Physics (RAGE) – *bouncing ball example*

```
. . .
import ray.physics.PhysicsEngine;
import ray.physics.PhysicsObject;
import ray.physics.PhysicsEngineFactory;

public class myGame extends VariableFrameRateGame
{
   private SceneNode        ball1Node, ball2Node, gndNode;
   private SceneNode        cameraPositionNode;

   private final static String GROUND_E = "Ground";
   private final static String GROUND_N = "GroundNode";

   private PhysicsEngine physicsEng;
   private PhysicsObject ball1PhysObj, ball2PhysObj, gndPlaneP;
   private boolean running = false;

   public MyGame()
   {  super();
   }

   public static void main(String[] args)  { . . . }

   public void setupCameras(. . .) { . . . }
-------------------------------------------------------------------
   protected void setupScene(Engine engine, SceneManager sm)
                                                  throws IOException
   {  SceneNode rootNode = sm.getRootSceneNode();

      // Ball 1
      Entity ball1Entity = sm.createEntity("ball1", "earth.obj");
      ball1Node = rootNode.createChildSceneNode("Ball1Node");
      ball1Node.attachObject(ball1Entity);
      ball1Node.setLocalPosition(0, 2, -2);

      // Ball 2
      Entity ball2Entity = sm.createEntity("Ball2", meshFilename);
      ball2Node = rootNode.createChildSceneNode("Ball2Node");
      ball2Node.attachObject(ball2Entity);
      ball2Node.setLocalPosition(-1,10,-2);

      // Ground plane
      Entity groundEntity = sm.createEntity(GROUND_E, "cube.obj");
      groundNode = rootNode.createChildSceneNode(GROUND_N);
      groundNode.attachObject(groundEntity);
      groundNode.setLocalPosition(0, -7, -2);

      initPhysicsSystem();
      createRagePhysicsWorld();
      . . .
      System.out.println("Press SPACE to start the physics engine!");
   }
-------------------------------------------------------------------
   protected void update(Engine engine)
   {  float time = engine.getElapsedTimeMillis();
      if (running)
      {  Matrix4 mat;
         physicsEngine.update(time);
         for (SceneNode s : engine.getSceneManager().getSceneNodes())
         {  if (s.getPhysicsObject() != null)
            {  mat = Matrix4f.createFrom(toFloatArray(
                              s.getPhysicsObject().getTransform()));
               s.setLocalPosition(mat.value(0,3),mat.value(1,3),
                                                  mat.value(2,3));
   } } } }
```

graphics world

```
   private void initPhysicsSystem()
   {  String engine = "ray.physics.JBullet.JBulletPhysicsEngine";
      float[] gravity = {0, -3f, 0};

      physicsEng = PhysicsEngineFactory.createPhysicsEngine(engine);
      physicsEng.initSystem();
      physicsEng.setGravity(gravity);
   }
-------------------------------------------------------------------
   private void createRagePhysicsWorld()
   {  float mass = 1.0f;
      float up[] = {0,1,0};
      double[] temptf;

      temptf = toDoubleArray(ball1Node.getLocalTransform().toFloatArray());
      ball1PhysObj = physicsEng.addSphereObject(physicsEngine.nextUID(),
                                                  mass, temptf, 2.0f);
      ball1PhysObj.setBounciness(1.0f);
      ball1Node.setPhysicsObject(ball1PhysObj);

      temptf = toDoubleArray(ball2Node.getLocalTransform().toFloatArray());
      ball2PhysObj = physicsEng.addSphereObject(physicsEngine.nextUID(),
                                                  mass, temptf, 2.0f);
      ball2PhysicsObj.setBounciness(1.0f);
      ball2Node.setPhysicsObject(ball2PhysicsObj);

      temptf = toDoubleArray(gndNode.getLocalTransform().toFloatArray());
      gndPlaneP = physicsEng.addStaticPlaneObject(physicsEng.nextUID(),
                                                  temptf, up, 0.0f);
      gndPlaneP.setBounciness(1.0f);
      gndNode.scale(3f, .05f, 3f);
      gndNode.setLocalPosition(0, -7, -2);
      gndNode.setPhysicsObject(gndPlaneP);

      // can also set damping, friction, etc.
   }
-------------------------------------------------------------------
   public void keyPressed(KeyEvent e)
   {  switch (e.getKeyCode())
      {  case KeyEvent.VK_SPACE:
            System.out.println("Starting Physics!");
            running = true;
            break;
      }
      super.keyPressed(e);
   }
-------------------------------------------------------------------
   private float[] toFloatArray(double[] arr)
   {  if (arr == null) return null;
      int n = arr.length;
      float[] ret = new float[n];
      for (int i = 0; i < n; i++)
      {  ret[i] = (float)arr[i];
      }
      return ret;
   }

   private double[] toDoubleArray(float[] arr)
   {  if (arr == null) return null;
      int n = arr.length;
      double[] ret = new double[n];
      for (int i = 0; i < n; i++)
      {  ret[i] = (double)arr[i];
      }
      return ret;
   }
}
```

physics world