#### Peter Mileff PhD

## **Programming of Graphics**

**Introduction to LWJGL** 

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# **LWJGL** Overview

# Lightweight Java Game Library https://www.lwjgl.org

#### What is LWJGL?

- Java library that enables cross-platform access to popular native APIs. Useful
  - for graphics (OpenGL)
  - for audio (OpenAL)
  - for parallel computing (OpenCL)
- It is a high performance, user-friendly wrapper library
   It is designed to create 2D and 3D graphics applications coded in Java

# **LWJGL** Overview

- LWJGL is an enabling technology and provides low-level access.
- It is cross platform
- It is not a framework and does not provide higher-level utilities than what the native libraries expose
  - It is not a real game engine
- LWJGL is open source

# Installation

### System Requirements

- Java SE Development Kit: version 1.8 or above
- Video Card that supports at least OpenGL version 1.1

### Configure Environment

- **PATH** and **JAVA\_HOME** environment variables should be set:
  - <u>PATH:</u> typically java\_install\_dir/bin
    - E.g.: C:\Program Files\Java\jdk1.8.0\_144\bin\
  - o <u>JAVA\_HOME</u>: java\_install\_dir
    - E.g.: c:\Program Files\Java\jdk1.8.0\_144

### Download LWJGL https://www.lwjgl.org/download

HOME GET STARTED DOWNLOAD CUSTOMIZE

# Download LWJGL 3All official releases are available for download<br/>from GitHub:You can customize your LWJGL build or use the<br/>latest stable & nightly releases:Or you can browse and download individual<br/>LWJGL artifacts:C Download from GithubI customize LWJGL 3Browse LWJGL files

# LWJGL modules

- LWJGL is organized in modules.
- Each module is packaged as a collection of artifacts
  - where each artifact has the same name but a different classifier.
- The artifact name for the LWJGL core module is just lwjgl.
- The artifact name for a binding module is

### lwjgl-<binding>

- For example the OpenGL module is Lwjgl-opengl
- You only need to download the modules that are needed for your project.

#### Release

Latest official release

3.1.3 build 16

Sep 21, 2017, 23:37:42 UTC

Presets

None

O Custom

Addons

Everything

Getting Started

Minimal OpenGL

Minimal Vulkan

JOML v1.9.4

Minimal OpenGL ES

LWJGLX/debug v1.0.0

steamworks4j v1.6.2

#### Mode

- ZIP Bundle
- Maven
- Gradle
- Ivy

#### Options

- Show descriptions
- Include source
- Include JavaDoc

#### Natives

- 🖸 📢 Windows
- 🛑 🗯 macOS
- 🛑 🔬 Linux

#### Stable

Beta quality, verified to work 3.1.4 SNAPSHOT build 1 Sep 26, 2017, 19:10:21 UTC

#### Contents LWJGL core Assimp bindings bgfx bindings EGL bindings GLFW bindings JAWT bindings jemalloc bindings LMDB bindings NanoVG & NanoSVG bindings Native File Dialog bindings Nuklear bindings **OpenAL** bindings OpenCL bindings OpenGL bindings OpenGL ES bindings OpenVR bindings OVR bindings par\_shapes bindings rpmalloc bindings SSE bindings stb bindings

- Tiny OpenEXR bindings
- Tiny File Dialogs bindings
- Vulkan bindings
- xxHash bindings
- Yoga bindings

#### Nightly

Bleeding edge, possibly broken

3.1.4 SNAPSHOT build 4

Oct 4, 2017, 09:05:59 UTC

## Setup LWJGL in Eclipse...

### **Create New Project**



### Create New Project

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Create a Java project in the workspace or in a	n external location.	/
Project name: FirstLWJGLDemo		
Use default location		
Location: E:\eclipse\workspace\FirstLWJG	Demo	Browse
JRE		
• Use an execution environment JRE:	JavaSE-1.8	~
O Use a project specific JRE:	jre1.8.0_144	
O Use default JRE (currently 'jre1.8.0_144')	)	Configure JREs
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# LWJGL external libraries

