Bouncing Ball

The equations of motion for an object moving under the influence of an acceleration "a" are given simply as....

Displacement $s = u + a \cdot \Delta t$

Velocity .... $v = u + \frac{1}{2} \cdot a \cdot \Delta t^2$

where "s" is the change in position over the time interval "Δt" given a uniform acceleration, "a".
"u" is the velocity at the start of the time increment and "v" is the velocity at the end of the increment.

At each bounce, it will be assumed that the ball loses some of its energy. This is described by the coefficient of restitution - the velocity of rebound divided by the velocity of approach.

$\text{restitution} := 85\%$ Equivalent to an energy loss of $1 - \text{restitution}^2 = 27.8\,\%$

Time step .... $\Delta t := 0.001 \cdot \text{sec}$

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Height := | a ← −g                                      ... set acceleration to -g
          | s_1 ← 100·mm                                ... starting height = 100 mm
          | u_1 ← 0·m·sec^(−1)
          | for i ∈ 2 .. 2000                           ... for each time step
          |   | u_i ← u_(i−1) + a·Δt                    ... new velcocity
          |   | s_i ← s_(i−1) + u_(i−1)·Δt + (1/2)·a·Δt^2   ... new height
          |   | if s_i < 0·mm                           ... if s < 0, floor contact has been
          |   |   | s_i ← 0·mm                              made. Reverse the velocity and
          |   |   | u_i ← −u_i·restitution                  apply the coefficient of restitution
          | s
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Note: This is not the most accurate integration scheme - but better procedures would not fit onto one page!