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Augmented Reality

My idea was to create a ball-in-a-box through augmented reality. The user holds a board in front of the camera, then the AR portion displays a ball on that surface. The user can then tilt the board and have the ball respond as a ball in a box should, moving side to side and bouncing off of walls.

The main challenge proved to be keeping track of a 3d world, then projecting that world into a 2d image. The ball (which ended up just being a rectangular wireframe puck) had to obey physics in the world frame, influenced by the orientation of the plate, then project into the image frame. By using Aruco tags and an initial calibration sequence, I was able to get rotations between the camera frame, the world frame, and the “plate frame” (or the frame of the board).

The problem I couldn't solve, however, was that the translated and projected 3D geometry looked great when the object was near (0,0,0), but as the object moved away from that point, it didn't change perspective to match the board. I attribute this to something involving not calibrating my camera with real dimensions, but I was never able to figure out the problem.

<https://youtu.be/j7n8h2Z7gtY>