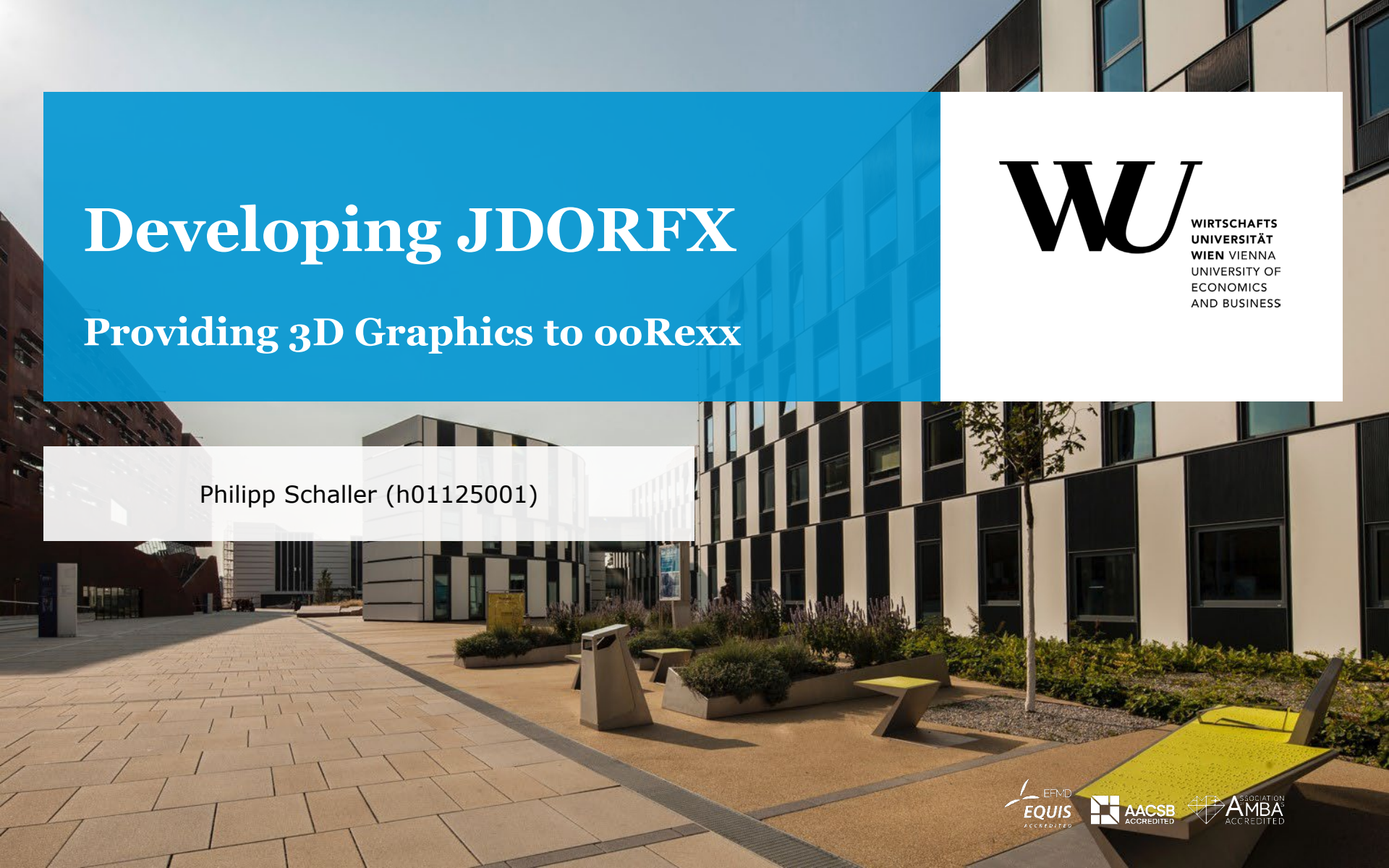

Developing JDORFX

Providing 3D Graphics to ooRexx

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Agenda

- Background
- Development
- Nutshell Examples

Java

- Developed by Sun Microsystems in 1995
- One of the most used programming languages today
- Java vitrual machine (JVM) allows to run Java program everywhere once compiled
- Extensive libraries
- Stricly typed language
- Case sensitive
- Classes organized in packages

ooRexx 1

- Developed by Mike F. Cowlishaw in 1979 (Rexx)
- Easy to learn syntax
- No strict types
- Setting Environment

ooRexx 2

- Instruction Types
  - Assignment Instructions
  - Keyword Instructions (e.g. DO)
  - Command Instructions
    - Will be sent to shell for execution
    - Or addressing other Rexx Command Handler with ADDRESS keyword
  - Directive Instructions (since ooRexx)
    - :: requires
    - Executed in setup phase

BSF4ooRexx850

- Bean Scripting Framework for ooRexx
- ooRexx function and class package
- Allows ooRexx to use all of Java
- Combines ooRexx human oriented design and Java functionalities
- Camouflaging Java objects as ooRexx objects
- Since BSF4ooRexx850: ability to implement Rexx command handlers in Java

JDOR

- Runtime Library written in Java
- Command Handler as part of BSF4ooRexx850
- Implements awt based Java2D
- No knowledge of Java necessary
- Uses JavaDrawingHandler

Java awt vs JavaFX

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Java awt

- First Release 1996
- Basic GUI toolkit
- Several Packages
- Uses Java Native Interface (JNI)
- GUI control and event management in a separate AWT/GUI thread

JavaFX

- First Release 2008
- Standalone GUI toolkit meant to replace AWT and Swing
- FX Thread
- Introduces Properties
- Multiplatform classes: eg Audio, Video, 3D Graphics
- Needs Java version with JavaFX package, eg Full JDK!

