

# Examining the effect of latency on the follower stopper controller

By Maya Kumar

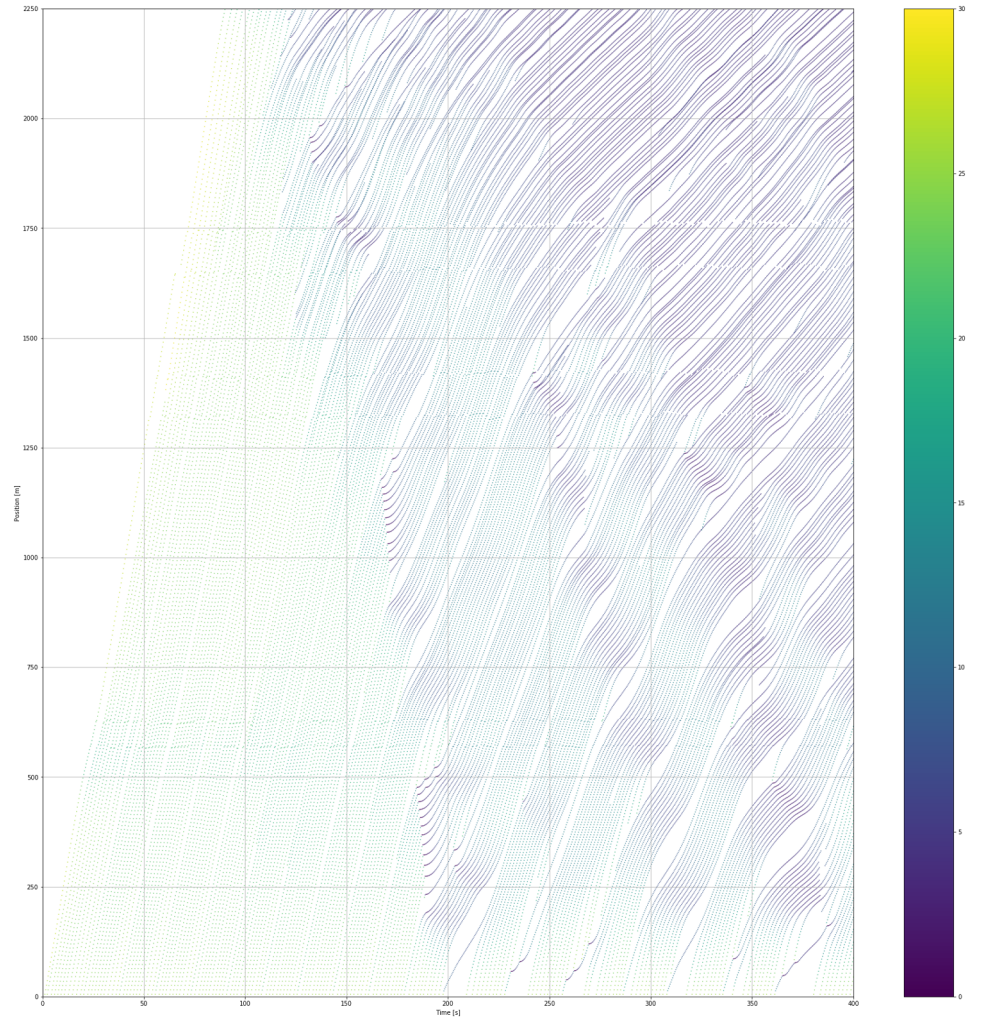
# Background

- Follower Stopper Controller
  - Designed to smooth out traffic waves
  - Up until now given a set desired speed
  - New version dynamically calculates desired speed by averaging speed of cars ahead
    - This data may be delayed. What is the effect of this delay?
- Steps:
  - Creating new version of follower stopper controller
  - Implementing on i210 Network
  - Experimenting with different viewing distances
  - Experimenting with different penetration rates
  - Experimenting with different delays

Comparing different  
viewing distances:

