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

Flow $q$ (veh/h)

Density $k$ (veh/km)
Traffic flow fundamentals

Flow $q$ (veh/h)

Density $k$ (veh/km)
Fundamental diagram

Flow $q$ (veh/h)

Density $k$ (veh/km)

85 km/h

1 veh / 1.5 s

150 veh/km/lane
Now, the real world

- Stochasticity
- (and capacity drop)

Capacity drop!
free flow capacity is higher than congested capacity
Inverse-lamda 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)
Stochasticity in traffic supply
Lane Distribution

Average lane distribution km 38.125 - Speed Limit 120kph

Fraction of the flow vs Density (veh/km)
Influence of speed limit

Average lane distribution km 38.125 - Speed Limit 120kph

Average lane distribution km 38.125 - Speed Limit 60kph
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
"I was hoping traffic would ease up after the polar ice cap melted."