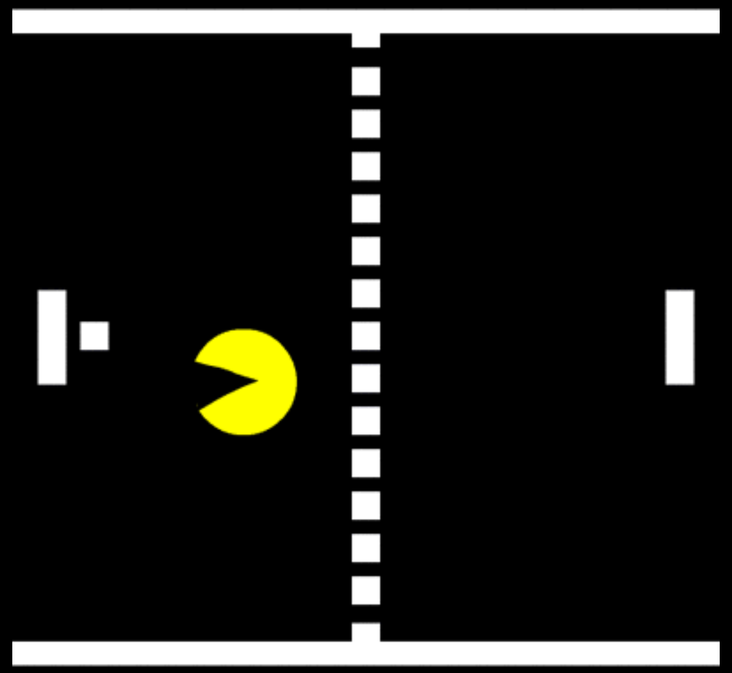
Basic gameplay programming.

