_renderString (g15canvas * *canvas*, unsigned char *stringOut*[], int *row*, int *size*, unsigned int *sx*, unsigned int *sy*)

Renders a string with font size in row.

Definition at line 104 of file text.c.

References G15_TEXT_LARGE, G15_TEXT_MED, G15_TEXT_SMALL, g15r_renderCharacterLarge(), g15r_renderCharacterMedium(), and g15r_renderCharacterSmall().

```

106 {
107
108     int i = 0;
109     for (i; stringOut[i] != NULL; ++i)
110     {
111         switch (size)
112         {
113             case G15_TEXT_SMALL:
114             {
115                 g15r_renderCharacterSmall (canvas, i, row, stringOut[i], sx, sy);
116                 break;
117             }
118             case G15_TEXT_MED:
119             {
120                 g15r_renderCharacterMedium (canvas, i, row, stringOut[i], sx, sy);
121                 break;
122             }
123             case G15_TEXT_LARGE:
124             {
125                 g15r_renderCharacterLarge (canvas, i, row, stringOut[i], sx, sy);
126                 break;
127             }
128             default:
129                 break;
130         }
131     }
132
133 }

```


4.2.2.20 void g15r_setPixel (g15canvas * *canvas*, unsigned int *x*, unsigned int *y*, int *val*)

Sets the value of the pixel at (x, y).

Sets the value of the pixel at (x, y)

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x X offset for pixel to be set.

y Y offset for pixel to be set.

val Value to which pixel should be set.

Definition at line 50 of file screen.c.

References g15canvas::buffer, BYTE_SIZE, G15_LCD_HEIGHT, G15_LCD_WIDTH, g15r_getPixel(), g15canvas::mode_reverse, and g15canvas::mode_xor.

Referenced by draw_ttf_char(), g15r_drawCircle(), g15r_drawIcon(), g15r_drawLine(), g15r_drawRoundBox(), g15r_drawSprite(), g15r_pixelBox(), g15r_pixelOverlay(), g15r_pixelReverseFill(), g15r_renderCharacterLarge(), g15r_renderCharacterMedium(), and g15r_renderCharacterSmall().

```

51 {
52     if (x >= G15_LCD_WIDTH || y >= G15_LCD_HEIGHT)
53         return;
54
55     unsigned int pixel_offset = y * G15_LCD_WIDTH + x;
56     unsigned int byte_offset = pixel_offset / BYTE_SIZE;
57     unsigned int bit_offset = 7 - (pixel_offset % BYTE_SIZE);
58
59     if (canvas->mode_xor)
60         val ^= g15r_getPixel (canvas, x, y);
61     if (canvas->mode_reverse)
62         val = !val;
63
64     if (val)
65         canvas->buffer[byte_offset] =
66             canvas->buffer[byte_offset] | 1 << bit_offset;
67     else
68         canvas->buffer[byte_offset] =
69             canvas->buffer[byte_offset] & ~(1 << bit_offset);
70
71 }
```

4.2.2.21 void g15r_ttfLoad (g15canvas * *canvas*, char * *fontname*, int *fontsize*, int *face_num*)

Loads a font through the FreeType2 library.

Load a font for use with FreeType2 font support

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

fontname Absolute pathname to font file to be loaded.

fontsize Size in points for font to be loaded.

face_num Slot into which font face will be loaded.

Definition at line 145 of file text.c.

References g15canvas::ftLib, G15_MAX_FACE, g15canvas::ttf_face, and g15canvas::ttf_fontsize.

```

146 {
147     int errcode = 0;
148
149     if (face_num < 0)
150         face_num = 0;
151     if (face_num > G15_MAX_FACE)
152         face_num = G15_MAX_FACE;
153
154     if (canvas->ttf_fontsize[face_num])
155         FT_Done_Face (canvas->ttf_face[face_num][0]);          /* destroy the last face */
156
157     if (!canvas->ttf_fontsize[face_num] && !fontsize)
158         canvas->ttf_fontsize[face_num] = 10;
159     else
160         canvas->ttf_fontsize[face_num] = fontsize;
161
162     errcode =
163         FT_New_Face (canvas->ftLib, fontname, 0, &canvas->ttf_face[face_num][0]);
164     if (errcode)
165     {
166         canvas->ttf_fontsize[face_num] = 0;
167     }
168     else
169     {
170         if (canvas->ttf_fontsize[face_num]
171             && FT_IS_SCALABLE (canvas->ttf_face[face_num][0]))
172             errcode =
173                 FT_Set_Char_Size (canvas->ttf_face[face_num][0], 0,
174                                 canvas->ttf_fontsize[face_num] * 64, 90, 0);
175     }
176 }
```

4.2.2.22 void g15r_ttfPrint (g15canvas * canvas, int x, int y, int fontsize, int face_num, int color, int center, char * print_string)

Prints a string in a given font.

Render a string with a FreeType2 font

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x initial x position for string.

y initial y position for string.

fontsize Size of string in points.

face_num Font to be used is loaded in this slot.

color Text will be drawn this color.

center Text will be centered if center == 1 and right justified if center == 2.

print_string Pointer to the string to be printed.

Definition at line 283 of file text.c.

References calc_ttf_centering(), calc_ttf_right_justify(), calc_ttf_true_ypos(), draw_ttf_str(), g15canvas::ttf_face, and g15canvas::ttf_fontsize.

```
285 {
286     int errcode = 0;
287
288     if (canvas->ttf_fontsize[face_num])
289     {
290         if (fontsize > 0 && FT_IS_SCALABLE (canvas->ttf_face[face_num][0]))
291         {
292             canvas->ttf_fontsize[face_num] = fontsize;
293             int errcode =
294                 FT_Set_Pixel_Sizes (canvas->ttf_face[face_num][0], 0,
295                                     canvas->ttf_fontsize[face_num]);
296             if (errcode)
297                 printf ("Trouble setting the Glyph size!\n");
298         }
299         y =
300             calc_ttf_true_ypos (canvas->ttf_face[face_num][0], y,
301                                 canvas->ttf_fontsize[face_num]);
302         if (center == 1)
303             x = calc_ttf_centering (canvas->ttf_face[face_num][0], print_string);
304         else if (center == 2)
305             x = calc_ttf_right_justify (canvas->ttf_face[face_num][0], print_string);
306         draw_ttf_str (canvas, print_string, x, y, color,
307                     canvas->ttf_face[face_num][0]);
308     }
309 }
```

4.2.3 Variable Documentation

4.2.3.1 unsigned char fontdata__6x4[]

Font data for the small (6x4) font.

