Directions

- Your answer should consist of 2 parts:

  (a) A program that solves the problem. You may use any programming language (not Excel). You may use standard libraries, but you may not use packages that solve the problem for you. In other words, I want to see your algorithmic approach: do not use an equation solver to solve equations, or a network library to solve network problems.

  (b) A description (around 1 paragraph) of your approach to the problem, including 1) how it works; 2) why it works; and 3) why you chose that approach.

- Your answer must work for any input in the given ranges.

Problem We want to predict vehicle trajectories through an intersection.

$n \in [3, 10]$ (n is an input) vehicles travel from point A to point B at exactly $v \in [20, 60]$ mi/hr (identical for all vehicles). Vehicles are initially separated by $h \in [3, 15]$ sec headways, but the minimum headway is $h' \in [2, 3]$ sec (identical for all vehicles). Vehicle lengths are $\ell_i \in [15, 30]$ ft (varies per vehicle).

There is a traffic light halfway between A and B that is red between $[t_1, t_2]$ and green otherwise. Vehicles stop for the red light and proceed as soon as possible after it turns green.

Write a program that calculates the position of each vehicle at 0.1 sec increments, while the vehicles are between A and B.

Example Suppose your inputs are

- $n = 6$
- $v = 30$ mi/hr
- $h' = 2$ sec
- $\ell_1 = \ell_2 = \ell_3 = \ell_4 = \ell_5 = \ell_6 = 20$ ft
- $t_1 = 50$, $t_2 = 80$

Then the vehicle trajectories will look like the following graph: