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FdF Cookbook   🔖 Watch

FdF (/tags/26/topics)   **Graphics (/tags/27/topics)**
MiniLibX (/tags/716/topics)

Altruist vbrazhni(https://profile.intra.42.fr/users/vbrazhni)

🔗 (/topics/19254/messages?page=1#93513)   👁 2270   🕐 2018-08-23   ⚙

Foreword

You can also read this information on my GitHub **wiki-pages**. Maybe it will be more comfortable for someone.

Link: https://github.com/VBrazhnik/FdF/wiki **488**   (https://github.com/VBrazhnik/FdF/wiki)

How to handle mouse buttons and key presses?

On `macOS` , if you want to handle mouse buttons and key presses and close the window with the red button, you can use the following function instead of the other hook functions:

```
int mlx_hook(void *win_ptr, int x_event, int x_mask, int (*funct)(), void *param);
```

To handle a key press

At the place of `int x_event` parametr use `2` .

At the place of `int (*funct)()` parameter you use the following function:

```
int key_press(int keycode, void *param)
```

To handle a key release

At the place of `int x_event` parametr use `3` .

At the place of `int (*funct)()` parameter you use the following function:

```
int key_release(int keycode, void *param)
```

To handle a mouse button press

At the place of `int x_event` parametr use `4` .

At the place of `int (*funct)()` parameter you use the following function:

```
int mouse_press(int button, int x, int y, void *param)
```

To handle a mouse button release

At the place of `int x_event` parametr use `5` .

At the place of `int (*funct)()` parameter you use the following function:

```
int mouse_release(int button, int x, int y, void *param)
```

To handle a mouse movement

At the place of `int x_event` parametr use `6` .

At the place of `int (*funct)()` parameter you use the following function:

Type some words...

```
int mouse_move(int x, int y, void *param)
```

To handle an expose event

At the place of `int x_event` parametr use `12`.

At the place of `int (*funct)()` parameter you use the following function:

```
int expose(void *param)
```

To handle a red button (X button) press

At the place of `int x_event` parametr use `17`.

At the place of `int (*funct)()` parameter you use the following function:

```
int close(void *param)
```

Complete `int close(void *param)` function:

```
int close(void *param)
{
    (void)param;
    exit(0);
}
```

Tip:

`x_mask` is ignored on macOS. But if you want that your `FdF` will have compatibility with Linux, you must use `x_mask`.

Key codes

Mouse button codes

- Left button — `1`
- Right button — `2`
- Third (Middle) button — `3`
- Scroll Up — `4`
- Scroll Down — `5`
- Scroll Left — `6`
- Scroll Right — `7`

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Masks

You can find values of `x_mask` here **543** (https://refspecs.linuxfoundation.org/LSB_1.3.0/gLSB/gLSB/libx11-ddefs.html).

Tip:

`x_mask` for `int close(void *param)` is (1L << 17).

Type some words...

Users in the topic

6   2   1   1   1   1   1   1

Links in the topic

Data Definitions for libX11 **543** (https://refspecs.linuxfoundation.org/LSB_1.3.0/gLSB/gLSB/libx11-ddefs.html) refspecs.linuxfoundation.org
Pages · VBrazhnik/FdF Wiki · GitHub **488** (https://github.com/VBrazhnik/FdF/wiki) github.com
Bresenham's line algorithm - Wikipedia **306** (https://en.wikipedia.org/wiki/Bresenham%27s_line_algorithm) en.wikipedia.org
Rotation matrix - Wikipedia **295** (https://en.wikipedia.org/wiki/Rotation_matrix) en.wikipedia.org
Xiaolin Wu's line algorithm - Wikipedia **252** (https://en.wikipedia.org/wiki/Xiaolin_Wu%27s_line_algorithm) en.wikipedia.org
Вращение фигуры в 3-х мерном пространстве | Компьютерная графика **227** (http://grafika.me/node/82) grafika.me
Isometric 2:1 Projections: Isometric Infographic Vectors - Vectips **187** (http://vectips.com/tutorials/isometric-infographic-vectors/) vectips.com
kirupa.com - Isometric Transformation **176** (https://www.kirupa.com/developer/actionscript/isometric_transforms.htm) kirupa.com
How do I calculate color gradients? - Graphic Design Stack Exchange **136** (https://graphicdesign.stackexchange.com/a/100926)
graphicdesign.stackexchange.com
Geometry (How Does Matrix Work: Part 1) **136** (http://www.scratchapixel.com/lessons/mathematics-physics-for-computer-
graphics/geometry/how-does-matrix-work-part-1) scratchapixel.com

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Altruist vbrazhni(https://profile.intra.42.fr/users/vbrazhni)

🔗 (/topics/19254/messages?page=1#93515)   👁 2142   🕐 2018-08-23   ⚙

How to draw a line?

