Elastic Collisions

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

Data Analysis: Head-on Collision

Measure and record the length of O_0–P_1.

Measure and record the length of O_1–T_1.

Determine and record the difference (and its uncertainty) in the lengths of the lines O_0–P_1, and O_1–T_1.

Record the angle between O_0–P_1 and O_1–T_1, as the difference in direction for the two vectors.

Data Analysis: Glancing Collision

Record the lengths and the uncertainties in the lengths of O_0–P_2 and O_2–T_2.

Measure and record the angle $\alpha(P_2–O_0–T_2)$ between the lines $O_0–P_2$ and $O_2–T_2$.

Measure and record the length of the vector sum.

Determine the difference in the lengths (and its uncertainty) for the vector sum and $O_0–P_2$.

Record the difference in direction of the vector sum and $O_0–P_2$.

Questions

In answering the following questions, be sure to include equations and to use the numerical results from the vector analysis to support your answers. Include units and uncertainties for all quantities.

Comparing your measurements from the "no collision" data and the "head-on" data, was momentum conserved (to within experimental uncertainty) in the "head-on" collision? See equations (3) and (4) in the lab manual.

Was kinetic energy conserved (to within experimental uncertainty) in the head-on collision? See equations (5) and (6) in the lab manual.

Comparing the "no collision" data with that from the glancing collision, was momentum conserved (to within experimental uncertainty) in the glancing collision? See equations (7) and (8) in the lab manual.

Was kinetic energy conserved (to within experimental uncertainty) in the glancing collision? See equations (9) and (10) in the lab manual.