Jonny Chute
Per.c
E Physics

Title: Projectile Motion

Purpose: Analyze projectile motion using video analysis

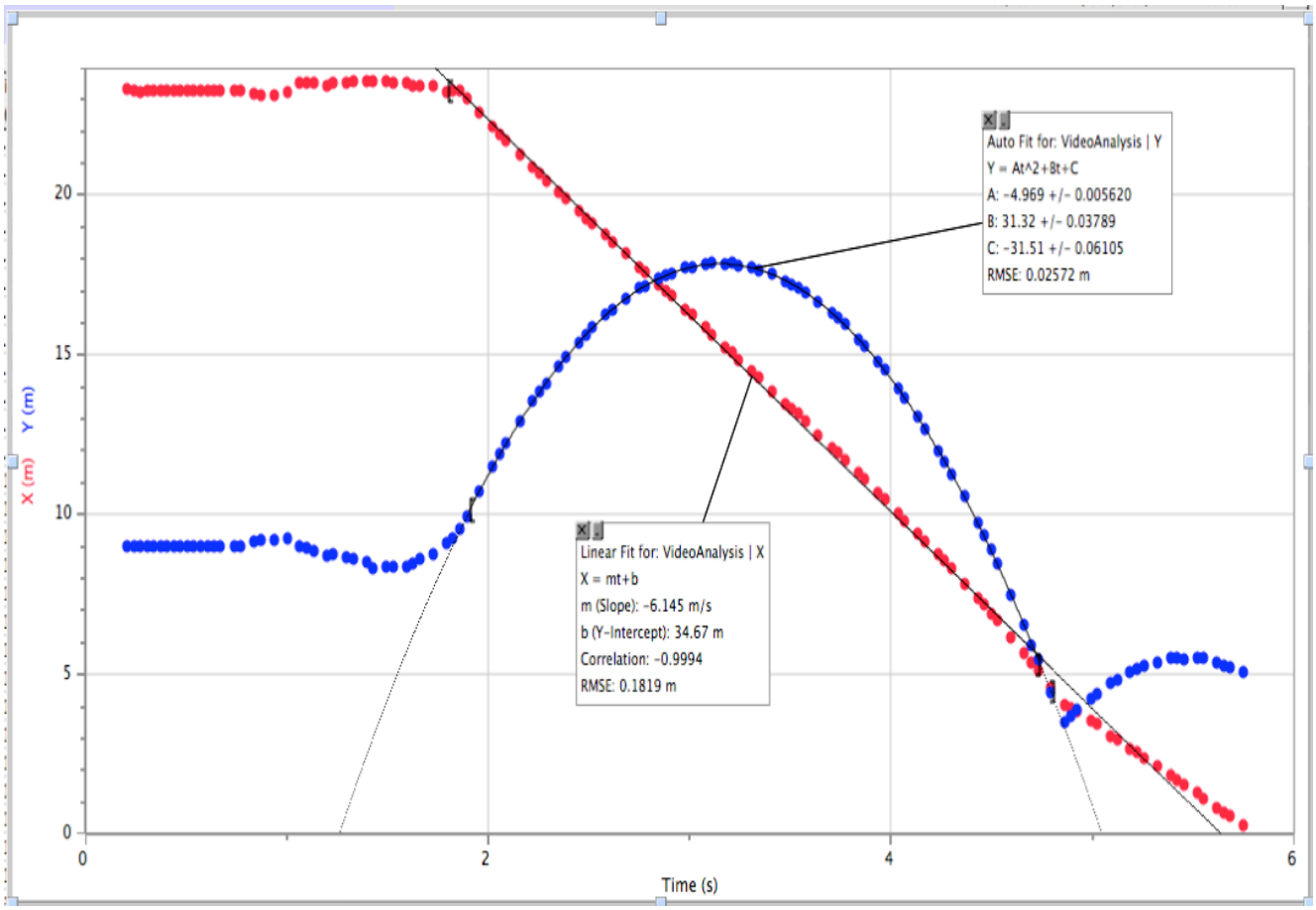
Background: projectile motion is defined as motion without wings, propulsion, friction (air resistance), under the influence of gravity. The formula for this motion is range +V0^2/g sin2theta

Materials: laptop computer with camera, logger pro, meter stick, Basketball

Procedure:

1. Setup cones with meter stick
2. Setup laptop facing the throw
3. Throw the ball while starting video capture
4. Observe captured video as charting dots on ball as it moves
5. Analyze the graph: x velocity and y velocity gravity from s= 1/2at^2

Data:


Auto Fit for: VideoAnalysis | Y
Y = At^2+Bt+C
A: -4.969 +/- 0.005620
B: 31.32 +/- 0.03789
C: -31.51 +/- 0.06105
RMSE: 0.02572 m
Linear Fit for: VideoAnalysis | X
X = mt+b
m (Slope): -6.145 m/s
b (Y-Intercept): 34.67 m
Correlation: -0.9994
RMSE: 0.1819 m
Y (m)
X (m)
Time (s)
0
5
10
15
20
0
2
4
6

	VideoAnalysis				
	Time (s)	X (m)	Y (m)	Vx (m/s)	Vy (m/s)
1	0.2083	23.32	8.985	-1.000	0.650
2	0.2417	23.29	9.015	-0.951	0.363
3	0.2750	23.23	9.015	-0.437	0.106
4	0.3083	23.26	9.015	0.104	0.025
5	0.3400	23.26	9.015	0.051	0.000
6	0.3733	23.26	9.015	0.025	0.000
7	0.4067	23.26	9.015	0.000	0.000
8	0.4383	23.26	9.015	0.000	0.000
9	0.4717	23.26	9.015	0.000	0.000
10	0.5050	23.26	9.015	0.000	0.000
11	0.5383	23.26	9.015	0.000	0.000
12	0.5717	23.26	9.015	0.000	0.000
13	0.6050	23.26	9.015	0.000	0.000
14	0.6367	23.26	9.015	0.000	0.000
15	0.6700	23.26	9.015	-0.057	0.076
16	0.7367	23.26	9.015	-0.227	0.316
17	0.7683	23.26	9.015	-0.726	1.013
18	0.8350	23.17	9.135	-0.817	1.308
19	0.8683	23.14	9.195	-0.056	0.602
20	0.9350	23.14	9.195	0.984	-0.090
21	1.000	23.23	9.225	2.223	-1.208
22	1.065	23.53	9.015	2.185	-2.225
23	1.098	23.50	8.955	0.555	-2.442
24	1.132	23.53	8.835	-0.191	-2.000
25	1.198	23.44	8.715	-0.062	-1.068
26	1.232	23.50	8.775	0.592	-0.961
27	1.297	23.53	8.655	0.678	-1.557

Observations: it was hard to catch the ball, it was important to make sure that the arc of the ball stayed in the picture frame, make sure you log into admin on the laptop or they will be useless on student accounts.

Analysis:
It wasn't windy, Our data was very clean. U can see from the dots that the video capture was consistent. The x velocity appeared to be about -6 meters a second. We did a curve fit on the y velocity and found gravity to be -4.9,meaning gravity was -9.8 m/s. it was hard to see the meter stick on the screen and to see the ball in the video.

Conclusion: we successfully captured the motion of a parabolic projectile, and determined that g was -9.8. In the future we may repeat this experiment with a better camera, with faster video. The frame rate was too fast for the computer to capture in real time. One might also repeat the lab with a brighter colored ball.