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Projectile Motion

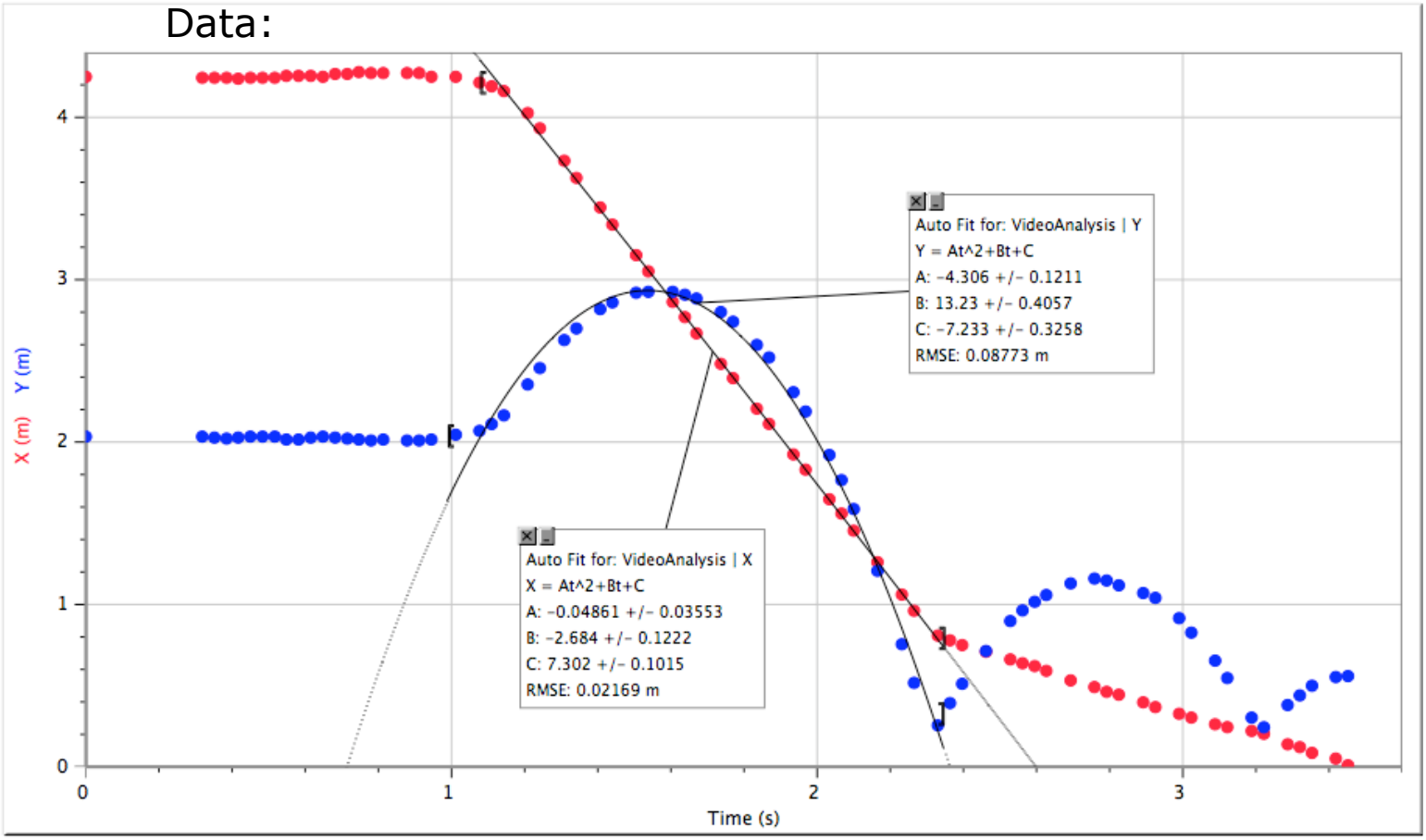
Purpose: To analyze projectile motion using video analysis.

Background: Projectile motion is defied as motion without wings, propulsion, friction (air resistance), under the influence of gravity. The formula for motion is Range=((Vo²)/g)sine 2 theta

Materials:A laptop computer with camera, logger pro application, a meter stick, and a ball thrower.

