BURSA ULUDAĞ ÜNİVERSİTESİ

BİLGİSAYAR MÜHENDİSLİĞİ

2023-2024 EĞİTİM ÖĞRETİM YILI BAHAR DÖNEMİ

BİLGİSAYAR GRAFİKLERİ RAPORU

MURAT BERK YETİŞTİRİR

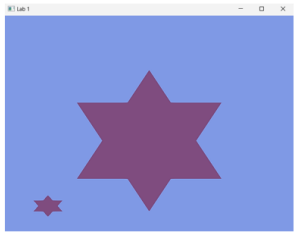
032290008

032290008@ogr.uludag.edu.tr

SORU: 02_Grafik çıktı öğeleri ders notunun 72. slaytına bakınız. Geliştirdiğiniz kodun yanı sıra pencere çıktısının görüntüsünü içeren raporunuzu pdf formatında kaydedip yükleyiniz.

Lab 1

- Bir OpenGL penceresine istediğiniz birer arka plan ve dolgu rengi ile 2-B koordinat sisteminde bir yıldız çiziniz.
  - Ana profilde (Core profile) modern OpenGL ile kodu geliştiriniz.



CEVAP KODU:

```
#include <glad/glad.h>
#include <GLFW/glfw3.h>

#include <iostream>

void framebuffer_size_callback(GLFWwindow* window, int width, int height);
void processInput(GLFWwindow* window);

// settings
const unsigned int SCR_WIDTH = 800;
const unsigned int SCR_HEIGHT = 600;

const char* vertexShaderSource = "#version 330 core\n"
"layout (location = 0) in vec3 aPos;\n"
"void main()\n"
"{\n"
"   gl_Position = vec4(aPos.x, aPos.y, aPos.z, 1.0);\n"
"}\0";
const char* fragmentShaderSource = "#version 330 core\n"
"out vec4 FragColor;\n"
"void main()\n"
"{\n"
"   FragColor = vec4(0.4f, 0.2f, 0.7f, 1.0f);\n"
"}\n\0";

int main()
{
    // glfw: initialize and configure
    // ------------------------------
    glfwInit();
    glfwWindowHint(GLFW_CONTEXT_VERSION_MAJOR, 3);
    glfwWindowHint(GLFW_CONTEXT_VERSION_MINOR, 3);
    glfwWindowHint(GLFW_OPENGL_PROFILE, GLFW_OPENGL_CORE_PROFILE);

#ifdef __APPLE__
    glfwWindowHint(GLFW_OPENGL_FORWARD_COMPAT, GL_TRUE);
#endif

    // glfw window creation
    // --------------------
    GLFWwindow* window = glfwCreateWindow(SCR_WIDTH, SCR_HEIGHT, "LearnOpenGL", NULL, NULL);
    if (window == NULL)
    {
        std::cout << "Failed to create GLFW window" << std::endl;
```

```
    glfwTerminate();
    return -1;
}
glfwMakeContextCurrent(window);
glfwSetFramebufferSizeCallback(window, framebuffer_size_callback);

// glad: load all OpenGL function pointers
// ---------------------------------------
if (!gladLoadGLLoader((GLADloadproc)glfwGetProcAddress))
{
    std::cout << "Failed to initialize GLAD" << std::endl;
    return -1;
}


// build and compile our shader program
// ------------------------------------
// vertex shader
unsigned int vertexShader = glCreateShader(GL_VERTEX_SHADER);
glShaderSource(vertexShader, 1, &vertexShaderSource, NULL);
glCompileShader(vertexShader);
// check for shader compile errors
int success;
char infoLog[512];
glGetShaderiv(vertexShader, GL_COMPILE_STATUS, &success);
if (!success)
{
    glGetShaderInfoLog(vertexShader, 512, NULL, infoLog);
    std::cout << "ERROR::SHADER::VERTEX::COMPILATION_FAILED\n" << infoLog << std::endl;
}
// fragment shader
unsigned int fragmentShader = glCreateShader(GL_FRAGMENT_SHADER);
glShaderSource(fragmentShader, 1, &fragmentShaderSource, NULL);
glCompileShader(fragmentShader);
// check for shader compile errors
glGetShaderiv(fragmentShader, GL_COMPILE_STATUS, &success);
if (!success)
{
    glGetShaderInfoLog(fragmentShader, 512, NULL, infoLog);
    std::cout << "ERROR::SHADER::FRAGMENT::COMPILATION_FAILED\n" << infoLog << std::endl;
}
// link shaders
unsigned int shaderProgram = glCreateProgram();
glAttachShader(shaderProgram, vertexShader);
glAttachShader(shaderProgram, fragmentShader);
glLinkProgram(shaderProgram);
// check for linking errors
glGetProgramiv(shaderProgram, GL_LINK_STATUS, &success);
if (!success) {
    glGetProgramInfoLog(shaderProgram, 512, NULL, infoLog);
    std::cout << "ERROR::SHADER::PROGRAM::LINKING_FAILED\n" << infoLog << std::endl;
}
glDeleteShader(vertexShader);
glDeleteShader(fragmentShader);