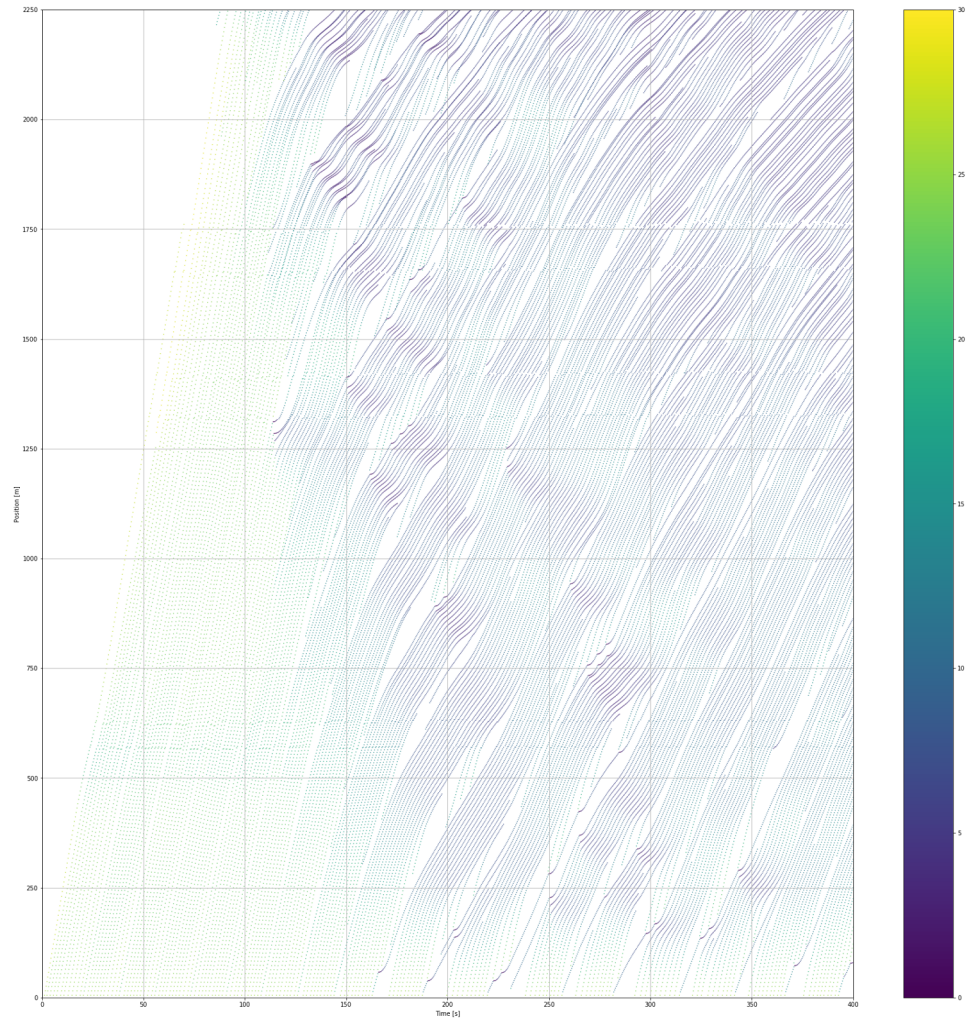
# distance #1

- Penetration rate: 10%
- Look ahead distance: **10 cars**
- Time delay: 0 seconds



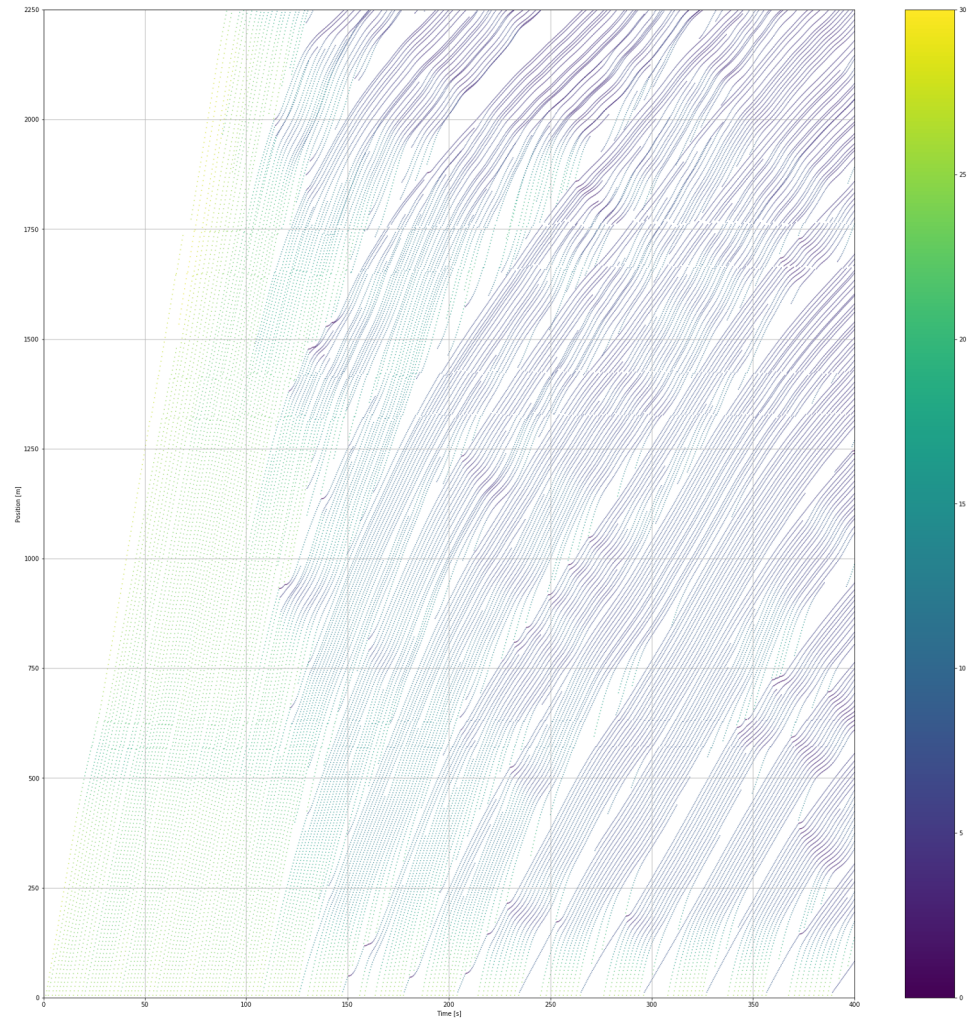
## distance #2

- Penetration rate: 10%
- Look ahead distance: **20 cars**
- Time delay: 0 seconds



