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9-15-08

Title: Projectile Motion

Purpose: By doing this project we hope to accomplish a better understanding of projectile motion and the effect of gravity.
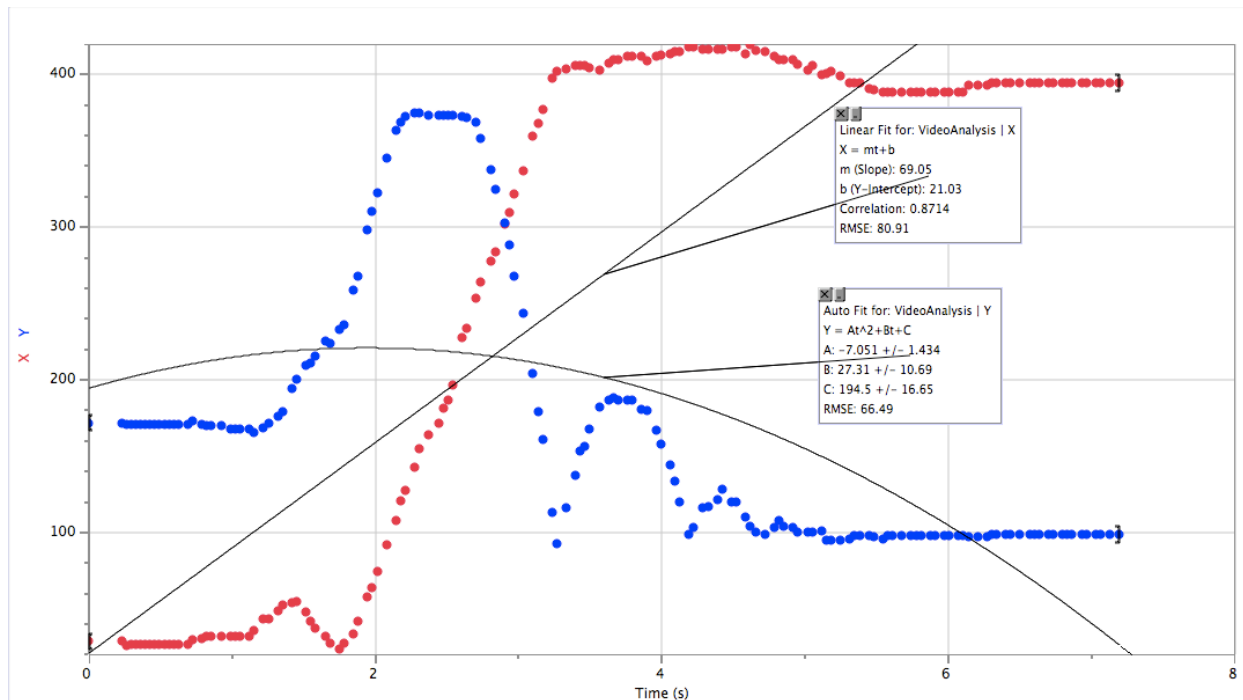
Background: Projectile motion is motion without wings, propulsion, friction, and the effect of gravity. The formula for the range of a projectile is Vo^2/g*sin2theta. The effect of gravity is about -9.8m/s.

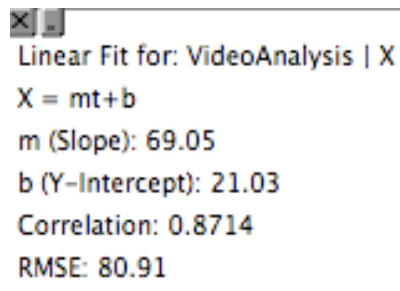# Materials: Laptop with camera and Logger Pro software, Meter Stick, Basketball

Procedure:

1. Place the meter stick in a visible location.
2. Place laptop facing the meter stick.
3. Start video capture in Logger Pro.
4. Throw the ball visibly parallel to the computer.
5. Stop video and retrieve ball.
6. Mark ball location throughout video in Logger Pro.
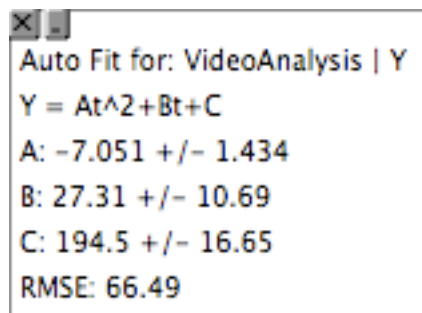7. Analyze graph in Logger Pro.

Data:

Linear Fit for: VideoAnalysis | X
X = mt+b
m (Slope): 69.05
b (Y-Intercept): 21.03
Correlation: 0.8714
RMSE: 80.91

Auto Fit for: VideoAnalysis | Y
Y = At^2+Bt+C
A: -7.051 +/- 1.434
B: 27.31 +/- 10.69
C: 194.5 +/- 16.65
RMSE: 66.49

Vx and Vy Graphs
Vx Analysis

Linear Fit for: VideoAnalysis | X

$X = mt+b$

m (Slope): 69.05

b (Y-Intercept): 21.03

Correlation: 0.8714

RMSE: 80.91

Vy Analysis

Auto Fit for: VideoAnalysis | Y

$Y = At^2+Bt+C$

A: $-7.051 +/- 1.434$

B: $27.31 +/- 10.69$

C: $194.5 +/- 16.65$

RMSE: 66.49

Observations: The ball went out of the picture. The ball had some back spin. After landing, the ball bounced back up.

Analysis: By doing this lab we found that gravity had an effect of about -9m/s during free fall. Which is close to what gravity really is which is about -9.8m/s during free fall. In all we found that maybe a little air resistance played a roll in affecting our data. Air resistance would slow the projectiles flight.. Also the fact that the location where the experiment took place was at a higher elevation than sea level. Since we are farther away from the center of the earth gravity is less.

Conclusion: In all we believe that we were able to further advance our knowledge in projectile motion and the effect of gravity. We also found out something new the effect of air resistance. If we were to improve on this project I would use a HD camera to capture the flight of the ball in more frames. If there were more frames than we could have a very accurate graph. Also I would use an aerodynamic projectile to reduce the effect of air resistance so that the graph would be even more accurate.