// set up vertex data (and buffer(s)) and configure vertex attributes
// ------------------------------------------------------------------
float vertices[] = {
    -0.5f, -0.5f, 0.0f,  // left
     0.5f, -0.5f, 0.0f,  // right
     0.0f,  0.7f, 0.0f,  // top
     0.5f, 0.3f, 0.0f,   // bottom-right
    -0.5f,  0.3f, 0.0f,  // bottom-left
    0.0f,  -0.8f, 0.0f,   // bottom-middle

    - 0.9f, -0.85f,  0.0f,  // left
    -0.6f, -0.85f,  0.0f,  // right
    -0.75f, -0.6f,  0.0f,  // top
    -0.6f, -0.70f, 0.0f, // bottom-right
```

```
        -0.9f, -0.70f,  0.0f,  // bottom-left
        -0.75f, -0.95f,  0.0f   // bottom-middle
    };
    unsigned int VBO, VAO;
    glGenVertexArrays(1, &VAO);
    glGenBuffers(1, &VBO);
    // bind the Vertex Array Object first, then bind and set vertex buffer(s), and then
configure vertex attributes(s).
    glBindVertexArray(VAO);

    glBindBuffer(GL_ARRAY_BUFFER, VBO);
    glBufferData(GL_ARRAY_BUFFER, sizeof(vertices), vertices, GL_STATIC_DRAW);

    glVertexAttribPointer(0, 3, GL_FLOAT, GL_FALSE, 3* sizeof(float), (void*)0);
    glEnableVertexAttribArray(0);

    // note that this is allowed, the call to glVertexAttribPointer registered VBO as the
vertex attribute's bound vertex buffer object so afterwards we can safely unbind
    glBindBuffer(GL_ARRAY_BUFFER, 0);

    // You can unbind the VAO afterwards so other VAO calls won't accidentally modify this
VAO, but this rarely happens. Modifying other
    // VAOs requires a call to glBindVertexArray anyways so we generally don't unbind VAOs
(nor VBOs) when it's not directly necessary.
    glBindVertexArray(0);


    // uncomment this call to draw in wireframe polygons.
    //glPolygonMode(GL_FRONT_AND_BACK, GL_LINE);

    // render loop
    // -----------
    while (!glfwWindowShouldClose(window))
    {
        // input
        // -----
        processInput(window);

        // render
        // ------
        glClearColor(0.7f, 0.5f, 0.1f, 1.0f);
        glClear(GL_COLOR_BUFFER_BIT);

        // draw our first triangle
        glUseProgram(shaderProgram);
        glBindVertexArray(VAO); // seeing as we only have a single VAO there's no need to bind
it every time, but we'll do so to keep things a bit more organized
        glDrawArrays(GL_TRIANGLES, 0, 12);
        // glBindVertexArray(0); // no need to unbind it every time

        // glfw: swap buffers and poll IO events (keys pressed/released, mouse moved etc.)
        // -------------------------------------------------------------------------------
        glfwSwapBuffers(window);
        glfwPollEvents();
    }

    // optional: de-allocate all resources once they've outlived their purpose:
    // ------------------------------------------------------------------------
    glDeleteVertexArrays(1, &VAO);
    glDeleteBuffers(1, &VBO);
    glDeleteProgram(shaderProgram);

    // glfw: terminate, clearing all previously allocated GLFW resources.
    // ------------------------------------------------------------------
    glfwTerminate();
    return 0;
}
```

```
// process all input: query GLFW whether relevant keys are pressed/released this frame and
react accordingly
// ---------------------------------------------------------------------------------------
--------------
void processInput(GLFWwindow* window)
{
    if (glfwGetKey(window, GLFW_KEY_ESCAPE) == GLFW_PRESS)
        glfwSetWindowShouldClose(window, true);
}

// glfw: whenever the window size changed (by OS or user resize) this callback function
executes
// ---------------------------------------------------------------------------------------
--
void framebuffer_size_callback(GLFWwindow* window, int width, int height)
{
    glViewport(0, 0, width, height);
}
```

CEVAP EKRAN GÖRÜNTÜSÜ: