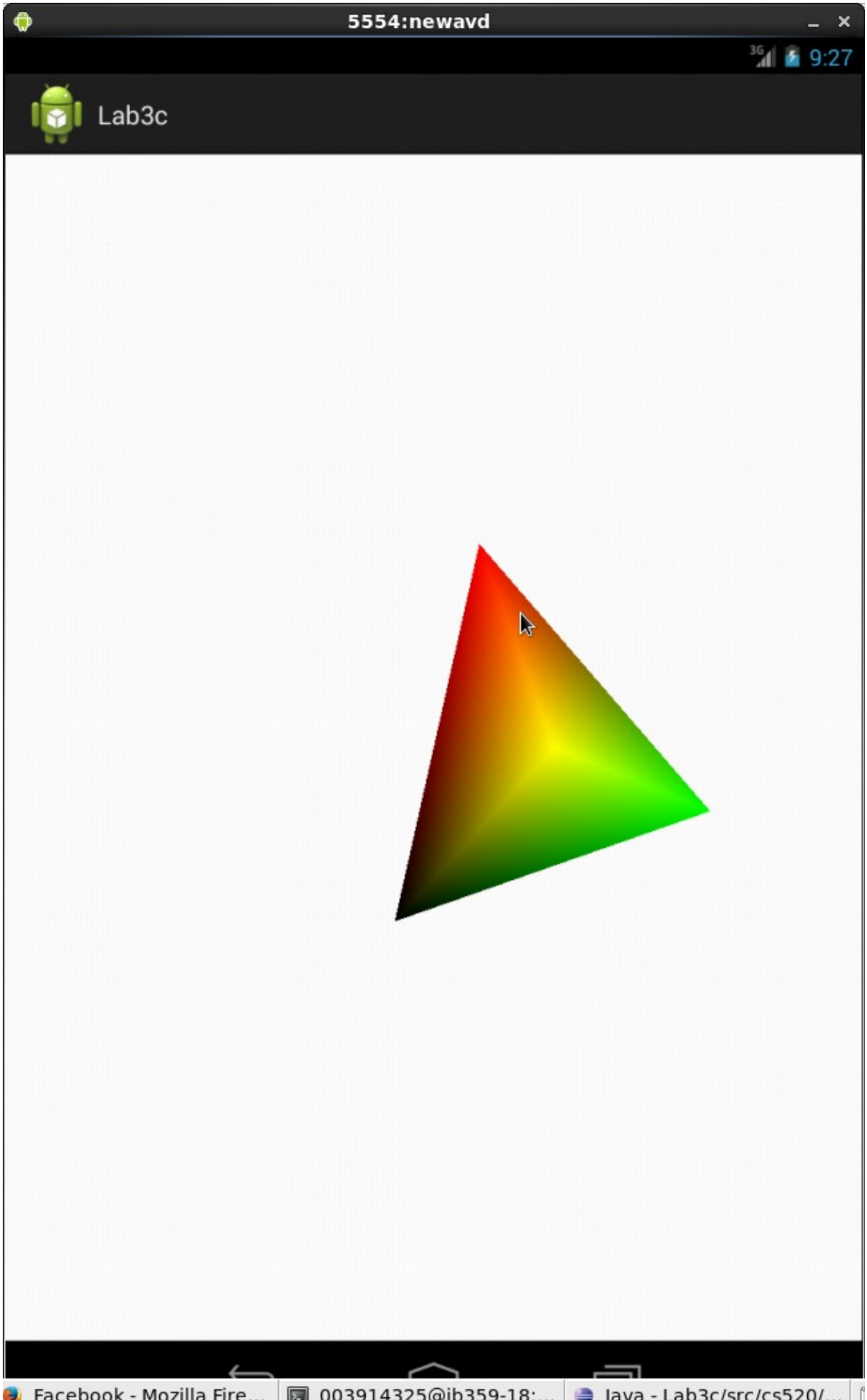
CSE520
Samuel Marrujo
Professor Yu
Lab 03

Draw a tetrahedron with Android

In this lab, we are to draw the tetrahedron using the Android libraries and using the Eclipse IDE. I have successfully completed this task, and here is a picture of the following:


5554:newavd
9:27
Lab3c
Facebook - Mozilla Fire...
003914325@jb359-18:...
Java - Lab3c/src/cs520/...

