

### SCUDEM Problem C - Game Play

A new game is proposed for a hand-held device. The game needs to be relatively simple and the computational resources required must be kept small. The proposed game is a network based game, so two players can play at the same time on their separate devices.

The concept is that there is an animated ping pong ball that moves through an obstacle course and its motion is controlled in turn by the two players. The first player moves a paddle to hit the ball into the obstacle courses. When the ball reaches the other end of the obstacle course the second player must move a paddle to return the ball to the first player who then maneuvers the ping pong ball back to the second player on the other end of the obstacle course. The process repeats until a player is unable to return the ball, thus giving the player who misses one point. Much like table tennis when a player reaches 21 points and the margin in points is 2 or more the player with the higher points loses and a winner is declared. Service alternates and either player can score on service.

The ping pong ball must move in two dimensions, left- right and forward- backward. The ball is exposed to friction so it will slow down if no other forces act on it. The players can provide a boost by pushing the ball with a force that can be forward or backward and a force that can be left or right. The player must use the forces to move the ball through the obstacle course as quickly as possible while avoiding any obstacles.

You are asked to develop the system of equations that describe the motion of the ping pong ball. You should also provide recommendations to the software developers. They need to know the levels of force necessary to make the game interesting, yet still playable. They also need to know what limitations should be put in place so that the game will be challenging, but not too easy. For example, there should be a limit on the amount of propellant available to apply force to the ping pong ball. The developers want players to develop a strategy on how to use the limited propellant allowed. Since these decisions depend on the number and size of the obstacles you should also provide recommendations about the obstacle course and overall game play that will make the experience as enjoyable as possible.