JavaDrawingHandler

- Class Constructor for custom JFrame
- Implements RexxRedirectingCommandHandler
- Hashmaps for storing variables
- Callback Method handleCommand
  - Iterates through redirected Rexx commands
- processCommand
  - Processes redirected Rexx commands
  - Switch Statement

Differences 1

JavaDrawingFrame

- JFrame class
- Embedded JPanel
- BufferedImage

JavaFXDrawingFrame

- Scene class
- Pane as Root Node
- Canvas
- Group Nodes
  - shapeGroup
  - shape3DGroup
  - lightGroup

Differences 2

JavaFXDrawingHandler

- Extents Application Class
- New Thread to Launch FX Thread
- Start Method
  - Stage that embeds custom Scene
  - New Runnalbe for GUI updates every 10 milliseconds

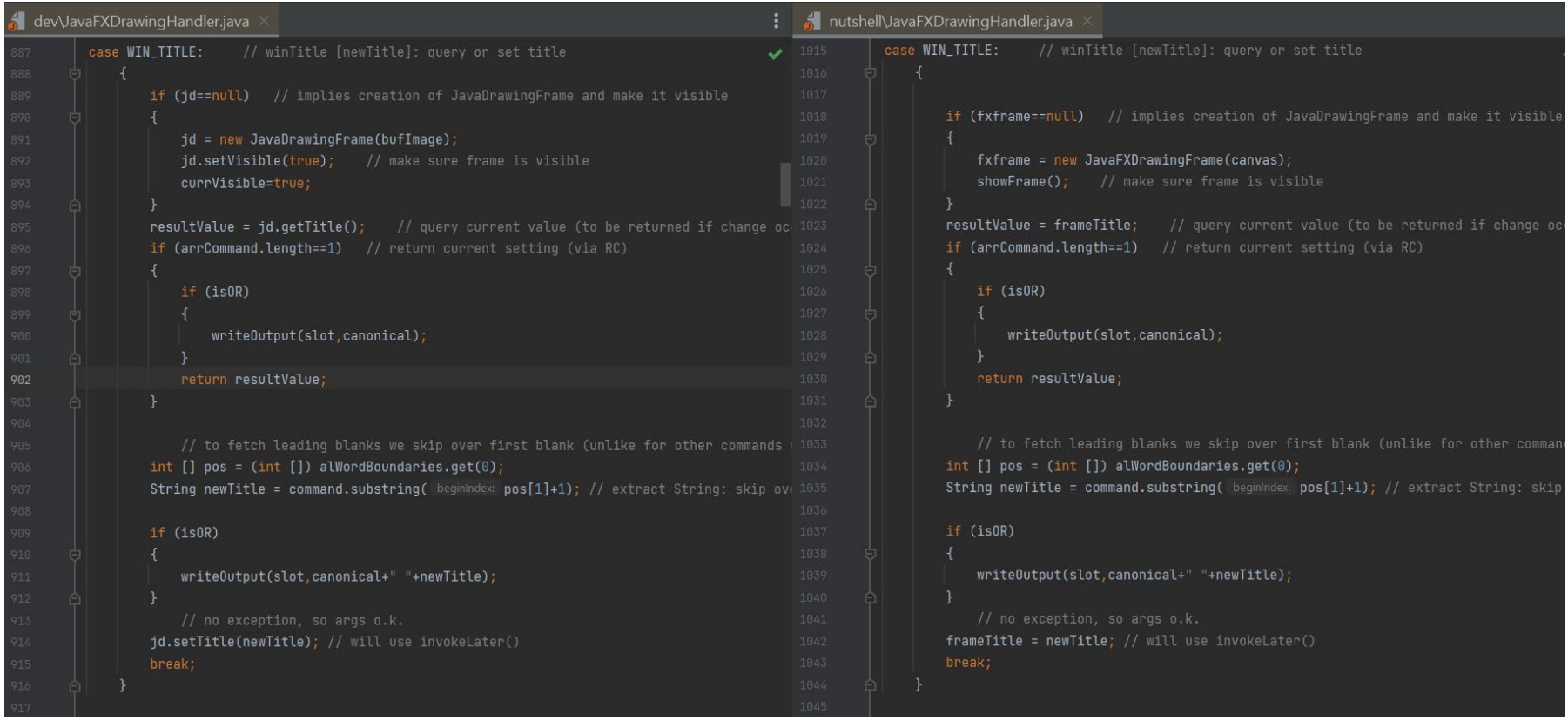
Differences 3

JavaFXDrawingHandler

- ConcurrentLinkedDeque for communiation between threads
  - Main Thread puts in changed Scene object
  - FX Thread reads Scene object

