Evaluation of parking capacities for heavy vehicles on highways

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Abstract

The efficient allocation of parking areas for heavy vehicles on major international road transport corridors is an essential matter of interest for road infrastructure operators. Heavy vehicle drivers have to comply with regulations regarding driving times and resting periods. They choose preferred parking areas based on maximum driving times, additional regulations and to a certain extent also on individual requirements. Consequently it is not efficient enough to only allocate additional parking areas based on traffic volumes. This paper presents a traffic model that estimates the utilisation of heavy vehicle parking areas along pre-defined routes along the Austrian motorway network. The calculation of the capacity utilization is based on current driving time limitations, application of benefits for certain parking areas due to attractiveness for heavy vehicle drivers as well as existing capacity constraints. Parking d-ecisions are calculated for individual trips along defined origin destination relations.

Keywords

heavy vehicles, parking capacity, traffic modelling, motorways, behaviour, infrastructure upgrade, assessment

Introduction

Regulations of the European parliament as well as national driving limitations in Austria specify that heavy vehicle drivers have to comply to resting periods at specific intervals during their trip. Apart from these regulations each driver has individual needs and preferences that affect the choice of the preferred heavy vehicle parking area to a certain extend. Individual input parameters as part of the decision making process are for example the attractiveness of the service station, shops or the availability of sanitary facilities.

Development of the modelling tool

A traffic model is developed that estimates the utilisation of heavy vehicle (HV) parking areas along pre-defined routes along the Austrian motorway network. The calculation of the capacity utilization is based on current driving time limitations, the application of benefits for certain parking areas due to attractiveness for heavy vehicle drivers as well as existing capacity constraints. Parking decisions are calculated for individual trips along defined origin destination relations.

The model uses a three stage approach to identify the HV parking area with the highest benefits for each individual trip along defined origin destination relations. In the first stage origin-destination data from the ASFINAG toll system is assessed and an estimation of driving time distributions for individual routes is carried out. Based on these distributions the model flags the HV parking area that is located as close as possible to the maximum available driving time.

In the second stage the attractiveness of surrounding HV parking areas in the vicinity of the flagged parking area from stage 1 is assessed and the flag is shifted in case a more attractive HV parking area is found in the vicinity of the proposed location of stage 1. The model assigns the HV parking area with the highest benefits for each driver.

In stage 3 the model estimates the total number of potential users for each HV parking area and calculates the estimated saturation for each HV parking area. The calculations are based on certain turnover rates. In case the saturation of a HV parking area exceeds a defined threshold the model re-distributes a proportion of the potential vehicles to the next HV parking area further down the corridor if the driving time stays within the regulatory limitations.

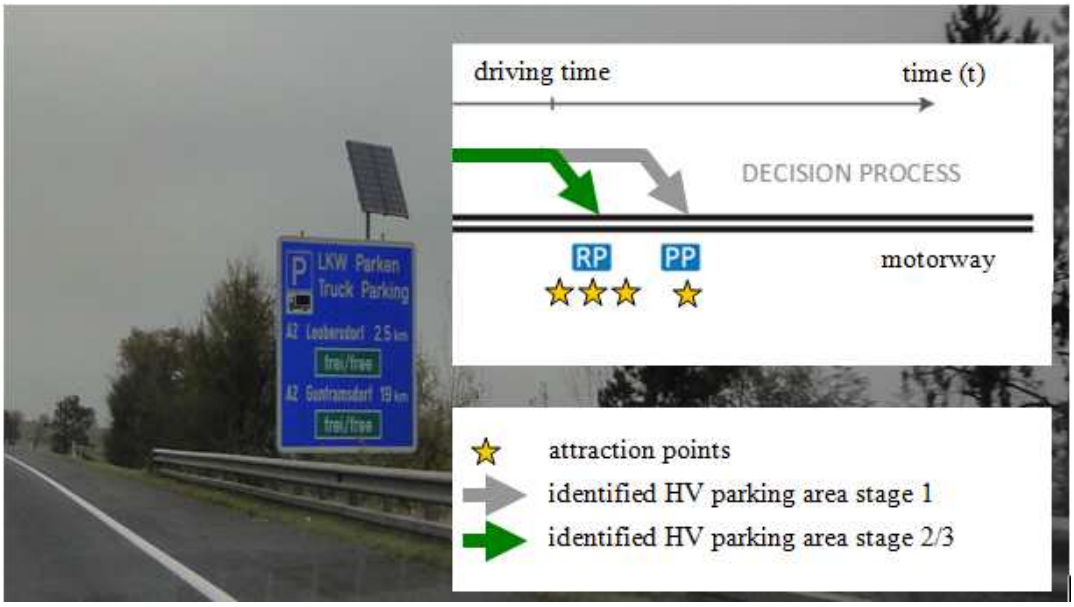

Figure - Example for modelling technique

Input data

The development of the traffic model is based on an extensive amount of input data from the following sources:

- origin-/ destination matrices: based on input data from the toll system of the ASFINAG aggregated origin-/ destination matrices are calculated
- technique for assessment of HV parking manoeuvres: based on the assessment of time differences (toll gantry data of the ASFINAG) between neighbouring road sections the in-house developed technique differentiates between heavy vehicles that continue on the main road, heavy vehicles that exit the motorway and those ones that stop for resting periods.
- modelling software: the modelling software used is VISUM from PTV AG Germany. Parts of the modelling algorithms were developed together with PTV AG Germany
- capacity utilisation survey for parking areas: a survey is conducted by third parties about the capacity utilisation of parking areas during the day and at night. This data is used for model validation and calibration purposes
- interviews with heavy vehicle drivers: interviews are carried out during traffic inspections by the police to assess typical driving behaviour and individual needs during resting periods Furthermore statistical data is collected as well as motivations for the decision process.
- geographical information data: the traffic model is based on a traffic graph for the area of interest that includes roads on the corridor as well as nodes and parking areas.

