Assignment 8

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1 Plotting the position of a cyclist with and without drag including the viscous drag term, and angle of inclination:

1.1 Cyclist with only Aerodynamic Drag term

The aerodynamic drag equation is characterised by $F_{drag} = C_D \rho A v^2$, where the coefficient of drag $C_D = 0.9$, $\rho = 1.225 kg/m^3$, $A = 0.33 m^2$ and v is the speed of the cyclist. Graphing the cyclists speed versus time for with aerodynamic drag and no drag. Figure 1.

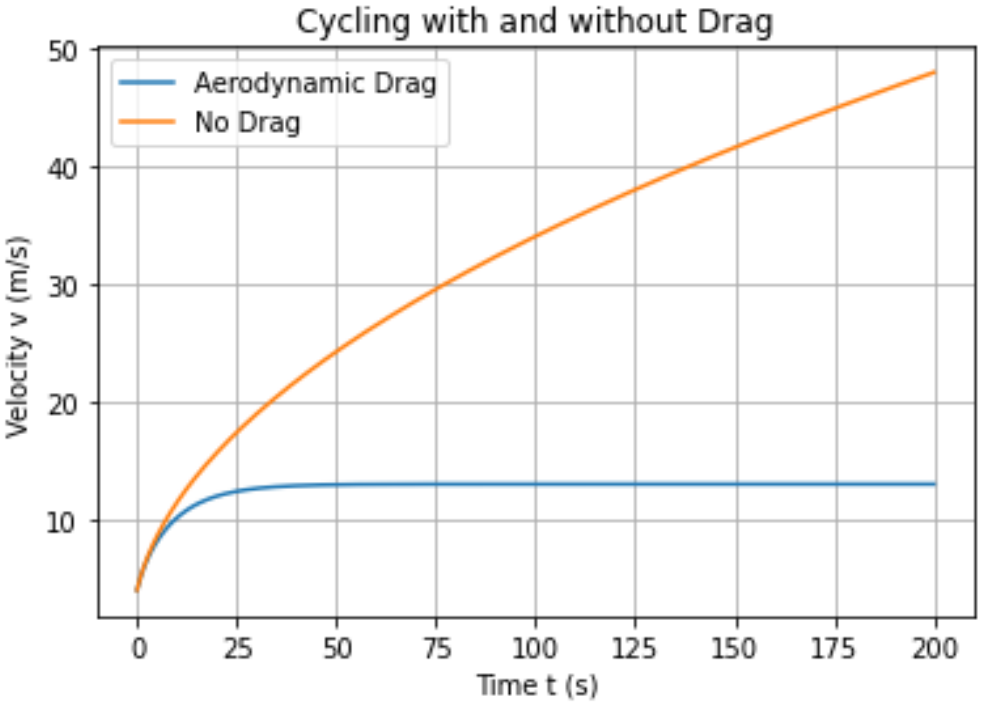

Figure 1: The cyclist plot for just aerodynamic drag and no drag.

1.2 Cyclist with the Aerodynamic Drag, and Viscous terms, and inclination of the obstacle

The viscous drag equation is characterised by $F_{drag,viscous} = -\eta A \frac{v}{h}$, where the viscosity $\eta = 2 * 10^{-5} Pa * s$, and rhe height of the cyclis is $h = 2m$. While also accounting for the slope of the rider by letting the force of gravity for the inclination of the slope be θ and the force equation as $F_g = g * sin(arctan(\theta/100))$ where $g = 9.8 m/s^2$. Plotting the new accelerations and plotting it gives Figure 2.

