Coms 331 **Animation** **Fall 2007**

Homework 17

1. Using the program `Lecture 17 Demo 1.cpp`, in the `idle()` function, change the statement `pos.x = 9.0;` to read `pos.x = 1.0;` Run the program. What is the effect?

2. Use the program `Lecture 17 Demo 3.cpp` in this and the next several exercises. In the `idle()` function, change the constant `-32.0` to `-320.0` in the statement that computes the rate of acceleration. The constant -32 was used because gravitational acceleration is 32 ft/sec^2 downward. Test the program. Does this rate of acceleration feel natural? Restore the value to `-32.0`.

3. In the `idle()` function, comment out the statements

```
float speed2 = speed + accel*elapsed;
pos.x += 0.5*(speed + speed2)*elapsed;
speed = speed2;
```

   and add the statements

```
speed += accel*elapsed;
pos.x += speed*elapsed;
```

   which are based on the formulas $\Delta v = a\Delta t$ and $\Delta x = v\Delta t$. Run the program. Does everything feel natural? Do you notice any undesirable effects?

4. In the `idle()` function, now reverse the order of the two statements that you added in the previous exercise. Run the program. Can you detect any difference?

5. Now we will introduce friction into our model. A simple model of friction is to assume that it is a force whose magnitude is proportional to the velocity and whose direction is opposite the direction of motion. Accordingly, introduce a global variable `friction`, with value `1.0`, into the program. In the `idle()` function, subtract `speed*friction` from the formula for acceleration. Test your program. What happens to the rolling ball when the surface is made level? How does the ball behave on a slightly tilted surface?

6. Adjust the value of `friction` of the previous exercise until the motion of the ball on a level surface and on tilted surfaces seems most natural to you. Is your value of `friction` greater than `1.0`?