Referenced by `g15r_renderCharacterSmall()`.

4.2.3.2 unsigned char fontdata__7x5[]

Font data for the medium (7x5) font.

Referenced by `g15r_renderCharacterMedium()`.

4.2.3.3 unsigned char fontdata__8x8[]

Font data for the large (8x8) font.

Referenced by `g15r_renderCharacterLarge()`.

4.3 pixel.c File Reference

```
#include <fcntl.h>
#include "libg15render.h"
```

Functions

- void **g15r_drawBar** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int color, int num, int max, int type)
Draws a completion bar.
- void **g15r_drawBigNum** (**g15canvas** *canvas, unsigned int x1, unsigned int y1, unsigned int x2, unsigned int y2, int color, int num)
Draw a large number.
- void **g15r_drawCircle** (**g15canvas** *canvas, int x, int y, int r, int fill, int color)
Draws a circle centered at (x, y) with a radius of r.
- void **g15r_drawIcon** (**g15canvas** *canvas, char *buf, int my_x, int my_y, int width, int height)
Draw an icon to the screen from a wbmp buffer.
- void **g15r_drawLine** (**g15canvas** *canvas, int px1, int py1, int px2, int py2, const int color)
Draws a line from (px1, py1) to (px2, py2).
- void **g15r_drawRoundBox** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int fill, int color)
Draws a box with rounded corners bounded by (x1, y1) and (x2, y2).
- void **g15r_drawSprite** (**g15canvas** *canvas, char *buf, int my_x, int my_y, int width, int height, int start_x, int start_y, int total_width)
Draw a sprite to the screen from a wbmp buffer.
- int **g15r_loadWbmpSplash** (**g15canvas** *canvas, char *filename)
Draw a splash screen from 160x43 wbmp file.
- char * **g15r_loadWbmpToBuf** (char *filename, int *img_width, int *img_height)
Load a wbmp file into a buffer.
- void **g15r_pixelBox** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int color, int thick, int fill)
Draws a box bounded by (x1, y1) and (x2, y2).
- void **g15r_pixelOverlay** (**g15canvas** *canvas, int x1, int y1, int width, int height, short colormap[])
Overlays a bitmap of size width x height starting at (x1, y1).
- void **g15r_pixelReverseFill** (**g15canvas** *canvas, int x1, int y1, int x2, int y2, int fill, int color)

Fills an area bounded by (x1, y1) and (x2, y2).

- void **swap** (int *x, int *y)

4.3.1 Function Documentation

4.3.1.1 void **g15r_drawBar** (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *color*, int *num*, int *max*, int *type*)

Draws a completion bar.

Given a maximum value, and a value between 0 and that maximum value, calculate and draw a bar showing that percentage.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the bar.

y1 Defines uppermost bound of the bar.

x2 Defines rightmost bound of the bar.

y2 Defines bottommost bound of the bar.

color The bar will be drawn this color.

num Number of units relative to max filled.

max Number of units equal to 100% filled.

type Type of bar. 1=solid bar, 2=solid bar with border, 3 = solid bar with I-frame.

Definition at line 337 of file pixel.c.

References **g15r_drawLine()**, and **g15r_pixelBox()**.

```

339 {
340     float len, length;
341     int x;
342     if (max == 0)
343         return;
344     if (num > max)
345         num = max;
346
347     if (type == 2)
348     {
349         y1 += 2;
350         y2 -= 2;
351         x1 += 2;
352         x2 -= 2;
353     }
354
355     len = ((float) max / (float) num);
356     length = (x2 - x1) / len;
357
358     if (type == 1)
359     {
360         g15r_pixelBox (canvas, x1, y1 - type, x2, y2 + type, color ^ 1, 1, 1);
361         g15r_pixelBox (canvas, x1, y1 - type, x2, y2 + type, color, 1, 0);
362     }
363     else if (type == 2)
364     {
365         g15r_pixelBox (canvas, x1 - 2, y1 - type, x2 + 2, y2 + type, color ^ 1,

```

```

366             1, 1);
367     g15r_pixelBox (canvas, x1 - 2, y1 - type, x2 + 2, y2 + type, color, 1,
368                 0);
369 }
370 else if (type == 3)
371 {
372     g15r_drawLine (canvas, x1, y1 - type, x1, y2 + type, color);
373     g15r_drawLine (canvas, x2, y1 - type, x2, y2 + type, color);
374     g15r_drawLine (canvas, x1, y1 + ((y2 - y1) / 2), x2,
375                 y1 + ((y2 - y1) / 2), color);
376 }
377 g15r_pixelBox (canvas, x1, y1, (int) ceil (x1 + length), y2, color, 1, 1);
378 }

```

4.3.1.2 void g15r_drawBigNum (g15canvas * *canvas*, unsigned int *x1*, unsigned int *y1*, unsigned int *x2*, unsigned int *y2*, int *color*, int *num*)

Draw a large number.

Draw a large number to a canvas

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the number.

y1 Defines uppermost bound of the number.

x2 Defines rightmost bound of the number.

y2 Defines bottommost bound of the number.

num The number to be drawn.

Definition at line 545 of file pixel.c.

References g15r_pixelBox().

```

546 {
547     x1 += 2;
548     x2 -= 2;
549
550     switch(num){
551         case 0:
552             g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
553             g15r_pixelBox (canvas, x1 +5, y1 +5, x2 -5, y2 - 6, 1 - color, 1, 1);
554             break;
555         case 1:
556             g15r_pixelBox (canvas, x2-5, y1, x2, y2 , color, 1, 1);
557             g15r_pixelBox (canvas, x1, y1, x2 -5, y2, 1 - color, 1, 1);
558             break;
559         case 2:
560             g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
561             g15r_pixelBox (canvas, x1, y1+5, x2 -5, y1+((y2/2)-3), 1 - color, 1, 1);
562             g15r_pixelBox (canvas, x1+5, y1+((y2/2)+3), x2 , y2-6, 1 - color, 1, 1);
563             break;
564         case 3:
565             g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
566             g15r_pixelBox (canvas, x1, y1+5, x2 -5, y1+((y2/2)-3), 1 - color, 1, 1);
567             g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
568             break;
569         case 4:
570             g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
571             g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2 -5, y2, 1 - color, 1, 1);