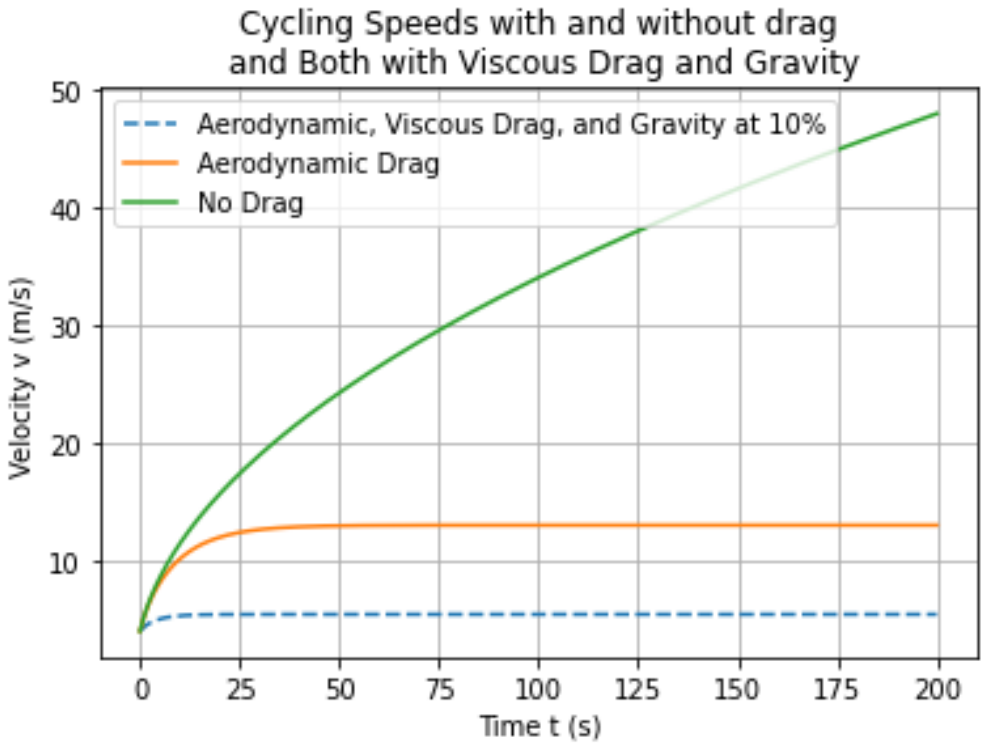

Figure 2: The cyclist plot for no drag, aerodynamic drag, viscous drag, and inclinated terrain in comparison.

2 Plotting a figurative zombie known as a walker in apocalyptic style

2.1 Plotting an individual zombie

If a zombie were to get loose and be tracked, the distance it travels is randomly forward or backward by one unit. This unit can be between -1, and 1. Over 100 steps from one zombie can be seen in Figure 3 and Figure 4

2.2 Plotting 500 zombies and plotting there mean displacement squared with steps

After one zombie got loose and infected 499 people resulting in 500 zombies from the same point in one axis, there positions can be seen in Figure 5 and Figure 6

My expectations for the position of the walkers were to have some walkers extremely displaced because of the oppurtnuity for a walker to walk 100 steps. However, I found this result to not be possible since in 100 steps the walker can only be displaced at maximum of 100. The mean displacement squared plot I was originally thinking that it should look like a bell curve in the distribution of walkers and displacement from the start, but its really just the average of all the walkers during each step, and the square makes the higher displaced walkers more noticeable, because the square makes the big differences bigger and small differences smaller.

