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Honors Physics

Title: Force Lab

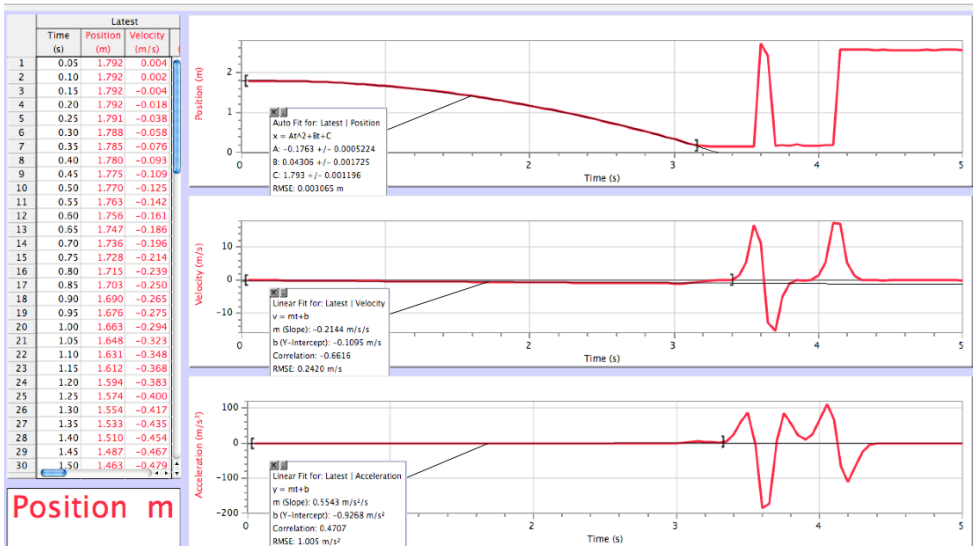
Purpose: The purpose of this lab was to find the velocity and acceleration of the carts by using a sonic ranger and Logger Pro.

Background: Force can be calculated using the formula F=ma. F is force, m is the mass in kilograms of the object in motion and a is the acceleration. The force of an object in motion is represented by the unit Newton's. One Newton is equal to1kg·meter/second^2. The mass of the fan cart was .5 kg, the mass of the weight was also .5 kg, the mass of the sail was 0.2 kg . Making the total weight of the cart 0.7 kg empty, and the weight of the cart full 1.2 kg. In each trial run we calculated the speed of the cart with and without a load while the fan was at high speed and low speed and on an inclined plane with low and high angles. To calculate the acceleration of the fan-cart while using the fan the formula (1/2a)t^2 is used. The value of a is half of the cart's acceleration. On the slope the acceleration is calculated by the formula Acceleration=gravity x sin theta.

Materials:
Laptop with Logger Pro.
Sonic ranger.
Cart with fan attached.
Cart without fan.
4 batteries.
500g weight.
Ramp with blocks to change the height.
Sail to reflect the ticks from the sonic ranger.

Procedure:
Step 1: First set up your laptop and sonic ranger to record using logger pro. Then set the sonic ranger about 2 meters from the fan cart. Make sure the surface is flat and the sail is set up straight with the ranger.
Step 2: Turn the fan on low and let it go towards the sonic ranger, at the same time press record in logger pro. Repeat this step with the 500g weight on the cart. Then repeat it with the cart on high, first without the weight and then add the weight.
Step 3: Now stet up the ramp at a low height and the sonic ranger at the bottom.
Step 4: Let the cart roll down making sure it doesn't hit the ranger and record its velocity, and acceleration.
Step 5: Now raise the ramp up higher and repeat step 4.

