



# Stochasticity in traffic supply

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# Topics

- Fundamental diagram
- Car-following behaviour
- Speed differences
- 3-phase traffic flow theory (stop and go traffic)
- (Lane changes and lane distribution
  - in relation with speed limit)
- Elimination of stochasticity

# Traffic flow fundamentals



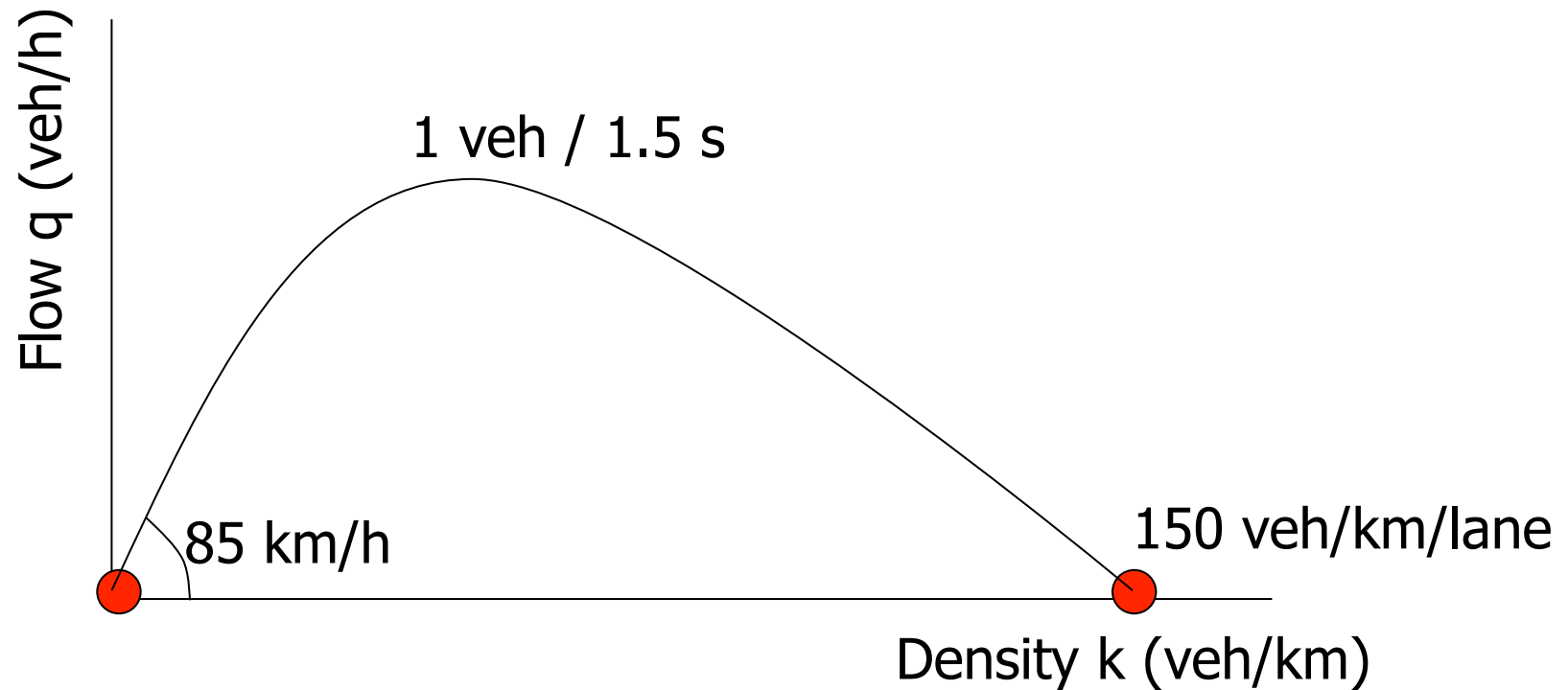


# Traffic flow fundamentals





# Fundamental diagram





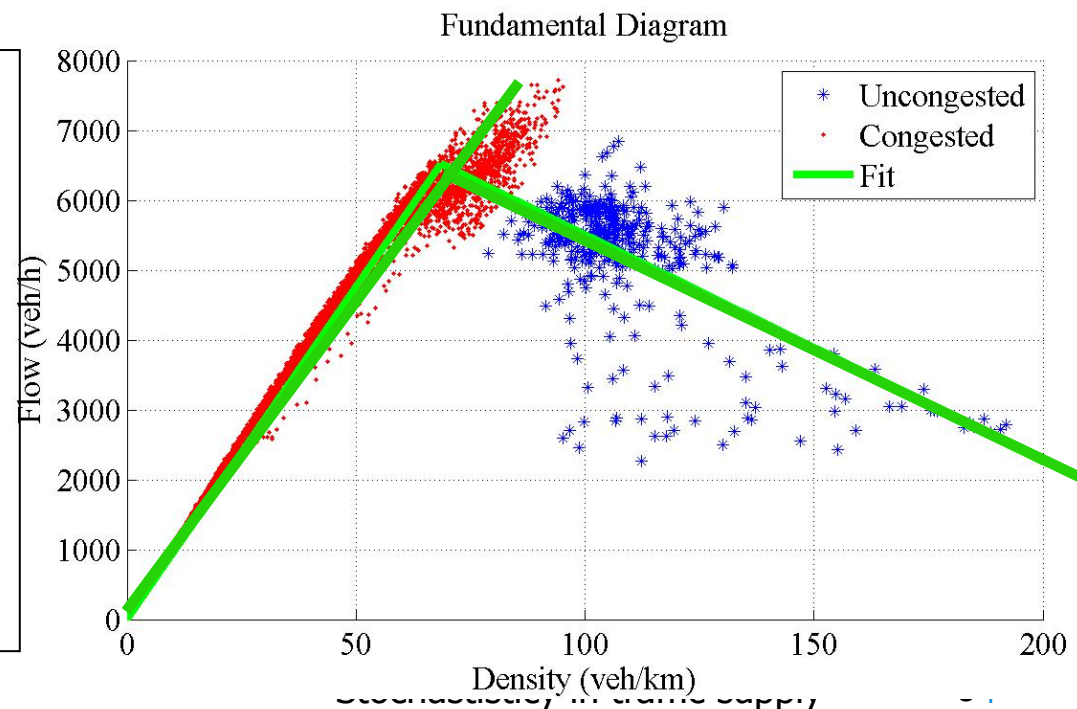
# Now, the real world

- Stochasticity
- (and capacity drop)

Capacity drop!

