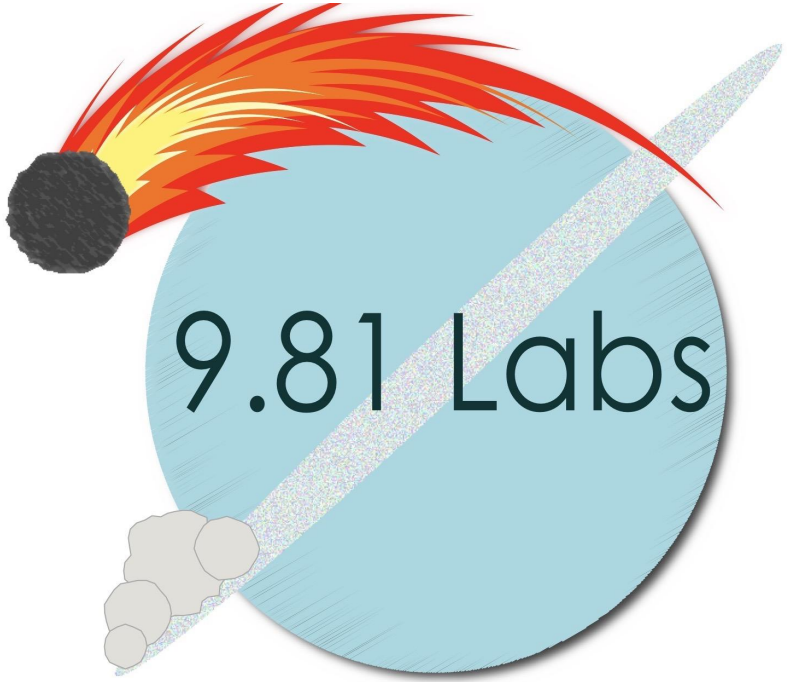


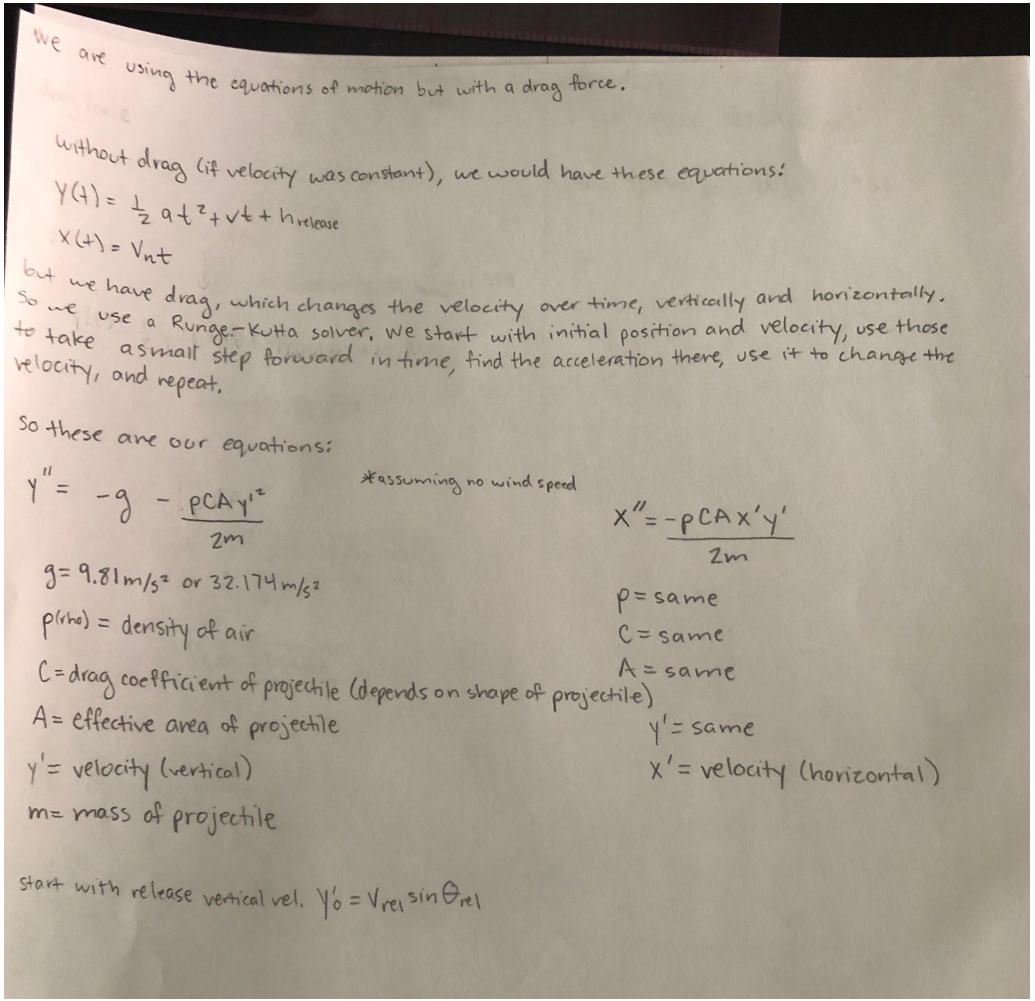
Charlotte, Liam, Justin, Victoria

We have been working on our Prototype trebuchet

Calculations

-drag force

-Runge-Kutta



We are using the equations of motion but with a drag force.

