

# Anatomy of a Game Engine

# Anatomy of a Game Engine

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# Anatomy of a Game Engine

## Table of Contents

- [Chapter 1. Slick0100: Getting started with the Slick2D game library](#)
  - [1.1. Table of Contents](#)
  - [1.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [1.3. Preview](#)
  - [1.4. Download the required software](#)
    - [Text editors](#)
    - [The Slick2D distribution](#)
    - [The Java Development Kit](#)
  - [1.5. Install the required software](#)
  - [1.6. Create, compile, and execute your first Slick2D program](#)
    - [Create a source-code file](#)
    - [Compile and run the program](#)
      - [Create a batch file](#)
      - [Execute the batch file](#)
  - [1.7. Run the program](#)
  - [1.8. Summary](#)
  - [1.9. What's next?](#)
  - [1.10. Miscellaneous](#)
  - [1.11. Download source code](#)
- [Chapter 2. Slick0110: Overview](#)
  - [2.1. Table of Contents](#)
  - [2.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [2.3. The bottom line at the top](#)
  - [2.4. Preview](#)
  - [2.5. What is a game engine?](#)
    - [A software framework](#)
  - [2.6. Background information](#)
  - [2.7. Discussion and sample code](#)
    - [A service provider program](#)
    - [Two primary objects](#)
      - [Behavior of an object of the AppGameContainer class](#)

- [Behavior of an object that implements the Game interface](#)
  - [Beginning of the class named Slick0110a](#)
  - [The Game interface](#)
- [2.8. Run the program](#)
- [2.9. Summary](#)
- [2.10. What's next?](#)
- [2.11. Miscellaneous](#)
- [Chapter 3. Slick0120: Starting your program](#)
  - [3.1. Table of Contents](#)
  - [3.2. Preface](#)
    - [Viewing tip](#)
      - [Listings](#)
  - [3.3. Preview](#)
  - [3.4. General background information](#)
  - [3.5. Discussion and sample code](#)
    - [Two primary objects](#)
      - [Behavior of an object of the AppGameContainer class](#)
      - [Behavior of an object that implements the Game interface](#)
    - [Starting the game](#)
    - [The constructors for the AppGameContainer class](#)
    - [The setup method of the AppGameContainer class](#)
    - [The getDelta method of the GameContainer class](#)
    - [The gameLoop method of the AppGameContainer class](#)
  - [3.6. Run the program](#)
  - [3.7. Summary](#)
  - [3.8. What's next?](#)
  - [3.9. Miscellaneous](#)
  - [3.10. Complete program listing](#)
- [Chapter 4. Slick0130: The game loop](#)
  - [4.1. Table of Contents](#)
  - [4.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [4.3. Preview](#)
  - [4.4. General background information](#)
    - [The property named running](#)
    - [The gameLoop method](#)
    - [The updateAndRender method](#)
      - [Calls to the update method](#)
      - [Calls to the render method](#)
    - [Overall structure of a game program](#)
  - [4.5. Discussion and sample code](#)

- [The program named Slick0130a](#)
  - [The screen output](#)
  - [Beginning of the class named Slick0130a](#)
  - [The main method](#)
  - [The overridden init method](#)
  - [The overridden update method](#)
  - [The overridden render method](#)
  - [End of discussion](#)
- [4.6. Run the program](#)
- [4.7. Summary](#)
- [4.8. What's next?](#)
- [4.9. Miscellaneous](#)
- [4.10. Complete program listing](#)
- [Chapter 5. Slick0140: A first look at Slick2D bitmap graphics](#)
  - [5.1. Table of Contents](#)
  - [5.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [5.3. Preview](#)
  - [5.4. General background information](#)
  - [5.5. Discussion and sample code](#)
    - [Beginning of the class named Slick0140a](#)
    - [The main method](#)
    - [The overridden init method](#)
    - [An empty update method](#)
    - [The overridden render method](#)
  - [5.6. Run the program](#)
  - [5.7. Summary](#)
  - [5.8. What's next?](#)
  - [5.9. Miscellaneous](#)
  - [5.10. Complete program listing](#)
- [Chapter 6. Slick0150: A first look at sprite motion, collision detection, and timing control](#)
  - [6.1. Table of Contents](#)
  - [6.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [6.3. Preview](#)
  - [6.4. General background information](#)
  - [6.5. Discussion and sample code](#)
    - [A program with a relatively constant frame rate - Slick0150a](#)
      - [The screen output for Slick0150a](#)

