SOL

Shape Oriented Language

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Why SOL?

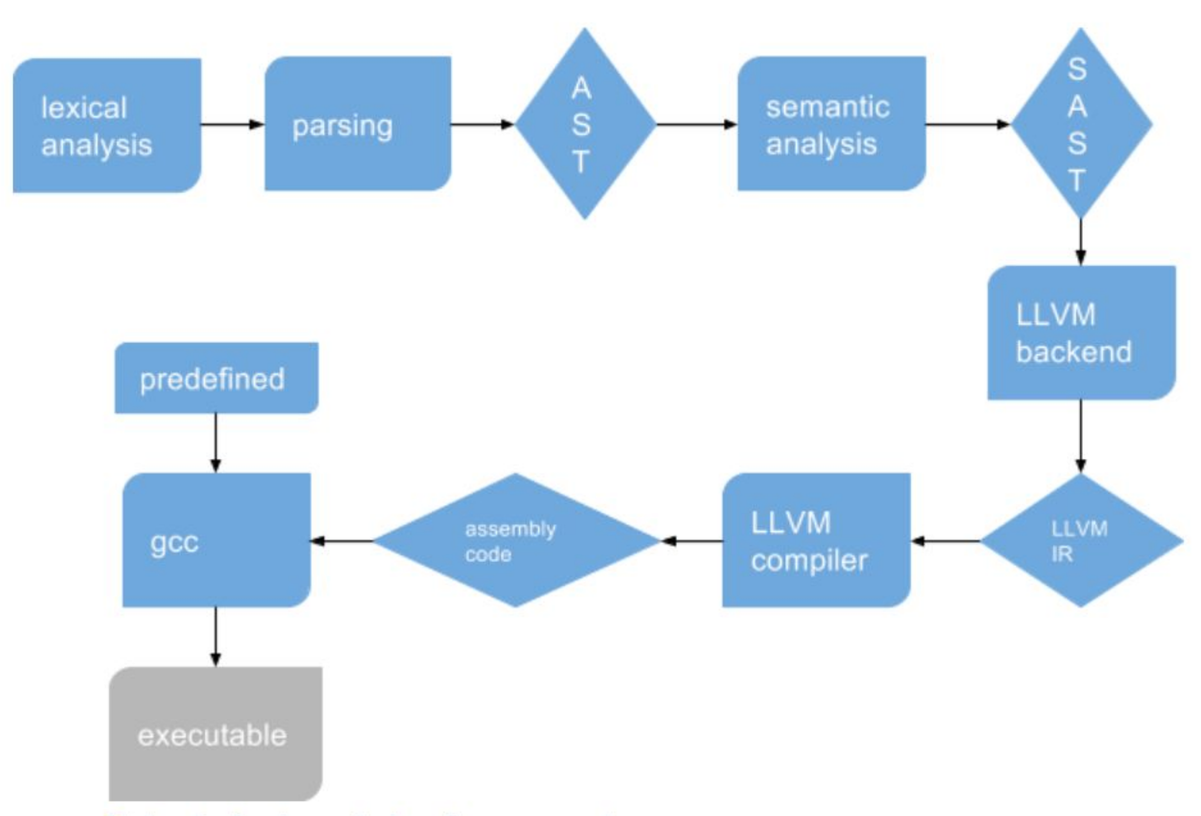
We wanted:

- a simple, lightweight object-oriented language for creating 2D animations
- the ability to define and create shapes (similar to a class)
- shapes to move as specified by the programmer
- to take away learning a complicated third-party animation tool, such as OpenGL