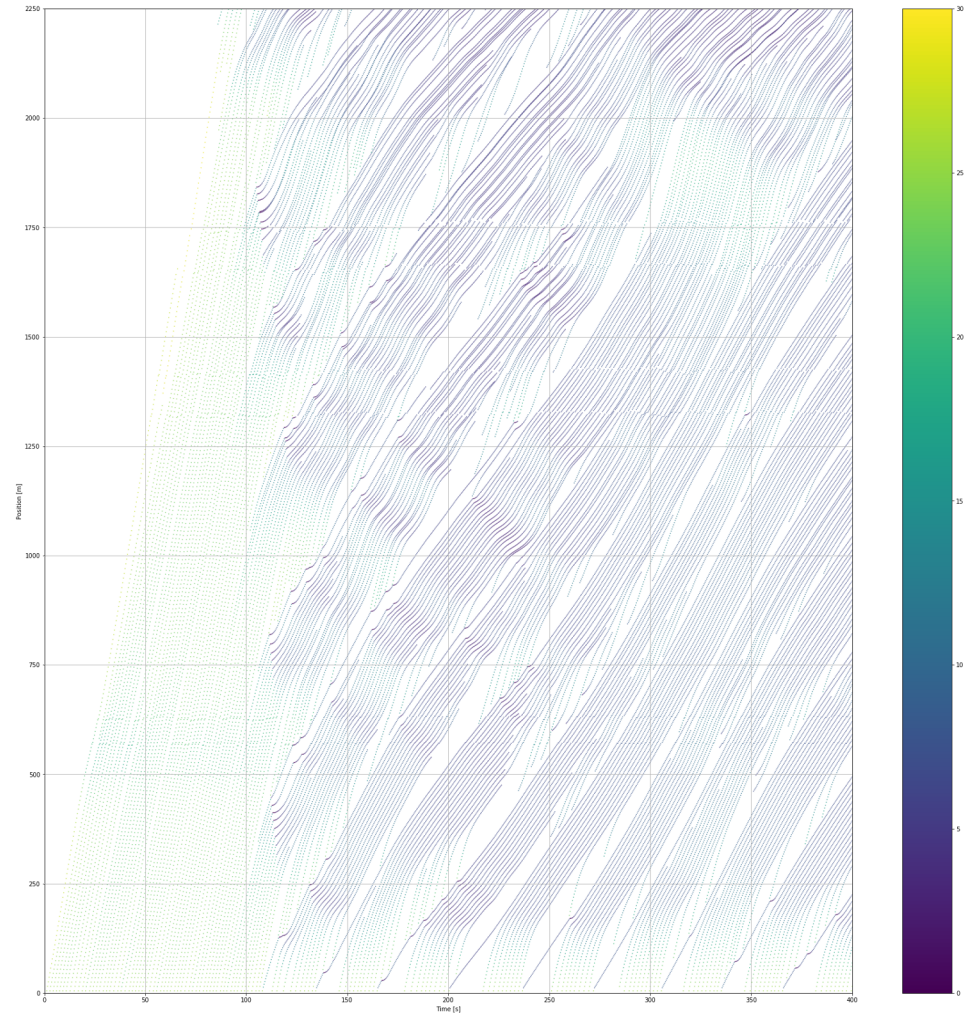
# distance #3

- Penetration rate: 10%
- Look ahead distance: **50 cars**
- Time delay: 0 seconds



# distance #4

- Penetration rate: 10%
- Look ahead distance: **All cars ahead**
- Time delay: 0 seconds

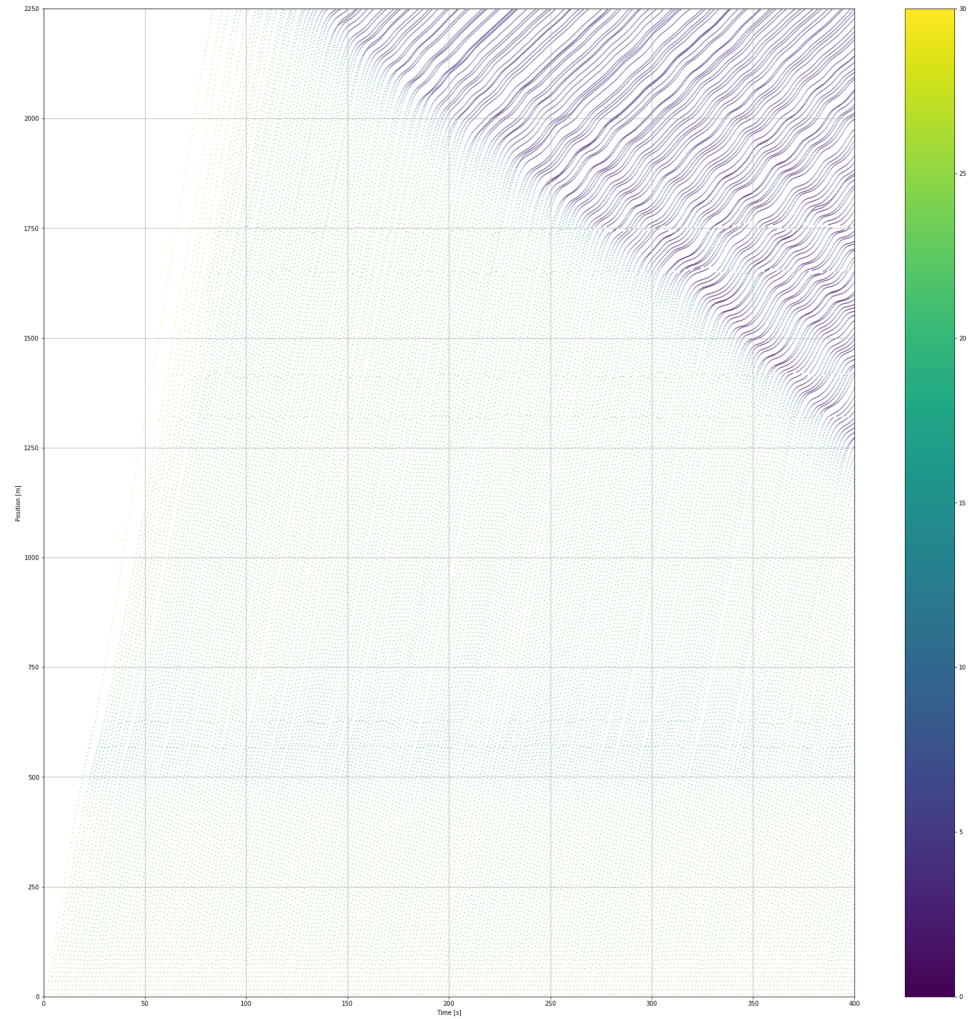


Comparing different  
penetration rates:



