The Simple DirectMedia Layer, (SDL) 2.0 Library
A Brief Introduction

September 4, 2017

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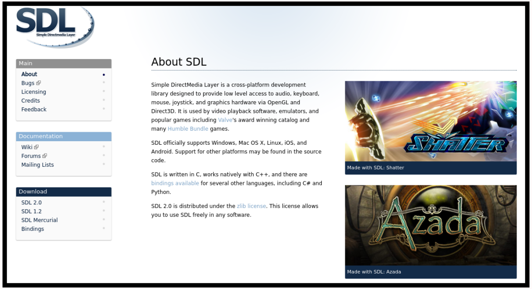
1. Resources



About SDL

Simple DirectMedia Layer is a cross-platform development library designed to provide low level access to audio, keyboard, mouse, joystick, and graphics hardware via OpenGL and Direct3D. It is used by video playback software, emulators, and popular games including Valve's award winning catalog and many Humble Bundle games.

SDL officially supports Windows, Mac OS X, Linux, iOS, and Android. Support for other platforms may be found in the source code.

SDL is written in C, works natively with C++, and there are bindings available for several other languages, including C# and Python.

SDL 2.0 is distributed under the zlib license. This license allows you to use SDL freely in any software.

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2. Why Use SDL?

- Compiles and runs on Linux, Windows, OSX
- Large user community
- Lightweight

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3. What’s new in 2.0?

- 3D accelerated, texture-based rendering
- Hardware-accelerated 2D graphics
- Multiple Windows
- Audio 7.1
- Audio capture support
- And more . . .

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Nvidia's GTX Titan Graphics Card

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4. Game Loop

- The game loop drives the video game.
- Our game loop will utilize the philosophy "run as fast as you can."

```
while ( true ) {
  processInput();
  update();
  render();
}
```

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4.1. Alternative Game Loop

- The game loop drives the video game.
- Our game loop will utilize the philosophy "run as fast as you can."

```
while ( true ) {
  processInput();
  update();
  render();
  sleep( ms );
}
```

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5. General Facts About SDL 2.0:

- No backward compatibility with 1.2
- No SDL_main
- Multiple windows:

```
SDL_Window *window =
  SDL_CreateWindow("Game Window",
                    posX,
                    posY,
                    640, 480,
                    <flags>);
```

- SDL_Window is a struct with a specified position, dimension, and flags.

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5.1. Some Window <flags>

- Must set posX & posY to SDL_WINDOWPOS_UNDEFINED for:
  - SDL_WINDOW_FULLSCREEN
- SDL_WINDOW_OPENGL
- Window can be centered with: SDL_WINDOWPOS_CENTERED

```
SDL_Window* window =
    SDL_CreateWindow( "Hello World", SDL_WINDOWPOS_CENTERED,
       SDL_WINDOWPOS_CENTERED, WIDTH, HEIGHT, SDL_WINDOW_SHOWN );
if( window == NULL ) {
   throw (std::string("Couldn't make a window: ")+SDL_GetError());
 }
```

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5.2. Surface v Texture

- Surface: always in RAM and always operated on by CPU
- Texture: SDL2 has a new rendering API: moves software rendering into video RAM and onto the GPU.
  - If possible: use OpenGL or Direct3D
  - Faster blits
  - Scaling

5.3. Renderer

-
  ```
  SDL_Renderer *renderer =
     SDL_CreateRenderer(window, -1, 0);
  ```
- SDL_Renderer is a struct that handles all drawing.
- The SDL_Renderer draws textures.
- It's attached to an SDL_Window and it can only render in that window.
- Keeps track of settings attached to the window, such as the window clear color.
- Hides details of how render occurs: OpenGL, Direct3D, or software surfaces
- If want to reduce tearing, instead of 0 for third parameter, use: SDL_RENDERER_PRESENTVSYNC

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5.4. Clearing the Window/Screen

```
SDL_SetRenderDrawColor(renderer,
   0, 0, 0, 255);
SDL_RenderClear(renderer);
SDL_RenderPresent(renderer);
```

- Black: (0, 0, 0)
- Alpha channel: 255 is opaque
- SDL_RenderClear() – paints window
- SDL_RenderPresent() – similar to SDL_Flip()

5.5. blitting Surfaces in SDL1.2

- In SDL 1.2 we loaded sprites from disk into SDL_Surfaces
- Surfaces were loaded once, and game loop went like this:
  - blit surface
  - SDL_Flip
  - repeat

5.6. rendering Textures from Surfaces

- In SDL2, we can load surfaces and then convert them to textures:

```
SDL_Surface *surface = IMG_Load("hello.bmp");
SDL_Texture *texture =
  SDL_CreateTextureFromSurface(renderer, surface);
SDL_FreeSurface(surface);  // throw surface away

Loop:
  SDL_RenderClear(renderer);
  SDL_RenderCopy(renderer, texture, NULL, NULL);
  SDL_RenderPresent(renderer);
```

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5.7. rendering Textures Directly

```
SDL_Texture *texture =
  IMG_LoadTexture(renderer, "hello.bmp");

Loop:
  SDL_RenderClear(renderer);
  SDL_RenderCopy(renderer, texture, NULL, NULL);
  SDL_RenderPresent(renderer);
```

Of course, we have memory leaks if we don't:

```
SDL_DestroyTexture(texture);
SDL_DestroyRenderer(renderer);
SDL_DestroyWindow(win);
```

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6. External Libraries

- The libraries we will use:
  - SDL_image: support for bmp, gif, png, jpg, tga, pcx, . . .
  - SDL_mixer: audio mixer library, supports mp3, midi, ogg.
  - SDL_ttf: support fo TrueType fonts
  - expat: SAX XML parser
- Additional libraries that we will not use:
  - SDL_rtf: for Rich Text Format
  - SDL_net: cross-platform networking library