

Avoiding the under-utilisation of the shoulder lane using ITS measures

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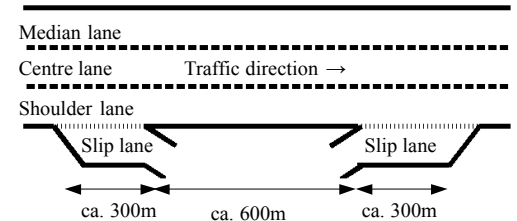


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Abstract

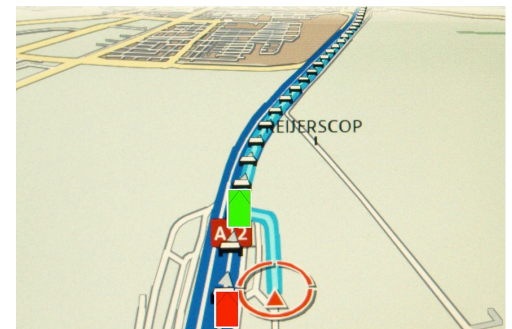
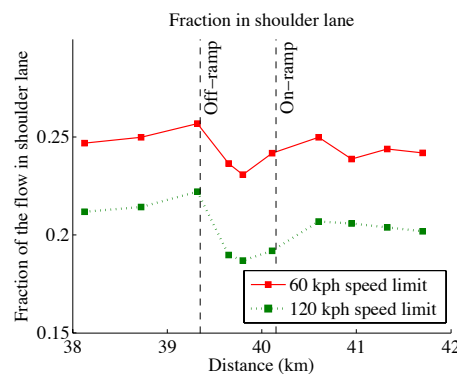
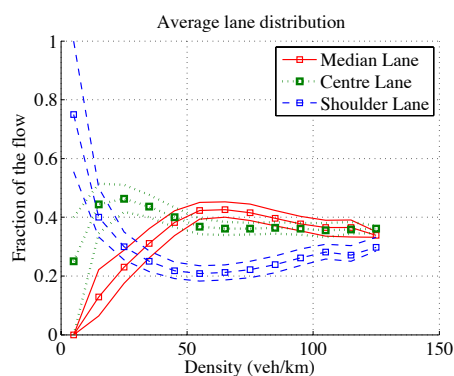
The distribution of traffic over different lanes is an important factor in the traffic operations. This study shows that up to capacity the shoulder lane is under-utilized on motorways since drivers who like to go fast, will not move into the slower shoulder lane. This underutilisation is even worse just upstream of an on-ramp because drivers will make place for merging drivers (courtesy lane changing). Traditional traffic measures like speed limits or an overtaking prohibition can prevent this.

However, there also exist a risk of over-correcting. The extra space on the shoulder lane is needed for drivers to merge into the traffic stream. If this space is not available, merging drivers might slow down to wait for a gap and then merge into their with too low speeds. This might cause stop-and-go waves and will reduce the capacity even more. Therefore, dedicated, co-operative individual adapted traffic management can be deployed to create exactly those gaps which are needed to accommodate the merging traffic.



Road layout

Data are collected at a five km long stretch of the three-lane motorway A12 in the Netherlands, including an on- and off-ramp. The speeds have been regulated dynamically during this period.



Situation without control

Right lane is under-utilised at densities near capacity. This is possibly caused by drivers wanting to overtake, even though the density in the shoulder lane is low.

This under-utilisation is stronger near on-ramps (see fig 2), because drivers pull out of the shoulder lane to enable merging vehicles to enter the motorway.

Collective advice: improvements

Collective measures to change the flow towards the shoulder lane are for instance:

- Speed limits
- Overtaking prohibition
- Aggregate-level ramp metering

These have a risk that the shoulder lane will be too occupied, causing congestion on the ramp, and possible slow merging vehicles causing congestion on the main route.

Individual advice: improvements

Co-operative systems can help to reach the optimal road use. Several types of advice are:

- Merging drivers:
 - The best gap to merge into
 - Acceleration profile towards the best merging speed
- Drivers on the main road
 - Lane advice avoiding unnecessary gaps at shoulder lane
 - Speed advice to create gaps for merging drivers