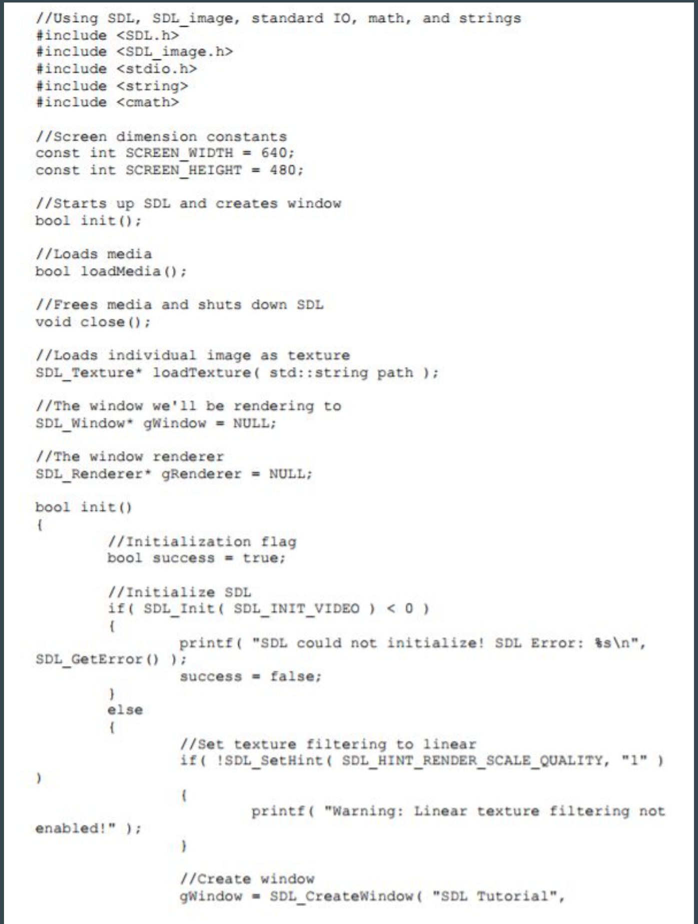
Advantages to SOL

- Easy to learn
  - similar to Java, C++
- Great alternative to C graphics libraries
  - Skip learning a complex language library
  - Object-oriented
- Easy memory management
  - Programmer does *not* have to worry about memory management
  - No memory leaks
- Abstracts cumbersome features in libraries
  - No renderers, screens, or external media needed to create and animate shapes