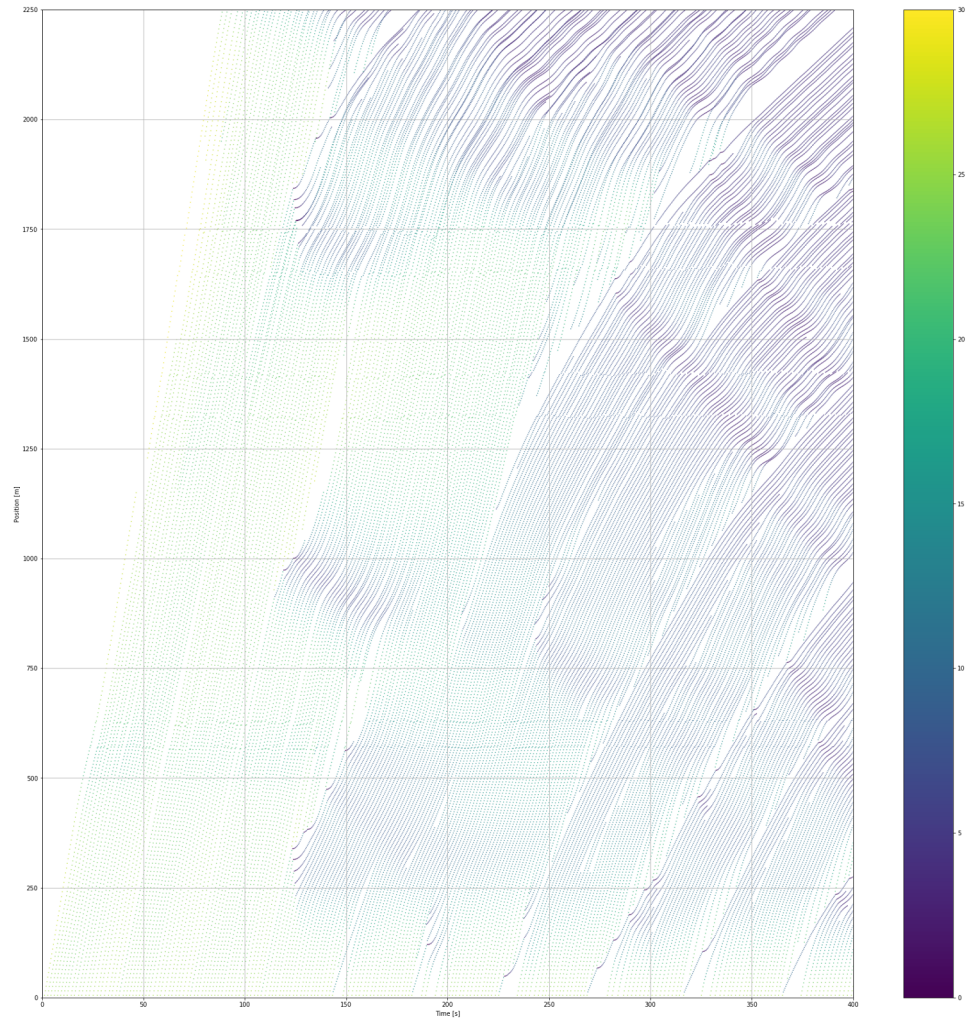
# Base Case

- Penetration rate: 0%
- Look ahead distance: n/a
- Time delay: n/a
- Average speed: 14.963 m/s
- Total fuel consumption: 313406.7