- Synchronized methods for changing Stage properties
  - Window show
  - Window Location
  - Window Resizable

Differences 4



dev\JavaFXDrawingHandler.java

```
887     case WIN_TITLE:     // winTitle [newTitle]: query or set title
888         {
889             if (jd==null)   // implies creation of JavaDrawingFrame and make it visible
890             {
891                 jd = new JavaDrawingFrame(bufImage);
892                 jd.setVisible(true);    // make sure frame is visible
893                 currVisible=true;
894             }
895             resultValue = jd.getTitle();    // query current value (to be returned if change oc
896             if (arrCommand.length==1)   // return current setting (via RC)
897             {
898                 if (isOR)
899                 {
900                     writeOutput(slot,canonical);
901                 }
902                 return resultValue;
903             }
904
905                 // to fetch leading blanks we skip over first blank (unlike for other commands
906             int [] pos = (int []) alWordBoundaries.get(0);
907             String newTitle = command.substring( beginIndex: pos[1]+1); // extract String: skip ov
908
909             if (isOR)
910             {
911                 writeOutput(slot,canonical+" "+newTitle);
912             }
913                 // no exception, so args o.k.
914             jd.setTitle(newTitle); // will use invokeLater()
915             break;
916         }
917
```

nutshell\JavaFXDrawingHandler.java

```
1015    case WIN_TITLE:     // winTitle [newTitle]: query or set title
1016        {
1017
1018            if (fxframe==null)   // implies creation of JavaDrawingFrame and make it visible
1019            {
1020                fxframe = new JavaFXDrawingFrame(canvas);
1021                showFrame();    // make sure frame is visible
1022            }
1023            resultValue = frameTitle;    // query current value (to be returned if change oc
1024            if (arrCommand.length==1)   // return current setting (via RC)
1025            {
1026                if (isOR)
1027                {
1028                    writeOutput(slot,canonical);
1029                }
1030                return resultValue;
1031            }
1032
1033                // to fetch leading blanks we skip over first blank (unlike for other comman
1034            int [] pos = (int []) alWordBoundaries.get(0);
1035            String newTitle = command.substring( beginIndex: pos[1]+1); // extract String: skip
1036
1037            if (isOR)
1038            {
1039                writeOutput(slot,canonical+" "+newTitle);
1040            }
1041                // no exception, so args o.k.
1042            frameTitle = newTitle; // will use invokeLater()
1043            break;
1044        }
1045
```

Challenges: Stroke

Setting Stroke Properties

JavaDrawingHandler

- awt Stroke class

JavaFXDrawingHandler

- JavaFX Stroke: only color value
- Storing properties in HashMap
  - Color
  - Width
  - LineJoin
  - DashArray

Challenges: PathAppend

Appending a named Shape to a named Path

JavaDrawingHandler

- Append Shape to Path

JavaFXDrawingHandler

- Turn named Shape into Path
- Iterate through PathElements
- Append new PathElements to named Path
- (Errors when joining shapes)