```

```

572         g15r_pixelBox (canvas, x1+5, y1, x2-5 , y1+((y2/2)-3), 1 - color, 1, 1);
573         break;
574     case 5:
575         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
576         g15r_pixelBox (canvas, x1+5, y1+5, x2 , y1+((y2/2)-3), 1 - color, 1, 1);
577         g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
578         break;
579     case 6:
580         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
581         g15r_pixelBox (canvas, x1+5, y1+5, x2 , y1+((y2/2)-3), 1 - color, 1, 1);
582         g15r_pixelBox (canvas, x1+5, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
583         break;
584     case 7:
585         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
586         g15r_pixelBox (canvas, x1, y1+5, x2 -5, y2, 1 - color, 1, 1);
587         break;
588     case 8:
589         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
590         g15r_pixelBox (canvas, x1+5, y1+5, x2-5 , y1+((y2/2)-3), 1 - color, 1, 1);
591         g15r_pixelBox (canvas, x1+5, y1+((y2/2)+3), x2-5 , y2-6, 1 - color, 1, 1);
592         break;
593     case 9:
594         g15r_pixelBox (canvas, x1, y1, x2, y2 , color, 1, 1);
595         g15r_pixelBox (canvas, x1+5, y1+5, x2-5 , y1+((y2/2)-3), 1 - color, 1, 1);
596         g15r_pixelBox (canvas, x1, y1+((y2/2)+3), x2-5 , y2, 1 - color, 1, 1);
597         break;
598     case 10:
599         g15r_pixelBox (canvas, x2-5, y1+5, x2, y1+10 , color, 1, 1);
600         g15r_pixelBox (canvas, x2-5, y2-10, x2, y2-5 , color, 1, 1);
601         break;
602     case 11:
603         g15r_pixelBox (canvas, x1, y1+((y2/2)-2), x2, y1+((y2/2)+2), color, 1, 1);
604         break;
605     case 12:
606         g15r_pixelBox (canvas, x2-5, y2-5, x2, y2 , color, 1, 1);
607         break;
608     }
609 }

```

4.3.1.3 void g15r_drawCircle (g15canvas * *canvas*, int *x*, int *y*, int *r*, int *fill*, int *color*)

Draws a circle centered at (*x*, *y*) with a radius of *r*.

Draws a circle centered at (*x*, *y*) with a radius of *r*.

The circle will be filled if *fill* != 0.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x Defines horizontal center of the circle.

y Defines vertical center of circle.

r Defines radius of circle.

fill The circle will be filled with color if *fill* != 0.

color Lines defining the circle will be drawn this color.

Definition at line 203 of file pixel.c.

References g15r_drawLine(), and g15r_setPixel().

```

204 {
205     int xx, yy, dd;
206
207     xx = 0;
208     yy = r;
209     dd = 2 * (1 - r);
210
211     while (yy >= 0)
212     {
213         if (!fill)
214         {
215             g15r_setPixel (canvas, x + xx, y - yy, color);
216             g15r_setPixel (canvas, x + xx, y + yy, color);
217             g15r_setPixel (canvas, x - xx, y - yy, color);
218             g15r_setPixel (canvas, x - xx, y + yy, color);
219         }
220         else
221         {
222             g15r_drawLine (canvas, x - xx, y - yy, x + xx, y - yy, color);
223             g15r_drawLine (canvas, x - xx, y + yy, x + xx, y + yy, color);
224         }
225         if (dd + yy > 0)
226         {
227             yy--;
228             dd = dd - (2 * yy + 1);
229         }
230         if (xx > dd)
231         {
232             xx++;
233             dd = dd + (2 * xx + 1);
234         }
235     }
236 }

```

4.3.1.4 void g15r_drawIcon (g15canvas * *canvas*, char * *buf*, int *my_x*, int *my_y*, int *width*, int *height*)

Draw an icon to the screen from a wbmp buffer.

Draw an icon to a canvas

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated in is found.

buf A pointer to the buffer holding the icon to be displayed.

my_x Leftmost boundary of image.

my_y Topmost boundary of image.

width Width of the image in buf.

height Height of the image in buf.

Definition at line 411 of file pixel.c.

References BYTE_SIZE, and g15r_setPixel().

```

412 {
413     int y,x,val;
414     unsigned int pixel_offset = 0;
415     unsigned int byte_offset, bit_offset;
416
417     for (y=0; y < height - 1; y++)

```



```

418     for (x=0; x < width - 1; x++)
419     {
420         pixel_offset = y * width + x;
421         byte_offset = pixel_offset / BYTE_SIZE;
422         bit_offset = 7 - (pixel_offset % BYTE_SIZE);
423
424         val = (buf[byte_offset] & (1 << bit_offset)) >> bit_offset;
425         gl5r_setPixel (canvas, x + my_x, y + my_y, val);
426     }
427 }

```

4.3.1.5 void gl5r_drawLine (gl5canvas * *canvas*, int *px1*, int *py1*, int *px2*, int *py2*, const int *color*)

Draws a line from (px1, py1) to (px2, py2).

A line of color is drawn from (px1, py1) to (px2, py2).

Parameters:

canvas A pointer to a **gl5canvas** (p. 5) struct in which the buffer to be operated on is found.

px1 X component of point 1.

py1 Y component of point 1.

px2 X component of point 2.

py2 Y component of point 2.

color Line will be drawn this color.

Definition at line 99 of file pixel.c.

References gl5r_setPixel(), and swap().

Referenced by gl5r_drawBar(), gl5r_drawCircle(), gl5r_drawRoundBox(), and gl5r_pixelBox().

```

101 {
102     /*
103      * Bresenham's Line Algorithm
104      * http://en.wikipedia.org/wiki/Bresenham's_algorithm
105      */
106
107     int steep = 0;
108
109     if (abs (py2 - py1) > abs (px2 - px1))
110         steep = 1;
111
112     if (steep)
113     {
114         swap (&px1, &py1);
115         swap (&px2, &py2);
116     }
117
118     if (px1 > px2)
119     {
120         swap (&px1, &px2);
121         swap (&py1, &py2);
122     }
123
124     int dx = px2 - px1;
125     int dy = abs (py2 - py1);

```

```

126
127  int error = 0;
128  int y = py1;
129  int ystep = (py1 < py2) ? 1 : -1;
130  int x = 0;
131
132  for (x = px1; x <= px2; ++x)
133  {
134      if (steep)
135          g15r_setPixel (canvas, y, x, color);
136      else
137          g15r_setPixel (canvas, x, y, color);
138
139      error += dy;
140      if (2 * error >= dx)
141      {
142          y += ystep;
143          error -= dx;
144      }
145  }
146 }
```

4.3.1.6 void g15r_drawRoundBox (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *fill*, int *color*)

Draws a box with rounded corners bounded by (x1, y1) and (x2, y2).