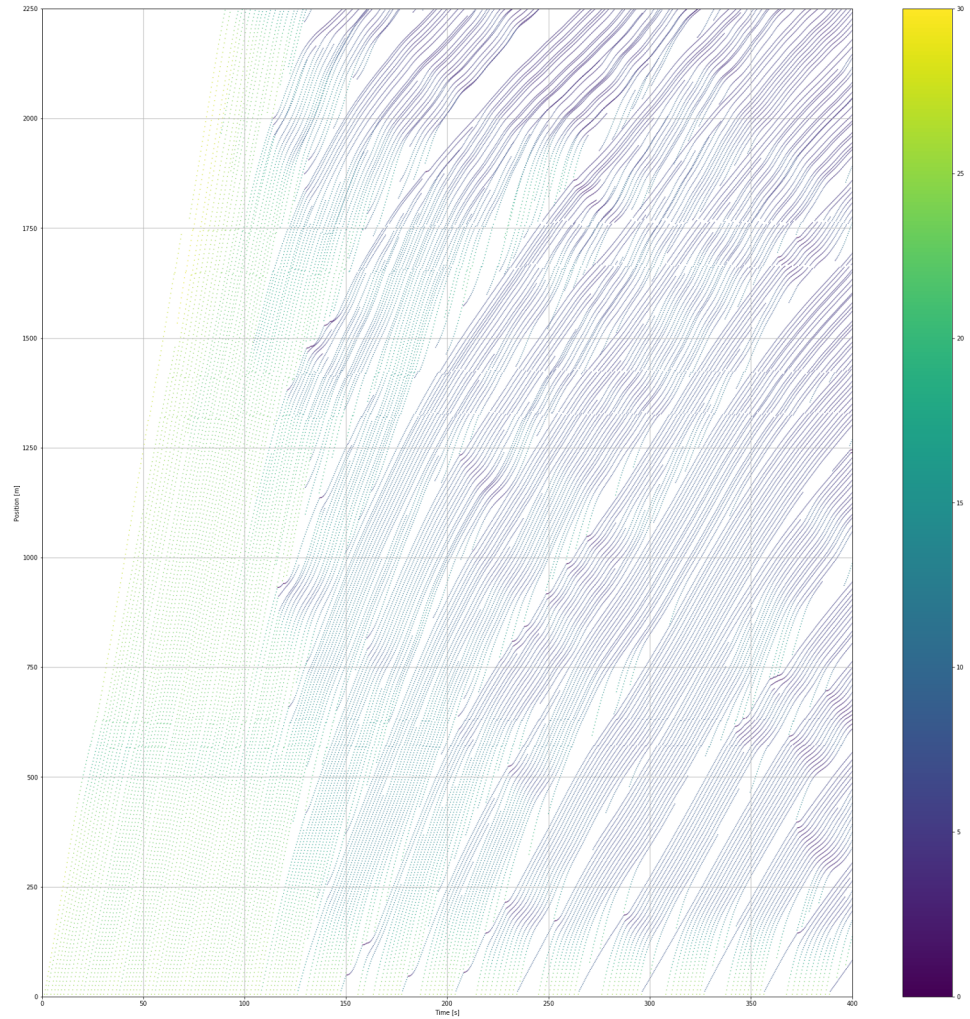
# Penetration rate #1

- Penetration rate: **5%**
- Look ahead distance: 50 cars
- Time delay: 0 seconds



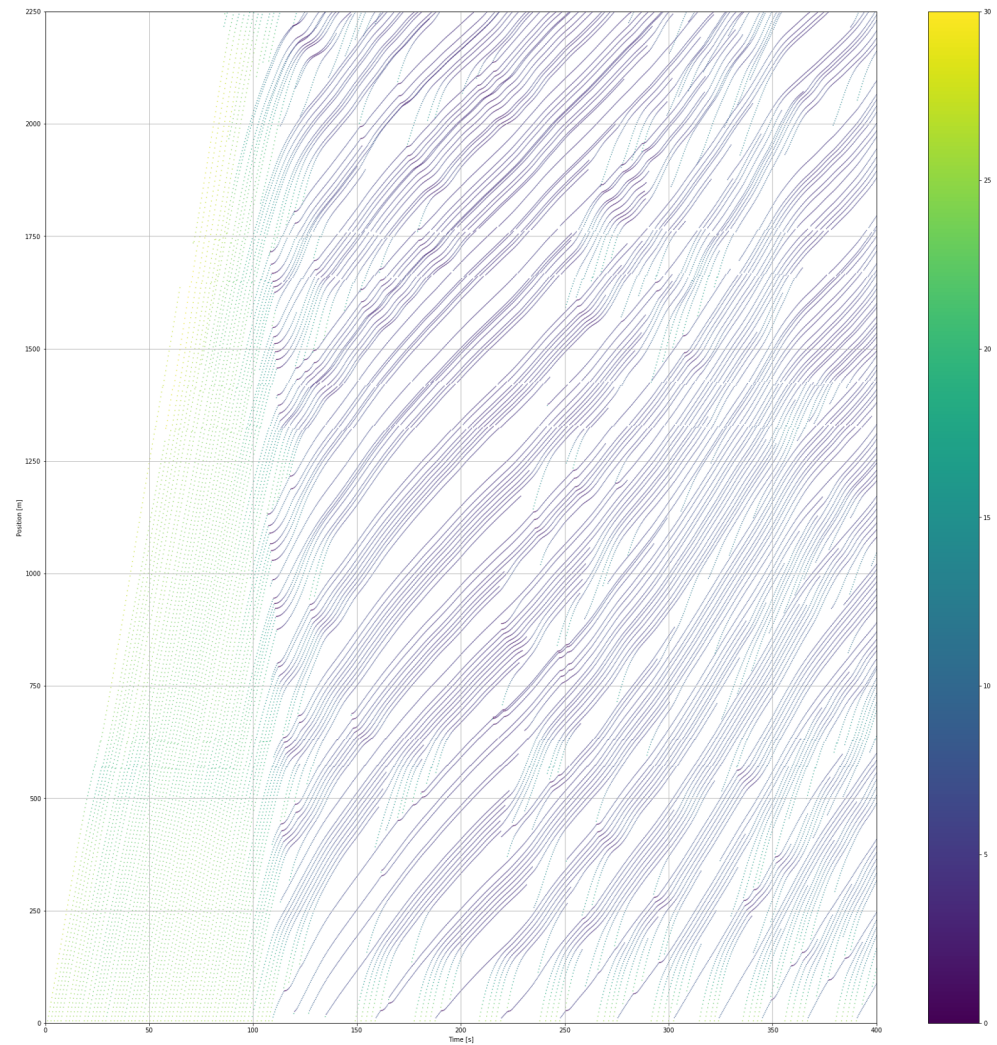
# Penetration rate #2

- Penetration rate: **10%**
- Look ahead distance: 50 cars
- Time delay: 0 seconds