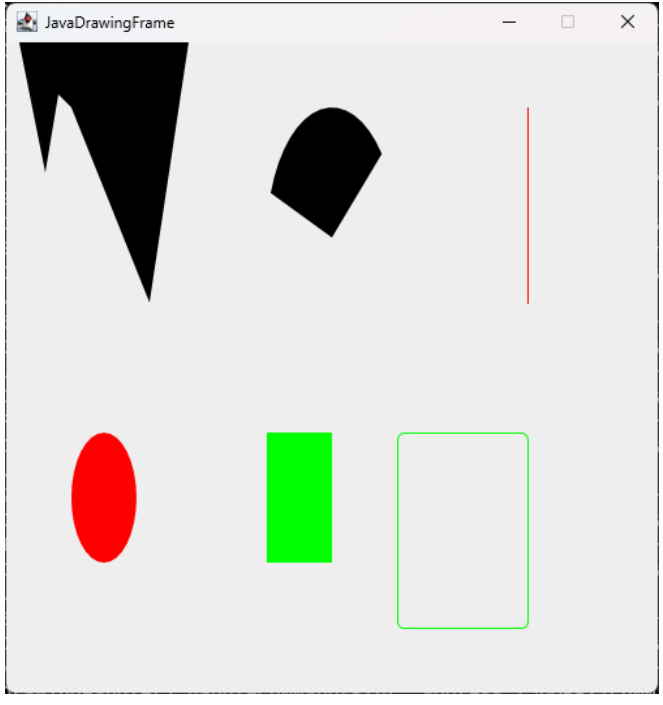
JDORFX Environment

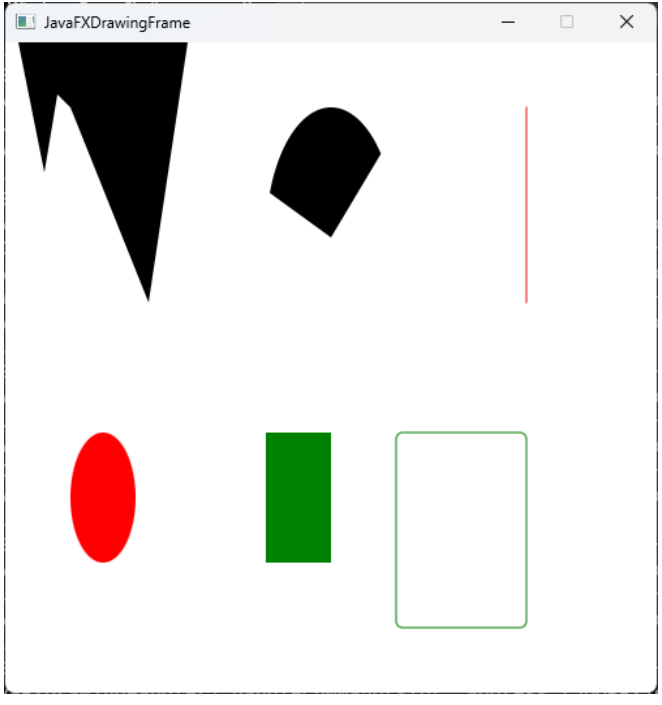
```
36  /** Creates a new command handler that will serve the environment by the name
37   *  of the optional environmentName argument.
38   *  @param environmentName the address environment name to use, if omitted defaults to "JDORFX"
39  */
40  ::routine addJdorFXHandler   public
41     use strict arg environmentName="JDORFX"
42
43     call BsfCommandHandler "add", -
44     environmentName, -
45     .bsf~new("org.oorexx.handlers.jdorfx.JavaFXDrawingHandler")
46
47   ::requires "BSF.CLS"    -- get ooRexx-Java bridge
```

Address JDORX in Rexx Programs

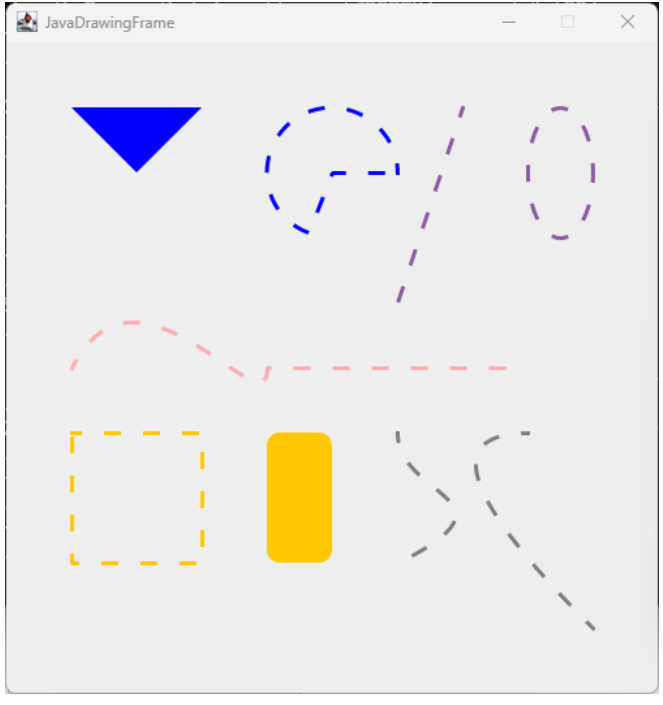
```
25  -- create JDORFX handler
26  -- load and add the Java Rexx command handler, using default name: JDORFX
27  call addJdorFXHandler
28  -- set default environment to JDORFX
29  address jdorfx
30
31  -- get ooRexx-Java bridge, contains JDORFX Rexx command handler
32  ::requires "jdorfx.CLS"
33
```