Create a new folder named lib in the project folder

- Copy the (proper) files into the lib folder:
   Example in case of Windows 64 bit:
  - lwjgl-glfw.jar
  - lwjgl-jemalloc-natives-windows.jar
  - lwjgl-jemalloc.jar
  - lwjgl-natives-windows.jar
  - lwjgl-opengl-natives-windows.jar
  - lwjgl-opengl.jar
  - lwjgl-stb-natives-windows.jar
  - lwjgl-stb.jar
  - lwjgl.jar

# Add libraries to build path

workspace - Java - Eclipse File Edit Source Refactor Navigate Search Project Run Window Help									
🚦 Package Explorer 🔀									
> 🚰 AssemblyManager [java_material master]									
FirstLWJGLDemo	✓ <sup>C</sup> → FirstLWJGLDemo C→ src								
> 🛋 JRE System L	ibrar	y [JavaSE-1.8]							
✓ ➢ lib		tives-windows.jar							
🔊 Iwjgi-gitv									
실 lwjgl-jem	nallo	c-natives-windows.jar							
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🛃 lwjgl-op		Open	F3						
📓 lwjgl-op		Show In	Alt+Shift+W >						
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🕌 lwjgl.jar	电	Copy Qualified Name	curre						
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# Jogl in Eclipse

#### To make all .jar files available to other projects

• Go to main menu, select Window > Preferences

#### In preferences window:

- in the drop down menu on the left hand side, follow the hierarchy- Java → Build Path → User Libraries.
- Click on "New..." button.
- It opens up a dialog box. Enter the library name. E.g.: LWJGL3
- Add jar files using button "Add External JARs...".
- It creates a new user library named LWJGL3

# LWJGL in Eclipse

#### We can start developing OpenGL based applications !

# Create a Hello World LWJGL application...

#### 1) Create a new package

workspace - Java - Eclipse File Edit Source Refactor Navigate Search Project Run Window Help 📑 • 🗐 🐚 🔌 🎋 • 🚺 • 💁 🖶 🐨 🐨 😂 🖨 🛷 • 🖗 - 🖓 • 🖗 - - - - -~ - -ES B 🛱 Package Explorer 🔀 129 > 😹 AssemblyManager [java\_material master] 唐 src New > 19 Java Project 3 2 Project... Open in New Window **Open Type Hierarchy** Package F4 H? Show In Alt+Shift+W > Class G 5 5 Interface G Сору Ctrl+C P Enum G°. Copy Qualified Name P Annotation 00 Ctrl+V Paste B Source Folder AY. 22 Delete Delete Java Working Set 13 Ctrl+Alt+Shift+Down Remove from Context 3 CŶ. Folder VB **Build Path** > 19 File Source Alt+Shift+S > Untitled Text File Refactor Alt+Shift+T > EŶ JUnit Test Case Import... Û Task 225 2 Export... 19 Example... Ro Refresh F5 Other... Ctrl+N 1 Assign Working Sets... Run As > 🔲 Ga Debug As > > 2 > Validate Restore from Local History... ns 🛷 Search 📮 Console 🔀 🍵 History > Maven s to display at this time. Team 5 Compare With > Properties Alt+Enter

#### • E.g.: com.lwjgl.demo

🖨 New Java P	ackage	12	_51		Х
Java Package				Y	
Create a new J	ava package.				
Creates folders	corresponding to packages.				
Source folder:	FirstLWJGLDemo/src			Browse	i
Name:	com.lwjgl.demo		7		
?		Finish		Cance	:

#### • Create a new class



### • E.g.: LWJGLHelloWorld

New Java Class			×				
<b>Java Class</b> Create a new Java	class.	C					
Source folder:	FirstLWJGLDemo/src	Brows	ie				
Package:	com.lwjgl.demo	Brows	e				
Enclosing type:		Brows	e				
Name: Modifiers:	LWJGLHelloWorld            ● public         ○ package         ○ private         ○ protected         abstract         final         static						
Superclass:	java.lang.Object	Brows	;e				
Interfaces:		Add					
		Remo	ove				
Which method stubs would you like to create? public static void main(String[] args) Constructors from superclass Inherited abstract methods Do you want to add comments? (Configure templates and default value here) Generate comments							
?	Finish	Cano	:el				



#### Get sample your first sample code from LWJGL website:

#### https://www.lwjgl.org/guide

 Copy the code into your class, replace class name and run

### GAME OVER