# Penetration rate #3

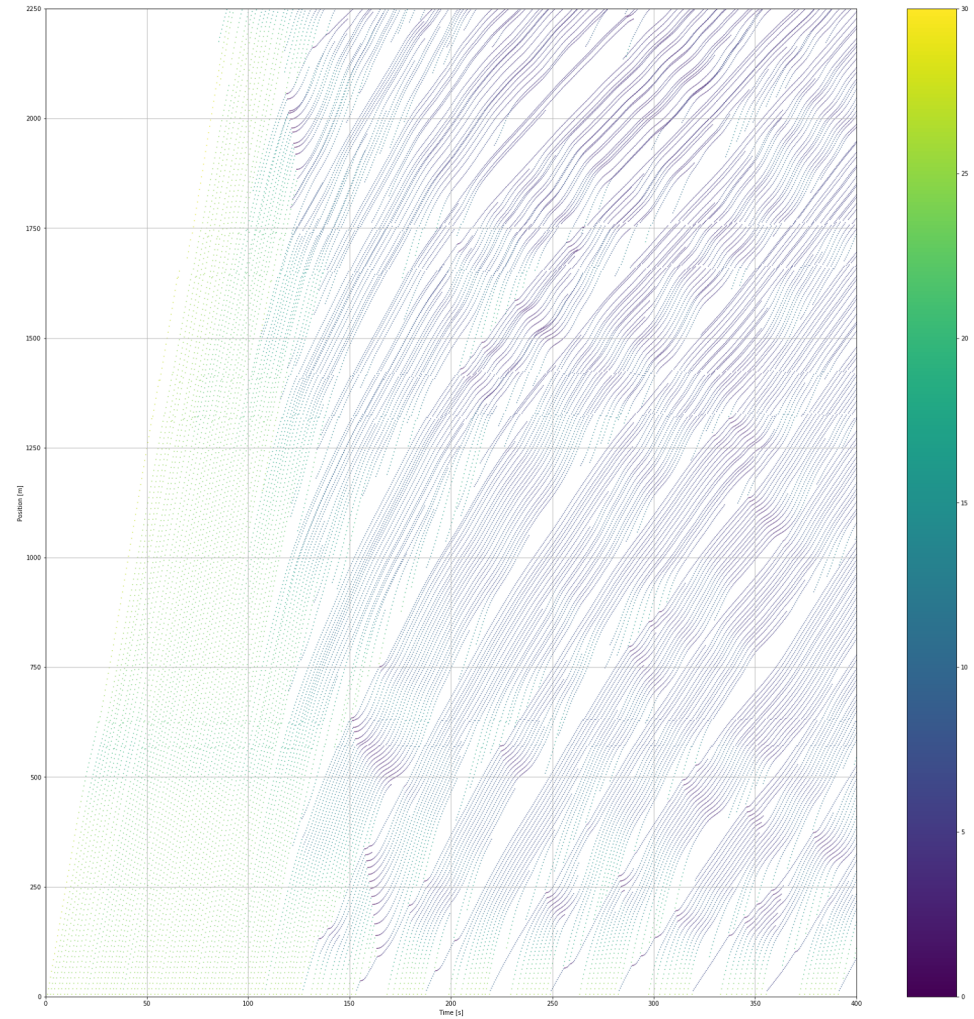
- Penetration rate: **20%**
- Look ahead distance: 50 cars
- Time delay: 0 seconds



Comparing different  
time delays:

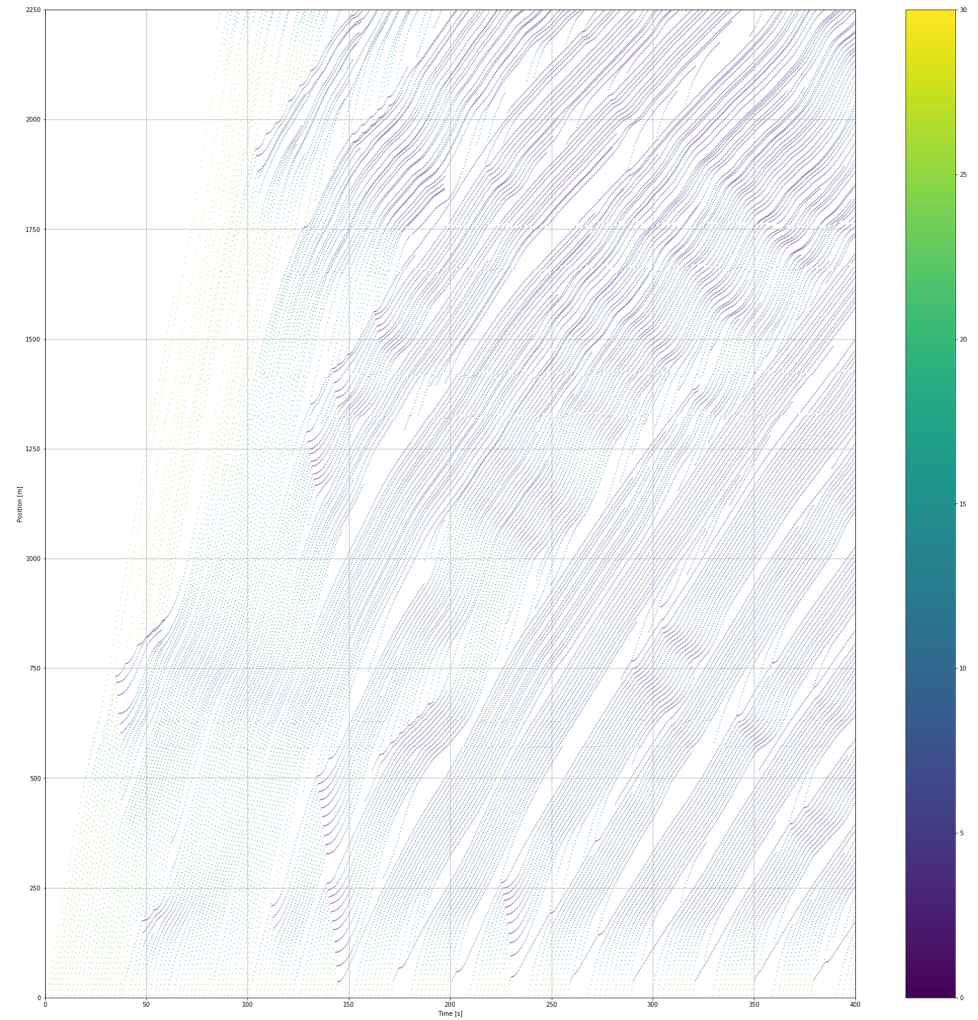
# Delay #1

- Penetration rate: 10%
- Look ahead distance: 50 cars
- Time delay: **0 seconds**