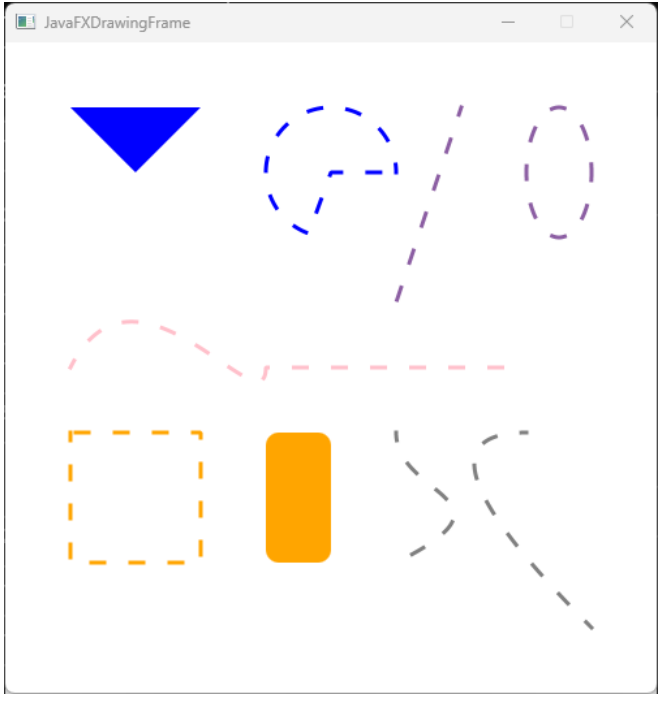
Nutshell: JDOR vs JDORFX Drawing



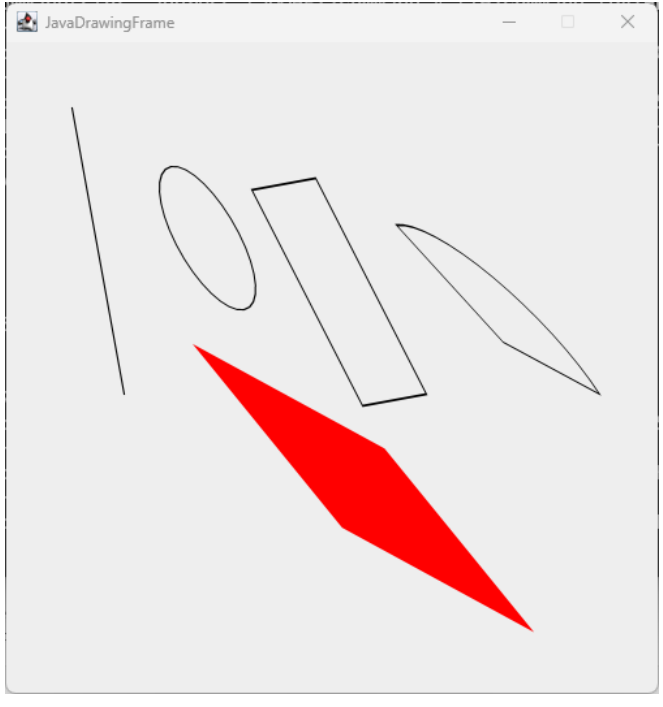


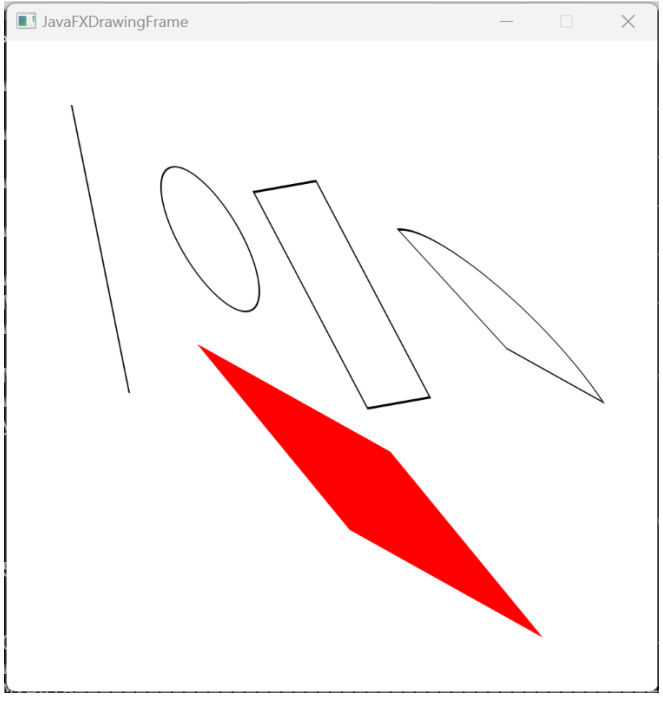
Nutshell: JDOR vs JDORFX 2D Shapes





Nutshell: JDOR vs JDORFX 2D Transform

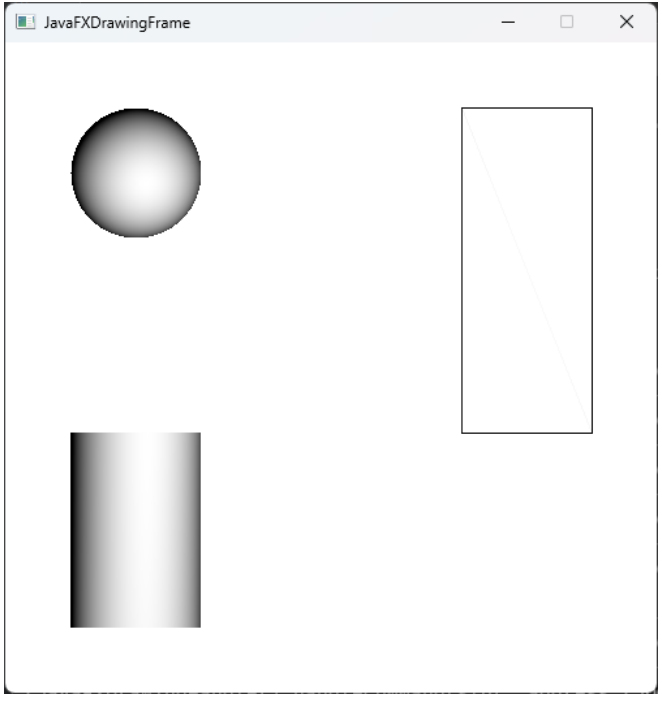




Nutshell: 3D Shapes

- 3DShape classes
  - Box
  - Cylinder
  - Sphere
- Draw3dShape: wireframe model
- Fill3dShape: model with filled vertecies

