Simulation Shot Calculations

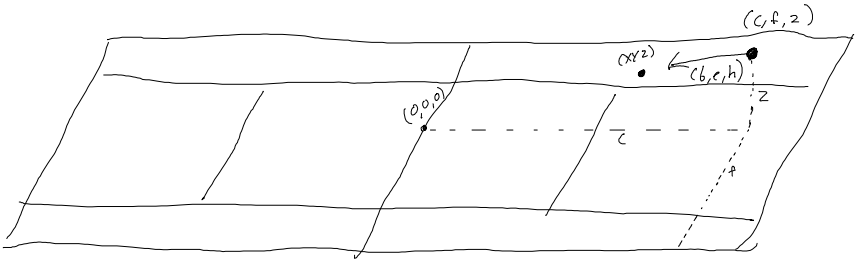
Monday, March 25, 2024 10:45 AM

1. Ball has a starting position (X,Y,Z)
   a. Think about normal spot that a ball would be in when hit from a serve/volley
2. Ball has an initial trajectory direction and velocity
   a. Find average volley/serve speed and choose a vector direction that would get over to the other side of the court
3. Given starting XYZ, what is the new XYZ considering the trajector/velocity/gravity at time t

Equations should have the body:
<x(t) = a*t^2 + b*t + c, y(t) = d*t^2 + e*t + f, z(t) = g*t^2 + h*t + i> where (c, f, z) is the initial position of the tennis ball in 3d space. (b, e, h) are the initial velocity of the ball in 3d space.

make y different
eqn with different
initial position/trajectory

input: t
output= X, Y, Z



Eqn 1: $\langle x, y, z \rangle$ = shot1(t)

Eqn 2: $\langle x, y, z \rangle$ = shot2(t)

⋮

Eqn 3: $\langle x, y, z \rangle$ = shot3(t)

Shot 1 has

(x_i, y_i, z_i) - Initial ball center position in 3D

(V_x, V_y, V_z) - Initial ball velocity of x, y, z components

All Shots

have eqn relating

$[x_i, y_i, z_i], [V_x, V_y, V_z], t \rightarrow [X_t, Y_t, Z_t]$

(initial position; velocity vectors)

$X_t = a_x t^2 + V_x t + x_i$

$Y_t = a_y t^2 + V_y t + y_i$

$Z_t = a_z t^2 + V_z t + z_i$

a_z = acceleration acting on z (- gravity)