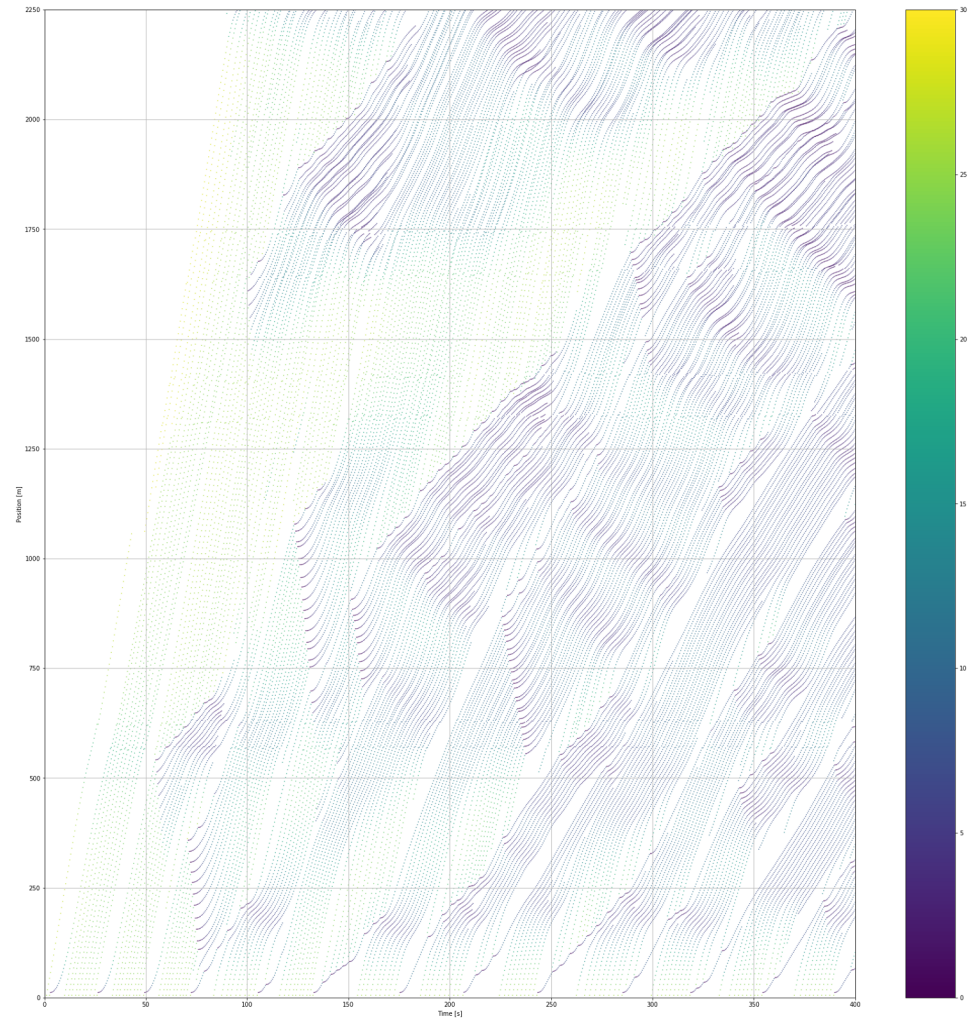
# Delay #2

- Penetration rate: 10%
- Look ahead distance: 50 cars
- Time delay: **1 second**