To draw a line you can use Bresenham's line algorithm **281** (https://en.wikipedia.org/wiki/Bresenham%27s_line_algorithm) (simpler solution) or
Xiaolin Wu's line algorithm **236** (https://en.wikipedia.org/wiki/Xiaolin_Wu%27s_line_algorithm) (more sophisticated solution which will produced
more beautiful result).

Altruist vbrazhni(https://profile.intra.42.fr/users/vbrazhni)

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How to create linear gradient?

Here we will consider how to find the color between any two color points through linear interpolation.

First of all we need to find current point position between two points with known colors. Position value must be expressed in percentages.

The following function will help you find this value:

Type some words...

```
double percent(int start, int end, int current)
{
    double placement;
    double distance;

    placement = current - start;
    distance = end - start;
    return ((distance == 0) ? 1.0 : (placement / distance));
}
```

You can calculate this value depending on which delta value is bigger. Delta between x values of known points or delta between y values.

Part of code:

```
// ...
    double percentage;

    if (delta.x > delta.y)
        percentage = percent(start.x, end.x, current.x);
    else
        percentage = percent(start.y, end.y, current.y);
// ...
```

Then for creating each light (**R**ed, **G**reen, **B**lue) we need to get light from start and end point and use linear interpolation. At the end we need to get new color by union red, green and blue light.

Part of code:

```
// ...
    int red;
    int green;
    int blue;

    // Get percentage

    red = get_light((start.color >> 16) & 0xFF, (end.color >> 16) & 0xFF, percentage);
    green = get_light((start.color >> 8) & 0xFF, (end.color >> 8) & 0xFF, percentage);
    blue = get_light(start.color & 0xFF, end.color & 0xFF, percentage);
    return ((red << 16) | (green << 8) | blue);
```

```
int get_light(int start, int end, double percentage)
{
    return ((int)((1 - percentage) * start + percentage * end));
}
```

Complete code:

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Type some words...

```
int get_light(int start, int end, double percentage)
{
    return ((int)((1 - percentage) * start + percentage * end));
}

int get_color(t_point current, t_point start, t_point end, t_point delta)
{
    int     red;
    int     green;
    int     blue;
    double  percentage;

    if (current.color == end.color)
        return (current.color);
    if (delta.x > delta.y)
        percentage = percent(start.x, end.x, current.x);
    else
        percentage = percent(start.y, end.y, current.y);
    red = get_light((start.color >> 16) & 0xFF, (end.color >> 16) & 0xFF, percentage);
    green = get_light((start.color >> 8) & 0xFF, (end.color >> 8) & 0xFF, percentage);
    blue = get_light(start.color & 0xFF, end.color & 0xFF, percentage);
    return ((red << 16) | (green << 8) | blue);
}
```

Basic information was found here **126**   (https://graphicdesign.stackexchange.com/a/100926).

Color for pixel

Everything is easy if you decided to use the following function:

```
int mlx_pixel_put(void *mlx_ptr, void *win_ptr, int x, int y, int color);
```

In this case, the order of lights is standard:

O   R   G   B
8 bits 8 bits 8 bits 8 bits

As you can see that the first byte is filled with zeros. It means that the alpha channel of color is not supported by `minilibx`.

You can find this information in `mlx_pixel_put` man file.

Also, this information is actual for color parameter in the function which displays text:

```
int mlx_string_put(void *mlx_ptr, void *win_ptr, int x, int y, int color, char *string);
```

But if you decided to use an image, you will face with more complicated usage rules.

You will work with the following three functions:

```
void *mlx_new_image(void *mlx_ptr, int width, int height);
```

```
char *mlx_get_data_addr(void *img_ptr, int *bits_per_pixel, int *size_line, int *endian);
```

```
int mlx_put_image_to_window(void *mlx_ptr, void *win_ptr, void *img_ptr, int x, int y);
```

And the most interesting is the second function with such parameters as `bits_per_pixel` and `endian`.

What is bits per pixel or bit-depth value? FdF Cookbook   [**FdF (/tags/26/topics)**]   [**Graphics (**

The number of bits used to define a pixel's color shade is its bit-depth. True color is sometimes known as 24-bit color. Some new color display systems offer a 32-bit color mode. The extra byte, called the alpha channel, is used for control and special effects information.

