

**22M:096:001**  
**Collisions Module–Mini-project Suggestions**

**Project 1**

The goal of this project is to generalize the complementarity model to accommodate several objects in motion at one time. Using MATLAB or C++, write code that simulates (in 2D) the motion of at least 10 circles confined within a large square. The circles should initially be randomly distributed throughout the square should be of varying radii. You may assume the spheres to experience a constant downward acceleration (gravity) or to be free from external forces. A working program must have implemented some form of collision detection, a complementarity style of collision resolution, and Newtonian motion when objects move freely.

**Project 2**

The goal of this project is to implement a basic complementarity simulator in which objects of different primitive shapes collide with one another. Your program should be able to simulate direct pairwise collision of objects of different shape. For instance, you may try to simulate the collision of a box with a circle, or a triangle with an octagon, or even two ellipses.

**Project 3**

The goal of this project is to derive a new model of collision which allows you to specify a desired coefficient of restitution. Your derivation should begin from Newton's laws of motion (as in class) and should end with a complementarity formulation involving your coefficient of restitution. Describe what the coefficient of restitution means and how you incorporate it in your model. Rework homework assignment 1 using your new model.