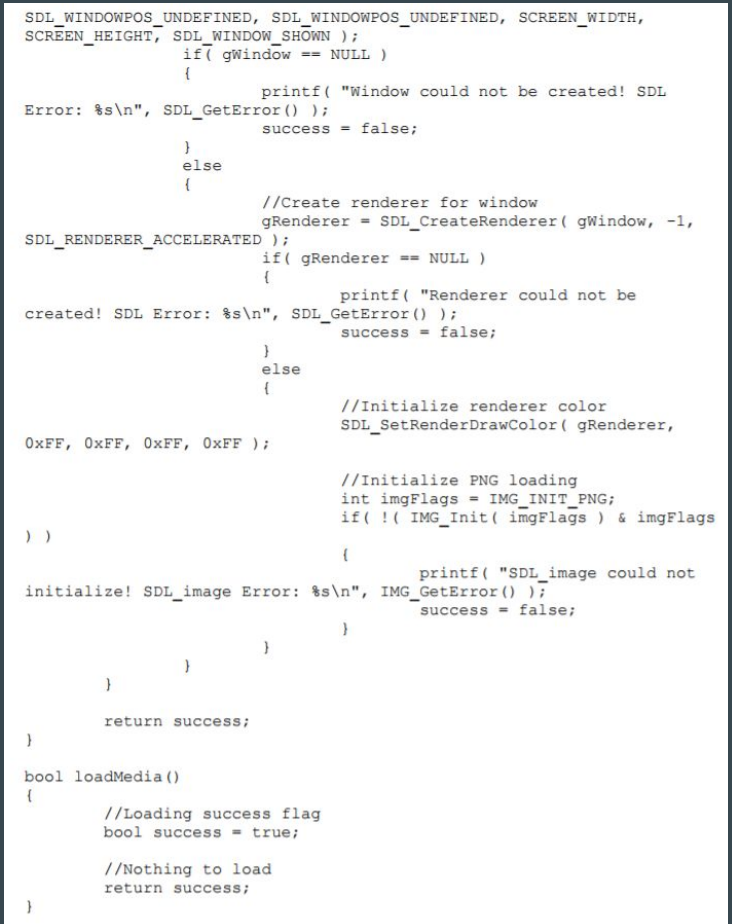
Architecture



Stationary Triangle in SDL

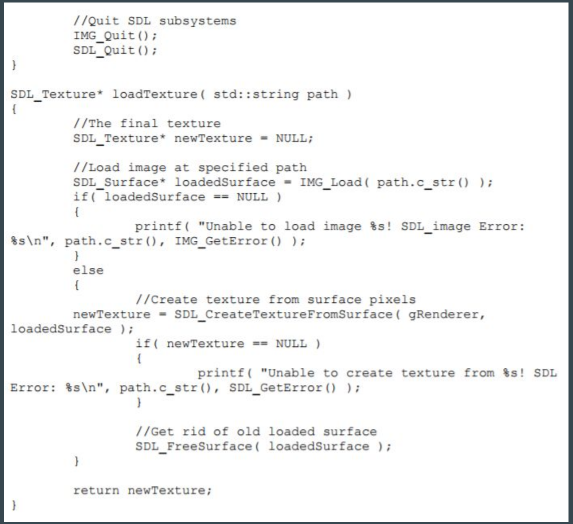


```
//Using SDL, SDL_image, standard IO, math, and strings
#include <SDL.h>
#include <SDL_image.h>
#include <stdio.h>
#include <string>
#include <cmath>

//Screen dimension constants
const int SCREEN_WIDTH = 640;
const int SCREEN_HEIGHT = 480;

//Starts up SDL and creates window
bool init();

//Loads media
bool loadMedia();

//Frees media and shuts down SDL
void close();

//Loads individual image as texture
SDL_Texture* loadTexture( std::string path );

//The window we'll be rendering to
SDL_Window* gWindow = NULL;

//The window renderer
SDL_Renderer* gRenderer = NULL;

bool init()
{
        //Initialization flag
        bool success = true;

        //Initialize SDL
        if( SDL_Init( SDL_INIT_VIDEO ) < 0 )
        {
                printf( "SDL could not initialize! SDL Error: %s\n",
SDL_GetError() );
                success = false;
        }
        else
        {
                //Set texture filtering to linear
                if( !SDL_SetHint( SDL_HINT_RENDER_SCALE_QUALITY, "1" )
)
                {
                        printf( "Warning: Linear texture filtering not
enabled!" );
                }

                //Create window
                gWindow = SDL_CreateWindow( "SDL Tutorial",
```

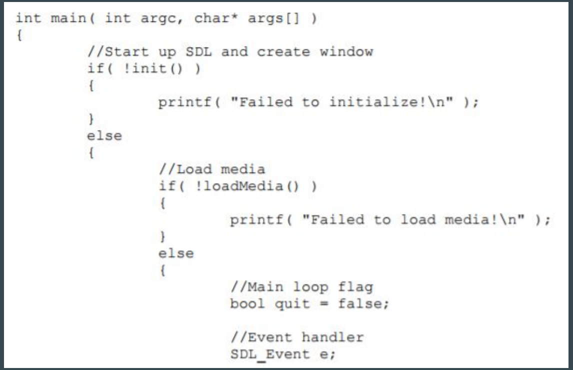


```
SDL_WINDOWPOS_UNDEFINED, SDL_WINDOWPOS_UNDEFINED, SCREEN_WIDTH,
SCREEN_HEIGHT, SDL_WINDOW_SHOWN );
                if( gWindow == NULL )
                {
                        printf( "Window could not be created! SDL
Error: %s\n", SDL_GetError() );
                        success = false;
                }
                else
                {
                        //Create renderer for window
                        gRenderer = SDL_CreateRenderer( gWindow, -1,
SDL_RENDERER_ACCELERATED );
                        if( gRenderer == NULL )
                        {
                                printf( "Renderer could not be
created! SDL Error: %s\n", SDL_GetError() );
                                success = false;
                        }
                        else
                        {
                                //Initialize renderer color
                                SDL_SetRenderDrawColor( gRenderer,
0xFF, 0xFF, 0xFF, 0xFF );

                                //Initialize PNG loading
                                int imgFlags = IMG_INIT_PNG;
                                if( !( IMG_Init( imgFlags ) & imgFlags
) )

                                {
                                        printf( "SDL_image could not
initialize! SDL_image Error: %s\n", IMG_GetError() );
                                        success = false;
                                }
                        }
                }
        }

        return success;
}

bool loadMedia()
{
        //Loading success flag
        bool success = true;

        //Nothing to load
        return success;
}
```