Type some words...

For `macOS` value of `bits_per_pixel` is constant. You can find the following lines in source files of minilibx:

```
#define UNIQ_BPP 4
```

```
// assume here 32bpp little endian

char *mlx_get_data_addr(mlx_img_list_t *img_ptr, int *bits_per_pixel, int *size_line, int *endian)
{
    *bits_per_pixel = UNIQ_BPP * 8;
    *size_line = img_ptr->width * UNIQ_BPP;
    // ...
}
```

If you decided to support only `macOS`, you don't need to worry about the size of the variable with color. It is exactly as needed — 4 bytes (32 bits).

`endian` is the most important parameter that we have to consider.

For `macOS` its value is `0`, which means `little endian`.

Information about `endian` value you can also find in source files of minilibx:

```
/*
** endian : 0 = sever X is little endian, 1 = big endian
** endian : useless on macos, client and graphical framework have the same endian
*/
```

```
// assume here 32bpp little endian

char *mlx_get_data_addr(mlx_img_list_t *img_ptr, int *bits_per_pixel, int *size_line, int *endian)
{
    // ...
    *endian = 0; // little endian for now on mac-intel
    // ...
}
```

Big-endian and little-endian are the formats of ordering bytes.

Big-endian is the format that we used to know as **normal**.

Little-endian order is **reversed**.

For color these two formats look like:

Byte number	0	1	2	3
Big endian	0	R	G	B
Little endian	B	G	R	0

So in the case of little-endian format, you have to use reversed order of color components:

```
// ...
    int i;

    i = (x * fdf->bits_per_pixel / 8) + (y * fdf->size_line);
    fdf->data_addr[i] = color; // B — Blue
    fdf->data_addr[++i] = color >> 8; // G — Green
    fdf->data_addr[++i] = color >> 16; // R — Red
    fdf->data_addr[++i] = 0; // Alpha channel
// ...
```

Altruist vbrazhni (https://profile.intra.42.fr/users/vbrazhni)

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How to rotate figure in 3D? FdF Cookbook **FdF (/tags/26/topics)** **Graphics (**

If you want to rotate a vector you should construct what is known as a rotation matrix **295** (https://en.wikipedia.org/wiki/Rotation_matrix).

X-Axis Rotation

Type some words...

$$R_x(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & cos(\theta) & -sin(\theta) \\ 0 & sin(\theta) & cos(\theta) \end{bmatrix}$$

After the transformations, we will get the formulas:

$x' = x;$
$y' = y * cos(\theta) + z * sin(\theta);$
$z' = -y * sin(\theta) + z * cos(\theta);$

Y-Axis Rotation

$$R_y(\theta) = \begin{bmatrix} cos(\theta) & 0 & sin(\theta) \\ 0 & 1 & 0 \\ -sin(\theta) & 0 & cos(\theta) \end{bmatrix}$$

After the transformations, we will get the formulas:

$x' = x * cos(\theta) + z * sin(\theta);$
$y' = y;$
$z' = -x * sin(\theta) + z * cos(\theta);$

Z-Axis Rotation

$$R_z(\theta) = \begin{bmatrix} cos(\theta) & -sin(\theta) & 0 \\ sin(\theta) & cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

After the transformations, we will get the formulas:

$x' = x * cos(\theta) - y * sin(\theta);$
$y' = x * sin(\theta) + y * cos(\theta);$
$z' = z;$

Source of information **227** (http://grafika.me/node/82) (Russian)

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🔗 (/topics/19254/messages?page=1#93530)   👁 2011   🕐 2018-08-23   ⚙

How to perform isometric transformations?

There are **"true"** isometric projection and **2:1** isometric projection.

True isometric projection uses a 30° angle (0.523599 rad).

2:1 isometric projection uses a 26.57° angle (0.46373398 rad).

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Type some words...