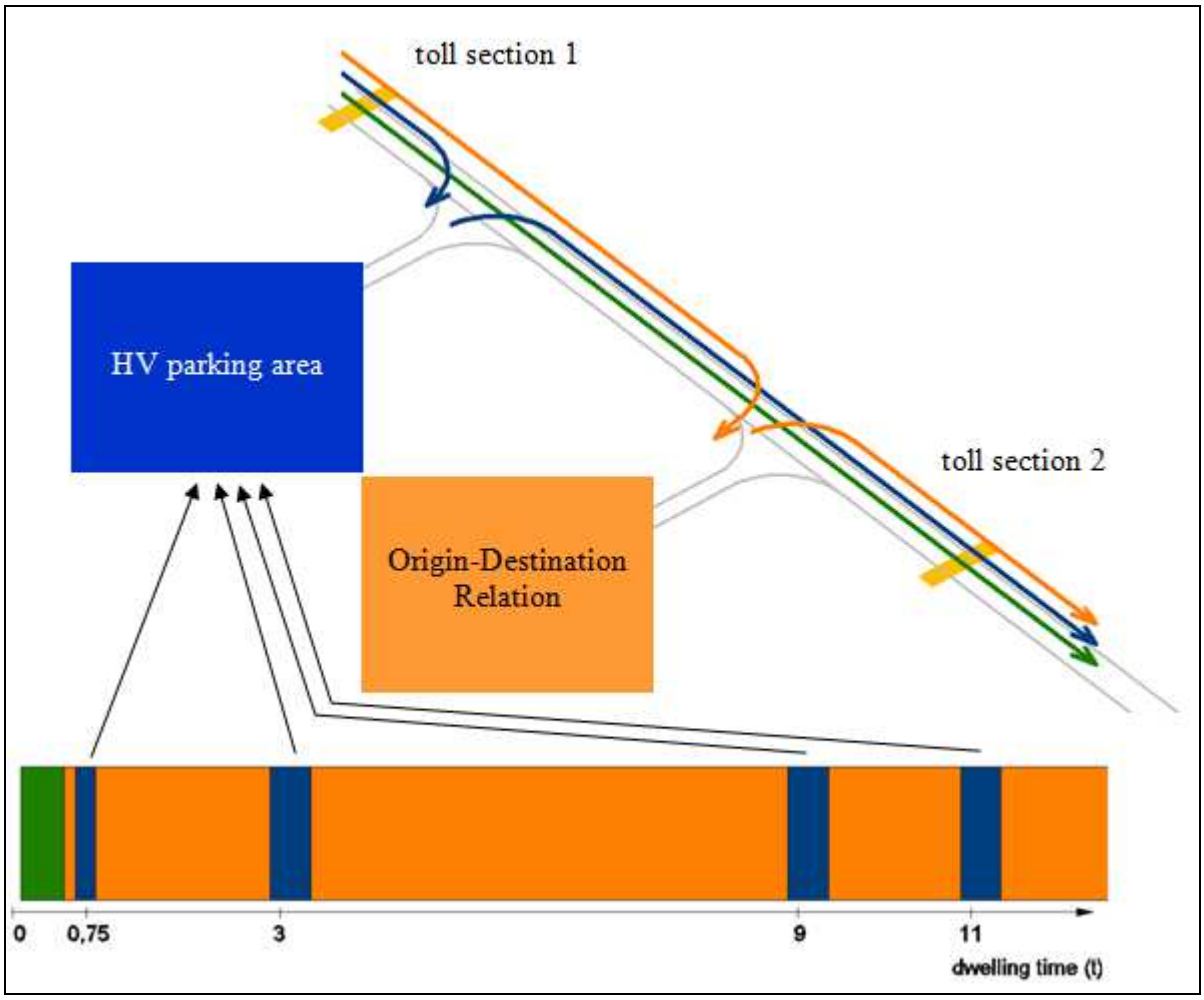

Figure - allocation of HVs to parking areas and destinations based on the dwelling times between toll section 1 and toll section 2

Based on the model calculations and traffic expertise a concept for future upgrades of heavy vehicle parking areas is developed by the authors.

Conclusion

The modelling tool presented in the paper enables a new technique for analysing HV parking areas and upgrade strategies. The model is developed with an adaptive approach to cover different road networks, turnovers and a variety of input data. It can be used for any road section and user scenarios.

Due to the extensive input data that is used for prediction of capacity utilization the tool can be used or if required also be modified to be suitable for different use cases and assessment regions. Main benefit of this new assessment tool is the consideration of driver's needs, maximum driving times, additional regulations and realistic input data from the ASFINAG toll system.

References

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