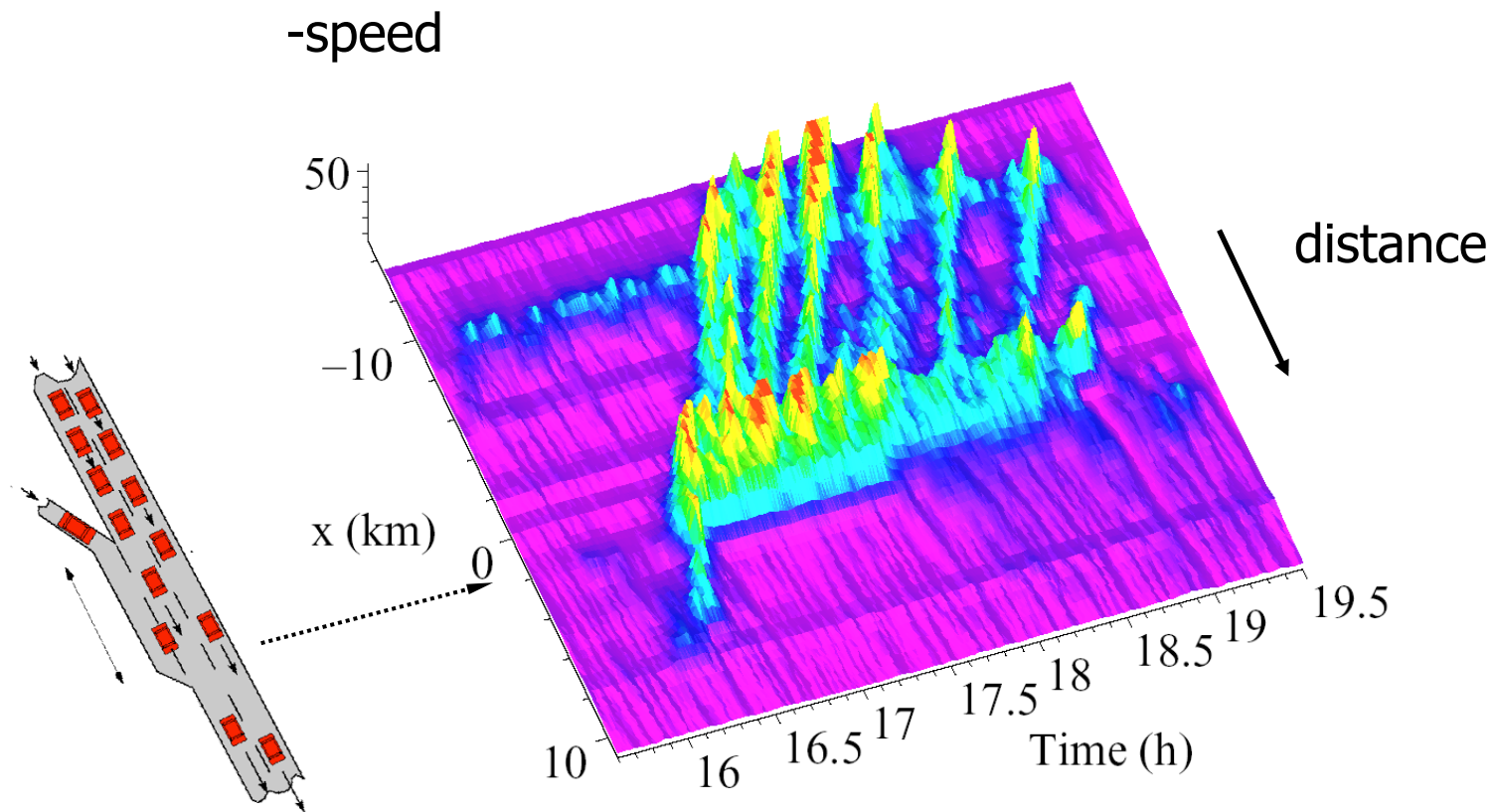
free flow capacity  
is higher than  
congested capacity

Inverse-lambda  
fundamental diagram



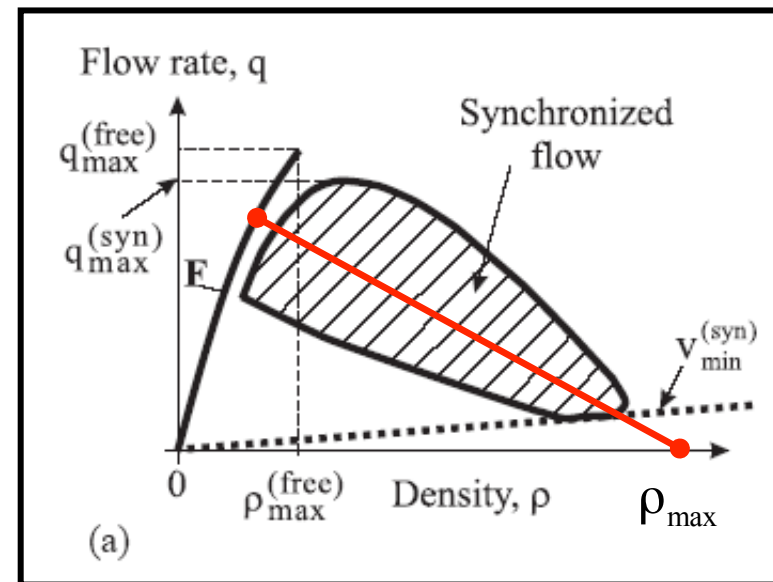


# Different traffic phases



# Three phases of traffic flow

- Three phase (state) theory of traffic flow:
  - Free flow
  - Synchronized flow (density > critical density, but less than jam density)
  - Wide moving jams (density = jam density)