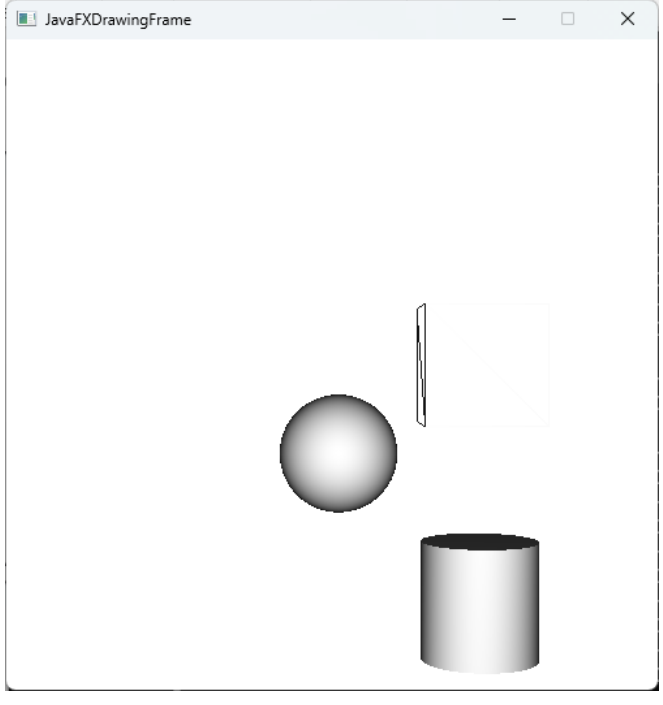
Nutshell: 3D Shapes

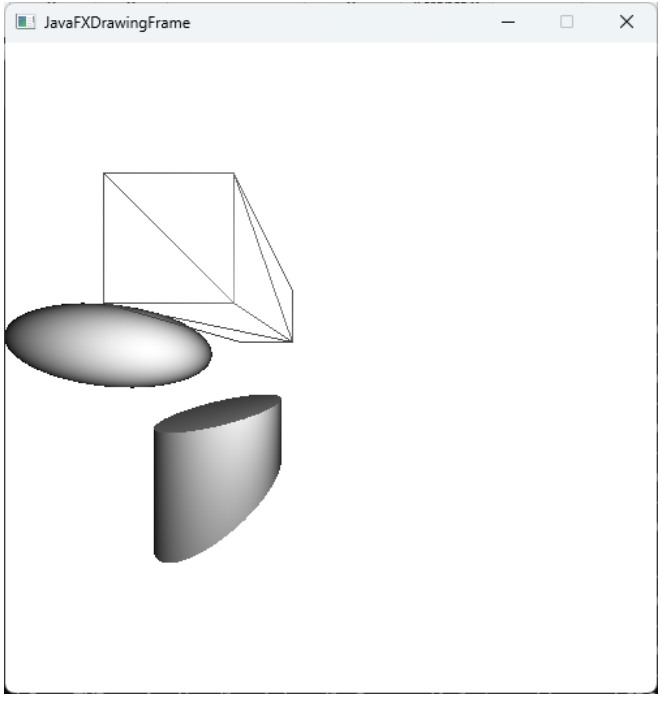


Nutshell: Camera

- Parallel Camera
  - Default Scene Camera
  - No Perspective Distortion
- Perspective Camera
  - Perspective Distortion
  - FieldOfView: defines the viewing volume for a perspective projection