- [Beginning of the class named Slick0150a](#)
- [The constructor and the main method](#)
- [The init method](#)
- [The update method](#)
- [The render method](#)
- [A program with a highly variable frame rate - Slick0150b](#)
  - [The screen output for Slick0150b](#)
  - [The render method](#)
  - [The update method](#)
- [6.6. Run the programs](#)
- [6.7. Summary](#)
- [6.8. What's next?](#)
- [6.9. Miscellaneous](#)
- [6.10. Complete program listings](#)
- [Chapter 7. Slick0160: Using the draw and drawFlash methods.](#)
  - [7.1. Table of Contents](#)
  - [7.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [7.3. Preview](#)
  - [7.4. General background information](#)
  - [7.5. Discussion and sample code](#)
    - [The program named Slick0160a](#)
      - [Beginning of the Slick0160a class](#)
      - [The main method](#)
      - [The init method](#)
      - [The update method](#)
      - [The render method](#)
    - [The program named Slick0160b](#)
      - [Beginning of the class named Slick0160b](#)
      - [The update method](#)
      - [The render method](#)
  - [7.6. Run the programs](#)
  - [7.7. Summary](#)
  - [7.8. What's next?](#)
  - [7.9. Miscellaneous](#)
  - [7.10. Complete program listing](#)
- [Chapter 8. Slick0170: Mouse and keyboard input](#)
  - [8.1. Table of Contents](#)
  - [8.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)

- [Listings](#)
- [8.3. Preview](#)
- [8.4. General background information](#)
- [8.5. Discussion and sample code](#)
- [8.6. Run the program](#)
- [8.7. Summary](#)
- [8.8. What's next?](#)
- [8.9. Miscellaneous](#)
- [8.10. Complete program listing](#)
- [Chapter 9. Slick0180: Sprite sheet animation, part 1](#)
  - [9.1. Table of Contents](#)
  - [9.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [9.3. Preview](#)
  - [9.4. General background information](#)
    - [The SpriteSheet class](#)
    - [The Animation class](#)
  - [9.5. Discussion and sample code](#)
    - [The class named Slick0180](#)
    - [The init method](#)
    - [The update method](#)
    - [The render method](#)
  - [9.6. Run the program](#)
  - [9.7. Summary](#)
  - [9.8. What's next?](#)
  - [9.9. Miscellaneous](#)
  - [9.10. Complete program listing](#)
- [Chapter 10. Slick0190: Sprite sheet animation, part 2](#)
  - [10.1. Table of Contents](#)
  - [10.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [10.3. Preview](#)
  - [10.4. General background information](#)
    - [The SpriteSheet class](#)
    - [The Animation class](#)
  - [10.5. Discussion and sample code](#)
    - [The class named Slick0190](#)
    - [The init method](#)
    - [The update method](#)

- [The render method](#)
- [10.6. Run the program](#)
- [10.7. Summary](#)
- [10.8. What's next?](#)
- [10.9. Miscellaneous](#)
- [10.10. Complete program listing](#)
- [Chapter 11. Slick0200: Developing a sprite class](#)
  - [11.1. Table of Contents](#)
  - [11.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [11.3. Preview](#)
  - [11.4. General background information](#)
  - [11.5. Discussion and sample code](#)
    - [The class named Sprite01](#)
    - [The class named Slick0200](#)
      - [The init method](#)
      - [The update method](#)
      - [The render method](#)
  - [11.6. Run the program](#)
  - [11.7. Summary](#)
  - [11.8. What's next?](#)
  - [11.9. Miscellaneous](#)
  - [11.10. Complete program listings](#)
- [Chapter 12. Slick0210: Collision detection and sound](#)
  - [12.1. Table of Contents](#)
  - [12.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [12.3. Preview](#)
  - [12.4. General background information](#)
  - [12.5. Discussion and sample code](#)
    - [The class named Sprite01](#)
    - [The class named Slick0210](#)
      - [The init method](#)
      - [The update method](#)
      - [The isCollision method of the Sprite01 class](#)
      - [The render method](#)
  - [12.6. Run the program](#)
  - [12.7. Summary](#)
  - [12.8. What's next?](#)

- [12.9. Miscellaneous](#)
- [12.10. Complete program listings](#)
- [Chapter 13. Slick0220: Simulating a pandemic](#)
  - [13.1. Table of Contents](#)
  - [13.2. Preface](#)
    - [Viewing tip](#)
      - [Images](#)
      - [Listings](#)
  - [13.3. Preview](#)
  - [13.4. General background information](#)
  - [13.5. Discussion and sample code](#)
    - [The class named Sprite01](#)
    - [The class named Slick0220](#)
      - [The init method](#)
      - [The update method](#)
      - [The render method](#)
  - [13.6. Run the program](#)
  - [13.7. Summary](#)
  - [13.8. Conclusion](#)
  - [13.9. Miscellaneous](#)
  - [13.10. Complete program listing](#)
- [Index](#)

# Chapter 1. Slick0100: Getting started with the Slick2D game library\*

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## Summary

Learn how to install Slick2D in such a way that you can easily compile and execute Slick2D programs from the command line with no need for a high level IDE.