Part 2



Mouse Input

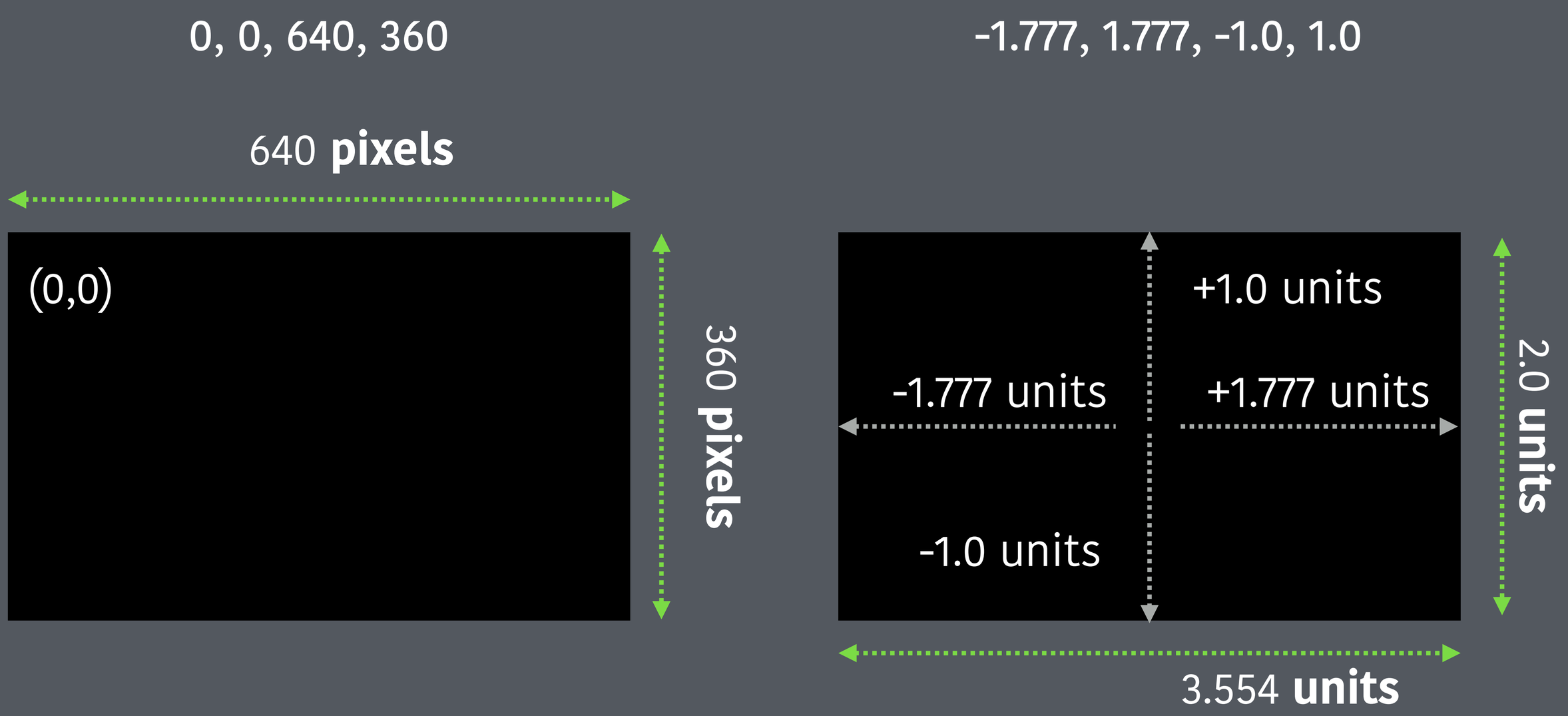
Mouse **motion**

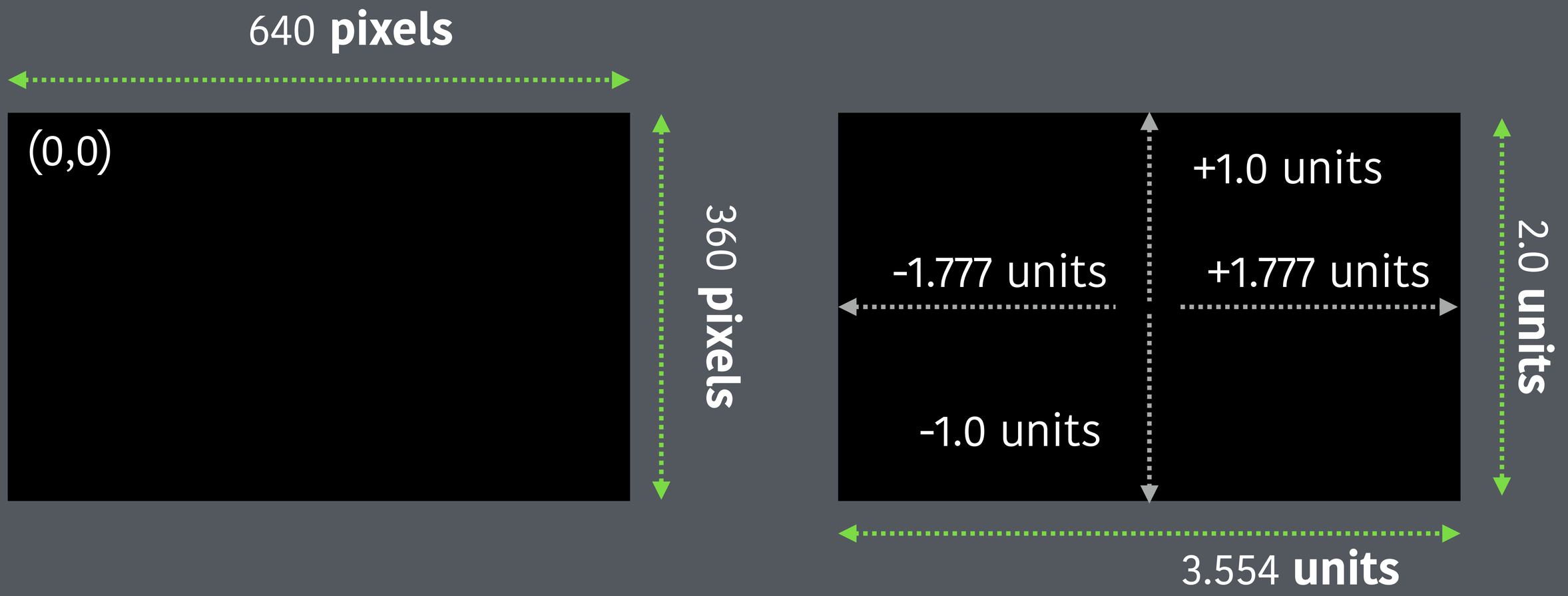
To respond to **mouse motion**, we must listen for the **SDL_MOUSEMOTION** event. We can then check the **new position of the mouse** by using the **event.motion.x** and **event.motion.y** variables.

```
while (SDL_PollEvent(&event)) {
    if (event.type == SDL_QUIT || event.type == SDL_WINDOWEVENT_CLOSE) {
        done = true;
    } else if(event.type == SDL_MOUSEMOTION) {
        // event.motion.x is the new x position
        // event.motion.y is the new y position
    }
}
```

