Comp 7508 Animation Assignment3 Report

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Tags	

Personal Information

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Parameters

```
particle_mass = 1
initial_velocity = ti.Vector([3.0, 0.0, 1.0])
initial_angular_velocity = ti.Vector([0.0, 0, 1.0])
gravity = ti.Vector([0.0, -9.8, 0.0])
# stiffness of the collision
collision_stiffness = 1e4
velocity_damping_stiffness = 1e4
friction_stiffness = 0.9
# simulation integration time step delta time
dt = 1e-3
```

Improvements on the Simulator

After implementing the 7 TODOs, we have realized a basic rigid body simulator without taking energy loss into consideration.

We may possibly add friction or collision to the simulator, slowing down the object when the rigid body object hits the wall. Let’s think of the collision on the wall first.

Following the equation given on the readme file, mu * N * vd, we have pre-defined mu and object velocity vd, so we only need to compute the contact force in order to calculate pressure. We can achieve that by using a contact model. We can use an impulse-based model, where the contact force is computed using the relative velocities of the colliding objects.

Once we have the contact force, we can calculate the pressure by dividing the force with area of contact. We can assume the rigid body is a perfect sphere, and calculate the area of contact (bottom of a curve-bottomed cone) using the existing collision code in substep(). Since our simulator detects collision through wall intrusion, the cone’s height will always be smaller than our perfect sphere’s radius, and we can calculate the surface area that have involved in the contact.