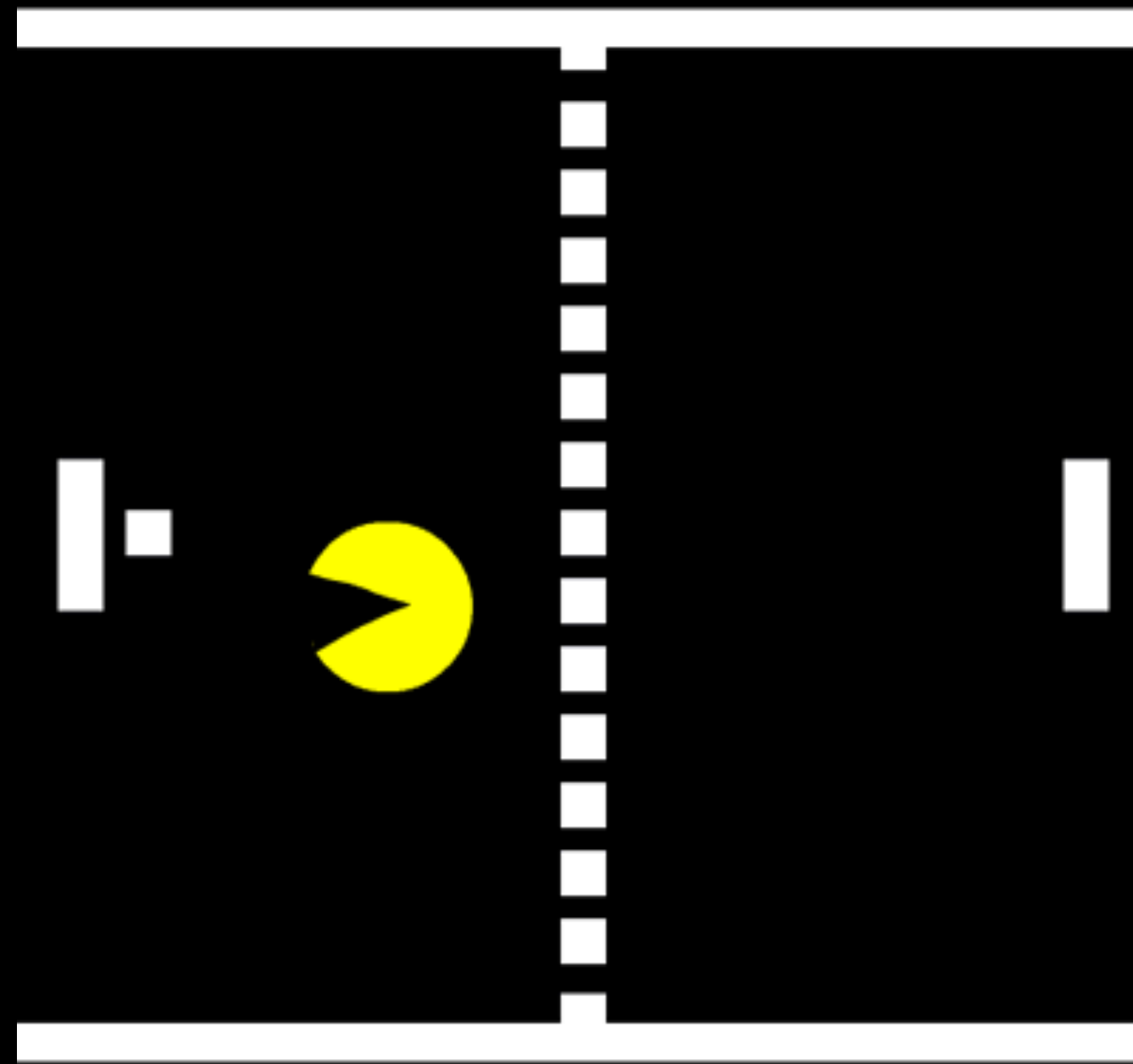


# Basic gameplay programming.

## 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!