SDL mouse coordinates
are in **pixels**!

Converting from **pixel** coordinates to **OpenGL units**.





units_x = (pixel_x / x_resolution) * ortho_width) - ortho_width / 2.0;

units_y = ((y_resolution - pixel_y) / y_resolution) * ortho_height) - ortho_height / 2.0;

Converting from **pixel coordinates** to **OpenGL units**.

units_x = (pixel_x / x_resolution) * ortho_width) - ortho_width / 2.0;

units_y = ((y_resolution - pixel_y) / y_resolution) * ortho_height) - ortho_height / 2.0;

```
while (SDL_PollEvent(&event)) {
    if (event.type == SDL_QUIT || event.type == SDL_WINDOWEVENT_CLOSE) {
        done = true;
    } else if(event.type == SDL_MOUSEMOTION) {

        float unitX = (((float)event.motion.x / 640.0f) * 3.554f ) - 1.777f;
        float unitY = (((float)(360-event.motion.y) / 360.0f) * 2.0f ) - 1.0f;

    }
}
```

Mouse **clicks**

To respond to **mouse clicks**, we must listen for the **SDL_MOUSEBUTTONDOWN** and/or **SDL_MOUSEBUTTONUP** (for mouse release) **events**. We can then check **which mouse button** was clicked using **event.button.button** (1, 2, 3, etc.) and the **position of the click** using **event.button.x** and **event.button.y** variables.

```
while (SDL_PollEvent(&event)) {
    if (event.type == SDL_QUIT || event.type == SDL_WINDOWEVENT_CLOSE) {
        done = true;
    } else if(event.type == SDL_MOUSEBUTTONDOWN) {

        // event.button.x is the click x position
        // event.button.y is the click y position
        // event.button.button is the mouse button that was clicked (1,2,3,etc.)

    }
}
```

Using **controllers**

Using **controllers**

```
SDL_Init(SDL_INIT_VIDEO | SDL_INIT_JOYSTICK);

// SDL_JoystickOpen is passed the joystick index

SDL_Joystick * playerOneController = SDL_JoystickOpen(0);

// game loop

// clean up for each open joystick

SDL_JoystickClose( playerOneController );
```

Controller **axis** motion

To respond to controller axis motion, we must listen for the **SDL_JOYAXISMOTION** event. We can check **which axis** is moved by looking at the **event.jaxis.axis** variable and the new **value of the axis** using the **event.jaxis.value** variable. **event.jaxis.which** tells us **which controller** this event is for.

```
while (SDL_PollEvent(&event)) {
    if (event.type == SDL_QUIT || event.type == SDL_WINDOWEVENT_CLOSE) {
        done = true;
    } else if(event.type == SDL_JOYAXISMOTION) {
      // event.jaxis.which tells us which controller (e.g. 0,1,etc.)
      // event.jaxis.axis tells us which axis moved (0 for x-axis ,1 for y, etc.)
      // event.jaxis.value tells us the new value of the axis from -32767 to 32767
    }
}
```

Controller **button** presses

To respond to controller **buttons**, we must listen for the **SDL_JOYBUTTONDOWN** and/or **SDL_JOYBUTTONUP** (for button release) events. We can check **which button** was pressed by looking at **event.jbutton.button** variable.

event.jbutton.which tells us which controller this event is for.

```
while (SDL_PollEvent(&event)) {
    if (event.type == SDL_QUIT || event.type == SDL_WINDOWEVENT_CLOSE) {
        done = true;
    } else if(event.type == SDL_JOYBUTTONDOWN) {

      // event.jbutton.which tells us which controller (e.g. 0,1,etc.)
      // event.jbutton.button tells us which button was pressed (0,1,2…etc)

    }
}
```

