Hang Time

Introduction

All of the biggest basketball players at some point or another have their vertical measured. One can then calculate the hang time. For example, Tracy McGrady's 42in vertical jump yields a 0.93s hang time. In this lab, we will try to see if our theoretical equations match this experiment for measuring your hang time.

Equipment List

1 laptop and LabPro set up, 2 motion sensors, 1 2-meter extension

Method

A student will stand below one motion detector and in front of another and jump, taking data on height and time. From there, the data will be compared with theory on the hang time.

Procedure

1. Check the wiring between the computer and the LabPro and between the LabPro and the motion sensors. One of the motion sensors should be on the ceiling. The other is next to the LabPro and laptop board.

2. Turn on the computer.

3. Double click on the LoggerPro icon. Two axes should be displayed (distance vs. time and velocity vs. time). If you do not see this, let your TA know and they will fix it.

4. Put the motion sensor on the floor with the gold colored screen parallel to the floor. It should be arranged so that it is about 0.5 meters away from where you are going to jump. Also, its gold colored screen should intersect the gold colored screen of the motion sensor on the ceiling making a crosshair of where your feet will be.

5. One partner will record data at the computer for a run. The other will stand about 0.5 meters away from the motion sensor on the floor under the motion sensor on the ceiling.

6. The partner at the computer will click the "Collect" icon. When the motion sensor starts to make noise, the partner standing in the crosshair will jump twice with their arms at their sides during the 5-second time period. The partner at the computer should watch the data to see when the jumps occur on the data.

7. From the data recorded during the run, record the initial and final times and distances for each jump. This can be obtained by clicking the icon on the menu bar that has x =? on it. Moving the mouse over the graphs, a table will be in one of the corners with the time and distance for each motion detector. The distances recorded should correspond to the detector attached to the ceiling and the times from the detector on the floor.

8. Switch places.

9. Repeat steps 5-8 until there are a total of ten jumps for both you and your partner.

10. Calculate Δt and Δx for each set of data that you have. Then take the averages of Δt and Δx. Using

$$\Delta t_{ave} = \sqrt{\frac{8\Delta x_{ave}}{a}}$$

and assuming a = g = 9.8m/s^2, calculate Δt from the Δx and compare it to your measured Δt.

Questions

How accurate is the data as compared to theory?

What sources of error could possibly account for any discrepancies between your data and your calculations?