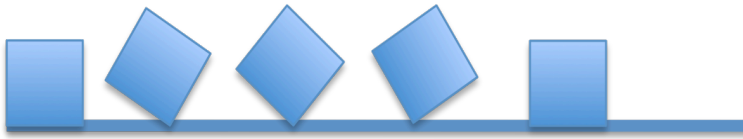


## Waves, collisions, and coherent motion of assemblages.

1. Describe tumbling of a heavy square on a horizontal plane. Assume that one pivot point lies on a plane at all time. Assume also that a fixed part of the energy is lost when the square side hits the plane. (the phases of the motion in the picture below are parted for better visibility, there is no sliding!)



2. Describe the motion of a falling domino train and the speed of the transitional wave. The size of the domino and the distance between pieces are known. Model the transfer of the momentum from one piece to the other. Search the literature, there are several solutions available.



3. Phase transition is chains. Consider equilibria and dynamics of the shown below mass-spring system. Assume that the springs (green) are massless and that the force in them is proportional to the elongation; all other rods are massless and rigid.

Derive and plot the force versus elongation dependence of a link. Show that a link has three equilibrium positions, two of them are stable.

Describe equilibria elongation of a chain with  $N$  links loaded with a fixed force.

Assuming that the mass (diamond shaped) of an element is given, derive the equation of the chain dynamics. Simulate dynamics of a chain with several elements.

