Physics Project

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Equations to solve

We use the cartesian coordinates for the golf ball and applying Newton's second law on each of the axis we have the following equations

air resistance and gravity only gives

$m\frac{d^2x}{dt^2} = -\frac{C_d\rho A}{2}(\frac{dx}{dt})^2$

$m\frac{d^2y}{dt^2} = -mg - \frac{C_d\rho A}{2}(\frac{dy}{dt})^2$

$m\frac{d^2z}{dt^2} = -\frac{C_d\rho A}{2}(\frac{dz}{dt})^2$

C_d =Drag coefficient
A = Cross sectional area
ρ =Air density

This system of differenteial equations can be solved by using the euler method . To do this the second order equations must be converted into a system of first order equations (a differential equation of order n can be converted to a system of n first order equation.)

air resistance with magnus

$m\frac{d^2x}{dt^2} = -\frac{C_d\rho A}{2}(\frac{dx}{dt})^2 + F_{mx}$

$m\frac{d^2y}{dt^2} = -mg - \frac{C_d\rho A}{2}(\frac{dy}{dt})^2 + F_{my}$

$m\frac{d^2z}{dt^2} = -\frac{C_d\rho A}{2}(\frac{dz}{dt})^2 + F_{mz}$

The additional term is takes the form $\mathbf{F} = S(\omega \text{ x } V)$