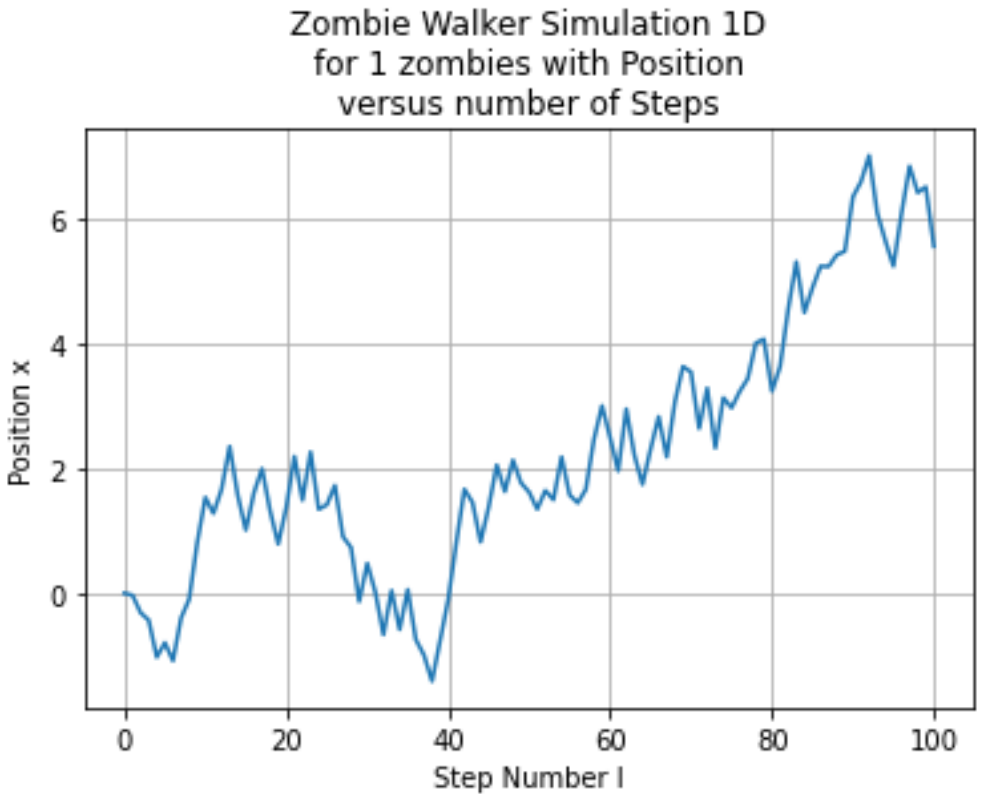

Figure 3: The position of the first walkers versus its steps.

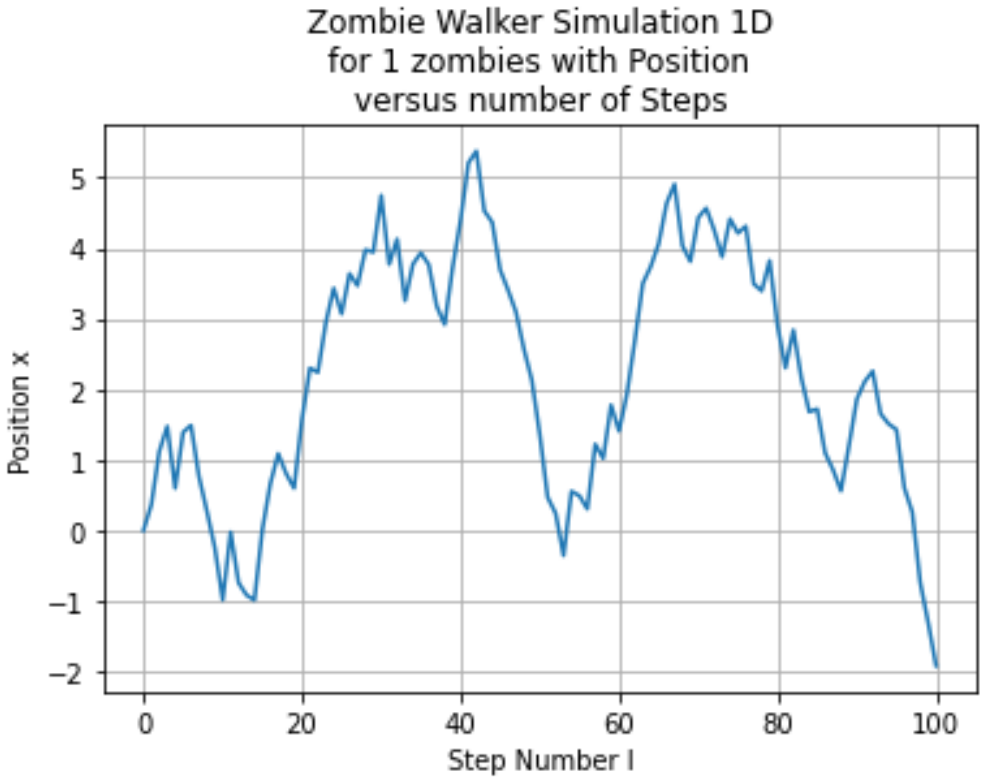

Figure 4: The position of the second walker versus its steps.