Nutshell: Camera

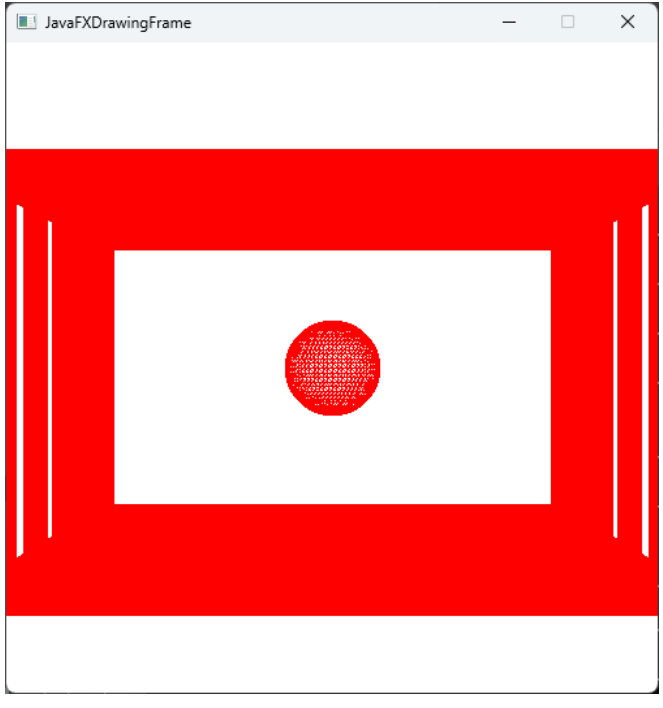


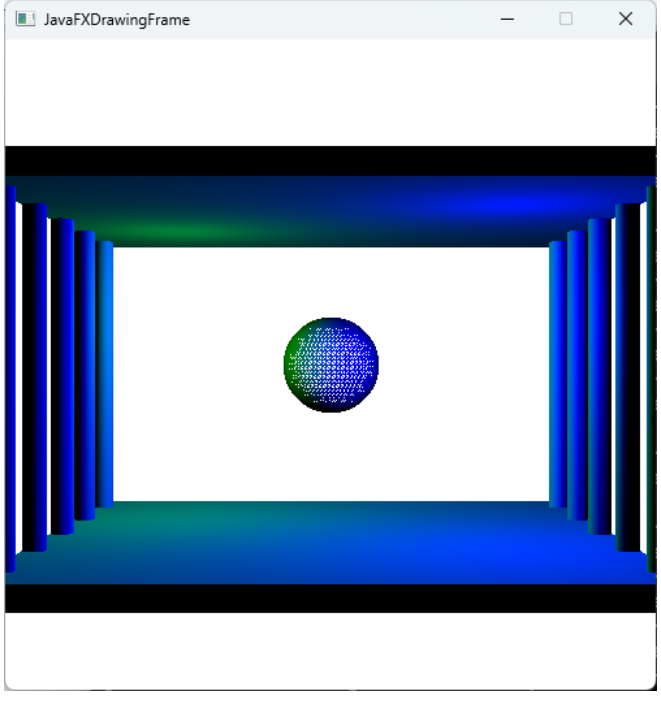


Nutshell: Ambient Light vs Point Light

- Ambient Light
  - Light source that appears to come from all directions
- Point Light
  - Radiates light away from its position

Nutshell: Ambient Light vs Point Light

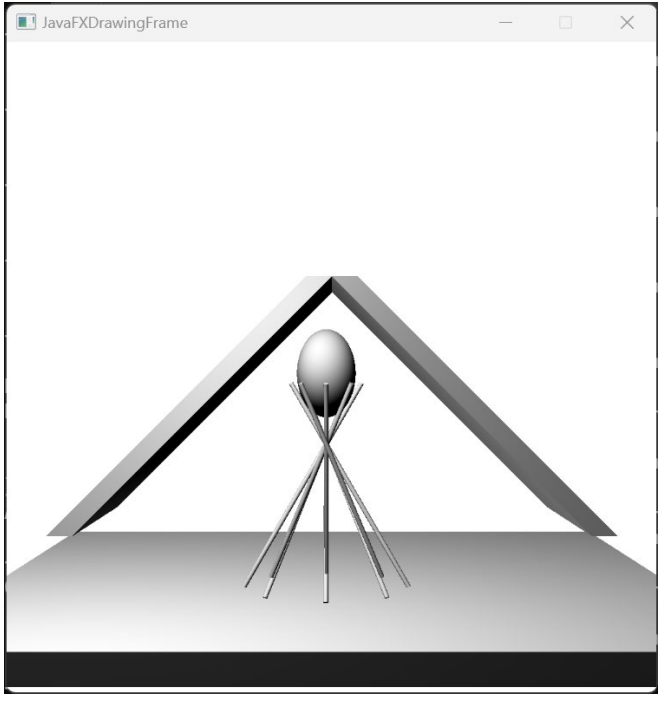




Nutshell: 3D Transformations

- 3D Tansformations
  - Translate
  - Rotate
  - Scale
  - Shear

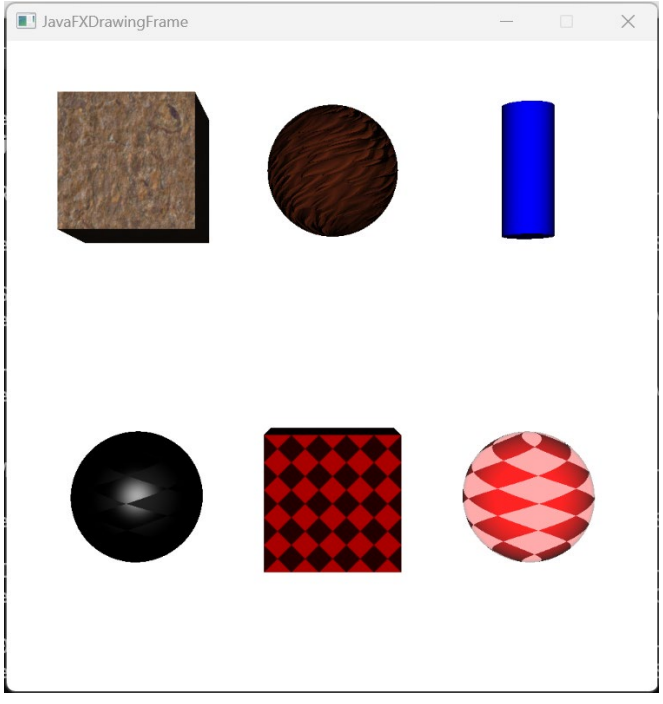
Nutshell: 3D Transformations



Nutshell: Materials

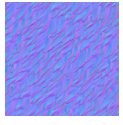
- Maps
  - BumpMap
  - DiffuseMap
  - SelfIlluminationMap
  - SpecularMap
    - Specular Power: level of smoothness, The smaller the value, the narrower the reflections and the smoother the surface appears.
- Color
  - DiffuseColor
  - SpecularColor