Draws a rounded box around the area bounded by (x1, y1) and (x2, y2).

The box will be filled if fill != 0.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the box.

y1 Defines uppermost bound of the box.

x2 Defines rightmost bound of the box.

y2 Defines bottommost bound of the box.

fill The box will be filled with color if fill != 0.

color Lines defining the box will be drawn this color.

Definition at line 252 of file pixel.c.

References G15_COLOR_BLACK, G15_COLOR_WHITE, g15r_drawLine(), and g15r_setPixel().

```

254 {
255     int y, shave = 3;
256
257     if (shave > (x2 - x1) / 2)
258         shave = (x2 - x1) / 2;
259     if (shave > (y2 - y1) / 2)
260         shave = (y2 - y1) / 2;
261
262     if ((x1 != x2) && (y1 != y2))
263     {
264         if (fill)
265         {
266             g15r_drawLine (canvas, x1 + shave, y1, x2 - shave, y1, color);
```

```

267     for (y = y1 + 1; y < y1 + shave; y++)
268         g15r_drawLine (canvas, x1 + 1, y, x2 - 1, y, color);
269     for (y = y1 + shave; y <= y2 - shave; y++)
270         g15r_drawLine (canvas, x1, y, x2, y, color);
271     for (y = y2 - shave + 1; y < y2; y++)
272         g15r_drawLine (canvas, x1 + 1, y, x2 - 1, y, color);
273     g15r_drawLine (canvas, x1 + shave, y2, x2 - shave, y2, color);
274     if (shave == 4)
275     {
276         g15r_setPixel (canvas, x1 + 1, y1 + 1,
277             color ==
278                 G15_COLOR_WHITE ? G15_COLOR_BLACK :
279                 G15_COLOR_WHITE);
280         g15r_setPixel (canvas, x1 + 1, y2 - 1,
281             color ==
282                 G15_COLOR_WHITE ? G15_COLOR_BLACK :
283                 G15_COLOR_WHITE);
284         g15r_setPixel (canvas, x2 - 1, y1 + 1,
285             color ==
286                 G15_COLOR_WHITE ? G15_COLOR_BLACK :
287                 G15_COLOR_WHITE);
288         g15r_setPixel (canvas, x2 - 1, y2 - 1,
289             color ==
290                 G15_COLOR_WHITE ? G15_COLOR_BLACK :
291                 G15_COLOR_WHITE);
292     }
293 }
294 else
295 {
296     g15r_drawLine (canvas, x1 + shave, y1, x2 - shave, y1, color);
297     g15r_drawLine (canvas, x1, y1 + shave, x1, y2 - shave, color);
298     g15r_drawLine (canvas, x2, y1 + shave, x2, y2 - shave, color);
299     g15r_drawLine (canvas, x1 + shave, y2, x2 - shave, y2, color);
300     if (shave > 1)
301     {
302         g15r_drawLine (canvas, x1 + 1, y1 + 1, x1 + shave - 1, y1 + 1,
303             color);
304         g15r_drawLine (canvas, x2 - shave + 1, y1 + 1, x2 - 1, y1 + 1,
305             color);
306         g15r_drawLine (canvas, x1 + 1, y2 - 1, x1 + shave - 1, y2 - 1,
307             color);
308         g15r_drawLine (canvas, x2 - shave + 1, y2 - 1, x2 - 1, y2 - 1,
309             color);
310         g15r_drawLine (canvas, x1 + 1, y1 + 1, x1 + 1, y1 + shave - 1,
311             color);
312         g15r_drawLine (canvas, x1 + 1, y2 - 1, x1 + 1, y2 - shave + 1,
313             color);
314         g15r_drawLine (canvas, x2 - 1, y1 + 1, x2 - 1, y1 + shave - 1,
315             color);
316         g15r_drawLine (canvas, x2 - 1, y2 - 1, x2 - 1, y2 - shave + 1,
317             color);
318     }
319 }
320 }
321 }

```

4.3.1.7 void g15r_drawSprite (g15canvas * canvas, char * buf, int my_x, int my_y, int width, int height, int start_x, int start_y, int total_width)

Draw a sprite to the screen from a wbmp buffer.

Draw a sprite to a canvas

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated in is found.
buf A pointer to the buffer holding a set of sprites.
my_x Leftmost boundary of image.
my_y Topmost boundary of image.
width Width of the sprite.
height Height of the sprite.
start_x X offset for reading sprite from buf.
start_y Y offset for reading sprite from buf.
total_width Width of the set of sprites held in buf.

Definition at line 443 of file pixel.c.

References `BYTE_SIZE`, and `g15r_setPixel()`.

```

444 {
445     int y,x,val;
446     unsigned int pixel_offset = 0;
447     unsigned int byte_offset, bit_offset;
448
449     for (y=0; y < height - 1; y++)
450         for (x=0; x < width - 1; x++)
451         {
452             pixel_offset = (y + start_y) * total_width + (x + start_x);
453             byte_offset = pixel_offset / BYTE_SIZE;
454             bit_offset = 7 - (pixel_offset % BYTE_SIZE);
455
456             val = (buf[byte_offset] & (1 << bit_offset)) >> bit_offset;
457             g15r_setPixel (canvas, x + my_x, y + my_y, val);
458         }
459 }
```

4.3.1.8 `int g15r_loadWbmpSplash (g15canvas * canvas, char * filename)`

Draw a splash screen from 160x43 wbmp file.

wbmp splash screen loader - assumes image is 160x43

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.
filename A string holding the path to the wbmp to be displayed.

Definition at line 387 of file pixel.c.