**

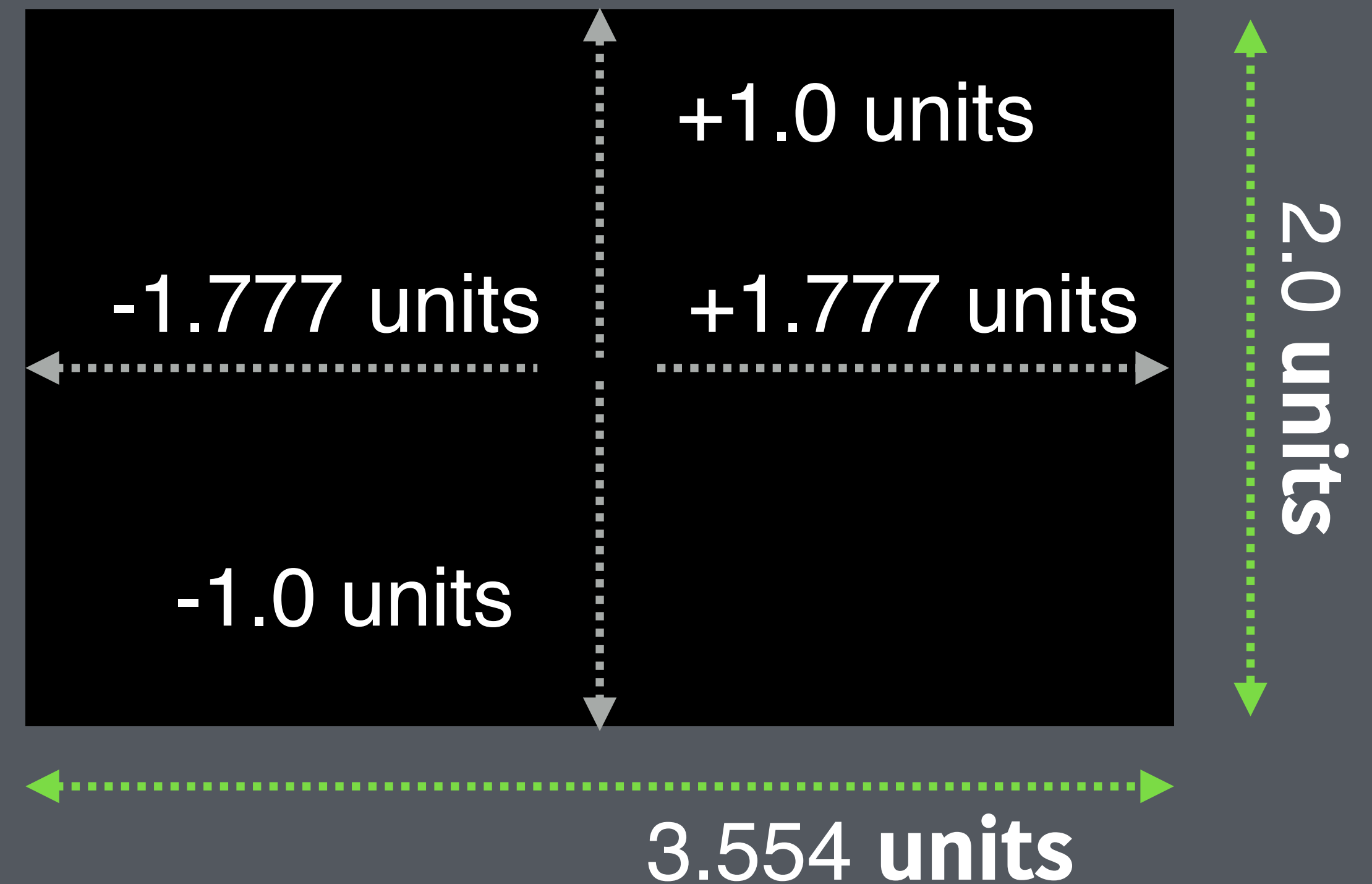
# Converting from **pixel** coordinates to **OpenGL units**.