Organizing our code

```
    glTexImage2D(GL_TEXTURE_2D, 0, GL_RGBA, surface->w, surface->h, 0, GL_BGRA, GL_UNSIGNED_BYTE, surface->pixels);

    glTexParameteri(GL_TEXTURE_2D, GL_TEXTURE_MIN_FILTER, GL_LINEAR);
    glTexParameteri(GL_TEXTURE_2D, GL_TEXTURE_MAG_FILTER, GL_LINEAR);

    SDL_FreeSurface(surface);

    return textureID;
}

int main(int argc, char *argv[])
{
    SDL_Init(SDL_INIT_VIDEO);
    displayWindow = SDL_CreateWindow("My Game", SDL_WINDOWPOS_CENTERED, SDL_WINDOWPOS_CENTERED, 640, 360, SDL_WINDOW_OPENGL);
    SDL_GLContext context = SDL_GL_CreateContext(displayWindow);
    SDL_GL_MakeCurrent(displayWindow, context);
#ifdef _WINDOWS
    glewInit();
#endif

    glViewport(0, 0, 640, 360);

    Matrix projectionMatrix;
    Matrix modelMatrix;
    Matrix viewMatrix;

    projectionMatrix.setOrthoProjection(-1.77777f, 1.7777f, -1.0f, 1.0f, -1.0f, 1.0f);
    ShaderProgram program(RESOURCE_FOLDER"vertex.glsl", RESOURCE_FOLDER"fragment.glsl");

    GLuint emojiTexture = LoadTexture(RESOURCE_FOLDER"emoji.png");

    glEnable(GL_BLEND);
    glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);

    float lastFrameTicks = 0.0f;
    float angle = 0.0f;

    SDL_Event event;
    bool done = false;
    while (!done) {

        while (SDL_PollEvent(&event)) {
            if (event.type == SDL_QUIT || event.type == SDL_WINDOWEVENT_CLOSE) {
                done = true;
            } else if(event.type == SDL_KEYDOWN) {
                if(event.key.keysym.scancode == SDL_SCANCODE_SPACE) {

                    angle = 0.0;

                }
            }
        }

        float ticks = (float)SDL_GetTicks()/1000.0f;
        float elapsed = ticks - lastFrameTicks;
        lastFrameTicks = ticks;

        glClearColor(0.2f, 0.2f, 0.2f, 1.0f);
        glClear(GL_COLOR_BUFFER_BIT);

        const Uint8 *keys = SDL_GetKeyboardState(NULL);

        if(keys[SDL_SCANCODE_LEFT]) {
            angle += elapsed * 2.0 * 3.14;
        }

        if(keys[SDL_SCANCODE_RIGHT]) {
            angle -= elapsed * 2.0 * 3.14;
        }

        modelMatrix.identity();
        modelMatrix.Rotate(angle);

        program.setModelMatrix(modelMatrix);
        program.setProjectionMatrix(projectionMatrix);
        program.setViewMatrix(viewMatrix);

        glUseProgram(program.programID);
```

```
Matrix projectionMatrix;

void main() {

    Setup();

    while(loop) {
        ProcessEvents();
        Update();
        Render();
    }

    Cleanup();
}
```