References `g15canvas::buffer`, `G15_BUFFER_LEN`, and `g15r_loadWbmpToBuf()`.

```

388 {
389     int width=0, height=0;
390     char *buf;
391
392     buf = g15r_loadWbmpToBuf(filename,
393                             &width,
394                             &height);
395
396     memcpy (canvas->buffer, buf, G15_BUFFER_LEN);
397     return 0;
398 }
```

4.3.1.9 char* g15r_loadWbmpToBuf (char * *filename*, int * *img_width*, int * *img_height*)

Load a wbmp file into a buffer.

basic wbmp loader - loads a wbmp image into a buffer.

Parameters:

filename A string holding the path to the wbmp to be loaded.

img_width A pointer to an int that will hold the image width on return.

img_height A pointer to an int that will hold the image height on return.

Definition at line 469 of file pixel.c.

References BYTE_SIZE.

Referenced by g15r_loadWbmpSplash().

```

470 {
471     int wbmp_fd;
472     int retval;
473     int x,y,val;
474     char *buf;
475     unsigned int buflen,header=4;
476     unsigned char headerbytes[5];
477     unsigned int pixel_offset = 0;
478     unsigned int byte_offset, bit_offset;
479
480     wbmp_fd=open(filename,O_RDONLY);
481     if(!wbmp_fd){
482         return NULL;
483     }
484
485     retval=read(wbmp_fd,headerbytes,5);
486
487     if(retval){
488         if (headerbytes[2] & 1) {
489             *img_width = ((unsigned char)headerbytes[2] ^ 1) | (unsigned char)headerbytes[3];
490             *img_height = headerbytes[4];
491             header = 5;
492         } else {
493             *img_width = headerbytes[2];
494             *img_height = headerbytes[3];
495         }
496
497         int byte_width = *img_width / 8;
498         if (*img_width %8)
499             byte_width++;
500
501         buflen = byte_width * (*img_height);
502
503         buf = (char *)malloc (buflen);
504         if (buf == NULL)
505             return NULL;
506
507         if (header == 4)
508             buf[0]=headerbytes[4];
509
510         retval=read(wbmp_fd,buf+(5-header),buflen);
511
512         close(wbmp_fd);
513     }
514

```

```

515     /* now invert the image */
516     for (y = 0; y < *img_height; y++)
517         for (x = 0; x < *img_width; x++)
518             {
519                 pixel_offset = y * (*img_width) + x;
520                 byte_offset = pixel_offset / BYTE_SIZE;
521                 bit_offset = 7 - (pixel_offset % BYTE_SIZE);
522
523                 val = (buf[byte_offset] & (1 << bit_offset)) >> bit_offset;
524
525                 if (!val)
526                     buf[byte_offset] = buf[byte_offset] | 1 << bit_offset;
527                 else
528                     buf[byte_offset] = buf[byte_offset] & ~(1 << bit_offset);
529             }
530
531     return buf;
532 }

```

4.3.1.10 void g15r_pixelBox (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *color*, int *thick*, int *fill*)

Draws a box bounded by (x1, y1) and (x2, y2).

Draws a box around the area bounded by (x1, y1) and (x2, y2).

The box will be filled if fill != 0 and the sides will be thick pixels wide.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of the box.

y1 Defines uppermost bound of the box.

x2 Defines rightmost bound of the box.

y2 Defines bottommost bound of the box.

color Lines defining the box will be drawn this color.

thick Lines defining the box will be this many pixels thick.

fill The box will be filled with color if fill != 0.

Definition at line 163 of file pixel.c.

References g15r_drawLine(), and g15r_setPixel().

Referenced by g15r_drawBar(), and g15r_drawBigNum().

```

165 {
166     int i = 0;
167     for (i = 0; i < thick; ++i)
168         {
169             g15r_drawLine (canvas, x1, y1, x2, y1, color);    /* Top    */
170             g15r_drawLine (canvas, x1, y1, x1, y2, color);    /* Left   */
171             g15r_drawLine (canvas, x2, y1, x2, y2, color);    /* Right  */
172             g15r_drawLine (canvas, x1, y2, x2, y2, color);    /* Bottom */
173             x1++;
174             y1++;
175             x2--;
176             y2--;
177         }

```

```

178
179  int x = 0, y = 0;
180
181  if (fill)
182  {
183      for (x = x1; x <= x2; ++x)
184          for (y = y1; y <= y2; ++y)
185              g15r_setPixel (canvas, x, y, color);
186  }
187
188 }
```

4.3.1.11 void g15r_pixelOverlay (g15canvas * *canvas*, int *x1*, int *y1*, int *width*, int *height*, short *colormap*[])

Overlays a bitmap of size width x height starting at (x1, y1).

A 1-bit bitmap defined in colormap[] is drawn to the canvas with an upper left corner at (x1, y1) and a lower right corner at (x1+width, y1+height).

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines the leftmost bound of the area to be drawn.

y1 Defines the uppermost bound of the area to be drawn.

width Defines the width of the bitmap to be drawn.

height Defines the height of the bitmap to be drawn.

colormap An array containing width*height entries of value 0 for pixel off or != 0 for pixel on.

Definition at line 74 of file pixel.c.

References G15_COLOR_BLACK, G15_COLOR_WHITE, and g15r_setPixel().

```

76 {
77  int i = 0;
78
79  for (i = 0; i < (width * height); ++i)
80  {
81      int color = (colormap[i] ? G15_COLOR_BLACK : G15_COLOR_WHITE);
82      int x = x1 + i % width;
83      int y = y1 + i / width;
84      g15r_setPixel (canvas, x, y, color);
85  }
86 }
```

4.3.1.12 void g15r_pixelReverseFill (g15canvas * *canvas*, int *x1*, int *y1*, int *x2*, int *y2*, int *fill*, int *color*)

Fills an area bounded by (x1, y1) and (x2, y2).

The area with an upper left corner at (x1, y1) and lower right corner at (x2, y2) will be filled with color if fill>0 or the current contents of the area will be reversed if fill==0.

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x1 Defines leftmost bound of area to be filled.

y1 Defines uppermost bound of area to be filled.

x2 Defines rightmost bound of area to be filled.

y2 Defines bottommost bound of area to be filled.

fill Area will be filled with color if fill != 0, else contents of area will have color values reversed.

color If fill != 0, then area will be filled if color == 1 and emptied if color == 0.

Definition at line 45 of file pixel.c.