Nutshell: Materials



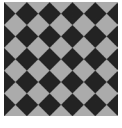
DiffuseMap

DiffuseMap



BumpMap

DiffuseColor

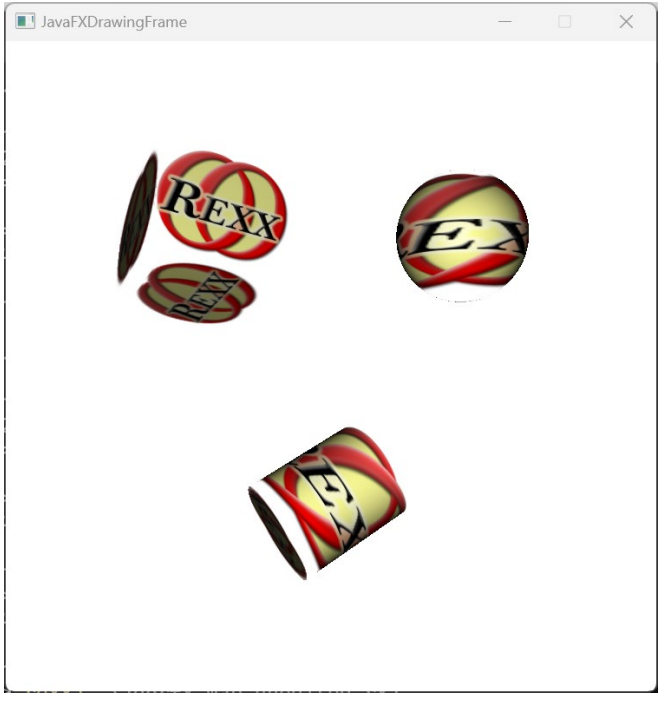


SpecularMap, DiffuseMap, SelfIlluminationMap

Nutshell: Unedited Maps

- Problems:
  - Distortion of Image when wrapped
  - Transparent Pixels of PNGs

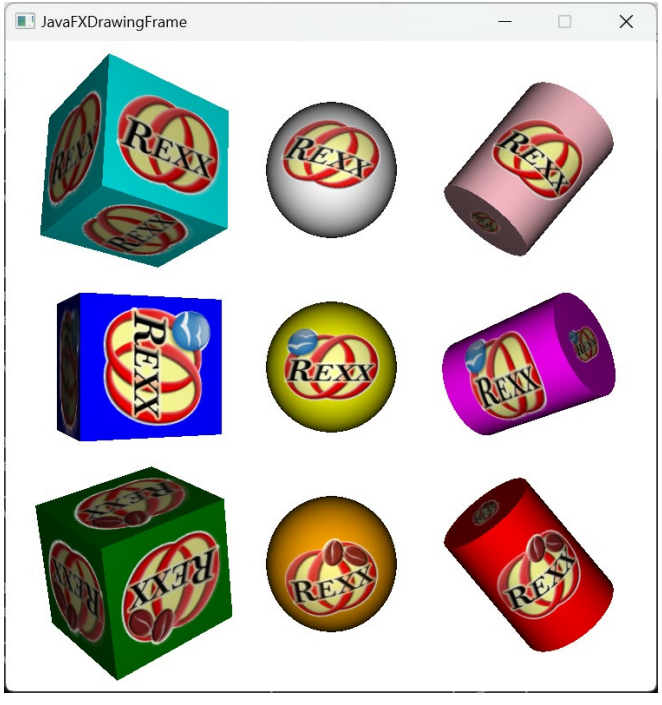
Nutshell: Unedited Maps



Nutshell: Edited Maps

- Edit Map properties:
  - Add Width
  - Add Height
  - Rotate Image
  - Add Color

Nutshell: Edited Maps



Java vs JDORFX

```java
import javafx.application.Application;
import javafx.scene.Group;
import javafx.scene.Scene;
import javafx.scene.shape.*;
import javafx.stage.Stage;

public class Example extends Application {

    @Override
    public void start(Stage stage) throws Exception {

        Group root = new Group();
        Scene scene = new Scene(root, width: 500, height: 500);

        Box box = new Box( width: 100,  height: 100,  depth: 100);
        box.setTranslateX(100);
        box.setTranslateY(100);
        box.setTranslateZ(100);

        root.getChildren().add(box);

        stage.setScene(scene);
        stage.show();

    }
}
```

```
call addJdorFXHandler
address jdorfx

newimage 500 500

shape3d myBox box 100 100 100 100 100 100

draw3dshape myBox

winshow

-- get ooRexx-Java bridge, contains JDORFX Rexx command handler
::requires "jdorfx.CLS"
```

Thank you for your Attention!

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