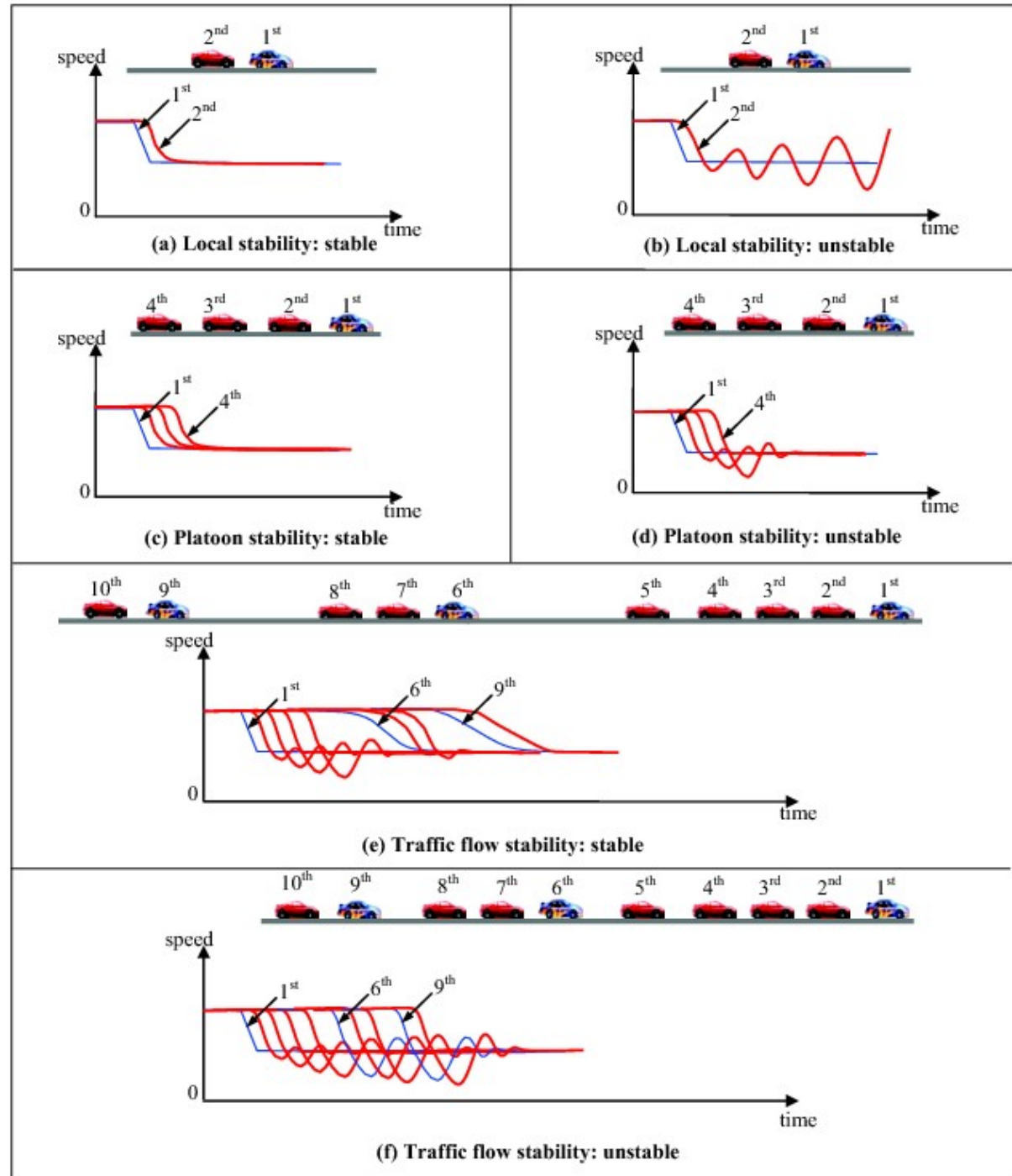


Local stability  
(1 follower instable)

