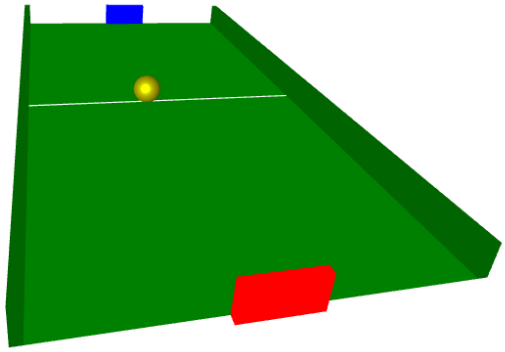
HAW HAMBURG

Assignment 1: A simple 3D pong game

The idea is to write a very simple pong game where the goal is to keep a ball within a playing field using a racket at the front and optionally at the back side of the playing field.



1 Requirements

1.1 Playing field, ball and modes

1. Create a green playing field of suitable dimensions consisting of:

   - a ground on which a ball can move
   - two cushions on the left and right hand sides

   The length of the field must be twice its width. The color of the cushions should be slightly darker than the ground.

2. Add a white line to the ground in the middle between the front and back side of the playing field.

3. Add a ball to the playing field:

   (a) Position the ball at a random point on the middle line in the playing field.

   (b) Give the ball a random initial velocity, with the largest speed component along the length of the playing field.

   (c) Let the ball bounce off the side cushions by specular reflection. Make sure that the ball stays entirely inside the playing field during the reflection process.

4. Add a flag in your program that can switch between single and double player mode. A documented flag in the code is enough, but feel free to add a button on the web page to switch the mode.

1.2 Single player mode

1. Add a cushion at the back side of the playing field and make sure the ball is specularly reflected off this cushion.
2. Add a rectangular red racket to the front side of the playing field:
   (a) The racket should have the same height and thickness as the cushion. Its width must be at most a fifth of the width of the playing field.
   (b) Position the racket initially at the center of the front side.
   (c) Add left and right arrow key events that move the racket to the left and to the right.
   (d) If the ball hits the racket it should be specularly reflected.
3. Stop the game when the ball leaves the playing field and report *Game Over!*.
4. Position the camera initially above the ground behind the red racket.

1.3 Double player mode

1. Add a red racket as for the single player mode.
2. Add a blue racket to the back side of the playing field:
   (a) Apart from the color it should look and work like the red racket.
   (b) Use the keys `a` and `d` to move the blue racket.
   (c) Make sure the ball gets reflected from the back side of the playing field only if it hits the blue racket.
3. Stop the game when the ball leaves the playing field and report *Game Over!* and who has won.
4. Create a second canvas, a second renderer and a second camera. Position the second camera above the ground behind the blue racket in such a way that a second player can see how to move the blue racket.

   Hint: It is not necessary to create a second scene to display the scene in a second canvas suitable for the blue player.

2 Hints

- Adjust the size of the various objects and ball and racket speeds such that it makes sense to play the game.
- You can use `THREE.MeshBasicMaterial` for all objects in the scene. Then you don't need a light source.

3 Coding style

- Stick to the coding style guide which can be found in the Readme file for chapter 3 in the gitlab repository.
- It is your choice whether you load the `three.js` library as a module or just as a JavaScript text file.

4 Handing in the solution

No group work allowed. Every course partiticipant has to write her or his *own* code!
Implement your entire solution within the two files `Assignment1.html` and `Assignment1.js`.
Feel free to change these files as you like but do not add any further files.
The deadline for submission is the **22th of November 2020**.