## 1.1. Table of Contents

- [Preface](#)
  - [Viewing tip](#)
    - [Images](#)
    - [Listings](#)
- [Preview](#)
- [Download the required software](#)
  - [Text editors](#)
  - [The Slick2D distribution](#)
  - [The Java Development Kit](#)
- [Install the required software](#)
- [Create, compile, and execute your first Slick2D program](#)
  - [Create a source-code file](#)

- [Compile and run the program](#)
  - [Create a batch file](#)
  - [Execute the batch file](#)
- [Run the program](#)
- [Summary](#)
- [What's next?](#)
- [Miscellaneous](#)
- [Download source code](#)

## 1.2. Preface

- [Viewing tip](#)
  - [Images](#)
  - [Listings](#)

### Turning the crank

As a professor of Computer Information Technology at Austin Community College, I teach courses in game programming using both C++ and C#/XNA. I have long had a concern that students enter my courses expecting to simply "*turn the crank*" on a game engine such as Dark GDK or XNA and have great games emerge from the other end of the process. Unfortunately, it isn't quite that easy.

### Anatomy of a game engine

Given time limitations and other restrictions, it is not practical to teach those students much about the inner working of such game engines. Therefore, I have decided to publish a series of modules on the anatomy of a game engine that my students, (*and other interested parties*) can read to learn about those inner workings.

### First in a collection

Therefore, this module is the first in a collection of modules designed to teach you about the anatomy of a typical game engine (*sometimes called a game framework*).

## The Slick2D library

I have chosen to concentrate on a free game library named [Slick2D](#), *(which is written in Java)* for several reasons including the following:

- Java is the language with which I am the most comfortable. Hence, I can probably do a better job of explaining the anatomy of a game engine that uses Slick2D than would be the case for a game engine written in C++, C#, Python, or some other programming language.
- Java has proven in recent years to be a commercially successful game programming language. For example, I cite the commercial game named [Minecraft](#), written in Java, for which apparently millions of copies have been sold. Also, knowing Java is very beneficial for those who might want to develop apps for Android.
- Slick2D is free and the source code for Slick2D is readily available.
- The overall structure of a basic Slick2D game engine is very similar to Dark GDK and XNA, and is probably similar to other game engines as well.
- Java is platform independent.

### Applicable to other environments as well

Although the modules in this collection will concentrate on the Java game library named Slick2D, the concepts involved and the knowledge that you will gain is applicable to other game engines written in different programming languages.

### Purpose

The purpose of this module is to get you started, including showing you how to download and install Slick2D, and how to compile and execute your first Slick2D program. Future modules will start digging into and explaining the inner workings of a basic Slick2D game engine.

### What you should know

This series of modules is not intended for beginning programmers. As a minimum, you should already know about fundamental programming concepts such as **if** statements, **for** loops, **while** loops, method or function calls, parameter passing, etc. Ideally, you will have some object-oriented programming knowledge in a modern programming language such as Java, C#, C++, or possibly Python or JavaScript.

You should also be relatively comfortable with the command-line interface, directory or folder trees, batch or script files, etc.

Finally, you should also be comfortable downloading and installing software on the machine and

operating system of your choice.

## What you will learn

In this module, you will learn how to download and install Slick2D on a Windows XP, Vista, or Windows 7 machine and how to compile and execute a very simple Slick2D program. *(If you are using a different operating system, you will need to translate this information to your system of choice. However, since Java is platform independent, the code details that I will discuss will apply to all or most platforms.)*

## Viewing tip

I recommend that you open another copy of this module in a separate browser window and use the following links to easily find and view the figures and listings while you are reading about them.

## Images

- [Image 1](#). Output from Slick2D during program startup.
- [Image 2](#). A default Slick2D game window.

## Listings

- [Listing 1](#). Slick2D program named Slick0100a.java.
- [Listing 2](#). The file named CompileAndRun.bat.

## 1.3. Preview

Most of the Slick2D tutorials that you will find on the Internet will begin by telling you to download and install a high-level IDE such as Eclipse or NetBeans. I won't do that.

While high-level IDEs are great for improving productivity for experienced programmers, I consider them to be overkill for students just learning how to program. Not only are they overkill, they also hide many details that beginning programmers need to understand.

Therefore, I will show you how to install Slick2D in such a way that you can easily compile and execute Slick2D programs from the command line with no need for a high level IDE. All you will

need is a text editor (*preferably color coded for Java syntax*) , the free Slick2D distribution, and the free Java Development Kit from Oracle.