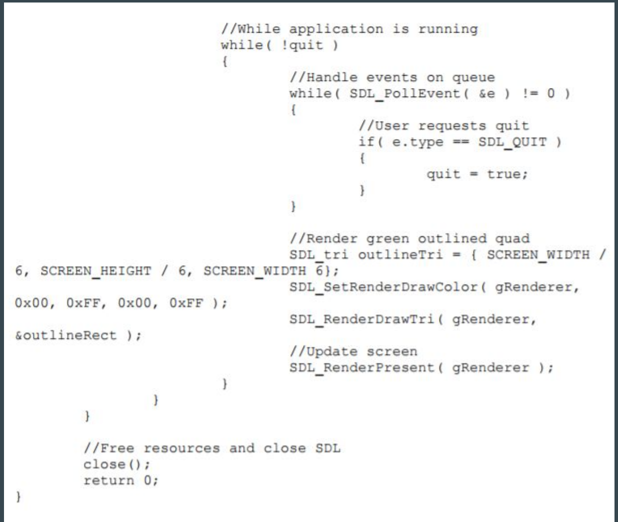
Stationary Triangle in SDL



```
        //Quit SDL subsystems
        IMG_Quit();
        SDL_Quit();
}

SDL_Texture* loadTexture( std::string path )
{
        //The final texture
        SDL_Texture* newTexture = NULL;

        //Load image at specified path
        SDL_Surface* loadedSurface = IMG_Load( path.c_str() );
        if( loadedSurface == NULL )
        {
                printf( "Unable to load image %s! SDL_image Error:
%s\n", path.c_str(), IMG_GetError() );
        }
        else
        {
                //Create texture from surface pixels
        newTexture = SDL_CreateTextureFromSurface( gRenderer,
loadedSurface );
                if( newTexture == NULL )
                {
                        printf( "Unable to create texture from %s! SDL
Error: %s\n", path.c_str(), SDL_GetError() );
                }

                //Get rid of old loaded surface
                SDL_FreeSurface( loadedSurface );
        }

        return newTexture;
}
```

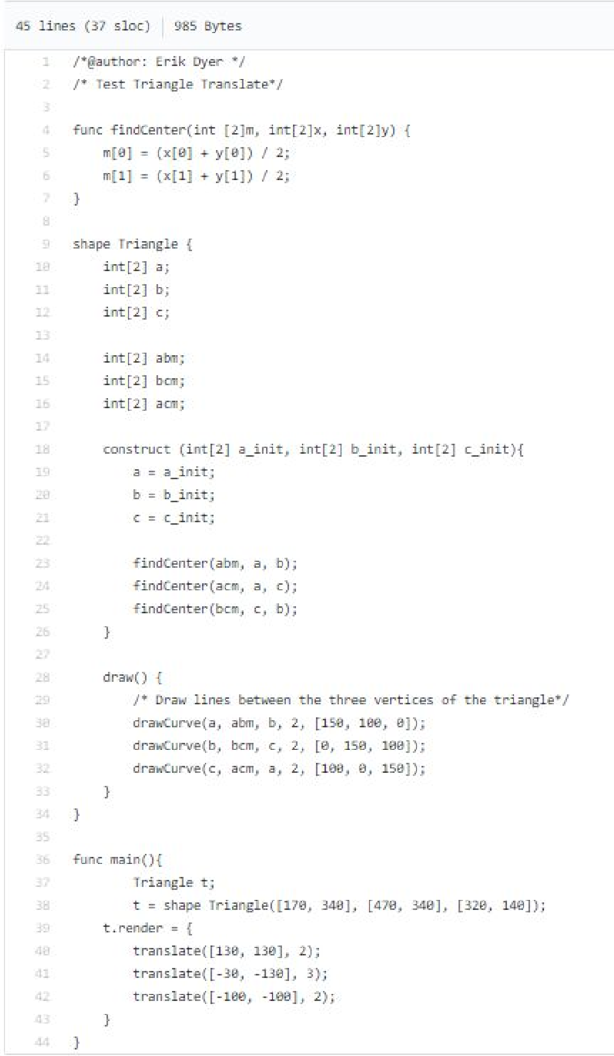


```
int main( int argc, char* args[] )
{
        //Start up SDL and create window
        if( !init() )
        {
                printf( "Failed to initialize!\n" );
        }
        else
        {
                //Load media
                if( !loadMedia() )
                {
                        printf( "Failed to load media!\n" );
                }
                else
                {
                        //Main loop flag
                        bool quit = false;

                        //Event handler
                        SDL_Event e;
```



```
                        //While application is running
                        while( !quit )
                        {
                                //Handle events on queue
                                while( SDL_PollEvent( &e ) != 0 )
                                {
                                        //User requests quit
                                        if( e.type == SDL_QUIT )
                                        {
                                                quit = true;
                                        }
                                }

                                //Render green outlined quad
                                SDL_tri outlineTri = { SCREEN_WIDTH /
6, SCREEN_HEIGHT / 6, SCREEN_WIDTH 6};
                                SDL_SetRenderDrawColor( gRenderer,
0x00, 0xFF, 0x00, 0xFF );
                                SDL_RenderDrawTri( gRenderer,
&outlineRect );
                                //Update screen
                                SDL_RenderPresent( gRenderer );
                        }
                }
        }

        //Free resources and close SDL
        close();
        return 0;
}
```

