

Ok, so we just have two dimension - a point mass moving in an x, y plane, y being downwards. Assuming only an impetus force (so there exists an initial velocity $[v_0^x, v_0^y]'$), so no constant force acting on the mass apart from gravity, and using a unit mass, we can write the trajectory of the ball as

$$\mathbf{r}_B(t) = \begin{bmatrix} b_1 t + b_0 \\ \frac{1}{2} g t^2 + c_1 t + c_0 \end{bmatrix}. \quad (1)$$

where b_i, c_i are equations which we can find using known initial conditions - assuming the ball starts at $[x_0, y_0]'$, then

$$b_0 = x_0 \quad (2)$$

$$b_1 = v_0^x \quad (3)$$

$$c_0 = y_0 \quad (4)$$

$$c_1 = v_0^y \quad (5)$$

Then, if I'm viewing your code correctly, all you want is the intercept time with one of the defined lines? And presumably a point of intercept? Since the trajectory of the ball is parameterized by time, and the lines are straight (ie, for all the lines, y is parameterized by x), for each line you can just solve a pair of equations in two unknowns. Note that the trajectory $\mathbf{r}_B(t)$ will intersect a straight line in at most two points, but one of those points will lie in the past. So, specifically, let each line be written $\mathbf{k} = [k_0^x + k^x, k_0^y + s k^x]'$, where $[k_0^x, k_0^y]'$ is the origin of the line, and s is the slope. Then the two equations we have to solve are

$$v_0^x t_f + x_0 = k_0^x + k^x \quad (6)$$

$$\frac{1}{2} g t_f^2 + v_0^y t_f + y_0 = k_0^y + s k^x \quad (7)$$

for t_f, k^x . If the line is vertical, we know the x-coordinate of intersection (since it is constant along the line) and can just find the y by solving the first equation for t_f , then calculating the value of the left-hand side of the second equation gives us the y-coordinate. Otherwise we can just substitute and get a quadratic,

$$\frac{1}{2} g t_f^2 + (v_0^y - s v_0^x) t_f + (y_0 - k_0^y - s x_0 + s k_0^x) = 0. \quad (8)$$

... so if you do that for each line, then for any real solution t_f , the ball will cross the line in question at that time and point. You can just order the solutions for t_f (discarding imaginary/negative solutions) to find where the ball actually hits. Introducing more forces will complicate the quadratic, but it will still be a quadratic.