Collision and Momentum

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**Introduction:**

In most all games, there are matters of collision in today’s technology based world. Ranging from billiards, to planets colliding, or even two characters (people) running into each other in football. Everything in the gaming world is likely based off of collisions against each other. Collision and Momentum finds the end result of the two object collisions.

**Methods:**

To find the final velocity of an object based off of a plane or line/wall, such as a sphere object bouncing off of a wall or anything solid and not moving, the problem is solved by figuring out first the normal vector if not already given. This is solved by taking the cross product of the two given vectors by the user.

From there, the magnitude of the normal vector is needed. Then finally, the normalized normal vector is solved by taking the normal vector divided by the normal magnitude.

That is done for all the x, y, and z coordinates. From there, the large equation for finding the final velocity is solved.

From there, the equation of taking the initial velocity minus the addition of 1 plus the coefficient of restitution time the initial velocity times the normalized normal vector added together and then multiplied by the normalized normal vector.

**Results:**

Given below is the output code for the final product of all of the calculations. Beginning first with the collision of an object off of a plane based on two given vectors and then secondly, finding the velocity of two objects after colliding off of each other.

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Object Reflection

What is the initial velocity for x?

-1

What is the initial velocity for y?

0

What is the initial velocity for z?

0

What is the coefficient of restitution?

.5

What is the first plane vector x?

0

What is the first plane vector y?

1

What is the first plane vector z?

0

What is the second plane vector x?

1

What is the second plane vector y?

0

What is the second plane vector z?

-1

x: -0.25

y: 0

z: 0.75

vPoint(w): 0

What is the initial velocity for object 1?

5

What is the initial velocity for object 2?

-5

What is the mass of object 1?

5

What is the mass of object 2?

10

What is the coefficient of restitution?

.5

The final velocity of object 1 is: -5m/s.

The final velocity of object 2 is: 0m/s.

Press any key to continue . . .

All results are the correct calculations that were expected came out correctly based on the shown user provided input of the velocities of objects in meters per second and masses in kilograms.

**Conclusions:**

This program solves for both the collision of an object off of a plane or wall. There were no noticeable deviations from correct calculations. Separating the two functions for personal use would be very simple and solving for this in a real game environment would work very well if the needed variables are known beforehand.