Without drag (if velocity was constant), we would have these equations:

$Y(t) = \frac{1}{2} a t^2 + vt + h_{release}$

$X(t) = V_n t$

but we have drag, which changes the velocity over time, vertically and horizontally. So we use a Runge-Kutta solver. We start with initial position and velocity, use those to take a small step forward in time, find the acceleration there, use it to change the velocity, and repeat.

So these are our equations:

*assuming no wind speed

$$y'' = -g - \frac{\rho C A y'^2}{2m}$$

$$x'' = -\frac{\rho C A x' y'}{2m}$$

$g = 9.81 m/s^2$ or $32.174 m/s^2$

ρ (rho) = density of air

C = drag coefficient of projectile (depends on shape of projectile)

A = effective area of projectile

y' = velocity (vertical)

m = mass of projectile

ρ = same

C = same

A = same

y' = same

x' = velocity (horizontal)

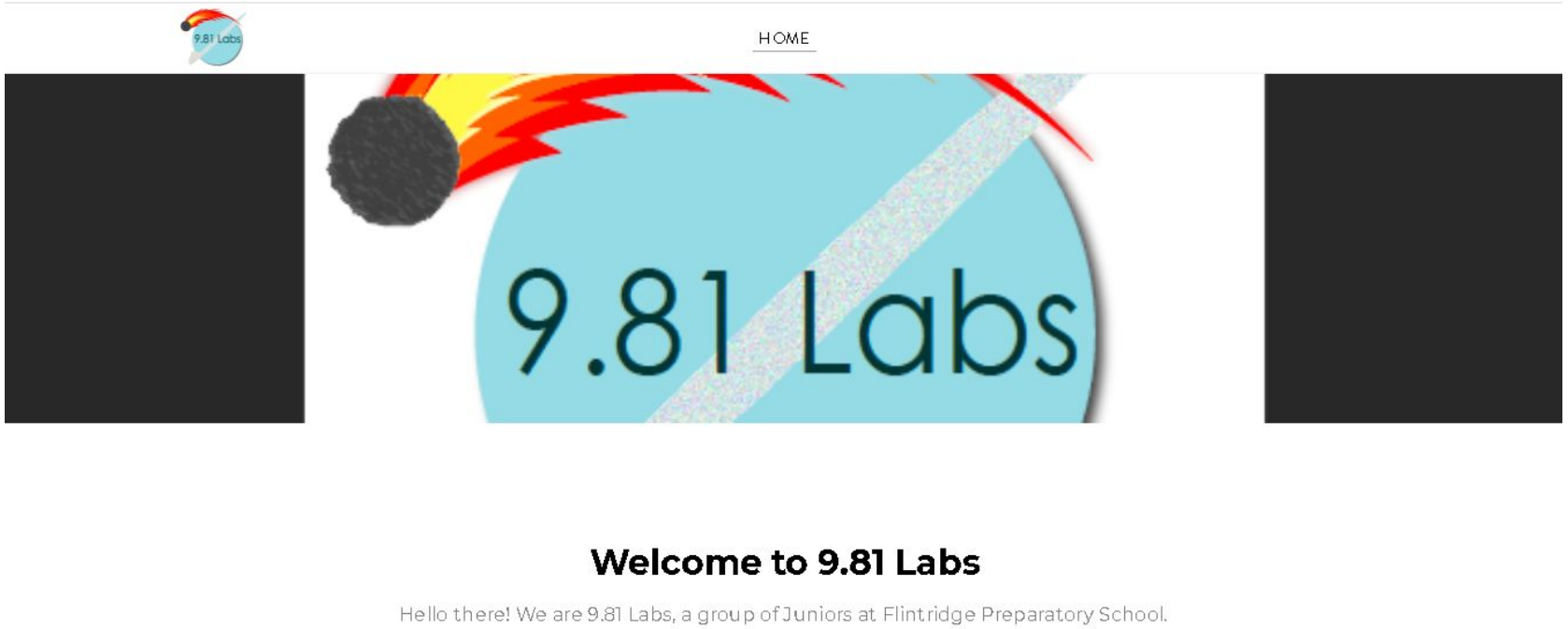
start with release vertical vel. $y'_0 = V_{rel} \sin\theta_{rel}$

WE MADE A WEBSITE!!

Social Media

Go to https://981labs.weebly.com to see what we are about

Our insta is @9.81labsjpl



Team Alfa

We have a group chat with Team Alfa. On their team is Cecilia and Maria, Jorge. Daniel.