

6.1: Background Material

Text References

- [impulse and momentum](#)
- [elastic and inelastic collisions in 1-dimension](#)

Force and Motion Sensors

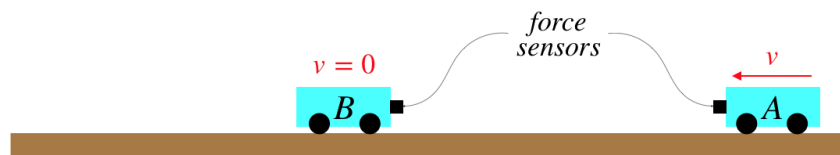
The equipment used in this lab includes two sensing devices that take data in real time. One of these is a force sensor, which measures force exerted in Newtons, and the other a motion sensor, which measures velocity in meters per second.

Both of these sensors electronically send their readings to a laptop at regular intervals. Force measurements are received by the computer 100 times per second, and velocity measurements are received 25 times per second. Upon receiving this information, the computer plots the values versus time on a graph, the details of which we will use for our analysis. Forces are recorded as positive values when they push on the sensor, and negative values when they pull on it. Motion detected by the motion sensors is recorded as a positive value when the object is moving away from the sensor, and a negative value when the object is approaching the sensor.

The experiment involves collisions of nearly-frictionless rolling carts, each of which carries a force sensor to record the force exerted on it by the other cart. As we are interested in the forces as a function of time, we don't want the collision to be between two hard surfaces, or the period of time over which the forces act will be too brief to measure, even at the impressive sampling rate of our force sensors. We have therefore engineered the two types of collisions we will study so that the force of the collision occurs at the leisurely pace of more than one tenth of a second!

The motion sensors are located on opposite ends of the track on which the carts are confined to roll, and measure the velocities of the carts closest to them. For simplicity, all of the cases we will study will involve a stationary target cart, but the conclusions of the experiment will be independent of this choice.

Figure 6.1.1 – Anatomy of the Collisions



We therefore will end up with four graphs plotted at the same time – a force and velocity for each cart. The information we extract from these plots will allow us to draw conclusions about impulse, momentum conservation, and kinetic energy conservation.

This page titled [6.1: Background Material](#) is shared under a [CC BY-SA 4.0](#) license and was authored, remixed, and/or curated by [Tom Weideman](#) directly on the LibreTexts platform.