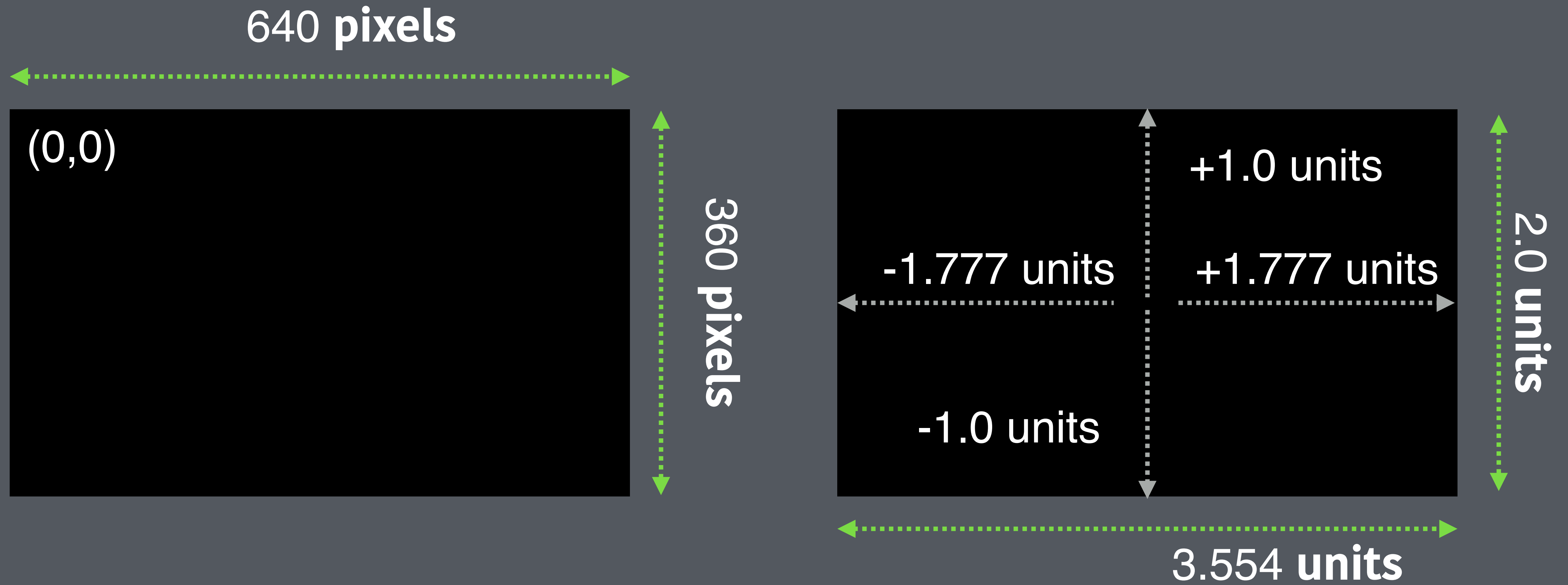
0, 0, 640, 360

640 pixels



-1.777, 1.777, -1.0, 1.0





```
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.)  
  
    }  
}
```

# Mouse event polling

```
int x,y;  
Uint32 SDL_GetMouseState(&x, &y);
```

Using controllers

# Using controllers



```
SDL_Init(SDL_INIT_VIDEO | SDL_INIT_JOYSTICK);
```

```
// SDL_JoystickOpen is passed the joystick index, returns  
NULL if unable to open joystick
```

```
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)  
  
    }  
}
```

Polling joystick state.

```
SDL_JoystickGetAxis(joystick, axisIndex);  
SDL_JoystickGetButton(joystick, buttonIndex);
```

# 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, 1.77777f, -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);
    }
}

```

```
void main() {  
    Setup();  
    while(loop) {  
        ProcessEvents();  
        Update();  
        Render();  
    }  
    Cleanup();  
}
```

```
void main() {  
    Setup();  
    while(loop) {  
        ProcessEvents();  
        Update();  
        Render();  
    }  
    Cleanup();  
}
```

```
void Setup() {  
    // setup SDL  
    // setup OpenGL  
    // Set our projection matrix  
}
```



```
void main() {  
    Setup();  
    while(loop) {  
        ProcessEvents();  
        Update();  
        Render();  
    }  
    Cleanup();  
}
```

```
void Setup() {  
    // setup SDL  
    // setup OpenGL  
    // Set our projection matrix  
}  
  
void ProcessEvents() {  
    // our SDL event loop  
    // check input events  
}
```

```
void main() {  
  
    Setup();  
  
    while(loop) {  
        ProcessEvents();  
        Update();  
        Render();  
    }  
  
    Cleanup();  
}
```

```
void Setup() {  
  
    // setup SDL  
    // setup OpenGL  
    // Set our projection matrix  
}  
  
void ProcessEvents() {  
    // our SDL event loop  
    // check input events  
}  
  
void Update() {  
    // move stuff and check for collisions  
}
```

```
void main() {  
  
    Setup();  
  
    while(loop) {  
        ProcessEvents();  
        Update();  
        Render();  
    }  
  
    Cleanup();  
}
```

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

```
void main() {  
  
    Setup();  
  
    while(loop) {  
        ProcessEvents();  
        Update();  
        Render();  
    }  
  
