IT Assignment – G(A)SP Balloon simulation

Languages: Arduino (C++ modified), Python

Designers: Maddie Mackey, Andrew Wilkie

Parts: 2 main (Simulator, Controller)

Requirements:

* Read and stream live data

Simulator

* Pygame
* Python
* Physics engine
* Receive data from serial
* Plot on Google Maps API

Controller

* Arduino
* Run on the Edison
* Send data

Libraries

* Physics engine (python?)
* Pygame (all included) #if used
* Arduino (all included) //if used

Equations

* Fdrag  
  D = Cd \*ρ\*v2/2\*A  
  <https://www.grc.nasa.gov/www/k-12/airplane/drageq.html>
* Terminal velocity  
  Fnet=mg-(1/2)CρAv2=0  
  (use to find velocity)  
  <http://hyperphysics.phy-astr.gsu.edu/hbase/airfri2.html>
* F=ma
* Maddie’s air density equation (approx. values)  
  Air density (rho - ρ)  
  ρ = 1.25e^(-0.000115x)  
  Largest error is approx. 0.03

The effect of roll on yaw?  
<http://www.decodedscience.org/side-effect-of-rolling-an-airplane-aircraft-yaw/7209>   
Need mathematical formula for this…

<http://www.instructables.com/id/Plotting-real-time-data-from-Arduino-using-Python-/>

<https://gist.github.com/electronut/d5e5f68c610821e311b0>

<http://playground.arduino.cc/Interfacing/Python>

<https://developers.google.com/gdata/articles/python_client_lib#introduction>

<http://www.instructables.com/id/Flight-Simulator-with-Arduino-and-Python/>

<http://pyode.sourceforge.net/> # possible physics engine

<http://stackoverflow.com/questions/10167329/change-the-position-of-the-origin-in-pygame-coordinate-system>