

# The GLFW Library

## Lecture 3

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# Outline

- 1 Graphics Libraries
- 2 Programming with GLFW
- 3 GLFW Callback Functions
- 4 Using the Key Callback Function
- 5 Assignment

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## Definition (Device-independent)

A library is **device-independent** if it provides a common API, regardless of the hardware on which it is used.

- The OpenGL API for Windows is identical to the OpenGL API for the Macintosh.
- Of course, the library must be compiled separately for each hardware system.

# Windows-Based Programming

- We will use the **Graphics Library Frameworks** (GLFW) library.
- The GLFW library contains functions that
  - Manage the graphics window (size, position, etc.)
  - Handle user-initiated events (mouse clicks, keystrokes, etc.)

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# Programming with GLFW

## Programming with GLFW

```
int main(int argc, char* argv[])
{
    glfwInit();
    GLFWwindow* window = glfwCreateWindow(width, height, title,
        NULL, NULL);
    glfwMakeContextCurrent(window);
    gl3wInit();
    init();
    while (!glfwWindowShouldClose(window))
    {
        display();
        glfwSwapBuffers(window);
        glfwPollEvents();
    }
    glfwDestroyWindow(window);
    glfwTerminate();
}
```

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- **Callback functions** are programmer-defined functions that are called *automatically* in response to specific events (e.g., a keystroke).
- The programmer writes the callback function and then **registers** it so that the library is aware of its existence.
- We can give the callback functions any name we like, but it is good (very good) to be systematic.

# GLFW Callback Functions

## Callback Prototypes

```
void framebufferSizeCB(GLFWwindow* window, int width,  
    int height);
```

- These functions handle window resizing, keystrokes, mouse movement, mouse clicks, and scrolling.

# GLFW Callback Functions

## Callback Prototypes

```
void framebufferSizeCB(GLFWwindow* window, int width,  
    int height);  
void keyCB(GLFWwindow* window, int key, int scancode,  
    int action, int mods);
```

- These functions handle window resizing, keystrokes, mouse movement, mouse clicks, and scrolling.

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void framebufferSizeCB(GLFWwindow* window, int width,  
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void keyCB(GLFWwindow* window, int key, int scancode,  
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void charCB(GLFWwindow* window,  
    unsigned int codepoint);
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void charCB(GLFWwindow* window,  
    unsigned int codepoint);  
void cursorPosCB(GLFWwindow* window,  
    double xpos, double ypos);
```

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void framebufferSizeCB(GLFWwindow* window, int width,  
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void charCB(GLFWwindow* window,  
    unsigned int codepoint);  
void cursorPosCB(GLFWwindow* window,  
    double xpos, double ypos);  
void mouseButtonCB(GLFWwindow* window, int button,  
    int action, int mods);
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void charCB(GLFWwindow* window,  
    unsigned int codepoint);  
void cursorPosCB(GLFWwindow* window,  
    double xpos, double ypos);  
void mouseButtonCB(GLFWwindow* window, int button,  
    int action, int mods);  
void scrollCB(GLFWwindow* window, double xoffset,  
    double yoffset);
```

- These functions handle window resizing, keystrokes, mouse movement, mouse clicks, and scrolling.

# GLFW Callback Functions

## GLFW Callback Functions

```
glfwSetFramebufferSizeCallback(window,  
    framebufferSizeCB);
```

- These functions register the callback functions.
- See the website <http://www.glfw.org/> for all the details.



# GLFW Callback Functions

## GLFW Callback Functions

```
glfwSetFramebufferSizeCallback(window,  
    framebufferSizeCB);  
glfwSetKeyCallback(window, keyCB);
```

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glfwSetFramebufferSizeCallback(window,  
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glfwSetCharCallback(window, charCB);  
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glfwSetMouseButtonCallback(window, mouseButtonCB);  
glfwSetScrollCallback(window, scrollCB);
```

- These functions register the callback functions.
- See the website <http://www.glfw.org/> for all the details.

# Other GLFW Functions

## Other GLFW Functions

```
void glfwGetFramebufferSize(GLFWwindow* window,  
    int* width, int* height);
```

- Several GLFW functions return the current status of various devices.

# Other GLFW Functions

## Other GLFW Functions

```
void glfwGetFramebufferSize(GLFWwindow* window,  
    int* width, int* height);  
int glfwGetKey(GLFWwindow* window, int key);
```

- Several GLFW functions return the current status of various devices.

# Other GLFW Functions

## Other GLFW Functions

```
void glfwGetFramebufferSize(GLFWwindow* window,  
    int* width, int* height);  
int glfwGetKey(GLFWwindow* window, int key);  
int glfwGetMouseButton(GLFWwindow* window,  
    int button);
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void glfwGetFramebufferSize(GLFWwindow* window,  
    int* width, int* height);  
int glfwGetKey(GLFWwindow* window, int key);  
int glfwGetMouseButton(GLFWwindow* window,  
    int button);  
void glfwGetCursorPos(GLFWwindow* window,  
    double* xpos, double* ypos);
```

- Several GLFW functions return the current status of various devices.

# Other GLFW Functions

## Other GLFW Functions

```
void glfwGetFramebufferSize(GLFWwindow* window,  
    int* width, int* height);  
int glfwGetKey(GLFWwindow* window, int key);  
int glfwGetMouseButton(GLFWwindow* window,  
    int button);  
void glfwGetCursorPos(GLFWwindow* window,  
    double* xpos, double* ypos);  
double glfwGetTime(void);
```

- Several GLFW functions return the current status of various devices.

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# The Key Callback Function

## The Key Callback Function

```
void keyCB(GLFWwindow* window, int key, int scancode, int action, int mods)
{
    if (action == GLFW_PRESS || action == GLFW_REPEAT)
    {
        switch (key)
        {
            case GLFW_KEY_EQUAL: // Plus + key
                ...
                break;

            case GLFW_KEY_RIGHT: // Right arrow key
                ...
                break;

            case GLFW_KEY_A:
                ...
                break;

            case GLFW_KEY_ESCAPE:
                glfwSetWindowShouldClose(window, true);
                break;
        }
    }
    return;
}
```

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# Assignment

## Assignment

- Read Appendix A in the Red Book.

- Visit the website

<http://www.glfw.org/documentation.html>