

Collision & Linear Momentum

Procedure:

1. Open the application and select Collision.
2. After selecting collision, the camera of the device will open
3. Please hold the camera on top of the target image for this module.
4. Two objects will be visible in between which collision will take place. (Fig 1)
5. Here, you can change the horizontal and vertical angle of both objects to change its position.
6. You can change the initial velocity for both the objects.
7. You can choose the type of collision i.e., elastic or inelastic collision.
8. Press “start/stop” button to see the collision
9. By pressing the “Show/hide texts” button you can see collision, mass, velocity and momentum of both the objects before and after the collision. (Fig 2)

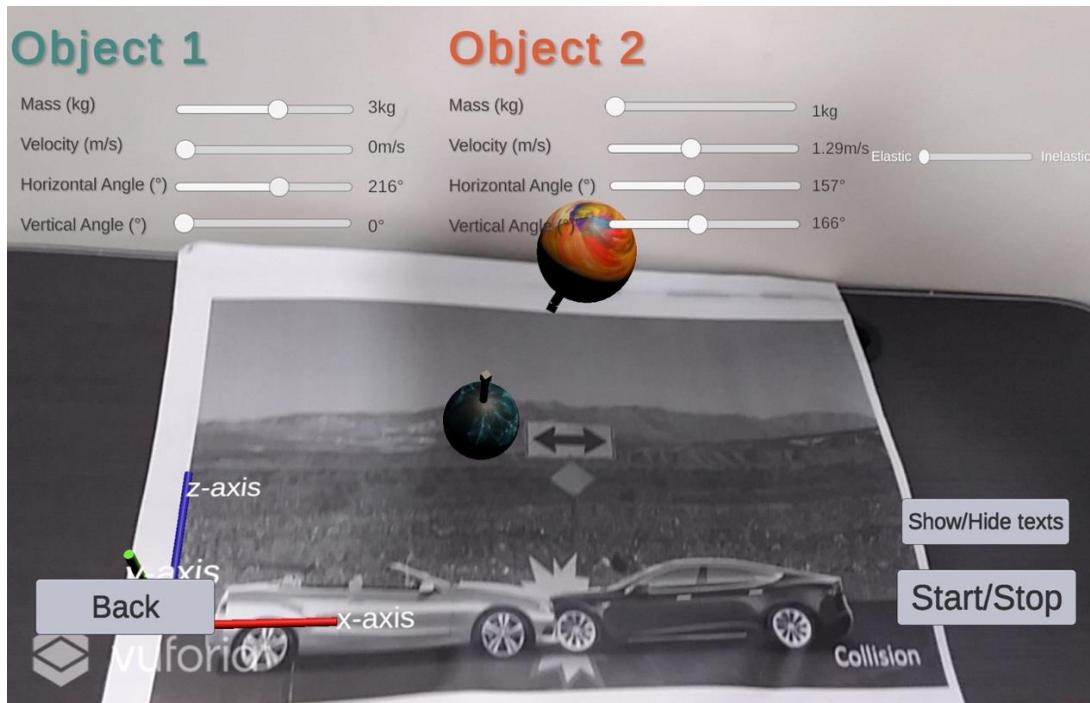


Fig 1: Collision between two objects

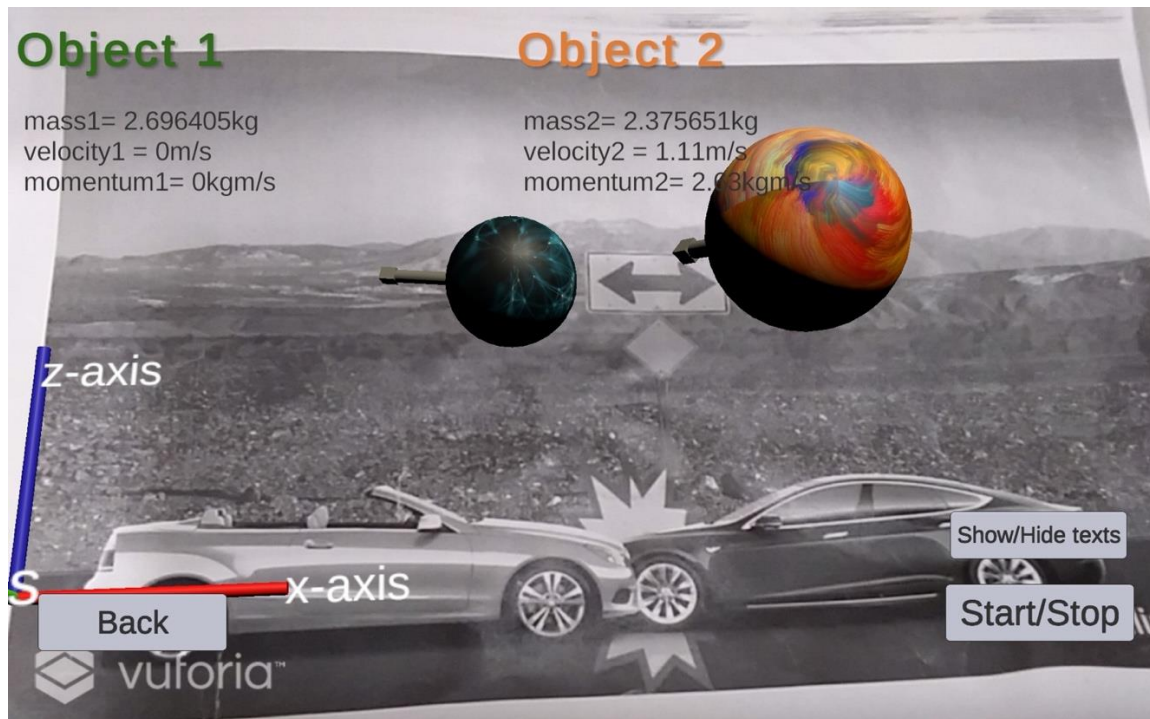


Fig 2: By pressing “show/hide texts” you can see the mass, velocity and momentum of both objects

Theory:

Collision is an event in which two or more objects crashes with another for a short period of time. In any collision momentum is conserved, which is expressed by: $m_1u_1=m_2u_2$

Elastic Collision: In elastic collision, the total kinetic energy and momentum remain conserved and the objects remains separated after the collision has occurred.

Equation used:

$$\text{final velocity of object 1, } V_1 = \frac{m_2(u_2 - u_1) + m_1 u_1 + m_2 u_2}{m_1 + m_2}$$

$$\text{final velocity of object 2, } V_2 = \frac{m_1(u_1 - u_2) + m_1 u_1 + m_2 u_2}{m_1 + m_2}$$

Inelastic Collision: In inelastic collision, energy is not conserved, and the objects becomes one single mass after the collision has occurred. The final momentum can be calculated by adding the momentum of the two objects.

Equation used:

$$m_1u_1+m_2u_2=(m_1+m_2)V_f$$

In all equations: m_1 = mass of 1st object, m_2 = mass of 2nd object, u_1 =initial velocity of 1st object and u_2 = initial velocity of 2nd object, V_1 = final velocity of 1st object, V_2 = final velocity of 2nd object and V_f is the vector sum of the two velocities.