Main Activity Code:

```
package cs520.lab3c;

import javax.microedition.khronos.egl.EGLConfig;
import javax.microedition.khronos.opengles.GL10;

import android.app.Activity;
import android.content.Context;
import android.opengl.GLSurfaceView;
import android.opengl.GLSurfaceView.Renderer;
import android.os.Bundle;
import android.view.MotionEvent;

/**
 * Wrapper activity demonstrating the use of {@link GLSurfaceView}, a view
 * that uses OpenGL drawing into a dedicated surface.
 *
 * Shows:
 * + How to redraw in response to user input.
 */
public class MainActivity extends Activity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);

        // Create our Preview view and set it as the content of our
        // Activity
        mGLSurfaceView = new TouchSurfaceView(this);
        setContentView(mGLSurfaceView);
        mGLSurfaceView.requestFocus();
        mGLSurfaceView.setFocusableInTouchMode(true);

        /*
        mGLSurfaceView = new GLSurfaceView(this);
        CubeRenderer1 renderer = new CubeRenderer1();
        mGLSurfaceView.setRenderer(renderer);
        setContentView(mGLSurfaceView);
*/
    }

    @Override
    protected void onResume() {
        // Ideally a game should implement onResume() and onPause()
        // to take appropriate action when the activity looses focus
        super.onResume();
        mGLSurfaceView.onResume();
    }

    @Override
    protected void onPause() {
        // Ideally a game should implement onResume() and onPause()
        // to take appropriate action when the activity looses focus
        super.onPause();
        mGLSurfaceView.onPause();
    }
```

```
    private GLSurfaceView mGLSurfaceView;
}

/**
 * Implement a simple rotation control.
 *
 */
class TouchSurfaceView extends GLSurfaceView {

    public TouchSurfaceView(Context context) {
        super(context);
        mRenderer = new CubeRenderer();
        setRenderer(mRenderer);
        //RENDERMODE_WHEN_DIRTY means "do not call onDrawFrame() unless
        // something explicitly requests rendering with requestRender()
        setRenderMode(GLSurfaceView.RENDERMODE_WHEN_DIRTY);
    }

    @Override public boolean onTrackballEvent(MotionEvent e) {
        mRenderer.mAngleX += e.getX() * TRACKBALL_SCALE_FACTOR;
        mRenderer.mAngleY += e.getY() * TRACKBALL_SCALE_FACTOR;
        requestRender();
        return true;
    }

    @Override public boolean onTouchEvent(MotionEvent e) {
        float x = e.getX();
        float y = e.getY();
        switch (e.getAction()) {
        case MotionEvent.ACTION_MOVE:
            float dx = x - mPreviousX;
            float dy = y - mPreviousY;
            mRenderer.mAngleX += dx * TOUCH_SCALE_FACTOR;
            mRenderer.mAngleY += dy * TOUCH_SCALE_FACTOR;
            requestRender();
        }
        mPreviousX = x;
        mPreviousY = y;
        return true;
    }

    /**
     * Render a cube.
     */
    private class CubeRenderer implements GLSurfaceView.Renderer {
        public CubeRenderer() {
            mCube = new Cube();
            mTetrahedron = new Tetrahedron();
        }

        public void onDrawFrame(GL10 gl) {
            /*
             * Usually, the first thing one might want to do is to clear
             * the screen. The most efficient way of doing this is to use
             * glClear().
             */

            gl.glClear(GL10.GL_COLOR_BUFFER_BIT | GL10.GL_DEPTH_BUFFER_BIT);
```

```
        /*
         * Now we're ready to draw some 3D objects
         */

        gl.glMatrixMode(GL10.GL_MODELVIEW);
        gl.glLoadIdentity();
        gl.glTranslatef(0, 0, -3.0f);
        gl.glRotatef(mAngleX, 0, 1, 0);
        gl.glRotatef(mAngleY, 1, 0, 0);

        gl.glEnableClientState(GL10.GL_VERTEX_ARRAY);
        gl.glEnableClientState(GL10.GL_COLOR_ARRAY);
        //mCube.draw(gl);
        mTetrahedron.draw(gl);
       /*
        mAngleX += 1.0f;  //Added by Tong for testing
        mAngleY += 2.0f;

        gl.glDisableClientState(GL10.GL_VERTEX_ARRAY);
        gl.glDisableClientState(GL10.GL_COLOR_ARRAY);
        */
    }

    public void onSurfaceChanged(GL10 gl, int width, int height) {
         gl.glViewport(0, 0, width, height);

         /*
          * Set our projection matrix. This doesn't have to be done
          * each time we draw, but usually a new projection needs to
          * be set when the viewport is resized.