Platoon/asymptotic  
stability

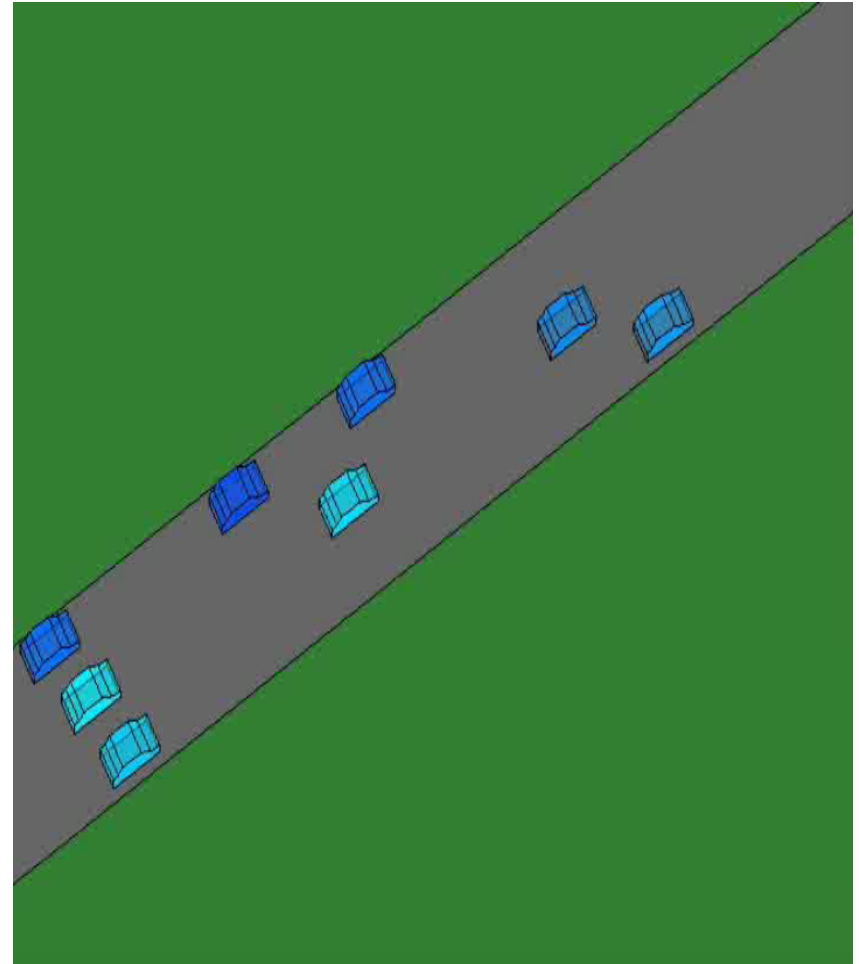
Traffic flow stability /

Traffic flow instability



# Driving behaviour studies

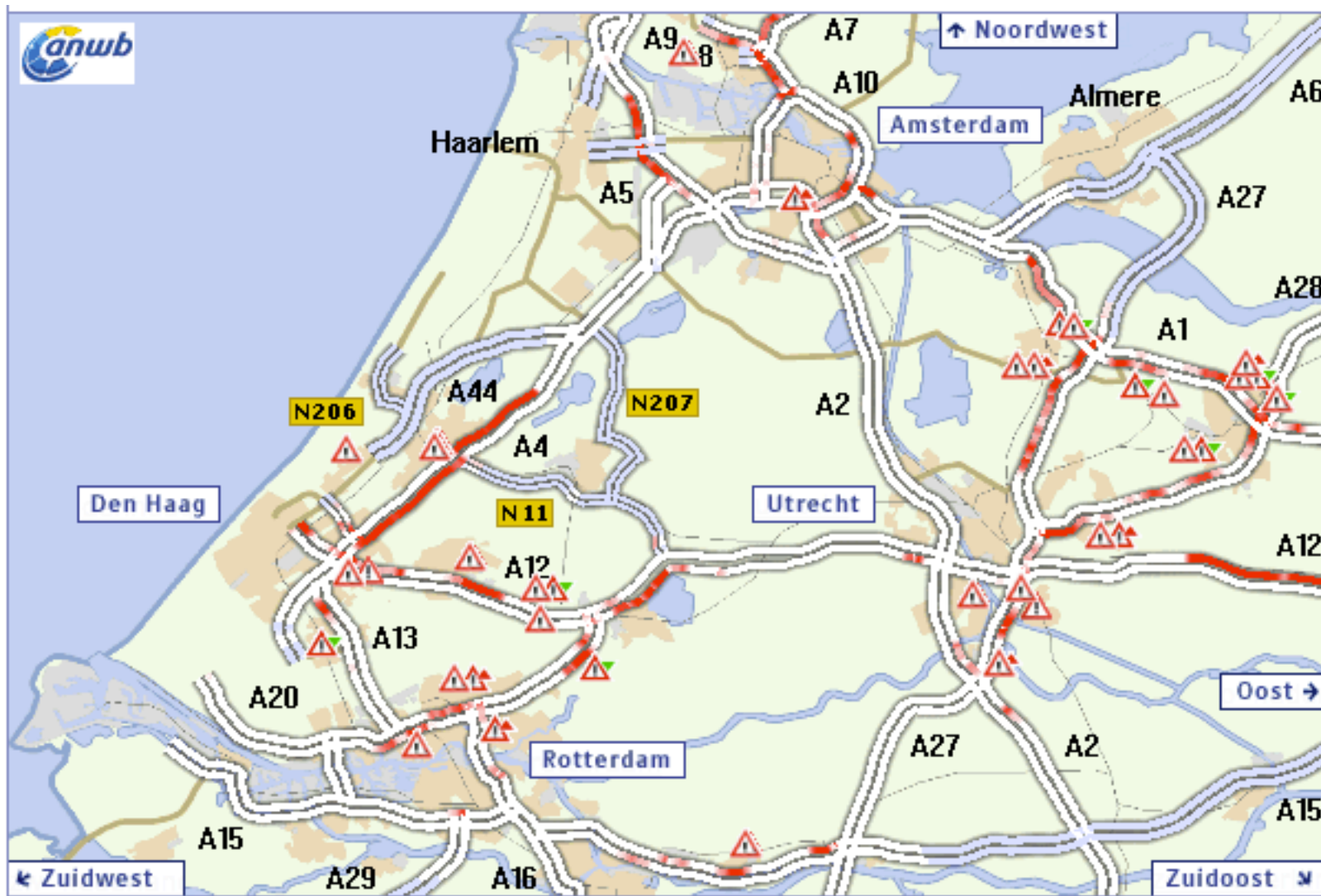
- Studies of car-following behaviour
- Helicopter + video to observe
- => driver heterogeneity
- Different reactions



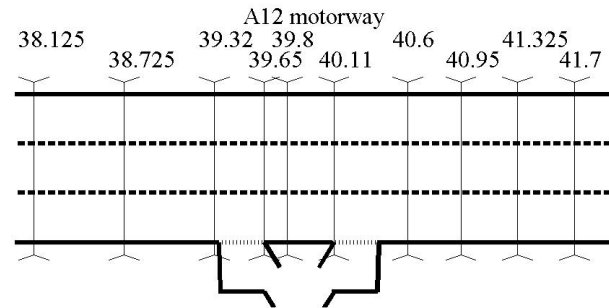
# Accident Apeldoorn

- Rubbernecking is reducing the capacity by 30-50% (and some people look more than others)