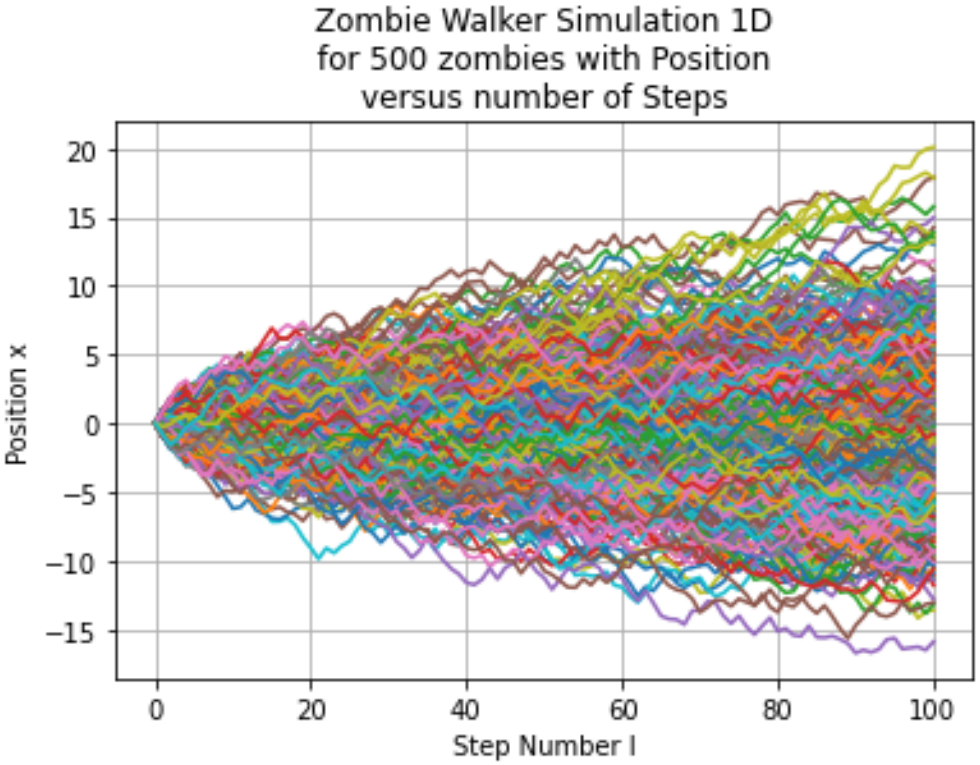

Figure 5: The position of 500 walker versus there steps.

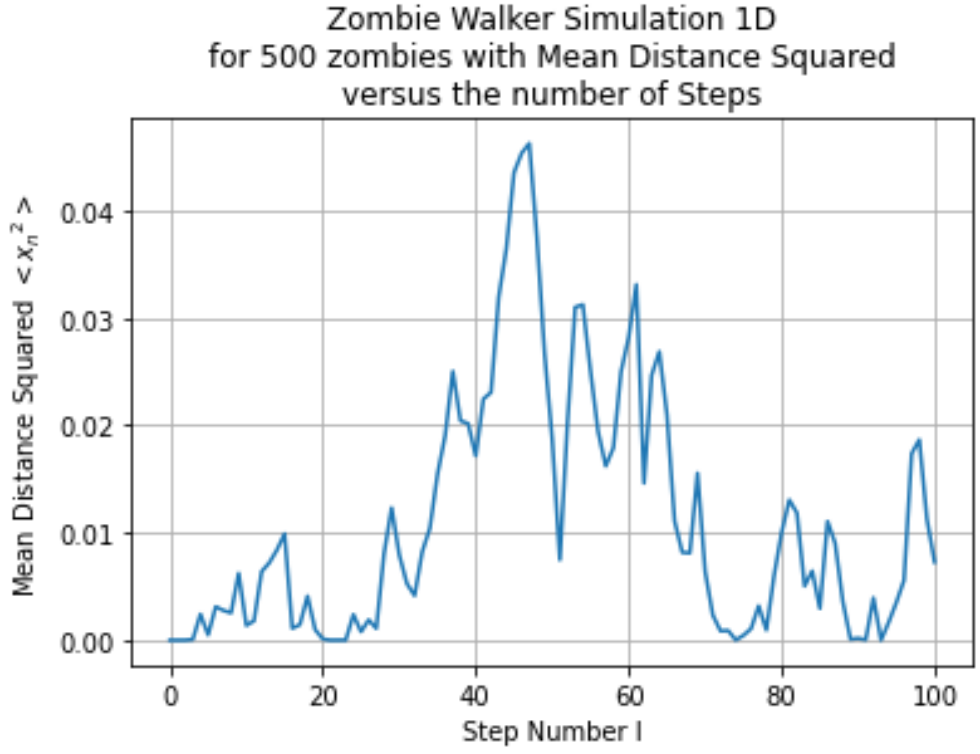

Figure 6: The mean displacement of the position of 500 walkers versus there steps.