Procedure:
#1 Set up meter stick flat on the ground in a visible location.
#2 Set laptop facing the target, and throw the ball.
#3 Make sure that the ball stays within the view of the camera.
#4 Record the ball being thrown for a second time, using the logger pro application.
#5 using logger pro record the path of the ball.
#6 Set the size by using the meter stick.
#7 Create a graph, and find the slope of the two lines using logger pro.

Data:



	(s)	(m)	(m)	(m/s)	(m/s)
22	1.077	4.214	2.069	-0.585	0.776
23	1.110	4.191	2.111	-0.953	1.485
24	1.143	4.161	2.164	-1.696	2.348
25	1.208	4.026	2.355	-2.304	2.747
26	1.242	3.932	2.456	-2.785	2.665
27	1.308	3.733	2.628	-2.966	2.389
28	1.342	3.627	2.700	-2.951	1.964
29	1.407	3.445	2.819	-2.943	1.574
30	1.440	3.339	2.860	-2.956	1.064
31	1.505	3.151	2.920	-2.922	0.629
32	1.538	3.052	2.926	-2.886	0.151
33	1.605	2.864	2.926	-2.864	-0.195
34	1.638	2.770	2.908	-2.924	-0.642
35	1.670	2.670	2.884	-2.887	-1.100
36	1.737	2.482	2.801	-2.811	-1.494
37	1.770	2.394	2.741	-2.816	-1.975
38	1.835	2.206	2.599	-2.840	-2.337
39	1.868	2.112	2.521	-2.825	-2.881
40	1.935	1.924	2.307	-2.815	-3.352
41	1.968	1.830	2.188	-2.804	-3.870
42	2.033	1.648	1.921	-2.801	-4.339
43	2.067	1.560	1.766	-2.904	-5.032
44	2.100	1.454	1.588	-2.998	-5.740
45	2.165	1.261	1.207	-2.972	-6.195
46	2.232	1.061	0.7552	-2.872	-6.151
47	2.265	0.9611	0.5174	-2.489	-4.514
48	2.330	0.8084	0.2557	-1.864	-1.405
49	2.363	0.7791	0.3925	-1.093	2.330
50	2.397	0.7497	0.5114	-0.786	2.963
51	2.462	0.7086	0.7136	-0.690	2.906
52	2.528	0.6617	0.8979	-0.688	2.520
53	2.562	0.6382	0.9633	-0.668	1.936
54	2.595	0.6205	1.017	-0.744	1.451

Observations: There was very little wind, so there shouldn't have been much alterations to the balls trajectory. Also the balls velocity was actually decreasing, even though the balls velocity should have been increasing, because it was going from standing still, to being thrown.

Analysis: The graph for the balls velocity appears to be backwards, or upside down, so the ball appears to have a negative velocity, because the ball was thrown from the wrong side of the camera. The ball was thrown from the right of the screen to the left, but the logger pro program recognizes the ball as going backwards, so then creating a graph for the balls velocity at a downward slope, or negative. If we were to throw the ball from the other side of the screen, from left to right, the graph would show the ball's velocity increasing. Also in the graph, the slope of the ball when it was thrown, and after it's first bounce are very similar. But there is a sharp increase in the balls velocity after the first bounce, which isn't true, because the velocity actually decreases. So there is a decrease in the balls velocity. But because it was filmed backwards, the velocity graph appears to be backwards. Another thing that went wrong is the fact that in the graph the dots on aren't at constant intervals, which may be caused by an error in the laptops camera. Which may have skipped frames in the action, making the video appear choppy, and then when you plot the points frame by frame, there is a discrepancy, creating an uneven graph. Another factor that might have led to incorrect information

may have been the tracing of the balls trajectory, which is done by hand, and it could easily have been incorrect.

Conclusion: We successfully analyzed the projectile motion of the ball being thrown. By the graphed data, it is shown that there the ball has a constant acceleration.If I were to do this lab again I would make sure to throw the ball from left to right in order to have the balls velocity shown as a positive. And I would have also been much more careful to create an accurate trace of the balls path.