Moving Triangle in SOL



45 lines (37 sloc) | 985 Bytes

```
/*@author: Erik Dyer */
/* Test Triangle Translate*/

func findCenter(int [2]m, int[2]x, int[2]y) {
    m[0] = (x[0] + y[0]) / 2;
    m[1] = (x[1] + y[1]) / 2;
}

shape Triangle {
    int[2] a;
    int[2] b;
    int[2] c;

    int[2] abm;
    int[2] bcm;
    int[2] acm;

    construct (int[2] a_init, int[2] b_init, int[2] c_init){
        a = a_init;
        b = b_init;
        c = c_init;

        findCenter(abm, a, b);
        findCenter(acm, a, c);
        findCenter(bcm, c, b);
    }

    draw() {
        /* Draw lines between the three vertices of the triangle*/
        drawCurve(a, abm, b, 2, [150, 100, 0]);
        drawCurve(b, bcm, c, 2, [0, 150, 100]);
        drawCurve(c, acm, a, 2, [100, 0, 150]);
    }
}

func main(){
        Triangle t;
        t = shape Triangle([170, 340], [470, 340], [320, 140]);
    t.render = {
        translate([130, 130], 2);
        translate([-30, -130], 3);
        translate([-100, -100], 2);
    }
}
```

Building a Shape

```
shape Line {
    int[2] a;
    int[2] b;
    int[2] c;

    construct (int[2] a_init, int[2] b_init){
        a = a_init;
        b = b_init;
        c[0] = (a[0] + b[0]) / 2;
        c[1] = (a[1] + b[1]) / 2;
      }

    draw() {
        drawCurve(a, c, b, 2, [0, 0, 0]);
     }
}
```

→ coordinates represented by int[2]

→ colors by int[3]

→ constructor used to set coordinates

→ define how coordinates will be connected with:

  - drawPoint(int[2], int[3])
  - drawCurve(int[2], int[2], int[2], int, int[3])
  - print(int[2], string, int[3])

→ drawCurve is a bezier curve that accepts 3 control points

Rendering the Shape

```
func main(){
    int[2] dis;
    Line l;
    dis = [200, 0];
    l = shape Line([1,3], [5,8]);


    l.render = {
        translate(dis, 2);
    }
}
```

→ coordinates represented by int[2]

→ declare an instance of the Shape and pass in corresponding values

→ define a render block for the shape with any of the following:

- translate(int[2], int)
- rotate(int[2], float, int)

DEMO