## 1.4. Download the required software

- [Text editors](#)
- [The Slick2D distribution](#)
- [The Java Development Kit](#)

### Text editors

There are numerous free text editors available on the Internet, some with and some without Java syntax color coding. (*In a pinch, even Windows Notepad will suffice.*) Here are links to a few of them.

- [JCreator](#)
- [jGRASP](#)
- [Dr.Java](#)
- [Arachnophilia](#)

### The Slick2D distribution

I will be using this material in some of the Java OOP programming courses that I teach. I expect that changes and improvements will be made to the Slick2D library over time. However, it can be very confusing when different students in the same programming course are using different versions of software, particularly if changes to the software are made that are not backward compatible.

Therefore, I will make a copy of the Slick2D distribution available by clicking [here](#) so that my students can all download and use the same version in my courses.

If you are not one of my students, you may prefer to go to the [Slick2D](#) main page and select the link to download the latest version of the distribution. Save that file because I will have more to say about it later.

# The Java Development Kit

Go to [Oracle](#) and download the latest release of Java SE (*standard edition*) that is compatible with your system. Then open the [installation instructions](#) and select the link for your system. For example, there is currently a link on that page that reads:

*[JDK Installation for Microsoft Windows](#) - Describes how to install the JDK on 32-bit and 64-bit Microsoft Windows operating systems.*

Follow the link to the installation instructions for your system and follow those instructions to install the Java Development Kit. When doing the installation, pay attention to the link that reads [Updating the PATH Environment Variable \(Optional\)](#). This is where many of my students encounter installation difficulties.

*((Note that over time, some of these links may change. However, the general concepts involved should continue to be relevant.))*

There are also issues dealing with something called the *classpath*, but I will explain how to deal with those issues later.

## 1.5. Install the required software

I am assuming that you can install the text editor and the JDK with no help from me. Therefore, I will concentrate on installing and configuring the Slick2D software.

### The Code folder tree

Begin by creating a folder somewhere on your disk named **Code** (*or some other similar name of your choosing*).

Create three sub-folders under the **Code** folder having the following names:

- jars
- lwjglbin
- Slick0100a (*this will change from one program to the next*)

### Extract the contents of the zip file

Using whatever program you can find to open a zip file (*I use a program named WinZip*), extract and save the following files from the Slick2D distribution file that you **downloaded earlier**.

- lwjgl.jar
- slick.jar
- natives-win32.jar

There are many other files in the Slick2D distribution file, but we don't need them just yet. If we need them in a future module, I will tell you.

These three files are needed to satisfy the *classpath* and *java.library.path* requirements that I will describe later.

### **The first two jar files**

Copy the first two jar files from the [above list](#) into the folder named **jars**.

As you will see later, this results in the need to execute the following command in order to set the classpath whenever you compile or execute a Slick2D program:

```
-cp ././jars/slick.jar;./jars/lwjgl.jar
```

### **The third jar file**

The third file in the [above list](#) applies to Windows only. If you are using a different system, you should find a similar file in the Slick2D distribution that applies to your system.

### **Extract contents of the jar file**

Using whatever program you can find to open a jar file (*I use a program named WinZip*), extract the following files from the file named **natives-win32.jar**:

- jinput-dx8.dll
- jinput-raw.dll
- lwjgl.dll
- OpenAL32.dll

Copy these four files into the folder named **lwjglbin**.

As you will see later, this results in the need to execute the following command in order to set the *java.library.path* system property:

**-Djava.library.path=../lwjgnbin**

*(These files can also be stored in the folder from which the program is being run and this will eliminate the requirement to set the java.library.path if you prefer that approach.)*

## 1.6. Create, compile, and execute your first Slick2D program

- [Create a source-code file](#)
- [Compile and run the program](#)
  - [Create a batch file](#)
  - [Execute the batch file](#)

### Create a source-code file

Use your text editor to create a text file named **Slick0100a.java** and store it in the folder named **Slick0100a** .

*(Be careful to ensure that the file has the correct extension, particularly if you create it with Windows Notepad. An extension of .txt won't work.)*

Carefully copy the code from [Listing 1](#) into the text file. This is the file that you will attempt to compile and run to confirm correct operation of your system.

```
/*Slick0100a.java  
Copyright 2012, R.G.Baldwin
```

```
A simple program that shows the method definitions  
required by the Slick framework.
```

```
Tested using JDK 1.7 under WinXP
```

```
***** /
```

```
import org.newdawn.slick.AppGameContainer;  
import org.newdawn.slick.BasicGame;  
import org.newdawn.slick.GameContainer;  
import org.newdawn.slick.Graphics;  
import org.newdawn.slick.SlickException;
```

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