References g15r_getPixel(), and g15r_setPixel().

```
47 {
48     int x = 0;
49     int y = 0;
50
51     for (x = x1; x <= x2; ++x)
52     {
53         for (y = y1; y <= y2; ++y)
54         {
55             if (!fill)
56                 color = !g15r_getPixel (canvas, x, y);
57             g15r_setPixel (canvas, x, y, color);
58         }
59     }
60 }
```

4.3.1.13 void swap (int * *x*, int * *y*)

Definition at line 23 of file pixel.c.

Referenced by g15r_drawLine().

```
24 {
25     int tmp;
26
27     tmp = *x;
28     *x = *y;
29     *y = tmp;
30 }
```


4.4 screen.c File Reference

```
#include "libg15render.h"
```

Functions

- void **g15r_clearScreen** (**g15canvas** *canvas, int color)
Fills the screen with pixels of color.
- int **g15r_getPixel** (**g15canvas** *canvas, unsigned int x, unsigned int y)
Gets the value of the pixel at (x, y).
- void **g15r_initCanvas** (**g15canvas** *canvas)
Clears the canvas and resets the mode switches.
- void **g15r_setPixel** (**g15canvas** *canvas, unsigned int x, unsigned int y, int val)
Sets the value of the pixel at (x, y).

4.4.1 Function Documentation

4.4.1.1 void g15r_clearScreen (g15canvas * canvas, int color)

Fills the screen with pixels of color.

Clears the screen and fills it with pixels of color

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

color Screen will be filled with this color.

Definition at line 80 of file screen.c.

References `g15canvas::buffer`, and `G15_BUFFER_LEN`.

```
81 {
82     memset (canvas->buffer, (color ? 0xFF : 0), G15_BUFFER_LEN);
83 }
```

4.4.1.2 int g15r_getPixel (g15canvas * canvas, unsigned int x, unsigned int y)

Gets the value of the pixel at (x, y).

Retrieves the value of the pixel at (x, y)

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x X offset for pixel to be retrieved.

y Y offset for pixel to be retrieved.

Definition at line 29 of file screen.c.

References g15canvas::buffer, BYTE_SIZE, G15_LCD_HEIGHT, and G15_LCD_WIDTH.

Referenced by g15r_pixelReverseFill(), and g15r_setPixel().

```

30 {
31     if (x >= G15_LCD_WIDTH || y >= G15_LCD_HEIGHT)
32         return 0;
33
34     unsigned int pixel_offset = y * G15_LCD_WIDTH + x;
35     unsigned int byte_offset = pixel_offset / BYTE_SIZE;
36     unsigned int bit_offset = 7 - (pixel_offset % BYTE_SIZE);
37
38     return (canvas->buffer[byte_offset] & (1 << bit_offset)) >> bit_offset;
39 }
```

4.4.1.3 void g15r_initCanvas (g15canvas * *canvas*)

Clears the canvas and resets the mode switches.

Clears the screen and resets the mode values for a canvas

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct

Definition at line 91 of file screen.c.

References g15canvas::buffer, g15canvas::ftLib, G15_BUFFER_LEN, g15canvas::mode_cache, g15canvas::mode_reverse, and g15canvas::mode_xor.

```

92 {
93     memset (canvas->buffer, 0, G15_BUFFER_LEN);
94     canvas->mode_cache = 0;
95     canvas->mode_reverse = 0;
96     canvas->mode_xor = 0;
97 #ifdef TTF_SUPPORT
98     if (FT_Init_FreeType (&canvas->ftLib))
99         printf ("Freetype couldnt initialise\n");
100 #endif
101 }
```

4.4.1.4 void g15r_setPixel (g15canvas * *canvas*, unsigned int *x*, unsigned int *y*, int *val*)

Sets the value of the pixel at (x, y).

Sets the value of the pixel at (x, y)

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x X offset for pixel to be set.

y Y offset for pixel to be set.

val Value to which pixel should be set.

Definition at line 50 of file screen.c.

References g15canvas::buffer, BYTE_SIZE, G15_LCD_HEIGHT, G15_LCD_WIDTH, g15r_getPixel(), g15canvas::mode_reverse, and g15canvas::mode_xor.

Referenced by draw_ttf_char(), g15r_drawCircle(), g15r_drawIcon(), g15r_drawLine(), g15r_drawRoundBox(), g15r_drawSprite(), g15r_pixelBox(), g15r_pixelOverlay(), g15r_pixelReverseFill(), g15r_renderCharacterLarge(), g15r_renderCharacterMedium(), and g15r_renderCharacterSmall().

```
51 {
52   if (x >= G15_LCD_WIDTH || y >= G15_LCD_HEIGHT)
53     return;
54
55   unsigned int pixel_offset = y * G15_LCD_WIDTH + x;
56   unsigned int byte_offset = pixel_offset / BYTE_SIZE;
57   unsigned int bit_offset = 7 - (pixel_offset % BYTE_SIZE);
58
59   if (canvas->mode_xor)
60     val ^= g15r_getPixel (canvas, x, y);
61   if (canvas->mode_reverse)
62     val = !val;
63
64   if (val)
65     canvas->buffer[byte_offset] =
66       canvas->buffer[byte_offset] | 1 << bit_offset;
67   else
68     canvas->buffer[byte_offset] =
69       canvas->buffer[byte_offset] & ~(1 << bit_offset);
70
71 }
```

4.5 text.c File Reference

```
#include "libg15render.h"
```

Functions

- int **calc_ttf_centering** (FT_Face face, char *str)
- int **calc_ttf_right_justify** (FT_Face face, char *str)
- int **calc_ttf_totalstringwidth** (FT_Face face, char *str)
- int **calc_ttf_true_ypos** (FT_Face face, int y, int ttf_fontsize)
- void **draw_ttf_char** (g15canvas *canvas, FT_Bitmap charbitmap, unsigned char character, int x, int y, int color)
- void **draw_ttf_str** (g15canvas *canvas, char *str, int x, int y, int color, FT_Face face)
- void **g15r_renderCharacterLarge** (g15canvas *canvas, int col, int row, unsigned char character, unsigned int sx, unsigned int sy)

Renders a character in the large font at (x, y).

- void **g15r_renderCharacterMedium** (g15canvas *canvas, int col, int row, unsigned char character, unsigned int sx, unsigned int sy)

Renders a character in the medium font at (x, y).

- void **g15r_renderCharacterSmall** (g15canvas *canvas, int col, int row, unsigned char character, unsigned int sx, unsigned int sy)

Renders a character in the small font at (x, y).

