Determination of turning rates using Floating Car Data

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Abstract
Turning rates are a crucial base for traffic volume maps as well as for traffic flow simulations. Manual determination is state of the art. More efficient is automated determination. An approach based on interpretation of Floating Car Data has been developed and tested. There is a high correlation between fully automated generated results and results of manual campaigns. 80 % of comparative cases have a deviation less than 20 %. Much better temporal and spatial turning rate availability is obtainable so. Last but not least lower efforts are caused using such an approach.

Keywords:
traffic planning, traffic simulation, turning rate, floating car data

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Floating car & floating phone data (2)

Turning rates – the fraction of traffic flows on crossings – are needed for long term (traffic planning, f. i. traffic volume maps) as well as for operational tasks (traffic management, f. i. traffic flow simulations). Manual determination is state of the art. Volumes of turnings are captured on days with - supposed - representative traffic conditions. The efforts by counting by field workers cause a strong focused use. Fully automated detection is restricted by costs. An extensive detection base, moreover traffic management purposes, is needed. So detection is used typically complementary to manual campaigns. Against this background the designated permanent and area wide determination of turning rates opened up by additional benefits of existing structures is getting more and more into focus. A new approach, determine turning rates using a taxi floating car system, will be presented.

The construction of a floating car system was ordered by Dresden Department of Transportation in 2007 to get a larger data base for their traffic management system. A cooperation with Dresden taxi co-operative has been arranged. There are about 500 vehicles which stand out due to high driving performance. Wide area coverage is caused by that. A short capturing interval was chosen. Vehicle positions are recorded every five seconds added by extra records for stops and starts. A complete reconstruction of driven routes is possible only by map matching. This circumstance is base for further analysis.

To determine turning rates, floating car records representing turnings are recorded. Following they are sorted by crossing accesses. Fraction is calculated in each case. For a test scenario a comparison between manual logging and the results of such an automated approach was realised (see Figure 1).

Result lists of more than 70 manual crossing counts were used. They include in sum more than 1.2 million turnings on about 600 turning relations in more than 200 crossing accesses. Representativeness was guaranteed by selection of eligible acquisition dates and times. Acquisition took place in third and fourth quarter 2009 all over the urban road network, including major as well as secondary crossings.

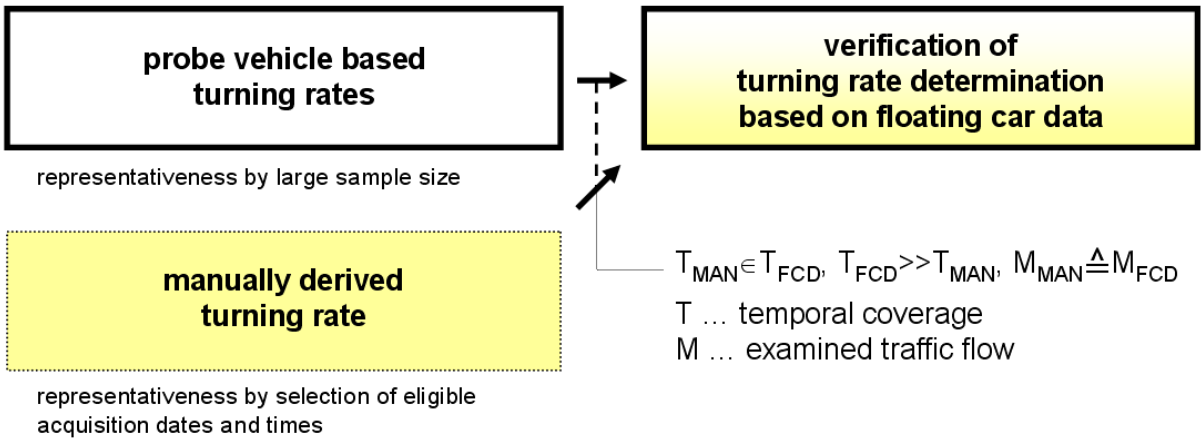

Figure 1 – Comparison between manually and automated determined turning rates

500.000 data sets recorded in third and fourth quarter 2009 were used to achieve comparability and representativeness for floating car data. A minimum of turnings per crossing access was defined. So turning rates of 200 crossing accesses could be determined finally and compared with results of manual campaigns. Result is a high correlation. 80 % of comparative cases have a deviation less than 20 % (see Figure 2).

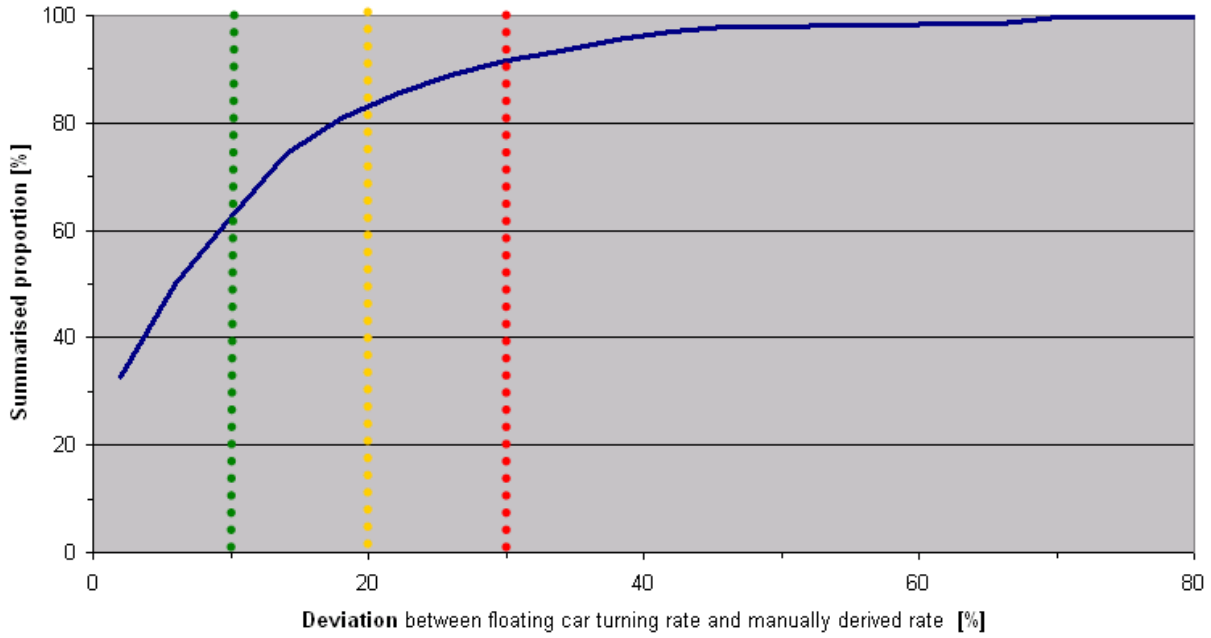

Figure 2 – Quality of turning rates derived from Floating Car Data

Typical use cases would be realisations in agglomerations or rural area with available floating car fleets (f. i. taxi and delivery fleets). Best conditions are foresight by opening up potentials of smartphones. It is a widespread technology still with high potential of growth. The described approach for turning rate determination seems to be portable with low customising only. Much better temporal and spatial coverage would be caused in both cases.

Selected references

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