Samantha Johnson
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Lab Report

Title: Projectile Motion

Purpose: To study projectile motion.

Background: A projectile is defined as something without wings that is thrown to have a constant horizontal velocity and a vertical velocity that is under only the force of gravity (no propulsion) ideally without air resistance.

Materials:

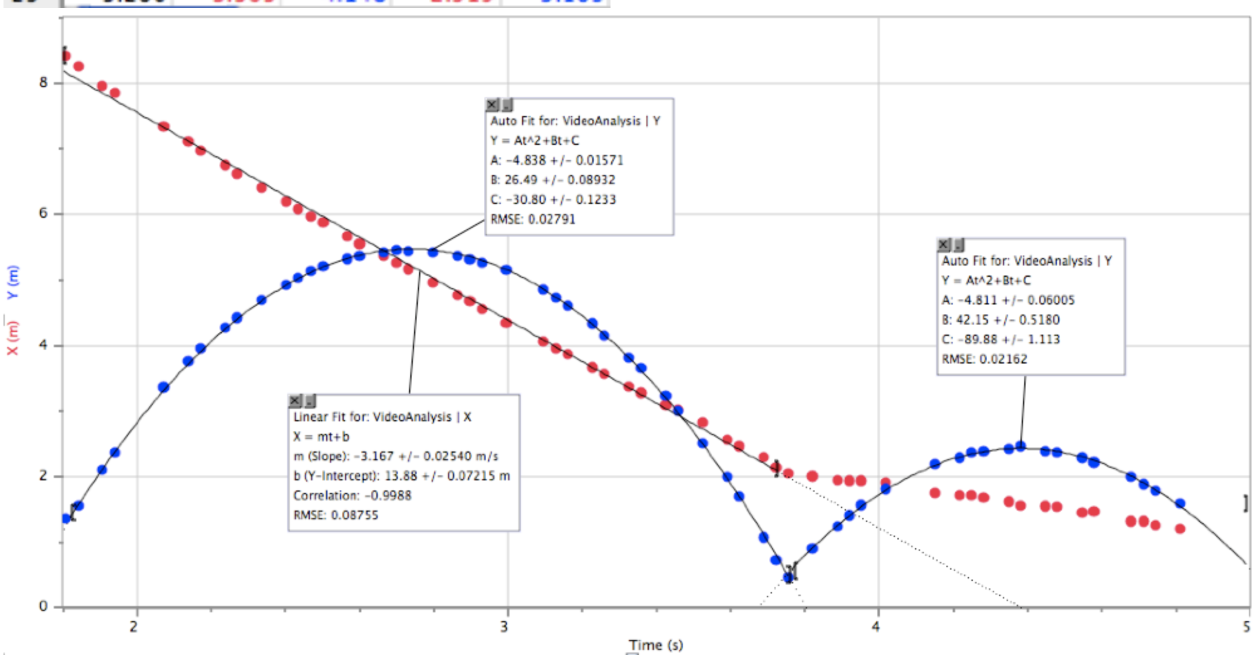
1) Computer with Logger Pro 3.5
2) Video Camera that can be used with Logger Pro
3) Meter Stick
4) Tennis Ball
5) Participant to throw the ball

Procedure:

1) Set up the experiment by setting the camera on a steady surface. Have your thrower stand in line with the meter stick (perpendicular to the shot of the camera) about 20 feet away.
2) Start the camera and have the thrower throw the ball into the air so that it will make an arc that will fit entirely in the frame of the video. Then stop the camera.
3) Once the video is in Logger Pro, put dots on the location of the ball in each shot. This should give you a graph.
4) Calibrate the graph by putting a calibrating line on the meter stick.
5) Curve fit the graphs.

Data:

	VideoAnalysis				
	Time (s)	X (m)	Y (m)	Vx (m/s)	Vy (m/s)
1	1.808	8.422	1.364	-4.630	6.602
2	1.842	8.265	1.552	-4.458	7.562
3	1.907	7.965	2.103	-4.145	7.872
4	1.940	7.851	2.364	-3.873	7.492
5	2.072	7.336	3.365	-3.770	6.996
6	2.138	7.108	3.757	-3.709	6.189
7	2.172	6.965	3.960	-3.625	5.420
8	2.237	6.751	4.279	-3.507	4.749
9	2.270	6.622	4.424	-3.439	4.264
10	2.335	6.408	4.700	-3.318	3.855
11	2.402	6.194	4.932	-3.295	3.446
12	2.435	6.079	5.033	-3.309	3.043
13	2.468	5.965	5.135	-3.107	2.516
14	2.502	5.879	5.207	-3.118	1.945
15	2.567	5.665	5.323	-3.203	1.569
16	2.600	5.551	5.367	-3.073	1.127
17	2.665	5.365	5.425	-2.977	0.799
18	2.698	5.265	5.454	-2.990	0.231
19	2.732	5.165	5.439	-2.998	-0.275
20	2.798	4.965	5.425	-3.016	-0.619
21	2.863	4.765	5.367	-2.999	-1.054
22	2.897	4.679	5.309	-3.153	-1.495
23	2.930	4.551	5.265	-3.190	-1.893
24	2.995	4.351	5.149	-3.026	-2.489
25	3.095	4.065	4.859	-3.006	-3.014
26	3.128	3.951	4.729	-3.023	-3.629
27	3.160	3.865	4.613	-2.954	-4.101
28	3.227	3.665	4.337	-2.966	-4.631
29	3.260	3.565	4.148	-2.919	-5.103



Observations: The graph of the horizontal displacement (the x value) is linear. The graph of the y value of the ball went up in a parabolic path from t~1.8s to t~2.7s where the velocity then changed to the negative direction until the ball bounced at t~3.75s. It went back up again until t~4.4s then continued down until the end of the video. In the formula of the vertical displacement line the leading term is A=-4.838 for the initial arc and A=-4.811 for the bounce.

Analysis: The graph of the horizontal displacement is linear because horizontal velocity is constant (neglecting air resistance) for projectiles. Meanwhile the graph of the vertical displacement is parabolic because the system was under the force of gravity. Gravity is defined as having a value of -9.8m/s2, making half that value -4.9m/s2. Because -4.838 and -4.811 are fairly close to -4.9 our experiment can be deemed a success. It was difficult to make sure that the ball stayed in the video frame the whole time. There is slight error due to human inaccuracy. Our numbers could be skewed due to poor placement of the dots in the movie. Also if we didn't calibrate the video quite right or weren't exactly in line with the meter stick, the numbers could be slightly off.

Conclusion: So, we now understand projectile motion by having completed this lab. It could be improved if the movie were better quality so the dots could be placed more accurately. Also if the video were to take pictures at a constant rate, the graphs would look better.