ePhysics (C)
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Projectile Motion Throw

purpose:

To learn projectile motion by using graph, with devices and programs given.

Background:

projectile motion is the motion that is affected by gravity (-9.8m/s^2) constantly, one can ignore small factors such as air resistance. The projectile motion should not include any other external propulsion.
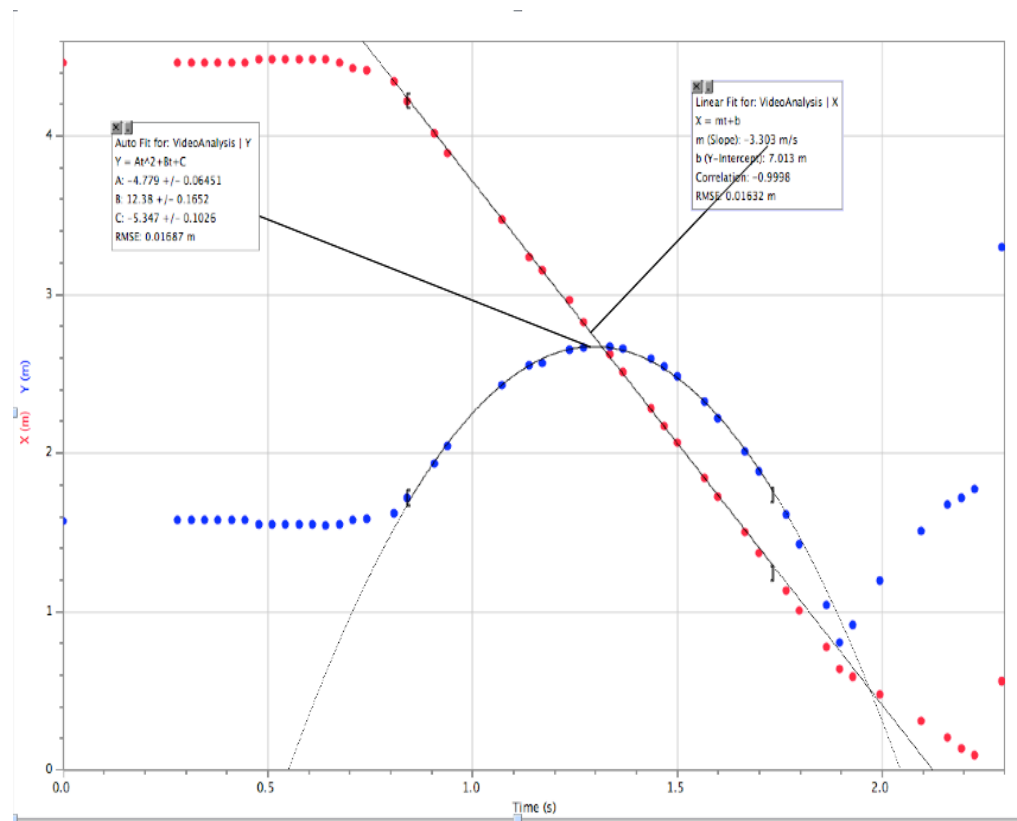
Materials:

laptop with camera, Soccer ball, Meter stick, cones(to show meter stick better in low quality video).

Procedure:

1. Set up the Laptop on a flat area, turn on the logger pro.
2. Put a meter stick so it shows on the video.
   A. Use cones to indicate the each end of meter stick
3. Go to insert, video capture
4. Click on start video capture when the experiment is begun.
5. Make sure the slide bar of video is at the first then start plotting on the video
6. Do curve/linear fit for the graph depends on graph shape.
7. Discuss with your group members about graphs.

Data:

Auto Fit for: VideoAnalysis | Y
Y = At^2+Bt+C
A: -4.779 +/- 0.06451
B: 12.38 +/- 0.1652
C: -5.347 +/- 0.1026
RMSE: 0.01687 m

Linear Fit for: VideoAnalysis | X
X = mt+b
m (Slope): -3.303 m/s
b (Y-Intercept): 7.013 m
Correlation: -0.9998
RMSE: 0.01632 m

	Time (s)	X (m)	Y (m)	Vx (m/s)	Vy (m/s)
1	0	4.466	1.570	0.000	0.029
2	0.2800	4.466	1.579	0.000	0.026
3	0.3133	4.466	1.579	0.000	0.011
4	0.3450	4.466	1.579	0.000	0.003
5	0.3783	4.466	1.579	0.015	-0.022
6	0.4117	4.466	1.579	0.058	-0.087
7	0.4450	4.466	1.579	0.189	-0.283
8	0.4783	4.483	1.553	0.189	-0.284
9	0.5117	4.483	1.553	0.059	-0.088
10	0.5433	4.483	1.553	0.015	-0.029
11	0.5767	4.483	1.553	-0.015	-0.022
12	0.6100	4.483	1.553	-0.088	-0.045
13	0.6417	4.483	1.544	-0.324	0.095
14	0.6750	4.466	1.553	-0.667	0.399
15	0.7083	4.431	1.579	-0.859	0.537
16	0.7417	4.414	1.588	-1.222	0.797
17	0.8083	4.344	1.622	-2.035	1.575
18	0.8400	4.222	1.718	-2.996	2.758
19	0.9067	4.014	1.936	-3.246	3.082
20	0.9400	3.892	2.049	-3.280	2.872
21	1.072	3.475	2.431	-3.263	2.467
22	1.138	3.240	2.553	-3.228	1.717
23	1.170	3.153	2.571	-3.047	1.145
24	1.237	2.962	2.649	-3.241	0.812
25	1.270	2.823	2.666	-3.343	0.303
26	1.335	2.623	2.675	-3.280	-0.147
27	1.368	2.509	2.658	-3.358	-0.701
28	1.435	2.283	2.597	-3.372	-1.143
29	1.468	2.170	2.544	-3.364	-1.712
30	1.500	2.066	2.484	-3.382	-2.231
31	1.567	1.840	2.327	-3.437	-2.678
32	1.598	1.727	2.223	-3.475	-3.124
33	1.665	1.501	2.014	-3.562	-3.491
34	1.698	1.370	1.883	-3.635	-4.069
35	1.765	1.136	1.614	-3.677	-4.773
36	1.797	1.005	1.422	-3.618	-5.425
37	1.863	0.7791	1.040	-3.447	-4.894
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Observations:

sunny but little windy. Good day to do projectile motion.

Analysis:

From formula, y=Ax^2+Bx+C, A is the acceleration of the projectile. The result is not perfectly accurate but it was off by .02. This is from the equation, $S=1/2at^2$, which is -9.8/2. Also, the slow frame rate of the camera might be the reason the graph is not perfectly accurate.

Conclusions:

In this lab, graph was accurate enough as we expected. The data shows -4.779(acceleration), which was very close to-4.9. This lab would give one, more clear information about projectile motion because one sees and does the lab. The concept of gravity is more tangible after doing the lab. Better camera would be needed

for future repetition of this experiment.