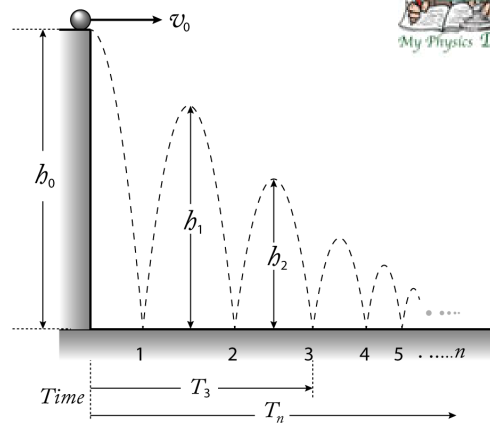

Ball Bounding on a floor infinite times

10-23, 2015 Tohei Moritani

$$e = \sqrt{\frac{h_{n+1}}{h_n}} \rightarrow h_{n+1} = h_n e^2$$

$$h = \tfrac{1}{2} g\, t^2 \rightarrow t = \sqrt{\frac{2h}{g}}$$

$$T_0 = \sqrt{\frac{2h_0}{g}}$$

$$h_1 = h_0\, e^2 \qquad T_1 = 2\sqrt{\frac{2h_1}{g}} = 2\, e\sqrt{\frac{2h_0}{g}}$$

$$h_2 = h_1\, e^2 = h_0\, e^4 \qquad T_2 = 2\sqrt{\frac{2h_2}{g}} = 2\, e^2\sqrt{\frac{2h_0}{g}}$$

$$h_3 = h_2\, e^2 = h_0\, e^6 \qquad T_3 = 2\sqrt{\frac{2h_3}{g}} = 2\, e^3\sqrt{\frac{2h_0}{g}}$$

$$h_n = h_{n-1}\, e^2 = h_0\, e^{2n} \qquad T_n = 2\sqrt{\frac{2h_n}{g}} = 2\, e^n\sqrt{\frac{2h_0}{g}}$$

$$k = 2\sqrt{\frac{2h_0}{g}}$$

Total Time = $\frac{k}{2} + k\,(e + e^2 + e^3 + \ \textbf{.....} e^n)$

$$When\ e < 1, \quad \lim_{n\to\infty} \sum_{n=0}^{n} e^n = \frac{1}{1-e}$$

$$\therefore\ Total\ Time = k\left(\frac{1}{1-e} - \frac{1}{2}\right)$$

$$h_0 = 1.00\ m,\ \ e = 0.800,\ \ v_0 = 1.00\ m/s$$

$$k = 2\sqrt{\frac{2\times 1}{9.8}} = 0.9035$$

$$Total\ Time = 0.9035(5 - 0.5) = 4.068$$

$\underline{Total\ Time\ \ 4.07\ s\ , Total\ Distance\ 4.07\ m}$