2:1 ISOMETRIC PROJECTION

TRUE ISOMETRIC PROJECTION

26.57°

30°

Source of information **179**   (http://vectips.com/tutorials/isometric-infographic-vectors/)
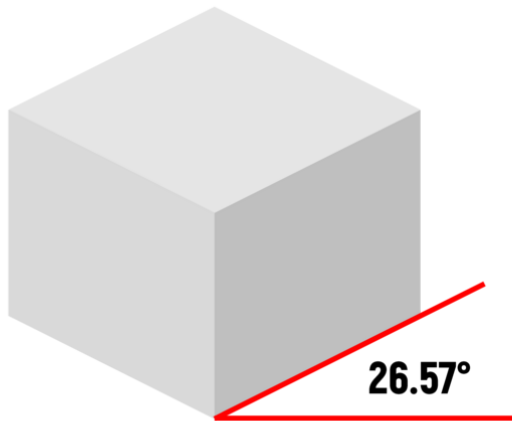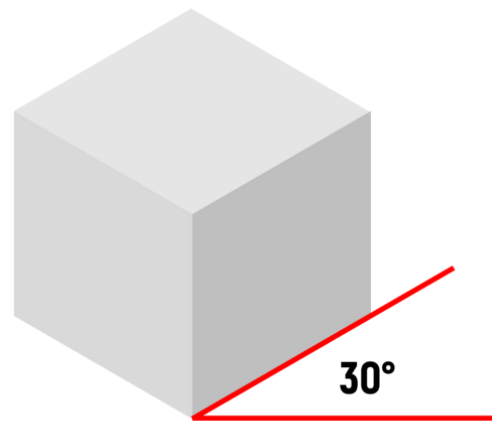
Code for transforming:

```
static void iso(int *x, int *y, int z)
{
    int previous_x;
    int previous_y;

    previous_x = *x;
    previous_y = *y;
    *x = (previous_x - previous_y) * cos(0.523599);
    *y = -z + (previous_x + previous_y) * sin(0.523599);
}

t_point project(t_point p, t_fdf *fdf)
{
// ...
    if (fdf->camera->projection == ISO)
        iso(&p.x, &p.y, p.z);
// ...
}
```

Source of information **167**   (https://www.kirupa.com/developer/actionscript/isometric_transforms.htm)

🕐 2019-01-10 ⚙

mtaylor
(https://profile.intra.42.fr/users/mtaylor)

This transformation is pretty good, but it results in a "backwards" image. (This is most noticeable in the example that says "42", but the text is reversed.)

To fix this, invert the + and -:

```
new_x = (x + y) * cos(angle);
new_y = (x - y) * sin(angle) - z;
```

↩ reply

🕐 2019-01-10 ⚙

Altruist vbrazhni
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It depends only on your realization of reading and storage coordinates of a map. Someone will get a completely correct image after projection, someone will get a reversed image.

You are completely right that it is simply to fix. You can correct this formula and formulas in the previous publication (changing sign before x, y or z) to reverse axis direction. And this change will reverse your image by x, y or z axis.

The format of formulas, that are listed here, is the best for my FdF. But if you get reversed images, change

FdF Cookbook   **FdF (/tags/26/topics)**   **Graphics (**

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↰ reply

🕓 2019-01-10   ⚙

mtaylor
(https://profile.intra.42.fr/users/mtaylor)

Slanting right:

```
new_x = (x + y) * cos(angle);
new_y = (x - y) * sin(angle) - z;
```

Slanting left:

```
new_x = (x - y) * -cos(angle);
new_y = ((x + y) * sin(angle)) - z;
```

Mirror image slanting right:

```
new_x = (x - y) * cos(angle);
new_y = ((x + y) * sin(angle)) - z;
```

Mirror image slanting left:

```
new_x = (x + y) * -cos(angle);
new_y = ((x - y) * sin(angle)) - z;
```

↰ reply

cfargere(https://profile.intra.42.fr/users/cfargere)

🔗 (/topics/19254/messages?page=1#108483)   👁 1290   🕓 2019-03-19   ⚙

Interestingly, the rotation matrix shown here are reversed from the scratchpixel tutorial here **108** (http://www.scratchapixel.com/lessons/mathematics-physics-for-computer-graphics/geometry/how-does-matrix-work-part-1).

cyuriko(https://profile.intra.42.fr/users/cyuriko)

🔗 (/topics/19254/messages?page=1#130351)   👁 616   🕓 2 months ago   ⚙

Most helpful, thanks!

bshara(https://profile.intra.42.fr/users/bshara)

🔗 (/topics/19254/messages?page=1#131137)   👁 506   🕓 2 months ago   ⚙

thanks😄

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jmacgyve(https://profile.intra.42.fr/users/jmacgyve)

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🔗 (/topics/19254/messages?page=1#133011)   👁 305   🕓 a month ago   ⚙

th

samymone(https://profile.intra.42.fr/users/samymone)

🔗 (/topics/19254/messages?page=1#133651)   👁 268   🕐 25 days ago   ⚙

very helpful, thanks!)

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