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```
void Setup() {

    // setup SDL
    // setup OpenGL
    // Set our projection matrix
}
```

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void Setup() {

    // setup SDL
    // setup OpenGL
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}

void ProcessEvents() {
    // our SDL event loop
    // check input events
}
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void Update() {
    // move stuff and check for collisions
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void Render() {
    // for all game elements
    // setup transforms, render sprites
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```

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void ProcessEvents() {
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void Update() {
    // move stuff and check for collisions
}

void Render() {
    // for all game elements
    // setup transforms, render sprites
}

void Cleanup() {
    // cleanup joysticks, textures, etc.
}
```
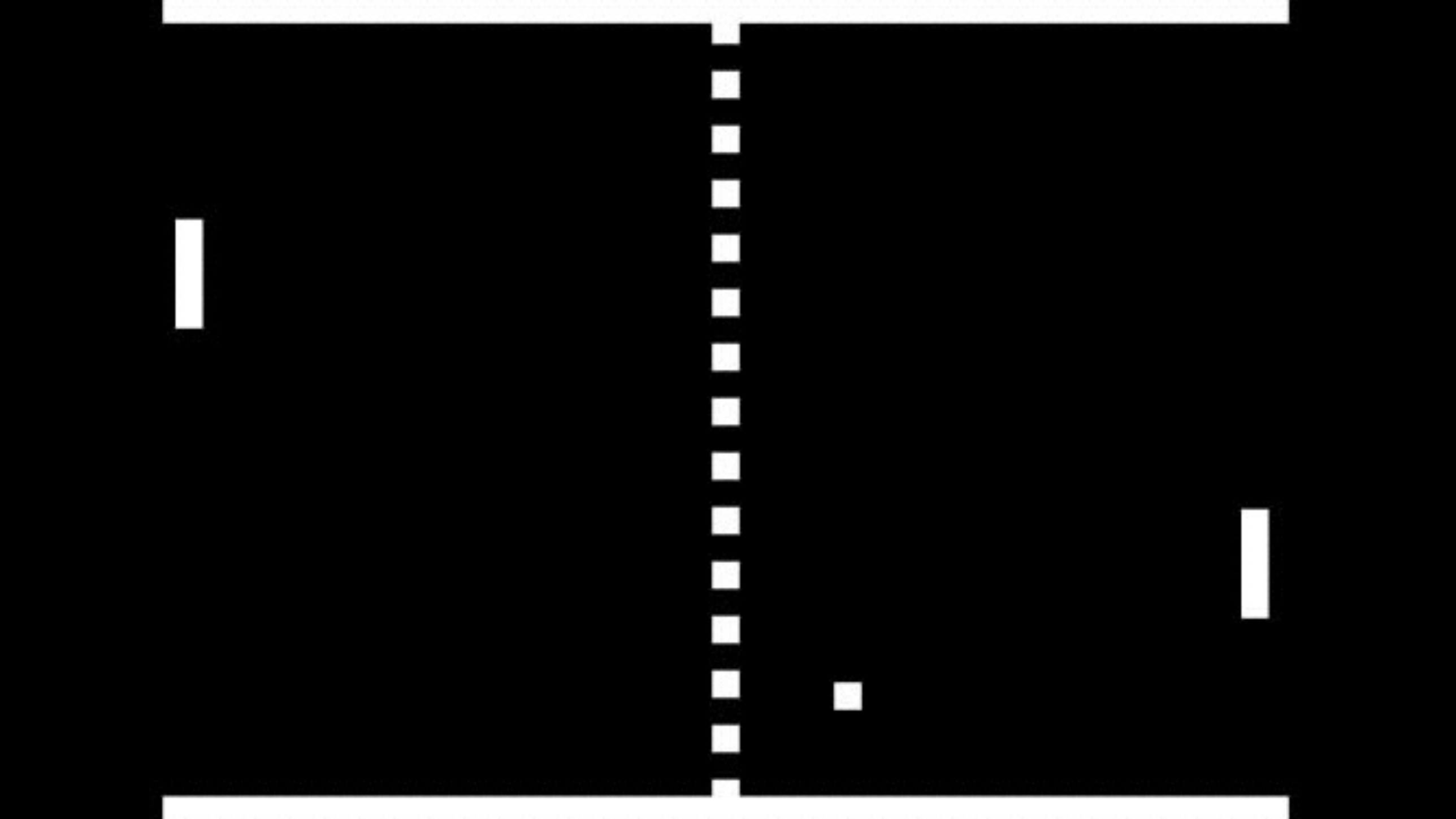

Entities

```
class Entity {
    public:

        void Draw();

        float x;
        float y;
        float rotation;

        int textureID;

        float width;
        float height;

        float speed;
        float direction_x;
        float direction_y;
};
```

Entities are a useful way for us to think about **objects** in the game.

Pong



Assignment #2

- Make **PONG**!
- **Doesn’t need** to keep score.
- But it **must detect player wins**.
- Can use **images** or **untextured polygons**.
- Can use **keyboard**, **mouse** or **joystick** input.