

Chaos and Quantum Chaos
Summer term 2021

1. Exercise

(to be presented and discussed on Monday April 19)

1.1 Billiard ball collisions: Sensitivity on initial conditions

Watch this video <https://tud.link/ajz4> (short link refers to videocampus.sachsen.de) simulating a sequence of collisions of billiard balls arranged along a line. In the first example the initial error in the angle increases, while it decreases in the second example.

Test whether the video of the second example is a fake:

1. Determine the angle of motion of the second ball after the collision, depending on the angle of the first ball relative to the axis connecting both balls. Assume elastic reflections.
2. For N balls, initially having the same distance, determine the angle of motion of the last ball. Assume small angles to get a short explicit expression.
3. Which dimensionless parameter is relevant?