          */

         float ratio = (float) width / height;
         gl.glMatrixMode(GL10.GL_PROJECTION);
         gl.glLoadIdentity();
         gl.glFrustumf(-ratio, ratio, -1, 1, 1, 10);
    }

    public void onSurfaceCreated(GL10 gl, EGLConfig config) {
        /*
         * By default, OpenGL enables features that improve quality
         * but reduce performance. One might want to tweak that
         * especially on software renderer.
         */
        gl.glDisable(GL10.GL_DITHER);

        /*
         * Some one-time OpenGL initialization can be made here
         * probably based on features of this particular context
         */
         gl.glHint(GL10.GL_PERSPECTIVE_CORRECTION_HINT,
                 GL10.GL_FASTEST);


         gl.glClearColor(1,1,1,1);
         gl.glEnable(GL10.GL_CULL_FACE);
         gl.glShadeModel(GL10.GL_SMOOTH);
```

```
            gl.glEnable(GL10.GL_DEPTH_TEST);
        }
        private Cube mCube;
        private Tetrahedron mTetrahedron;
        public float mAngleX;
        public float mAngleY;
    }

    private final float TOUCH_SCALE_FACTOR = 180.0f / 320;
    private final float TRACKBALL_SCALE_FACTOR = 36.0f;
    private CubeRenderer mRenderer;
    private float mPreviousX;
    private float mPreviousY;
}

class CubeRenderer1 implements GLSurfaceView.Renderer
{
  GL10 gl;
  Cube cube = new Cube();
  Tetrahedron tetrahedron = new Tetrahedron();
  private float anglex;
  private float anglez;
  private final int nfaces = 12;
  //@Override
  //Refresh automatically
  public void onDrawFrame(GL10 gl)
  {
        gl.glClear(GL10.GL_COLOR_BUFFER_BIT | GL10.GL_DEPTH_BUFFER_BIT);
        gl.glEnableClientState(GL10.GL_VERTEX_ARRAY);
        gl.glEnableClientState(GL10.GL_COLOR_ARRAY);
        gl.glMatrixMode(GL10.GL_MODELVIEW);
        gl.glLoadIdentity();
        gl.glTranslatef(0.0f, 0.0f, -4.0f);
        //gl.glTranslatef(0.0f, 0.0f, -3.0f);
        gl.glRotatef( anglex, 1.0f, 0.0f, 0.0f ); // Rotate about  x-axis
        gl.glRotatef( anglez, 0.0f, 0.0f, 1.0f); // Rotate about z-axis
        //cube.draw(gl);
        tetrahedron.draw(gl);
        anglex += 1.0f;
        anglez += 2.0f;
        gl.glDisableClientState(GL10.GL_VERTEX_ARRAY);
        gl.glDisableClientState(GL10.GL_COLOR_ARRAY);
  }


  public void onSurfaceChanged(GL10 gl, int width, int height)
  {
        gl.glViewport(0, 0, width, height);
        float ratio = (float) width / height;
        gl.glMatrixMode(GL10.GL_PROJECTION);
        gl.glLoadIdentity();
        gl.glFrustumf(-ratio, ratio, -1, 1, 1, 10);
  }

  public void onSurfaceCreated(GL10 gl, EGLConfig config)
  {
      gl.glDisable(GL10.GL_DITHER);
      gl.glHint(GL10.GL_PERSPECTIVE_CORRECTION_HINT, GL10.GL_FASTEST);
```

```
        gl.glClearColor(1, 1, 1, 0);
        gl.glEnable(GL10.GL_CULL_FACE);
        gl.glShadeModel(GL10.GL_SMOOTH);
        gl.glEnable(GL10.GL_DEPTH_TEST);
    }

}
```

Renderer Code:

```
package cs520.lab3c;

import java.nio.ByteBuffer;
import java.nio.ByteOrder;
import java.nio.IntBuffer;

import javax.microedition.khronos.opengles.GL10;

/**
 * A vertex shaded cube.