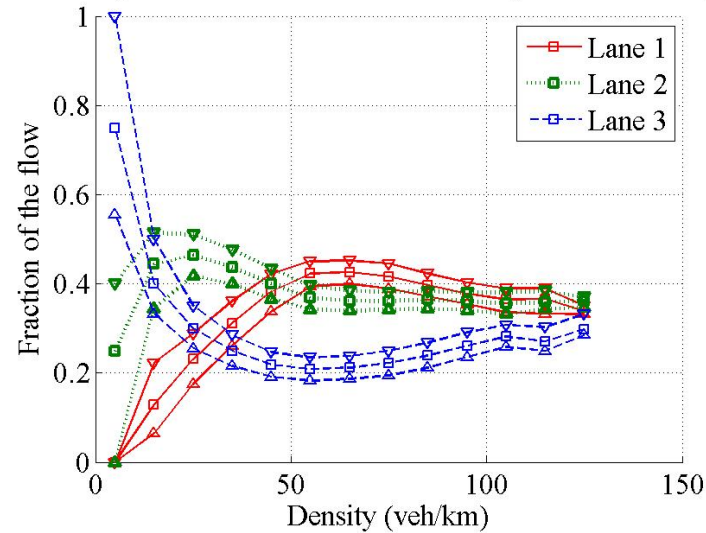




# Lane Distribution



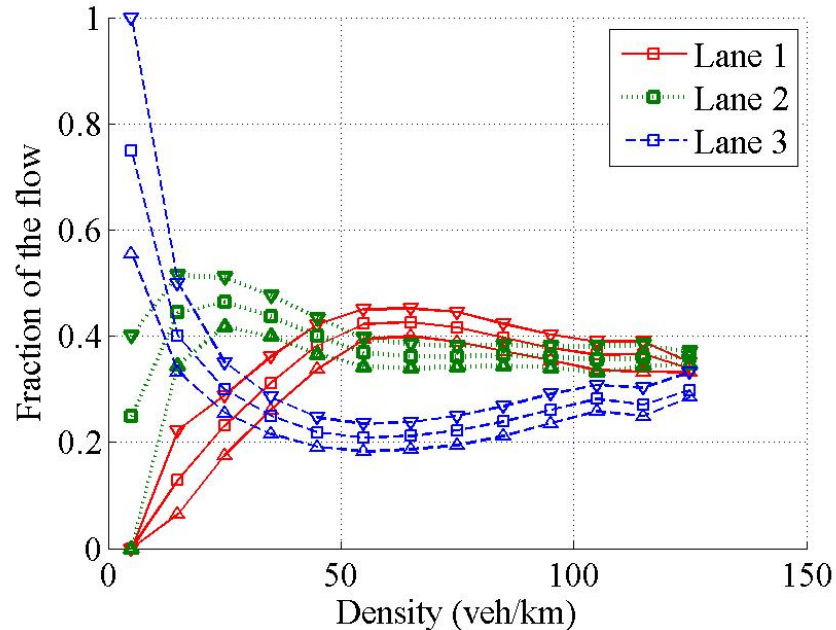
Average lane distribution km 38.125 - Speed Limit 120kph



