

Projectile motion is a form of motion in which an object or particle (called a projectile) is thrown near the earth's surface, and it moves along a curved path under the action of gravity only. The only force of significance that acts on the object is gravity, which acts downward to cause a downward acceleration. There are no horizontal forces needed to maintain the horizontal motion – consistent with the concept of inertia.

Motion equations

$$\begin{cases} \frac{ds}{dt} = v \\ \frac{dv}{dt} = a \end{cases}$$

In our model we have two forces F_g – gravitation force and F_r – resistance force

$$F_g = mg$$

$$F_r = -kv$$

Where k is drag coefficient ($k=0$ means vacuum, $k>0$ some environment with resistance)

$$\text{Total force } F_t = F_g + F_r$$

$$F_t = mg - kv$$

$$\text{Acceleration} = F_t/m \text{ so } a = \frac{mg - kv}{m}$$

Prepare simulation of projectile motion solving equations using Euler's method and MidPoint method (improved Euler's method)