 */
class Cube
{
    public Cube()
    {
        int one = 0x10000;
        int vertices[] = {
                -one, -one, -one,
                one, -one, -one,
                one,  one, -one,
                -one,  one, -one,
                -one, -one,  one,
                one, -one,  one,
                one,  one,  one,
                -one,  one,  one,
        };

        int colors[] = {
                0,    0,    0,  one,
                one,    0,    0,  one,
                one,  one,    0,  one,
                0,  one,    0,  one,
                0,    0,  one,  one,
                one,    0,  one,  one,
                one,  one,  one,  one,
                0,  one,  one,  one,
        };

        byte indices[] = {
                0, 4, 5,    0, 5, 1,
                1, 5, 6,    1, 6, 2,
                2, 6, 7,    2, 7, 3,
                3, 7, 4,    3, 4, 0,
                4, 7, 6,    4, 6, 5,
                3, 0, 1,    3, 1, 2
```

```
        };

        // Buffers to be passed to gl*Pointer() functions
        // must be direct, i.e., they must be placed on the
        // native heap where the garbage collector cannot
        // move them.
        //
        // Buffers with multi-byte datatypes (e.g., short, int, float)
        // must have their byte order set to native order

        ByteBuffer vbb = ByteBuffer.allocateDirect(vertices.length*4);
        vbb.order(ByteOrder.nativeOrder());
        mVertexBuffer = vbb.asIntBuffer();
        mVertexBuffer.put(vertices);
        mVertexBuffer.position(0);

        ByteBuffer cbb = ByteBuffer.allocateDirect(colors.length*4);
        cbb.order(ByteOrder.nativeOrder());
        mColorBuffer = cbb.asIntBuffer();
        mColorBuffer.put(colors);
        mColorBuffer.position(0);

        mIndexBuffer = ByteBuffer.allocateDirect(indices.length);
        mIndexBuffer.put(indices);
        mIndexBuffer.position(0);
    }

    public void draw(GL10 gl)
    {
        gl.glFrontFace(GL10.GL_CW);
        gl.glVertexPointer(3, GL10.GL_FIXED, 0, mVertexBuffer);
        gl.glColorPointer(4, GL10.GL_FIXED, 0, mColorBuffer);
        gl.glDrawElements(GL10.GL_TRIANGLES, 36, GL10.GL_UNSIGNED_BYTE,
mIndexBuffer);
    }

    private IntBuffer   mVertexBuffer;
    private IntBuffer   mColorBuffer;
    private ByteBuffer  mIndexBuffer;
}

class Tetrahedron
{
    public Tetrahedron()
    {
        int one = 0x10000;
        int vertices[] = {
                  0, one, 0,
                  0, -one, 0,
                  one, 0, 0,
                  one, 0, -one
        };

        int colors[] = {
                0,    0,    0,  one,
                one,    0,    0,  one,
                one,  one,    0,  one,
                0,  one,    0,  one,
```

```
        };

        byte indices[] = {
                  1, 3, 2,
                  0, 1, 2,
                  0, 2, 3,
                  0, 3, 1
        };

        // Buffers to be passed to gl*Pointer() functions
        // must be direct, i.e., they must be placed on the
        // native heap where the garbage collector cannot
        // move them.
        //
        // Buffers with multi-byte datatypes (e.g., short, int, float)
        // must have their byte order set to native order

        ByteBuffer vbb = ByteBuffer.allocateDirect(vertices.length*4);
        vbb.order(ByteOrder.nativeOrder());
        mVertexBuffer = vbb.asIntBuffer();
        mVertexBuffer.put(vertices);
        mVertexBuffer.position(0);

        ByteBuffer cbb = ByteBuffer.allocateDirect(colors.length*4);
        cbb.order(ByteOrder.nativeOrder());
        mColorBuffer = cbb.asIntBuffer();
        mColorBuffer.put(colors);
        mColorBuffer.position(0);

        mIndexBuffer = ByteBuffer.allocateDirect(indices.length);
        mIndexBuffer.put(indices);
        mIndexBuffer.position(0);
    }

    public void draw(GL10 gl)
    {
        gl.glFrontFace(GL10.GL_CW);
        gl.glVertexPointer(3, GL10.GL_FIXED, 0, mVertexBuffer);
        gl.glColorPointer(4, GL10.GL_FIXED, 0, mColorBuffer);
        gl.glDrawElements(GL10.GL_TRIANGLES, 12, GL10.GL_UNSIGNED_BYTE,
mIndexBuffer);
    }

    private IntBuffer   mVertexBuffer;
    private IntBuffer   mColorBuffer;
    private ByteBuffer  mIndexBuffer;

}
```