- void **g15r_renderString** (g15canvas *canvas, unsigned char stringOut[], int row, int size, unsigned int sx, unsigned int sy)

Renders a string with font size in row.

- void **g15r_ttfLoad** (g15canvas *canvas, char *fontname, int fontsize, int face_num)

Loads a font through the FreeType2 library.

- void **g15r_ttfPrint** (g15canvas *canvas, int x, int y, int fontsize, int face_num, int color, int center, char *print_string)

Prints a string in a given font.

4.5.1 Function Documentation

4.5.1.1 int calc_ttf_centering (FT_Face face, char * str)

Definition at line 209 of file text.c.

References `calc_ttf_totalstringwidth()`.

Referenced by `g15r_ttfPrint()`.

```
210 {
211     int leftpos;
212
213     leftpos = 80 - (calc_ttf_totalstringwidth (face, str) / 2);
214     if (leftpos < 1)
```

```
215     leftpos = 1;
216
217     return leftpos;
218 }
```

4.5.1.2 int calc_ttf_right_justify (FT_Face *face*, char * *str*)

Definition at line 221 of file text.c.

References `calc_ttf_totalstringwidth()`.

Referenced by `gl5r_ttfPrint()`.

```
222 {
223     int leftpos;
224
225     leftpos = 160 - calc_ttf_totalstringwidth (face, str);
226     if (leftpos < 1)
227         leftpos = 1;
228
229     return leftpos;
230 }
```

4.5.1.3 int calc_ttf_totalstringwidth (FT_Face *face*, char * *str*)

Definition at line 191 of file text.c.

Referenced by `calc_ttf_centering()`, and `calc_ttf_right_justify()`.

```
192 {
193     FT_GlyphSlot slot = face->glyph;
194     FT_UInt glyph_index;
195     int i, errcode;
196     unsigned int len = strlen (str);
197     int width = 0;
198
199     for (i = 0; i < len; i++)
200     {
201         glyph_index = FT_Get_Char_Index (face, str[i]);
202         errcode = FT_Load_Glyph (face, glyph_index, 0);
203         width += slot->advance.x >> 6;
204     }
205     return width;
206 }
```

4.5.1.4 int calc_ttf_true_ypos (FT_Face *face*, int *y*, int *ttf_fontsize*)

Definition at line 179 of file text.c.

Referenced by `gl5r_ttfPrint()`.

```
180 {
181
182     if (!FT_IS_SCALABLE (face))
183         ttf_fontsize = face->available_sizes->height;
184
185     y += ttf_fontsize * .75;
186
187     return y;
188 }
```

4.5.1.5 void draw_ttf_char (g15canvas * *canvas*, FT_Bitmap *charbitmap*, unsigned char *character*, int *x*, int *y*, int *color*)

Definition at line 233 of file text.c.

References g15canvas::ftLib, and g15r_setPixel().

Referenced by draw_ttf_str().

```

235 {
236     FT_Int char_x, char_y, p, q;
237     FT_Int x_max = x + charbitmap.width;
238     FT_Int y_max = y + charbitmap.rows;
239     static FT_Bitmap tmpbuffer;
240
241     /* convert to 8bit format.. */
242     FT_Bitmap_Convert (canvas->ftLib, &charbitmap, &tmpbuffer, 1);
243
244     for (char_y = y, q = 0; char_y < y_max; char_y++, q++)
245         for (char_x = x, p = 0; char_x < x_max; char_x++, p++)
246             if (tmpbuffer.buffer[q * tmpbuffer.width + p])
247                 g15r_setPixel (canvas, char_x, char_y, color);
248 }
```

4.5.1.6 void draw_ttf_str (g15canvas * *canvas*, char * *str*, int *x*, int *y*, int *color*, FT_Face *face*)

Definition at line 251 of file text.c.

References draw_ttf_char().

Referenced by g15r_ttfPrint().

```

253 {
254     FT_GlyphSlot slot = face->glyph;
255     int i, errcode;
256     unsigned int len = strlen (str);
257
258     for (i = 0; i < len; i++)
259     {
260         errcode =
261             FT_Load_Char (face, str[i],
262                           FT_LOAD_RENDER | FT_LOAD_MONOCHROME |
263                           FT_LOAD_TARGET_MONO);
264         draw_ttf_char (canvas, slot->bitmap, str[i], x + slot->bitmap_left,
265                       y - slot->bitmap_top, color);
266         x += slot->advance.x >> 6;
267     }
268 }
```

4.5.1.7 void g15r_renderCharacterLarge (g15canvas * *canvas*, int *col*, int *row*, unsigned char *character*, unsigned int *sx*, unsigned int *sy*)

Renders a character in the large font at (x, y).

Definition at line 22 of file text.c.

References fontdata_8x8, G15_COLOR_BLACK, G15_COLOR_WHITE, and g15r_setPixel().

Referenced by g15r_renderString().

```

25 {
26     int helper = character * 8;    /* for our font which is 8x8 */
27
28     int top_left_pixel_x = sx + col * (8);    /* 1 pixel spacing */
29     int top_left_pixel_y = sy + row * (8);    /* once again 1 pixel spacing */
30
31     int x, y;
32     for (y = 0; y < 8; ++y)
33     {
34         for (x = 0; x < 8; ++x)
35         {
36             char font_entry = fontdata_8x8[helper + y];
37
38             if (font_entry & 1 << (7 - x))
39                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
40                               G15_COLOR_BLACK);
41             else
42                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
43                               G15_COLOR_WHITE);
44         }
45     }
46 }
47 }

```

4.5.1.8 void g15r_renderCharacterMedium (g15canvas * *canvas*, int *col*, int *row*, unsigned char *character*, unsigned int *sx*, unsigned int *sy*)

Renders a character in the meduim font at (x, y).

Definition at line 50 of file text.c.

References fontdata_7x5, G15_COLOR_BLACK, G15_COLOR_WHITE, and g15r_setPixel().

Referenced by g15r_renderString().

```

53 {
54     int helper = character * 7 * 5;    /* for our font which is 6x4 */
55
56     int top_left_pixel_x = sx + col * (5);    /* 1 pixel spacing */
57     int top_left_pixel_y = sy + row * (7);    /* once again 1 pixel spacing */
58
59     int x, y;
60     for (y = 0; y < 7; ++y)
61     {
62         for (x = 0; x < 5; ++x)
63         {
64             char font_entry = fontdata_7x5[helper + y * 5 + x];
65             if (font_entry)
66                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
67                               G15_COLOR_BLACK);
68             else
69                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
70                               G15_COLOR_WHITE);
71         }
72     }
73 }
74 }

```

4.5.1.9 void g15r_renderCharacterSmall (g15canvas * *canvas*, int *col*, int *row*, unsigned char *character*, unsigned int *sx*, unsigned int *sy*)

Renders a character in the small font at (x, y).