# Delay #3

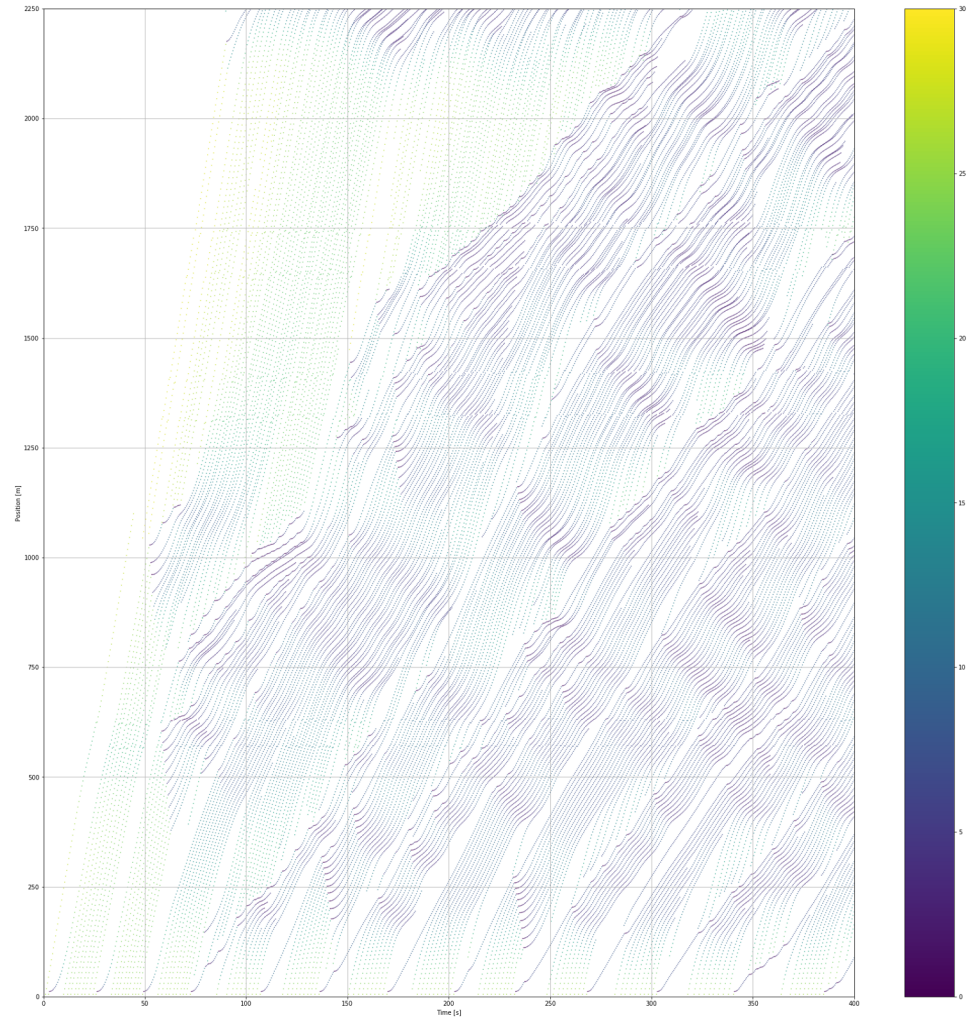
- Penetration rate: 10%
- Look ahead distance: 50 cars
- Time delay: **2 seconds**





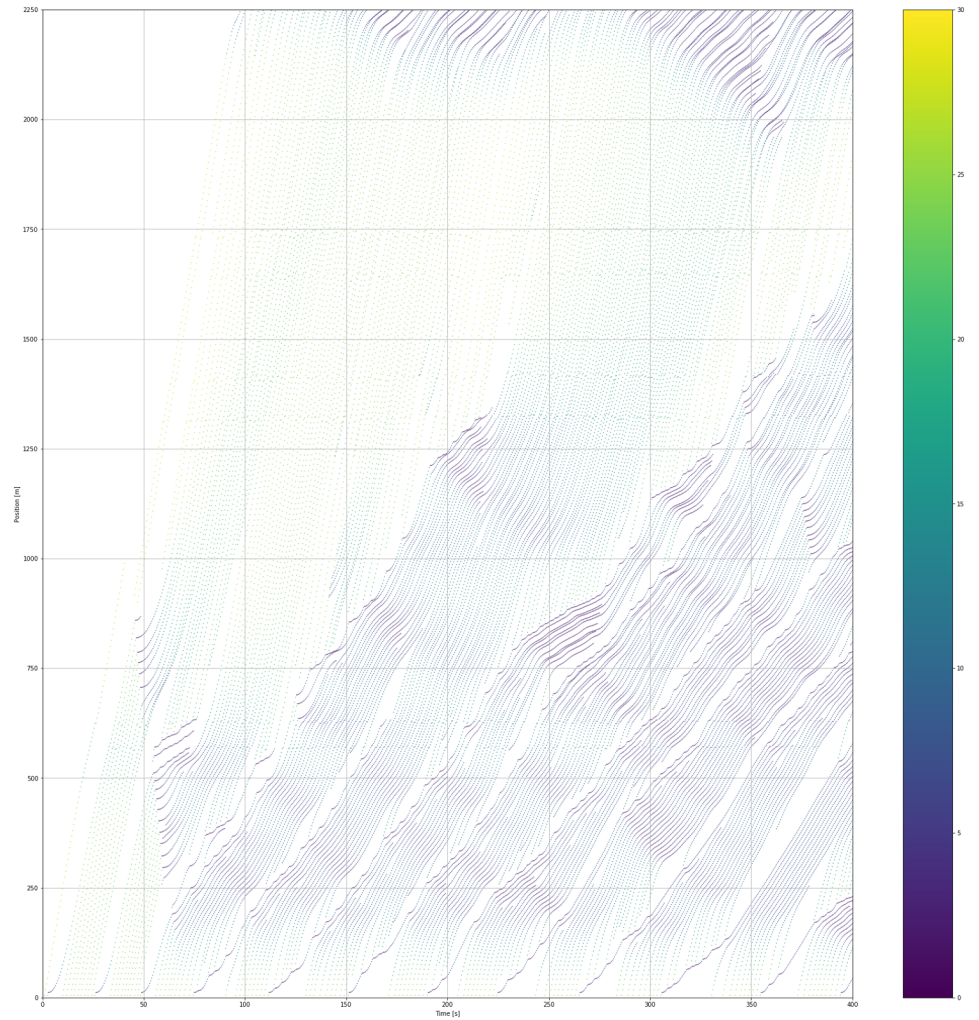
# Delay #4

- Penetration rate: 10%
- Look ahead distance: 50 cars
- Time delay: **3 seconds**



# Delay #5

- Penetration rate: 10%
- Look ahead distance: 50 cars
- Time delay: **4 seconds**



## Further Questions

- Balance of prioritizing speed and energy consumption?
- Is the follower stopper a good controller?
- Exactly how much delay can be tolerated until it is no longer useful?