Billiard

**Problem:**
Before a pool-billiard game starts, 15 balls form an equilateral triangle on the table. Under what conditions will the impact of the white ball (16\textsuperscript{th} ball) produce the largest disorder of the balls?

- definitions
- solution by a simulation
- different forms of disorder
- conclusions
- disorder at the end
- chose of a standard table
  * size: 1,2m times 2,4m
  * diameter of the balls 5,2cm
  * $\rho_{\text{balls}} = 3 \frac{kg}{l}$
- simulation concerns:
  * 16 equal balls
  * energy lost in ball-ball and ball-wall interactions
  * roll friction
  * nearly elastic hits
  * different starting hits:
    - 5 different positions for the white ball
    - speeds varies between $1 \frac{m}{s}$ and $5 \frac{m}{s}$
    - angle varies between $-50^\circ$ and $50^\circ$

- simplifications:
  * no pocket
  * no spin
  * no rolling energy
- useful definitions:
  * boxcount
  * stretched boxcount
  * linear distances
  * square distances

- indirect definitions:
  * difference between two similar hits
  * time
conclusions

- difference between simulation and reality

- general conclusions are:
  * high energy
  * play from behind
  * play under a angle ≈ 45°

- other possibilities:
  * “jumping balls”
    (table takes most of the impulse)
  * extreme spin
    (not very important in ball-ball interaction)