    Cleanup();  
}
```

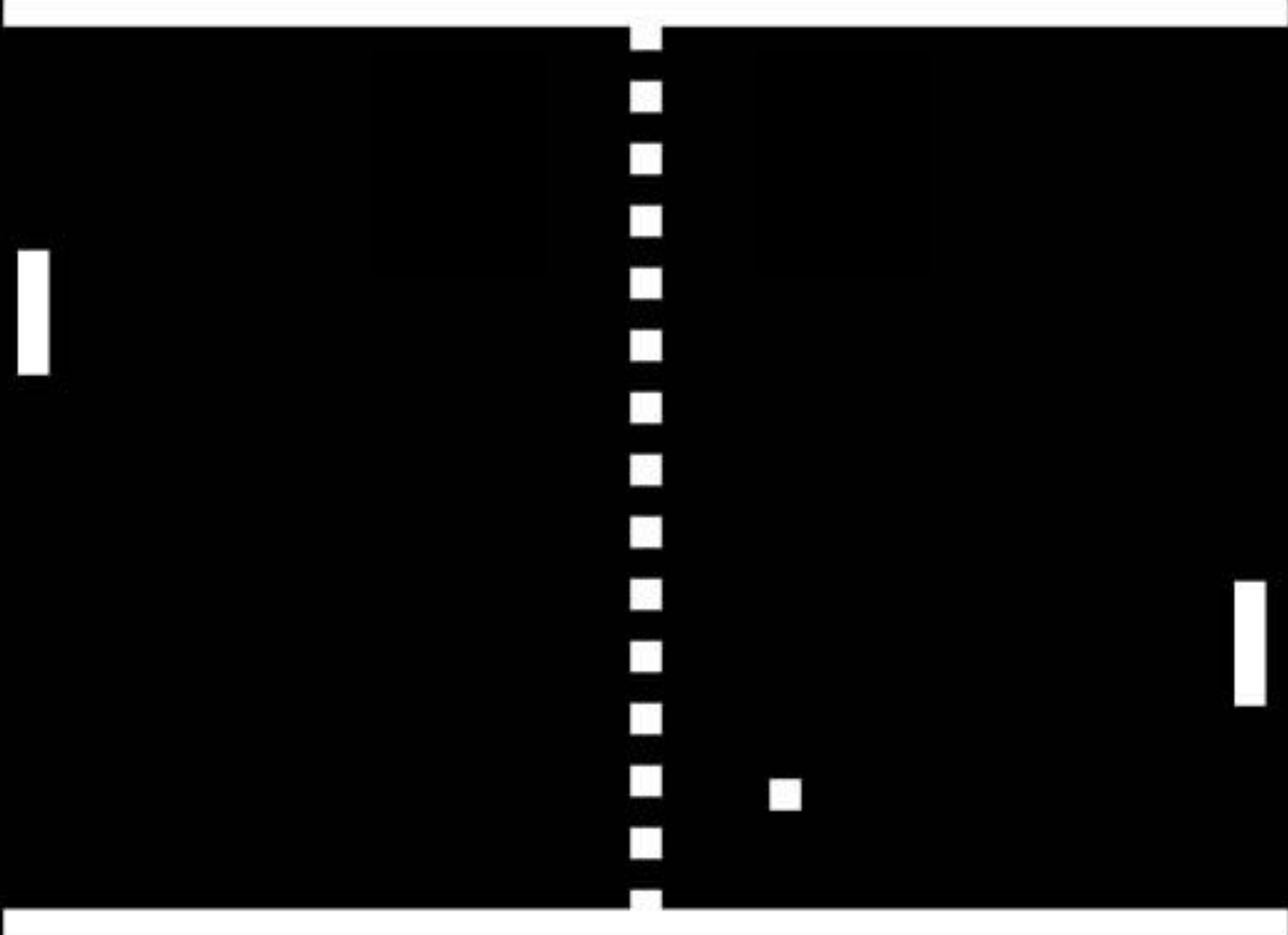
```
void Setup() {  
  
    // setup SDL  
    // setup OpenGL  
    // Set our projection matrix  
}  
  
void ProcessEvents() {  
    // our SDL event loop  
    // check input events  
}  
  
void Update() {  
    // move stuff and check for collisions  
}  
  
void Render() {  
    // for all game elements  
    // setup transforms, render sprites  
}  
  
void Cleanup() {  
    // cleanup joysticks, textures, etc.  
}
```

# Entities

```
class Entity {  
    public:  
  
        void Draw(ShaderProgram *p);  
  
        float x;  
        float y;  
        float rotation;  
  
        int textureID;  
  
        float width;  
        float height;  
  
        float velocity;  
        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.