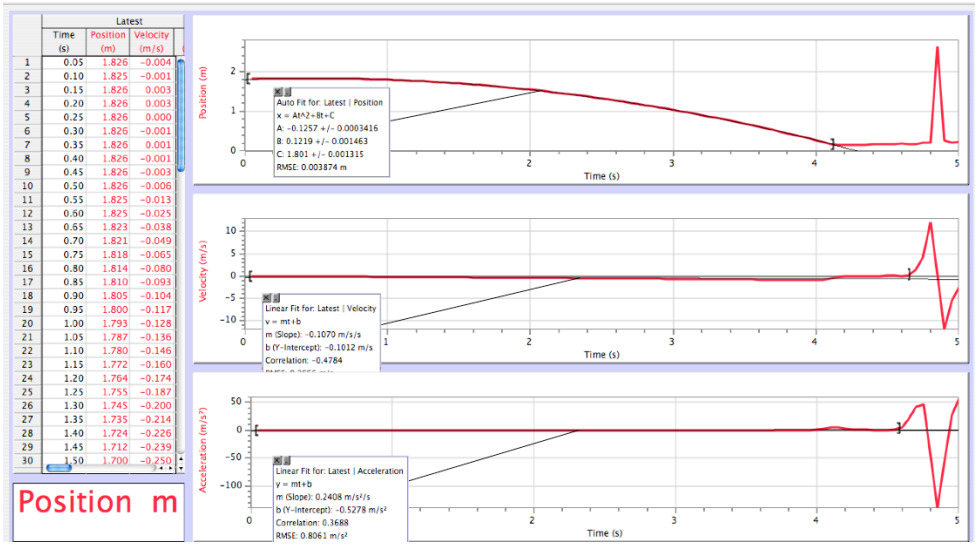
Data:




Fan on high without weight.

Acceleration:

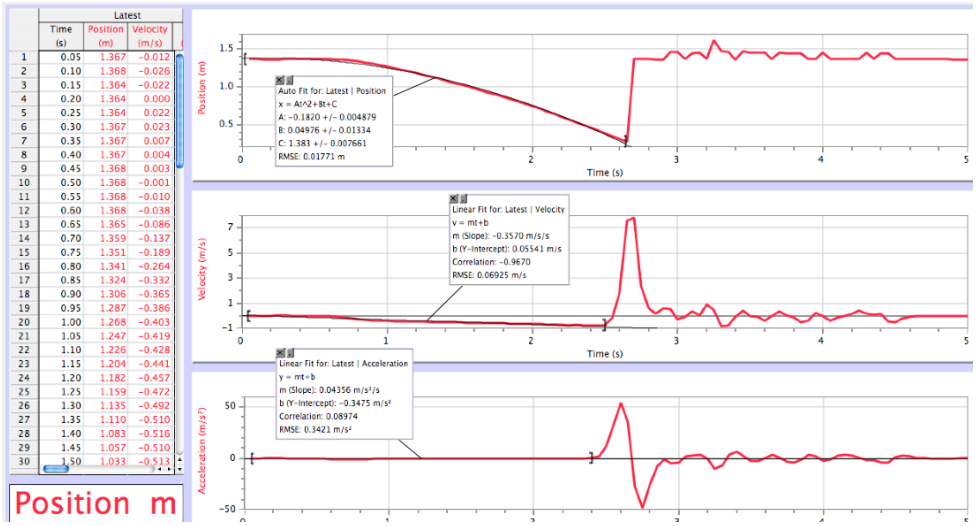
Force:




Fan on high with weight.

Acceleration:

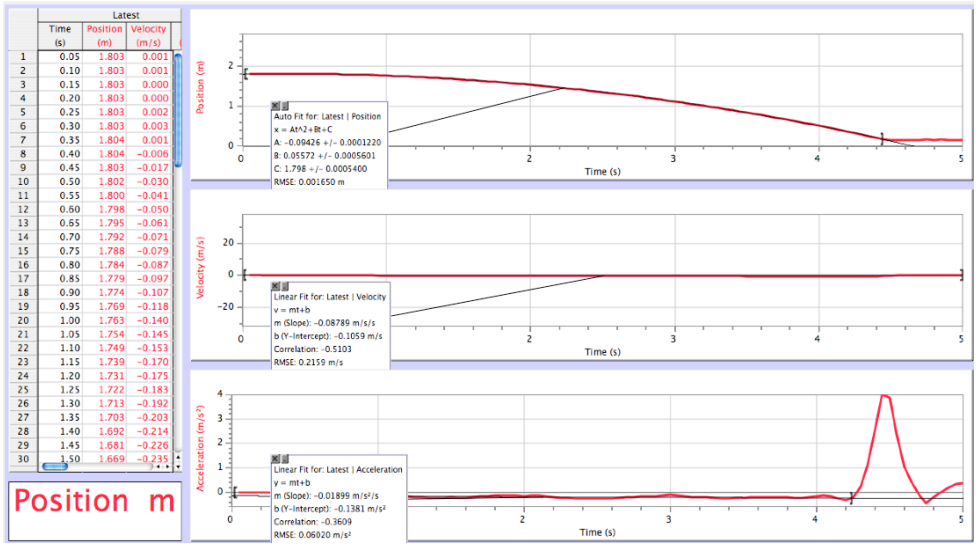
Force:




fan on low with no weight.

