**Experiment 4: Momentum and Impulse**

Kubilay Agi

UID: 304784519

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TA: Jordan Runco

Partner: Shannon Largman, Tian Dai

**(2) Discussion**

Our glider has a mass of (201.9 ± 0.2) g. Because the scales that we used to measure the glider’s mass can only go up to 110 g, we used a (100.0 ± 0.2) g mass as a counterbalance. The photogate flag has a width of (0.375 ± 0.005) m.

**Figure 1:** This plot shows the force sensor’s voltage reading for different masses that were hung from it. The slope of the line is (-6.42 ± 0.0617) N/V.

Our force sensor was tared when the sensor was pointing downward, and this is when we recorded data points for our calibration. However, when we turned the force sensor to be on its side to measure the force applied by the glider in the next part of the experiment, the noise in the sensor was significantly higher. The noise when it was pointed downward was around 0.001 V. When the sensor was horizontal, the noise was about 0.42 V. It is possible that the sensor’s end was loose on our device and was measuring the force of gravity acting on the piece hanging off the end of it.

|  |  |  |
| --- | --- | --- |
| Trial | Initial Velocity (*m/s*) | Final Velocity (*m/s*) |
| 1 | 0.108 ± 0.001 | 0.084 ± 0.001 |
| 2 | 0.186 ± 0.001 | 0.142 ± 0.001 |

**Figure X:** asdfasflasdfasdf

|  |  |  |
| --- | --- | --- |
| Trial | Initial Momentum (*kg\*m/s*) | Final Momentum (*kg\*m/s*) |
| 1 | -0.0218 ± 0.009 | 0.0170 ± 0.005 |
| 2 | -0.0376 ± 0.012 | 0.0286 ± 0.007 |

**Figure X:** asdfaslffjasdfl

**Figure X:** asdfasdf

**Figure X:** asdfasf

|  |  |  |
| --- | --- | --- |
| Trial | Impulse from Momentum (*Ns*) | Impulse from Integration (*Ns*) |
| 1 | 0.0389 ± | 0.0430 ± |
| 2 | 0.0662 ± | 0.0706 ± |

**Figure X:** asdfas

The impulse was calculated by subtracting the initial momentum from the final momentum. The integrated version was done by summing all the values of the force that were part of the impulse curve and then multiplying that by the time step mane

**(3) Extra Credit**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Trial Method | Glider *a* Initial Velocity (*m/s*) | Glider *a* Final Velocity (*m/s*) | Glider *b* Initial Velocity (*m/s*) | Glider *b* Final Velocity (*m/s*) | Coefficient of Restitution |
| Both bumpers | -0.134 ± | 0.0925 ± | 0.137 ± | -0.0873 ± | 0.662 ± |
| No bumpers | -0.347 ± | 0.0482 ± | 0.340 ± | -0.0365 ± | 0.123 ± |

**Figure X:**

Glider *a* was moving in the positive direction after the collision

We must note that our track was not entirely level so glider *a* moving in the positive direction after the collision accelerated and the other glider *b* moving in the negative direction would decelerate.

**Presentation Mini-Report**

**Introduction**

**Methods**