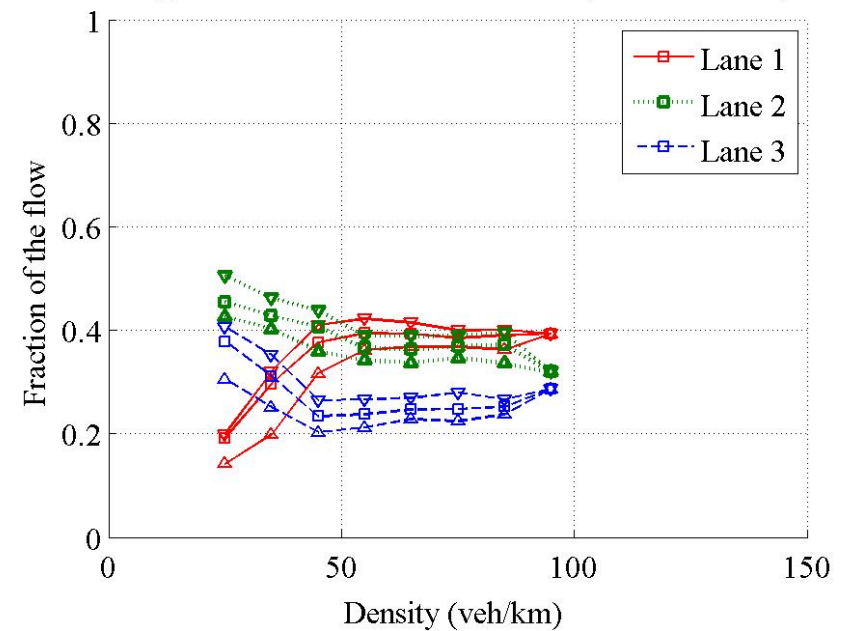


# Influence of speed limit

Average lane distribution km 38.125 - Speed Limit 120kph



Average lane distribution km 38.125 - Speed Limit 60kph



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16

# Macroscopic Fundamental Diagram

- Removes all stochastic noise?
- Average flow and density in area
- Requires homogeneity
- Introduced Geroliminis (2008)

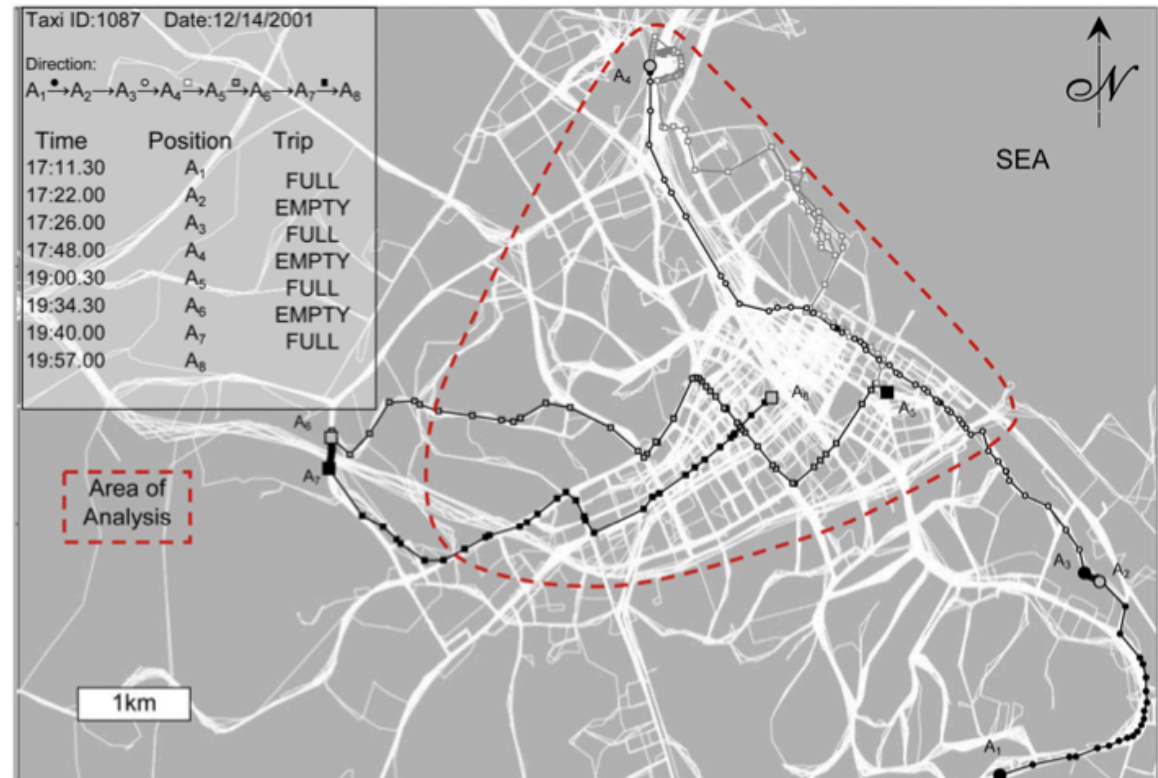


Fig. 5. Trajectory of taxi 1087, and area map (in white) produced by a superposition of all the taxi trajectories.

- Apparently quite good, but only with homogeneous networks