Acceleration:

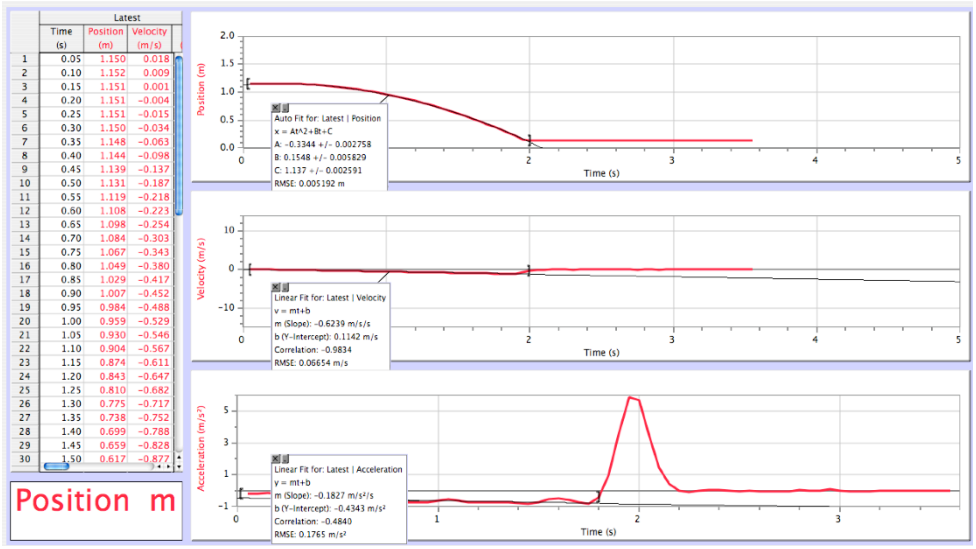
Force:



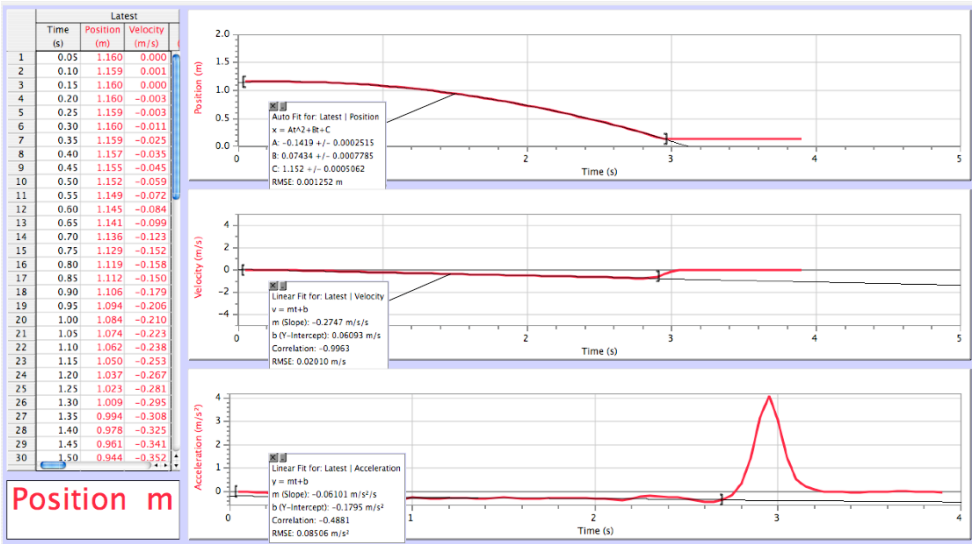

Fan on low with weight.

Acceleration:

Force:




Cart at high incline, 11 cm.
Acceleration:
Force:




Cart at low incline, 6 cm.
Acceleration:
Force:

Observations:  It was hard to keep the fan cart going in a straight line towards the sonic ranger so we had to point the cart to the left a little bit to get it to be picked up by the ranger the whole time. Next time we will use a track to prevent this.

Analysis: our experiment turned out great with the new sonic rangers and the program Logger Pro it was very simple. Logger pro does all the calculations based on the speed at which the sound bounces off the sail and returns to the sonic ranger. We were able to find accurate acceleration and velocity using Logger Pro.

Conclusion: we were able to find the acceleration and velocity using the sonic ranger and Logger Pro. the way the program sets it up it is a very simple project. It does all the calculation for you, all you have to do is record the cart moving towards the sonic ranger. The only thing that would ensure better data would to be put the fan car on a track and record as I said in the observations section.