Definition at line 77 of file text.c.

References `fontdata_6x4`, `G15_COLOR_BLACK`, `G15_COLOR_WHITE`, and `g15r_setPixel()`.

Referenced by `g15r_renderString()`.

```

80 {
81     int helper = character * 6 * 4;          /* for our font which is 6x4 */
82
83     int top_left_pixel_x = sx + col * (4);    /* 1 pixel spacing */
84     int top_left_pixel_y = sy + row * (6);    /* once again 1 pixel spacing */
85
86     int x, y;
87     for (y = 0; y < 6; ++y)
88     {
89         for (x = 0; x < 4; ++x)
90         {
91             char font_entry = fontdata_6x4[helper + y * 4 + x];
92             if (font_entry)
93                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
94                               G15_COLOR_BLACK);
95             else
96                 g15r_setPixel (canvas, top_left_pixel_x + x, top_left_pixel_y + y,
97                               G15_COLOR_WHITE);
98         }
99     }
100 }
101 }
```

4.5.1.10 void g15r_renderString (g15canvas * *canvas*, unsigned char *stringOut*[], int *row*, int *size*, unsigned int *sx*, unsigned int *sy*)

Renders a string with font size in row.

Definition at line 104 of file text.c.

References `G15_TEXT_LARGE`, `G15_TEXT_MED`, `G15_TEXT_SMALL`, `g15r_renderCharacterLarge()`, `g15r_renderCharacterMedium()`, and `g15r_renderCharacterSmall()`.

```

106 {
107
108     int i = 0;
109     for (i; stringOut[i] != NULL; ++i)
110     {
111         switch (size)
112         {
113             case G15_TEXT_SMALL:
114             {
115                 g15r_renderCharacterSmall (canvas, i, row, stringOut[i], sx, sy);
116                 break;
117             }
118             case G15_TEXT_MED:
119             {
120                 g15r_renderCharacterMedium (canvas, i, row, stringOut[i], sx, sy);
121                 break;
122             }
123             case G15_TEXT_LARGE:
124             {
125                 g15r_renderCharacterLarge (canvas, i, row, stringOut[i], sx, sy);
126                 break;
127             }
128             default:
129                 break;
130         }
131     }
```



```

131     }
132
133 }
```

4.5.1.11 void g15r_ttfLoad (g15canvas * *canvas*, char * *fontname*, int *fontsize*, int *face_num*)

Loads a font through the FreeType2 library.

Load a font for use with FreeType2 font support

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

fontname Absolute pathname to font file to be loaded.

fontsize Size in points for font to be loaded.

face_num Slot into which font face will be loaded.

Definition at line 145 of file text.c.

References g15canvas::ftLib, G15_MAX_FACE, g15canvas::ttf_face, and g15canvas::ttf_fontsize.

```

146 {
147     int errcode = 0;
148
149     if (face_num < 0)
150         face_num = 0;
151     if (face_num > G15_MAX_FACE)
152         face_num = G15_MAX_FACE;
153
154     if (canvas->ttf_fontsize[face_num])
155         FT_Done_Face (canvas->ttf_face[face_num][0]);      /* destroy the last face */
156
157     if (!canvas->ttf_fontsize[face_num] && !fontsize)
158         canvas->ttf_fontsize[face_num] = 10;
159     else
160         canvas->ttf_fontsize[face_num] = fontsize;
161
162     errcode =
163         FT_New_Face (canvas->ftLib, fontname, 0, &canvas->ttf_face[face_num][0]);
164     if (errcode)
165     {
166         canvas->ttf_fontsize[face_num] = 0;
167     }
168     else
169     {
170         if (canvas->ttf_fontsize[face_num]
171             && FT_IS_SCALABLE (canvas->ttf_face[face_num][0]))
172             errcode =
173                 FT_Set_Char_Size (canvas->ttf_face[face_num][0], 0,
174                                 canvas->ttf_fontsize[face_num] * 64, 90, 0);
175     }
176 }
```

4.5.1.12 void g15r_ttfPrint (g15canvas * *canvas*, int *x*, int *y*, int *fontsize*, int *face_num*, int *color*, int *center*, char * *print_string*)

Prints a string in a given font.

Render a string with a FreeType2 font

Parameters:

canvas A pointer to a **g15canvas** (p. 5) struct in which the buffer to be operated on is found.

x initial x position for string.

y initial y position for string.

fontsize Size of string in points.

face_num Font to be used is loaded in this slot.

color Text will be drawn this color.

center Text will be centered if center == 1 and right justified if center == 2.

print_string Pointer to the string to be printed.

Definition at line 283 of file text.c.

References `calc_ttf_centering()`, `calc_ttf_right_justify()`, `calc_ttf_true_ypos()`, `draw_ttf_str()`, `g15canvas::ttf_face`, and `g15canvas::ttf_fontsize`.

```

285 {
286     int errcode = 0;
287
288     if (canvas->ttf_fontsize[face_num])
289     {
290         if (fontsize > 0 && FT_IS_SCALABLE (canvas->ttf_face[face_num][0]))
291         {
292             canvas->ttf_fontsize[face_num] = fontsize;
293             int errcode =
294                 FT_Set_Pixel_Sizes (canvas->ttf_face[face_num][0], 0,
295                                     canvas->ttf_fontsize[face_num]);
296             if (errcode)
297                 printf ("Trouble setting the Glyph size!\n");
298         }
299         y =
300             calc_ttf_true_ypos (canvas->ttf_face[face_num][0], y,
301                                 canvas->ttf_fontsize[face_num]);
302         if (center == 1)
303             x = calc_ttf_centering (canvas->ttf_face[face_num][0], print_string);
304         else if (center == 2)
305             x = calc_ttf_right_justify (canvas->ttf_face[face_num][0], print_string);
306         draw_ttf_str (canvas, print_string, x, y, color,
307                     canvas->ttf_face[face_num][0]);
308     }
309 }
```

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