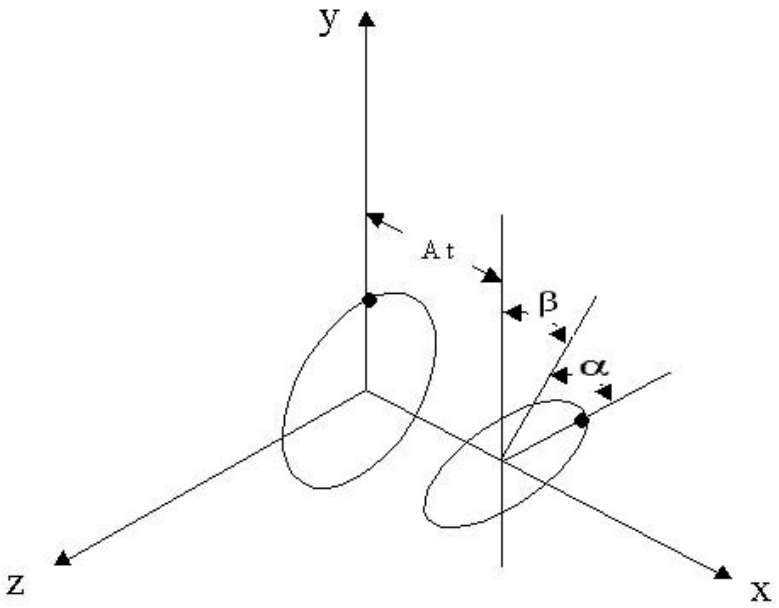
EQUATIONS OF MOTION
SIMULTANEOUS ROTATION OF A PARTICLE ABOUT TWO AXES



Rotation about primary (X) axis

$X1 = 0$
$Y1 = r \cos \alpha$
$Z1 = -r \sin \alpha$

Rotate above system about secondary (Z) axis

$X2 = Y1 \sin \beta$
$Y2 = Y1 \cos \beta$
$Z2 = Z1$

Add translation along X axis

$X = A(t) + X2$
$Y = Y2$
$Z = Z2$

Where A = some constant

Total equation of motion for particle as function of time (t):
For the case under consideration: $A = 1$
$r = 0.5$
$\beta = 22.5(t)$ degrees
$\alpha = 2\beta$

Thus:
$X = t + 0.5 \cos(45t)\sin(22.5t)$
$Y = 0.5 \cos(45t)\cos(22.5t)$
$Z = -0.5 \sin(45t)$

Background of Theory and Author follows on next page

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